FINAL REPORT ON

Broadband Assessment and Feasibility Analysis

HRGreen

102 South Tejon Street, Suite1100

Colorado Springs, CO 80903

Phone: 719.644.7077

Fax: 855.641.5877

PREPARED FOR

Town of Buena Vista

Town of Buena Vista

210 East Main Street

P.O. Box 2002

Buena Vista, CO 81211

August 23, 2017

HRGreen

102 South Tejon Street | Suite1100 | Colorado Springs, CO 80903
Main 719.644.7077 + **Fax** 855.641.5877

HRGREEN.COM

August 23, 2017

Phillip Puckett

Town Administrator
Town of Buena Vista
210 East Main Street
P.O. Box 2002
Buena Vista, CO 81211

Subject: **Report on Broadband Assessment and Feasibility Analysis**

Dear Mr. Puckett:

HR Green, Inc. (HR Green) is pleased to present to this report on the Town of Buena Vista's Broadband Assessment and Feasibility Analysis.

This report summarizes dozens of hours of individual and group interviews, hundreds of survey responses and more than 200 hours of work by HR Green and its partners to carefully study the issues identified by the Town as critical to the future direction of broadband for the community.

We appreciate the time spent by the Board of Trustees on August 8, 2017. During this discussion, we identified several issues that required follow up, and additional conversations were held with regional economic development and county officials, and private providers. The results of these discussions have been incorporated into this final report to the town. We are ready to help you continue to advance this initiative in whatever way we can and encourage you to continue to pursue your Town's broadband goals.

Sincerely,

David S. Zelenok, PE
Local Governmental Services Manager

Edward Barrett
Project Manager/Director of Broadband Services

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Section 1 Executive Summary

The Town of Buena Vista contracted HR Green and its teaming partners in the Spring of 2017 to provide a comprehensive broadband assessment and feasibility study ("Study"). Since this time, the HR Green team has invested more than 200 hours of effort to identify current community and regional fiber assets, collect and analyze public input, and study technical and financial solutions for both publicly-deployed and public private partnership (P3) alternatives.

This study will be discussed with community leaders at an August 8, 2017 working session of the Buena Vista Board of Trustees and we encourage the review of this report to enable a robust conversation on the broadband future of the Town. There are Five Key Findings that are discussed throughout the report.

FINDING #1: **Residents Are Not Satisfied with Current Provider Options**
During the public involvement phase, a public survey was conducted for residents and businesses. The residential survey indicated that, with the exception of customers on Charter, no other providers are meeting the Federal Communications Commission's definition of Advanced Telecommunication Services of 25 Megabits per second (Mbps) download and 3 Mbps upload speed. Residents also perceive a gap between the price paid and the value received for broadband services, and indicated unhappiness with too-frequent service outages. This creates an environment where public demand appears to support a Town-led broadband initiative.

FINDING #2: **Backhaul is Available and Physical Redundancy is Coming**
HR Green conducted an extensive survey of both town and regional fiber assets in a search for a physically-redundant fiber optic network path. Redundant fiber optic backhaul is often seen as a cricial contributor to ***reliability*** since a seemingly small cut through a fiber optic cable miles away can reduce or eliminate service to the world wide web. The town's current backhaul path into Buena Vista runs exclusively between Salida. A single, wayward cut to the path anywhere along Highway 285 can result in outages for the entire Town.

> ***"I think it is very important for the future of BV to have high speed internet service because the world is changing very rapidly and rural areas will be left behind or left out if high speed internet is not available." – Survey Respondent***

CenturyLink has proposed the construction of a redundant path over Cottonwood Pass and into Gunnison, but it is likely that this will not be commercially available until at least 2019. However, even if this path is built, it is unclear whether and how connection to another primary Internet Transit Point (e.g. 910 Building in Denver, St. Lake, etc.) would exist. Our investigation uncovered that Mammoth Networks is now working toward creating offering a newphysically redundant path in Q4/2017 or Q1/2018. This Mammoth service, when offered, has the potential to significantly enhance the redundancy and increase competition among major "backhaul" providers in the region. More detail about these new connections is contained in **Section 6.** The current business case model assumes the purchase of 10Gbps lambdas from CenturyLink,

but the Mammoth connection would provide Buena Vista with superior physical redundancy at the point it becomes available for commercial use.

FINDING #3: **Municipal-Retail Broadband is Feasible for Buena Vista**

Our study evaluated five possible business models which would advance Buena Vista's goals. The results of this study are further discussed in Section 9 of this report. The most successful U.S. business model, and one discussed as a preferred alternative during HR Green's kickoff meeting with Town Staff, is the delivery of retail broadband services via a town owned and operated network.

Figure 1 – Communications equipment on a utility pole in Buena Vista, CO.

This model requires a significant up-front deployment of capital to fund the buildout and operating losses as the new service provider ramps its subscriber base and becomes a viable operating concern. Two scenarios evaluated the cost and pro-forma financials of a ubiquitous build covering every residence and business in the Buena Vista town limits. Full details of this model are found in Section 10.

The preferred alternative, should the Town pursue a Municipal Retail Model, estimates the following costs and returns:

- $4.3 Million spend to cover the capital outlay and operational costs for three years allowing the new entity to reach cash-flow positive stature.
- Earnings Before Taxes, Interest, Depreciation & Allowances (EBTIDA) turns cash-flow positive in Year 3 of implementation.
- Take rates were estimated to reach 44% of residents and 30% of business in the first three-years of operation, rising to 54%/45% by year 10. This is reasonable and comports with national experience by other municipalities.
- Buildout would begin in May 2018 and continue to completion by August 2019. A pilot neighborhood would begin in July of 2018 with selection determined by initial customer early sign-ups.
- Pricing for services would range from $15 for 5Mbps to $139 for fully symmetrical, 1Gbps service for residential customers.

- Multiple governance solutions exist for operating such and organization including town department, separate non-profit organization with oversight by the Town and even the contracting of operations to the private sector. Contracting is similar but not the same as P3 approaches discussed next.

FINDING #4: **Public-Private Partnerships (P3) are unlikely but possible.**

Buena Vista has several local parties who either provide services today or have expressed an interest in being part of the future solution for the Town. Central Colorado Telecom (CCT) has invested its resources to provide an alternative service delivery model by providing a wireless internet alternative to residents and businesses. CCT is also providing fiber services to 20-30 business and residential customers on a limited deployment, 6-strand fiber network. They have expressed interest in being a provider, and also expressed concerns that a municipal build would jeopardize their prior investments. Another local resource may be Blue Tail Technology, owned by Alex Telthorst. Blue Tail is an experienced regional network operator in Colorado, and Alex has expressed an interest in participating with the Town. Sangre de Cristo Electric Association is a willing partner and there may be opportunities to both utilize their infrastructure and to cooperate in some way with their future fiber-to-the-substation communication network.

Figure 2 – A fiber optic line and other communication equipment reflect a more heavily encumbered electrical pole in Buena Vista, CO.

Despite these local resources, it is unlikely that P3 models requiring meaningful private sector investment to build a fiber to the premises (FTTP) service will be attractive to providers. Buena Vista's stated goals were to develop a ubiquitous network for all businesses and residences, with affordable and fair service pricing. The private sector typically seeks a three to five year ROI which is highly unlikely with the feasibility analysis performed. If a P3 option is pursued, Buena Vista's public contribution would be the deployment and investment of the physical infrastructure. This would be accomplished through leveraging a 25-year, low-interest Revenue or General Obligation bond allowing costs to amortized over a much greater period.

It is possible that a private party could be contracted to operate a municipally-owned network, or that other operations agreements could be developed that would be mutually beneficial. Possible constructs of these solutions are further defined in Section 10 of this report, but these negotiations fall outside the scope of this Feasibility Report.

FINDING #5: **Regional Solutions May Offer Future Advantage**

Buena Vista's size limits its ability to amortize build and electronics costs. The scope of this study was limited to the town's physical boundaries, eliminating several neighborhoods to the West and Southeast that could help Buena Vista obtain critical mass, allowing for further reductions in pricing to provided services.

The Town has taken a leadership position in Chaffee County, County government and economic development officials have expressed interest in participating in joint efforts to expand broadband across the area, as are leaders in Salida and surrounding communities. If the Town does not pursue a go-it-alone strategy, we strongly encourage Buena Vista to work with other entities to create Intergovernmental Agreements that may allow aggregation of services to create more attractive financial alternatives for the Town and its residents/businesses.

OBSERVATIONS & RECOMMENDATIONS

The report concludes with four observations that are paired with suggestions to further Buena Vista's goals. Those observations and suggestions are detailed in Section 10 of this report, but our highlighted as follows:

OBSERVATION #1: **Addressable market is a challenge for Buena Vista**

Buena Vista is a vibrant and growing, though relatively small, community of 1,239 households. In the public broadband environment, the importance of size cannot be understated. Infrastructure equipment is constructed and *priced* for larger environments. Further, aggregation of endpoints is central to financial feasibility and profit in the carrier business. We suggest that the Town continue to work to identify surrounding communities or county entities to build mass and increase opportunities to improve aggregation.

> ***Buena Vista should address issues of aggregation and market size by developing mutually-beneficial relationships with Sangre de Cristo Electric, private providers such as Colorado Central Telecom and Blue Tail Technology, and public partners such as Chaffee County, Salida, and the CDOT Regional Director and DOLA.***
> ***– HR Green Recommendation***

OBSERVATION #2: **Deepen your community's technical knowledge base**

The wireless networks installed and planned are upgrades to the current state in Buena Vista but are unlikely to provide long-term solutions to the issues the Town faces. Even with the advent of 5G cellular and newer Wi-Fi standards, proprietary wireless solutions are not a long-term replacement for fiber optics, given the current and projected growth rates of data use in this country.

We strongly recommend the Town develop a standing technology group of community "champions" - committed individuals willing to seek funding, expand the ongoing work and continue to learn and plan for the Town's broadband future.

OBSERVATION #3: **Develop procedures to take full advantage of private and public sector opportunities related to fiber optic infrastructure.**

The Town has created "fiber readiness" with its recent approach to the CDOT construction on Highway 24. Continue to develop a rudimentary vision or master plan of the Town's future needs for publically-owned fiber optic infrastructure and create public policy to advance that vision.

OBSERVATION #4: **Step carefully when considering P3 solutions**

We believe the Town must be realistic when considering the creation of public-private partnerships. It is understandable to want to seek private sector investment, but you must understand that the factors discussed in this report may make Buena Vista's goals very difficult to achieve via private sector partners. Our research into the Town's current broadband environment shows a community that faces challenges with limited availability of high speeds and above-national-average pricing.

In order to develop a sustainable deployment model, our analysis assumed an increase in prices and a significant reduction in Capital Expenditures (Capex) spending. A private provider would not turn EBITDA positive until the third year, and would have lost more than $1 million in operating costs to deliver the ubiquitous solution the Town seeks. This finding means a private partner is highly unlikely to pursue a full buildout without significant concessions/investments by the Town.

In summary, our advice to the town: Pursue your goals; pursue your objectives.

Fiber to the Home is definitely feasible over the long-term in Buena Vista, but it will require local government support to make it happen. All but a small handful of communities have been successful. Over 400 communities nationwide have found themselves in your position and are investing and prospering through their persistence and hard work. Each of those communities has stories to tell, lessons to offer. Each and every one of those cities has seen enhanced economic development, enabling private sector and improvements in the community's quality of life. It can be yours too.

Section 2 Business Case Needs

A ROBUST PUBLIC OUTREACH PROGRAM

In order to better understand the needs of the community, an aggressive public outreach program was launched by HR Green, and supported by Town staff. HR Green's partner, Blakey + Company deployed a residential and business survey and generated community awareness through a robust engagement plan. This program was designed to inform local residents about the study, promoted the Town's public meeting on March 27th, and encouraged residents and businesses to fill out the survey. These efforts included:

- Public Relations — Press releases were sent to the local newspaper and radio stations. The press releases were followed by phone calls to ensure receipt of the information and to encourage coverage of the study and public meeting. The Chaffee County Times ran an article about the study and published the day and time for the public meeting. The local radio stations all ran announcements about the public meeting in the week leading up to the event.

- Town Website Notices — Information about the study and links to the surveys were provided on the Town of Buena Vista website.

- Email Messages — An email message about the study, public meeting and links to the surveys was distributed by the Buena Vista Chamber of Commerce and Visitor Center to their main distribution list.

- Town Newsletter — Information about the study, public meeting and surveys was included in the Town of Buena Vista monthly newsletter that runs in the Chaffee County Times.

- Information Table — Blakely + Company staffed an information table at the Buena Vista Public Library on Saturday, March 25th and distributed information about the public meeting and hard copies of the surveys.

> ***"I don't feel our businesses are very well served. Service is slow, has outages and is expensive."***
> ***– Kathi Perry, Executive Director, Buena Vista Chamber of Commerce & Visitor Center***

- Canvassed Local Businesses — On Saturday, March 25th we distributed information about the public meeting and surveys to local businesses throughout Buena Vista.

- Survey Distribution — The Town of Buena Vista distributed surveys to any resident or business owner who preferred to fill out a hard copy survey, rather than taking the online survey.

- Public Meetings — HR Green hosted a public meeting on Monday, March 27th in the evening. Approximately 12 local residents and business owners attended the event. While the number of attendees was lower than projected, the business owners in

attendance had high awareness of the study and provided significant input and ideas about the process.

- Organization/Small Group Meetings — As part of the community outreach program HR Greens staff conducted more than 15 individual or group meetings with members of the Board of Trustees, current and potential service providers and representatives from key local business and community anchor institutions.

The Buena Vista residential and business survey ascertained the current state of communications services in the community, and to determine constituent demand for improved services. Separate surveys were issued to residents and businesses, and responses rates differed significantly between the two groups.

RESIDENTIAL SURVEY FINDINGS

For residential service, 205 survey responses were received, but 114 surveys were fully completed. This results in a 95% confidence level that responses are accurate to within +/-9%. The full findings of the Residential Survey by questions are found in Appendix I of this document. However, there are a number of key findings that are discussed in more detail below, which helps to illustrate the challenging conditions today, and indicate a need for more robust broadband services in the future.

There is a speed gap in Buena Vista

The Federal Communications Commission defines Advance Telecommunication Services (aka, "Broadband") as delivery of services to customers at the minimum of 25 Mbps download speed and 3 Mbps upload speed. It further defines normal use as 100Mbps download. In Buena Vista, three companies currently provide 94.5% of respondents' broadband services, led by Charter with nearly 50.

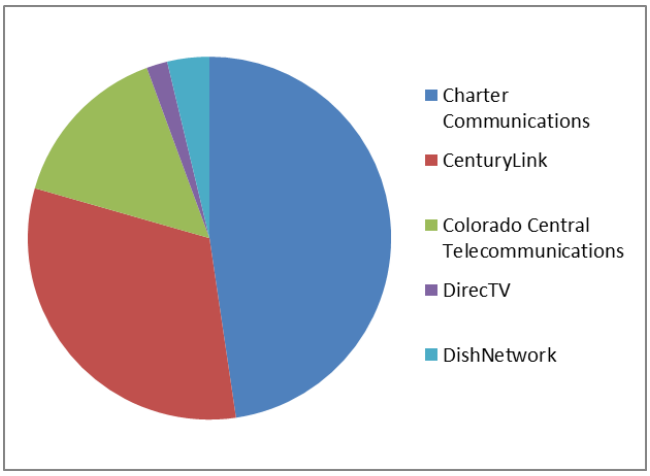

Figure 3 - This chart shows the percent of customers in the survey who indicated their primary broadband services provider.

The deployed residential networks play a significant role in the speeds respondents receive from their provider. Charter is delivering broadband and cable television services via DOCSIS 3.0 architecture over coaxial network, is meeting federal standards, which are generally considered well below actual needs today. Colorado Central Telecom has begun to deliver fiber to the home inside the town limits, but the primary delivery method to its clients is via fixed wireless network architecture. CenturyLink subscribers are receiving services via DSL deployed on an aged copper-based architecture, and Dish and DirecTV households are also likely receiving broadband services via a subcontract to CenturyLink

The graph to the right provides a summary of self-reported speed tests by each respondent based on their provider. As the graphic reflects, only those customers receiving Charter services are receiving services that meet the federal guidelines at a 43.7/5.8 service level. The remaining providers collectively averaged speeds of 8.1/2.4, falling short of even the prior FCC definition of broadband. Stated differently – nearly 66% of the homes responding to this with access to the internet cannot claim that they have **broadband**, and by the FCC's definition, are "underserved."

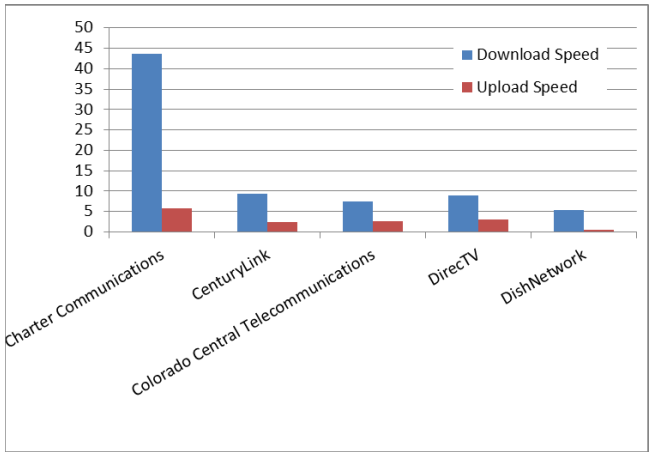

Figure 4 - Average Upload and Download Speeds reported by survey respondents.

Providers are not Meeting Resident Expectations

The survey asked residents to evaluate five key components of customer satisfaction, and also to rate the importance of those five components. The five areas rated were Service Reliability; Speed as Advertised; Customer and Technical Support; Relevant Service Offerings; and Price or Value for Services Received. By mapping these two ratings in the figure at right we can see that importance was generally ranked a full point higher (on a 1-6 scale) for each of the five components.

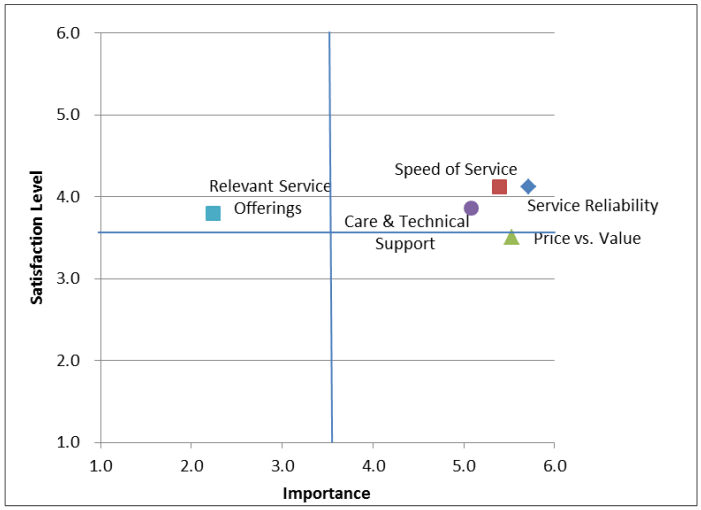

Figure 5 - Survey respondents were asked to rate the Importance and Satisfaction of various broadband categories. Whiles satisfaction scores were in the 3-4 range, far below the perceived importance of most aspects.

Of particular note is the significant gap between the high importance of Price vs. Value for Services Received (5.5 Rating) to residents and the low level of satisfaction with this component (3.5 Rating). This indicates a significant gap between expectation and reality for Buena Vista residents, which is further reinforced by our comparative analysis of current providers, which indicates an average price of $5.95 per Mbps varying from a low of $1 per Mb to $11.25 per Mb. National prices vary significantly depending primarily on the level of competition and provider. In the advanced gigabit cities there has been some solidification of price: 1Gbps (1Gbps is equal to 1,000 Mbps) is normatively $70, 100Mbps is sold for $50 or 7 cents to 50 cents per Mb.

Comcast has announced gigabit services, in a few locations in Colorado, often at $159.95, or 16 cents per Mb. Yet in Kansas City, where they compete with Google Fiber, Comcast sells gigabit service for the new norm of $70. In summary, residents are, frankly receiving comparatively slow speeds and high unit prices, leaving open the door to successful penetration of a higher bandwidth service.

Buena Vista is an "Unbundled" Town – Which Creates Opportunities

TV, Phone and Internet providers have typically relied on a bundled approach to offering services. Known as "double-play" or "triple-play," these service approaches leverage consumer behavior to increase both initial take rates and customer "stickiness" or retention long term. In assessing responses in Buena Vista, it is apparent that residents in the community are much more prone to access services via multiple providers, and maintain a healthy willingness to change providers if and when a prospective alternative is presented.

Seventy-two (72) percent of respondents indicated that they currently have more than one provider of communication services to their home. Surprisingly, 80% of respondents indicated that they are either somewhat or very likely to purchase internet as a standalone service. Also, importantly, 79% of them indicated they were somewhat or very likely to purchase internet services from the "Town of Buena Vista or one of its partners."

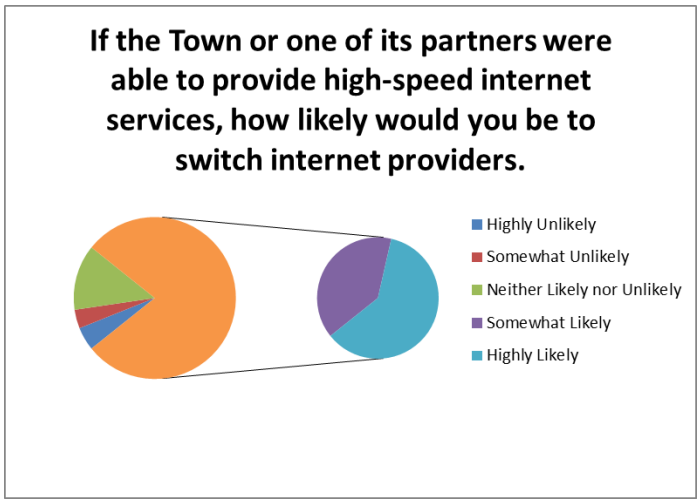

Figure 6 - Nearly 80% of residents indicated they were likely or very likely to purchase internet services from the Town of Buena Vista or one of its partners.

Outages are Too Common

Survey respondents indicated a high occurrence of internet outages through their current provides when compared to national averages. Thirty-seven (37) percent of respondents indicated that they have an hour-long outage on at least once a week. Additionally, 47 percent of respondents indicated they have an hour-long outage at least monthly (see figure at right).

Most internet service providers (ISPs) attempt to attain a 99.999% (commonly referred to as "five nines") of network availability. This equates to total service outages of time, meaning a total service outage goal of just five minutes per YEAR of service. Yet, in total, 84% of Buena Vista area respondents reported more frequent and more severe outages on at least a monthly basis.

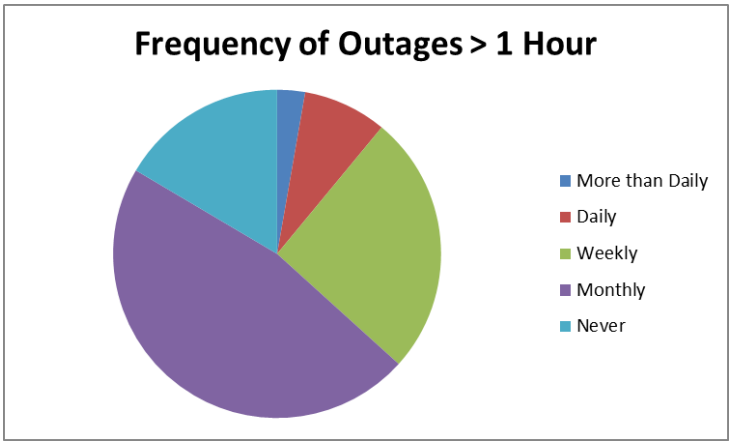

Figure 7 - Outages are a persistent problem for residents of Buena Vista. This chart shows the frequency of outages reported by residents responding to the survey.

A review of comments indicates dissatisfaction with this issue, but also little outrage over such outages reflecting the unfortunate acceptance of this as the "local normal," where outages are viewed as a "price of living in Buena Vista." Residents need and deserve higher reliability for services in the community.

BUSINESS SURVEY FINDINGS

Business responses were muted and there were not enough responses to create a statistically relevant analysis. This low number was despite significant outreach efforts through both the Town and its economic development-related entities. Only 23 businesses responded to the survey, and 18 completed the entire survey. Of the 18 completing the entire survey, four were associated with technology/communications companies that may have a vested interest in the outcome of the study.

Outreach to businesses included email messages distributed by the Buena Vista Chamber of Commerce and Visitor Center and an afternoon cavass of local businesses. However, these efforts were unable to drive a meaningful response rate. Because of the low response rate, the discussion of business survey results should be viewed as anecdotal and NOT statistically valid.

Responses to the Business survey are summarized below:

- 18 of the respondents said their name could be shared with Town officials (A4)
- 15 of the respondents said their business was headquartered in Buena Vista. (Q5)
- Four respondents were retail stores, four were other consumer products/services and 11 listed "other." Of the "other" respondents, two were motels and four were internet/technology related companies. (Q6)
- Ten of the respondents employ less than five people in their company. (Q7)
- Eighteen (18) respondents answered question #8 and all indicated they have an internet service subscription.
- Ten (10) respondents use Charter Communications for their internet services. (Q10)
- Eleven (11) respondents pay between $50.00 and $99.00 per month for their internet service. (Q11)
- The types of internet service included cable (8 responses), satellite internet (3) and fiber optic connection (3). There were 17 total responses. (Q12)
- Questions 13 and 14 need to be looked at together. They ask respondents to rate their level of satisfaction and level of importance (ratings were on a six point scale where 6 was the highest rating) for five elements of their internet service. In all cases satisfaction was below importance. The largest gap was for service reliability (1.27) and the narrowest gap was for relevant service offerings (.19). (Q13 and Q14)

	Satisfaction	Importance	Gap
Service Reliability	**4.67**	**5.94**	**1.27**
Speed as advertised	**4.67**	**5.83**	**1.16**
Price or value for services received	**4.50**	**5.44**	**.94**
Customer and technical support	**4.61**	**5.50**	**.89**
Relevant service offerings	**4.56**	**4.75**	**.19**

- Four of respondents said their internet service was never unavailable. Nine (9) said it was unavailable less than one hour **per month**. (Q15)
- When asked how satisfied they were with the speeds and options available from local internet providers, the respondents averaged 3.44 on a scale of 1 to 5.
- All three of the respondents who indicated a one or two, said speed was the primary reason for their dissatisfaction. (Q16 and Q17))

- Average upload speed reported was 111.30 Mb per second. The average was skewed by two reports of 375 and 600 Mb per second. The average download speed reported was 117.21, with the same two people reporting 375 and 600 Mb per second for download speed. (Q19)
- Fourteen (14) respondents said they would be interested in a broadband service that had greater reliability and speed for a comparable price to their current service. (Q20)
- Ten (10) respondents said availability of high-speed, broadband internet service has had some to significant impact on their plans to expand their business. The other eight said it has had little to no impact. (Q21)
- Two (2) of the respondents said they had considered moving or relocating their business as a result of limited access to high-speed, broadband internet services. (Q22)
- Nine (9) of the respondents said they would somewhat or very likely to switch to high speed internet services provided by the Town of Buena Vista or one of its partners. Four (4) were neutral and four (4) were very unlikely to switch. (Q24)
- Only six respondents feel it's appropriate for the Town of Buena Vista or one of its partners to offer internet services, even if they compete with private sector companies. (Q25)

Section 3 Market Assessment

OVERVIEW OF EXISTING INTERNET SERVICE PROVIDERS IN BUENA VISTA

At present, residents and businesses in Buena Vista, CO. (zip code 81211) can obtain internet access services from a variety of ISPs and WISPs (wireless internet service providers) via DSL (over copper), cable, fixed wireless, and satellite. Our review of available service providers indicates that there are three providers operating fiber networks within town boundaries (although Colorado Central Telecom is the only residential service provider.

This section describes consumer internet offerings available to residents and businesses from seven established ISPs and WISPs. Its goal is to draw a representative picture of the internet market in Buena Vista and include one or more providers that serve their customers via copper (DSL), cable, fixed-wireless, and satellite. Given the relative remoteness (in comparison to Front Range cities for instance) and relatively low population density of Buena Vista, great care has been taken to characterize the availability of internet access in Buena Vista by provider and transport media, and to limit inclusion in this list to providers for which a meaningful degree of availability and customer penetration can be verified.

The on-line ads of a number of ISPs attempt to claim that their services are available ubiquitously across an entire region of the country while further analysis often leads to the conclusion that their actual penetration in a given area is too low to be of significance to the larger study. Given Buena Vista's relatively low population density outside the core downtown area and its location relative to other population centers it is important to keep a provider's primary access media in mind (copper, satellite, etc) as some media are inherently better suited, performance wise or cost wise, to a given population distribution and its topography.

The following statistics describe internet availability by transport medium (DSL, cable, etc.) in Buena Vista with data drawn from two dedicated websites [4,6] which are consistent in every regard excepting one small variance, residential cable availability, which is noted below.

INTERNET PROVIDERS IN 81211 (BUENA VISTA, CO) [4,6]

"There are 4 home internet options and 6 business internet companies with available service in Buena Vista 81211. 80.6% of customers can get fixed-line service. The number of providers in this zip is about average".

Internet service providers (ISPs) in 81211:

- 1 DSL provider
- 1 cable providers
- 1 fixed wireless provider
- 3 business providers
- Satellite TV & internet providers

Internet service type	Availability: Percentage of residents with access to this service type
Fiber	0%
Cable	60%[6], 64%[4]
DSL	79%
Fixed wireless	80.6%
Satellite	99%

The following table provides an overview of the most popular ISPs in Buena Vista and their entry level service packages.[1,2,3,4,5,6] **Note: The rates in this table reflect the promotional pricing that ISPs typically offer for the first 12 – 24 months of service, customarily with a term commitment of similar duration.** Longer term, non-promotional rates are discussed further down**.**

Service Type	Provider	Monthly rates starting at Res/Business	Speeds starting at "up to" (down/up)	Availability (Residential/ Business)	Consumer rating 5 = best
DSL (copper)	CenturyLink	$34.95/$29.99	12M/1M (res) 7M/1M (bus)	79%/75%	2
Cable	Charter	$39.99/$59.99	60M/5M	60 – 65%	3
Fixed wireless	CCT	$44.95/$54.95	4M/1M	89.9% res	4
Satellite	HughesNet	$49.99/NA	25M/3M	>100%	5
	Excede	$49.99/NA	12M/3M	>100%	4
	Dish	$59.99	10M/NA	>100%	N/A

In interpreting and providing a proper context for viewing the data in the above table, which should be used as a guideline for understanding the present state of internet services in Buena Vista, rather than an absolute measure, a few notes are in order.

- In regards to speeds, all ISPs advertise a maximum achievable or "up to" data speed which is what a consumer can expect to experience only under the best of all circumstances. The actual speeds enjoyed by customers on average are typically lower than the advertised "up to" speeds and can be highly variable across a given 24 hour period. This is because all internet service providers, regardless of transport medium, employ in their designs some degree of concentration and sharing of network resources. In a survey of informational and provider websites, no service provider publishes a guaranteed minimum throughput speed.

- The incumbent provider of basic telephony services and DSL (internet access over copper) is CenturyLink (CTL). DSL is a competitive product whose realized speeds can vary significantly due to a number of factors, from as low as 1Mbps/.25Mbps to 12M/3M, but engineering guidelines typically dictate that the distance to the customer from the central office or DSLAM (Digital Subscriber Line Access Module) will not exceed 5,000 ft. of data-conditioned cable to qualify for DSL at all. Yet sources [2,4] indicate that DSL is available to 79% of the residential market and 75% of business customers in Buena Vista.

- At the opposite end of the availability spectrum is satellite service. Because of their extra-terrestrial access scheme, satellite service providers theoretically can, and in practice often do, boast of availability approaching 100%.

Here is a representative statement from HughesNet's website describing the availability of their internet services. *"Because HughesNet® provides Internet service to customers through the use of satellite technology, virtually every residential home and business in the continental U.S. can get HughesNet service. Service can be installed in any building with a clear view of the southern sky, making it a great option for people who live in rural areas".*

This is of particular applicability to Buena Vista given the middling penetration of twisted-pair copper and coaxial cable facilities.

It is our professional opinion (confirmed by a review of survey responses) that satellite providers offer a very unsatisfying, and low-speed option as a provider of broadband services. Further lessening the attractiveness of satellite providers are frequent and aggressive overall data caps, which limit the overall consumption (similar to cellular plans that cap data use on their networks).

NON-PROMOTIONAL, MONTHLY RECURRING CHARGES AND HOW SERVICE PROVIDERS DIFFER IN ADVERTISING AND FURNISHING THE RANGE OF SERVICE PLANS:

An analysis of the extended term service plans and various tiers available from the mix of ISPs providing internet services in Buena Vista (and other cities) reveals that the key differentiating factors between plans and their prices is sometimes a business decision, but is more often tied to the underlying transport technology (i.e. DSL, fixed wireless, satellite). To compare and contrast these various service plans, the major ISPs in Buena Vista will each now be discussed in detail.

Charter (Spectrum Internet). After 12 months of introductory pricing ($39.99 res, $59.99 business), this cable provider quotes the following. Residential rates: $75/month for "up to" 60Mbps/5Mbps. Business services are available as either $79.99/month for 60M/4M, or $119.99 for 100M/7M service.

HughesNet. This ISP provides internet access via satellite. The key aspect that differentiates it and other satellite operators from terrestrial purveyors is not speed but data caps - how much data is allowed per month in a given plan. As you increase in service tiers, you pay more for more data. The downstream/upstream data rates for all residential and business plans is 25M/3M, starting at $49.95 for residential service plus $14.95 monthly for rental of a dish and modem and 10Gig of "anytime" data. Business plans start at $69.95/month plus $19.95 monthly for equipment rental plus a $99 a one-time setup fee for 10Gig of "anytime" data. 25Gig of anytime data is available to business customers for $99.99 a month plus equipment rental and set up fees.

excede. excede is another satellite-based service provider. Like Hughes, all residential and business service plans advertise the same data rates of 12M/3M while data caps increase with more expensive plans starting at 12Gig residential and 30Gig for business plans. Business plans, which come with a static ip address, start at $200/month for 30Gig of anytime data, and incur a $600 one time installation fee. There are no installation fees for residential service. Note

however, for home-based businesses, even if the subscriber has a dish to receive residential services, a second dish is required to access business services. As data caps are met or exceeded, the customer is not charged for data overages but the speeds they experience are lowered.

Being neither evasive nor opaque, excede would not provide specific price points for extended service arrangements. Their rationale is interesting. excede is deploying a new, high capacity, state of the art communications satellite which their website claims should be operational by 4Q17. Their reticence to discuss pricing is based on the fact that they want to see how well the new satellite actually performs and the total data throughput that it will be capable of.

CenturyLink (CTL). Two direct inquiries regarding CTL's service plans yielded the promotional pricing included in the above table. However, in adherence to internal policies, CTL declined to discuss non-promotional pricing, stating that they do not know how pricing will change once the initial, promotional contract had expired.

Colorado Central Telecom (CCT). CCT is a fixed wireless ISP based in Buena Vista that offers internet service in the town and in adjoining communities in Chaffee County. CCT also provides FTTP (fiber to the premises, home or business) to a small number of customers in Buena Vista's core downtown area (less than 20 business and 20 residential customers as of this report writing). In addition to being a local operator, there are a few key parameters that set CCT apart from other purveyors in that they have no term commitments, no data caps, and no introductory, or promotional pricing for their wireless broadband product. They offer residential and business fiber-based data products offering higher speeds, as well. The fiber products do have a no-term-commitment option at a higher price point, but the table below reflects the lowest available pricing given a term commitment as noted. The next two tables describe their residential and business service plans.

Colorado Central Telecom[7]

Business Service Package	Cost per Month	Data Rates (down/up)	Data Cap	Term Commitment?
Home Basic	$44.95	4M/1M	None	No
Home Plus	$69.95	8M/2M	None	No
Home Premium	$89.95	12M/2M	None	No
Fiber	$44.95	5M/1M	None	One Year
Fiber	$74.95	50M/5M	None	One Year
Fiber	$99.95	100M/10M	None	One Year
Fiber	$124.95	150M/15M	None	One Year

Business Service Package	Cost per Month	Data Rates (down/up)	Data Cap	Term Commitment?
Business Basic	$54.95	4M/1M	None	No
Business Plus	$79.95	8M/1.5M	None	No
Business Premium	$99.95	12M/2M	None	No
Fiber	$89.95	50M/5M	None	Two Years
Fiber	$99.95	75M/7.5M	None	Two Years
Fiber	$149.95	100M/10M	None	Two Years
Fiber	$199.95	150M/15M	None	Two Years

As there are three satellite service providers in Buena Vista, all with comparable service offerings, one could theoretically argue that due to the presence of these providers that excluding cost, everyone in Buena Vista should be able to have internet access.

But observations and independent analysis[1] tell a different story. Availability cannot be equated with commitment. In Buena Vista, the number of actual internet service subscribers falls far short of the number of potential customers with coverage available via one or more technologies, i.e. satellite only (>100%), fixed-wireless (>90%), or DSL (79%). The reasons for this shortfall of internet access subscribers versus service availability are an area worthy of further investigation.

The website www.broadbandsearch.net summarizes their assessment of the situation as follows. *"**Underachiever.** Things are looking rough for Buena Vista, CO. for broadband service. An underdog score of 26 was calculated based upon poor coverage, slow download and upload speeds, restrictive package pricing, and less than favorable user testimonials".*

VOICE AND VIDEO SERVICES

The primary focus of HR Green's competitive analysis was competing private broadband services. However, a complete analysis of the competitive marketplace is not complete without also understanding pricing for Voice and Video Services. Most providers seek to create value-added bundles of services, for instance a bundle of Voice, Video and Data (broadband) is frequently referred to as a "Triple Play" bundle.

A review of pricing, below, shows services provide by the primary carriers for standalone voice and video services. Bundling discounts become more complex than can be adequately reflected but are considered in the financial models created for Buena Vista's consideration.

Voice Provider	Residential Starting Monthly Phone Rates	Business Starting Monthly Phone Rates
CenturyLink	$19.00	Not Available
Charter	$19.99	$29.99
CCT	$34.55 (VoIP)	$34.55/Line

Video Provider	Basic Package	MidTier Package	TopTier Package
CenturyLink*	**$29.99**	**$39.99**	**$44.99**
Charter*	**$64.99**	**$84.99**	**$104.99**
CCT	**Future Service**	**Future Service**	**Future Service**
Dish*	**$49.99**	**$59.99**	**$69.99/$79.99**
DirecTV*	**$50.00**	**$70.00**	**$125.00**

* Introductory Rates offered with contract.

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3. www.internetprovidersbyzip.com
4. www.highspeedinternet.com
5. www.decisiondata.org
6. www.inmyarea.com
7. https://uwn.com/colorado-central-telecom-llc
8. http://www.satelliteinternet.com/plans-pricing

Section 4 GIS Based Asset Map

GIS-BASED ASSET MAP

As part of the study, the HR Green team created a comprehensive map of the fiber assets in and around the Town of Buena Vista. This map is available and will be provided to Town staff in conjunction with the delivery of the final report to the Board of Trustees and in the Esri-compatible version identified in the contract.

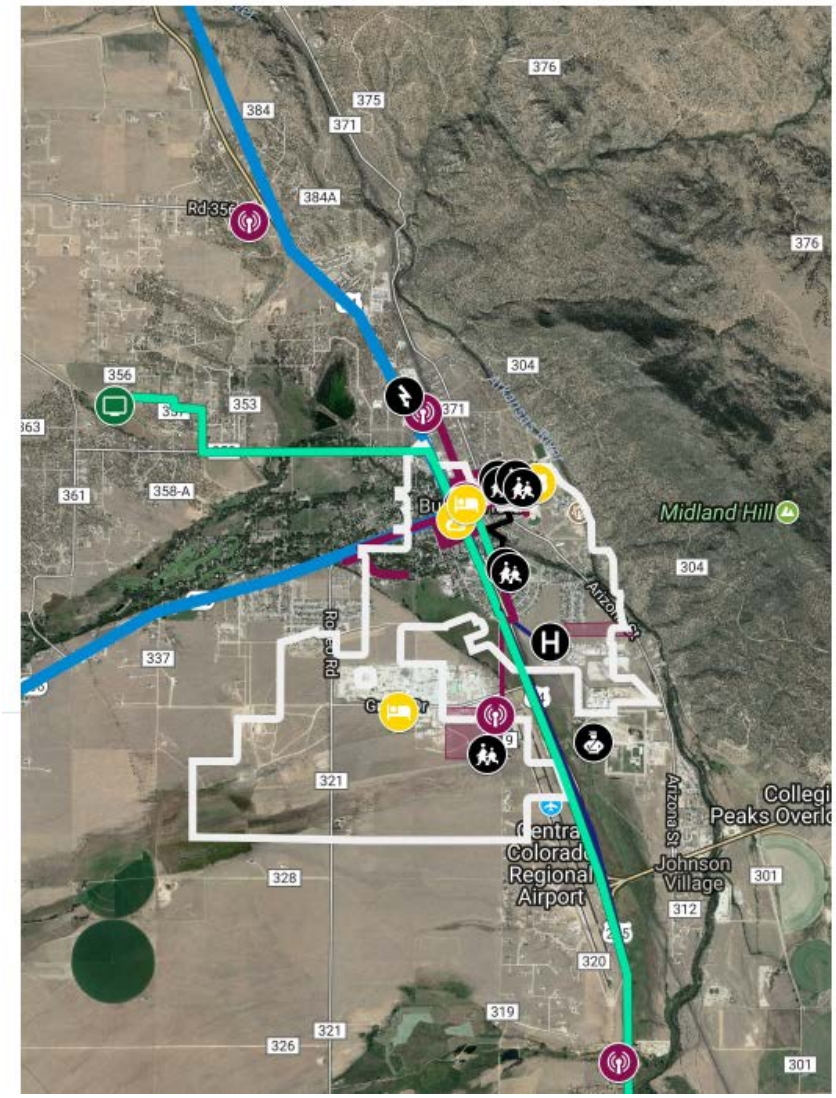

Figure 8 - This chart depicts the current fiber assets of incumbent providers in and around Buena Vista.

Section 5 Gap Analysis

A consolidated overview of the most crucial perceived gaps in service, speed, pricing and reliability were discussed in Section 3 of this document.

Section 6 Evaluate the Town's Fiber Optic Network Capabilities

TOWN OF BUENA VISTA CAPABILITIES

The Town has chosen to deploy a non-fiber based communication system as both the backbone for town communication needs, and to power a Public Wi-Fi program to provide service to residents and community visitors.

The current town pilot project solution is based on the use of point-to-point, licensed and unlicensed microwave spectrum to link the town's public facilities and anchor institutions, and provide a middle mile solution for community use.

The private middle-mile network is designed to provide high-speed connectivity between public facilities, as indicated in the backhaul and aggregation network diagram to the right.

In addition to the middle mile network for use by the town, the pilot project includes the deployment of a publicly-accessible Wi-Fi deployment at McPhelemy, Columbine and River parks. This network is designed to enhance public access to broadband services.

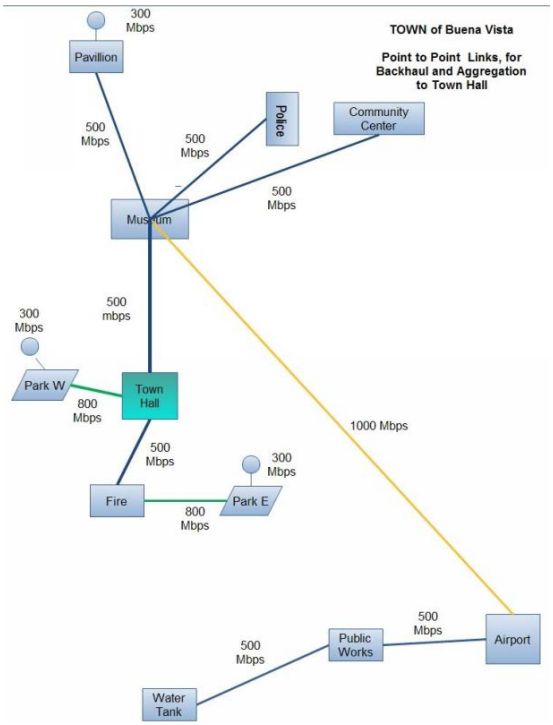

Figure 9 - A map of the current wireless access network installed by the Town of Buena Vista

The Town of Buena Vista has constructed a Data Center at the Public Works building that currently houses the primary server center for the town. It is possible that this facility could serve as the future data center for an FTTP deployment and house necessary Inside Plant Equipment.

A complete technical analysis of the capacity of this facility was not completed as a scope item for this study. While suitable for the town's current service needs, its location on the second floor of a pole barn building would require further study as a suitable location for a communications head-end location due to concerns with HVAC capacity. The feasibility analysis does not include additional cost to build/equip the data center with further equipment.

Figure 10 - Buena Vista Information Technology Director Larry Deffenbaugh stands inside the Server Room at the city's Public Works Building.

OTHER LOCAL FIBER ASSETS

HR Green conducted a review of the deployed fiber assets of existing communications providers as part of its alternatives for local and backhaul services. Currently, there are three providers providing fiber-based services with last mile connectivity to business and residential customers inside the boundaries of the Town of Buena Vista.

Colorado Central Telecom currently has a deployed and operational fiber network totaling just less than five route miles. The fiber network is primarily a six-strand network. It was acquired by CCT, who subsequently invested in excess of $100,000 to repair and upgrade the existing, but degraded fiber in the field. They are serving roughly 40 residential and business customers. The network does not provide ubiquitous service across the boundary of the Town limits. It is our professional opinion that – due to the small fiber counts of CCT's deployed fiber – it would be difficult to leverage this fiber to reduce the overall capital cost of deployment.

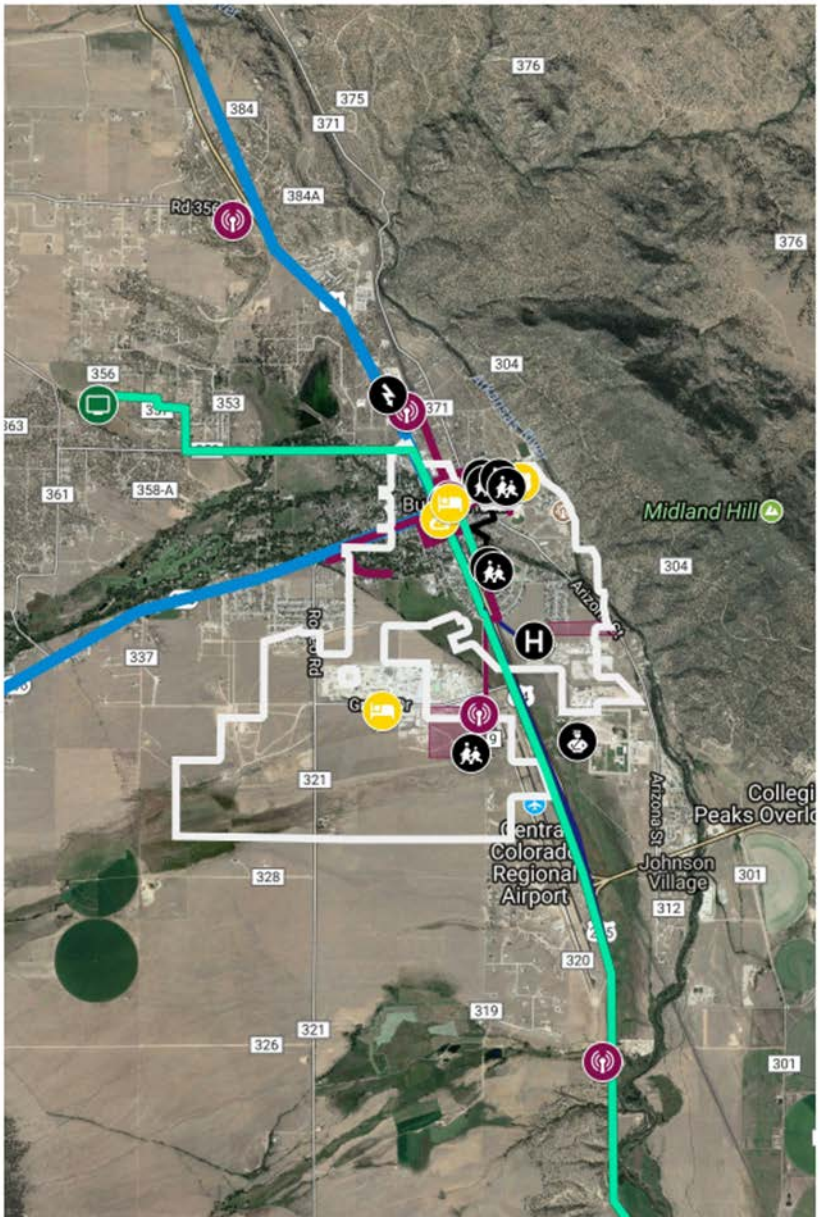

Figure 11 - This map reflects the GIS map prepared by HR Green to show current incumbent fiber assets inside Town Limits. Green lines represent best-known mapping of Charter fiber; purple represents CCT fiber and blue represents current and proposed CenturyLink fiber assets. Black circles represent community anchor institution locations.

CenturyLink and Charter currently have deployed fiber architecture into Buena Vista and are serving communications and business customers with capacity as high as 10Gbps. Both of these providers have a core network travelling from the south of Town along Railroad or Highway 24, and capacity to serve the Airport industrial park and other business accounts. It appears that there are no fiber-based residential services available via these two providers.

BACKHAUL AND REDUNDANCY

HR Green conducted an extensive survey of both town and regional fiber assets in a search for a physically-redundant fiber optic network path. Redundant fiber optic backhaul is often seen as a cricial contributor to ***reliability*** since a seemingly small cut through a fiber optic cable miles away can reduce or eliminate service to the world wide web. The town's current backhaul path into Buena Vista runs exclusively between Salida. A single, wayward cut to the path anywhere along Highway 285 can result in outages for the entire Town.

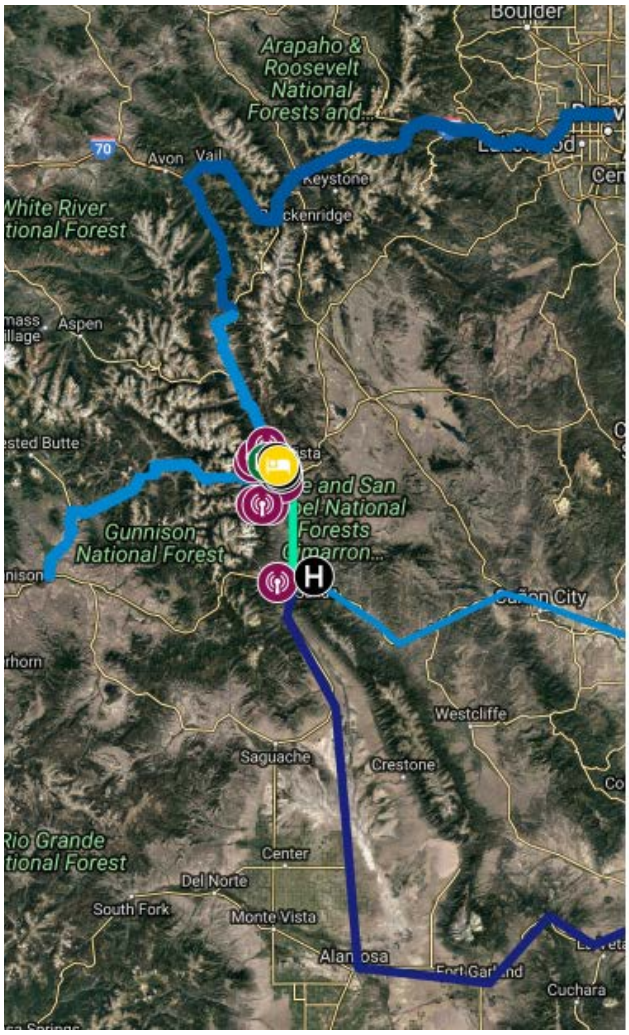

Figure 12 - This map shows a wider view of current and potential backhaul options available through current incumbent providers. The northern route reflects CenturyLink fiber which HR Green understands is available, but currently unlit. The Western path is a proposed route over Cottonwood Pass being constructed in conjunction with the current highway project there.

CenturyLink has proposed the construction of a redundant path over Cottonwood Pass and into Gunnison, but it is likely that this will not be commercially available until at least 2019. However, even if this path is built, it is unclear whether and how connection to another primary Internet Transit Point (e.g. 910 Building in Denver, St. Lake, etc.) would exist.

Our investigation uncovered that Mammoth Networks is in the final implementation stages and has stated they are planning to offer a physically redundant path in Q4/2017 or Q1/2018. While the details are emerging, we understand the physical route will go north from Buena Vista and tie in eventually to the major east/west cable that runs from Denver to Salt Lake City along I-70. The current business case model assumes the purchase of 10Gbps lambdas from CenturyLink, but the Mammoth connection would provide Buena Vista with superior physical redundancy if and when they become available.

There also exist several licensed microwave paths out Buena Vista. These services typically do not provide enough capacity or throughput to support ongoing operations for the Town's potential gigabit-speed broadband services. However, such services could support broadband operations should existing fiber lines be disabled as an emergency backup.

Section 7 Legal and Regulatory Considerations

The legal and regulatory considerations that pertain have historically developed upon service lines. Voice and video services have been the primary, but not sole, focus where regulation exists. The two key regulatory bodies are the Federal Communications Commission (FCC)[1] and the Colorado Public Utilities Commission (the "Commission"). In addition, video franchises are the responsibility of Buena Vista itself, who last issued a transfer of franchise ownership to Charter on March 26, 2013. Listed here are those considerations involving Competitive Local Exchange Carriers (CLECs), interconnected VoIP, video franchising, and a few comments on Broadband Internet Access Service (BIAS). This latter item, BIAS, is under pressure from the new Administration (FCC) and maybe subject to near term adjustment. Indeed, it must be fully understood that regulations change. As such this section is not intended to be exhaustive. Further, it is not intended, nor represents itself, to be legal advice. What is hoped is that this provides a general landscape and education concerning these issues.

One last caveat: This section does not cover such items as tax, environmental, corporate, employment and typical organizational issues. There are also issues that arise "in-and-around" the delivery of services such as owning or renting, utility poles and the rights and responsibilities therein. Some of these corollary regulations are important issues to understand. We include a few of the more current issues in the section on Town Policies, as they are often those regulations that cities themselves have responsibility to establish or administer.

These include such matters as permitting, easements, dig-once policies, small cell deployments, and bars to exclusivity agreements in Multi-dwelling Units (MDUs) or with developers (FCC driven, locally enforced). This last issue – exclusivity – is important for Buena Vista, as it appears that certain recent local practices are outside the intent of FCC rules. In addition, those practices may limit the ability of sustainable FTTH solutions. Lastly, it should be noted that significant regulation exists concerning "cable service." You may find reference to this in some franchise agreements, but those regulations generally do not bear upon FTTH or similar fiber builds. However, copyright protection and privacy notices, particularly as it applies to video content and subscriber information, do apply though it is contained in "cable services" and in general law.

TELECOMMUNICATION SERVICES - INTERCONNECTED VOIP: FEDERAL

Context and Definitions

Within the FCC regulations and the pertinent acts of Congress, are a series of important terms that guide the applicability of any given requirement. The two most important terms are "telecommunications service" (aka: common carriage) and "telecommunications" (aka: private carriage). Telecommunications service is fundamental to the 1996 Telecommunication Act and 1934 Communications Act, both as amended. Although critical for *interstate carriers*, most of the distinctions here do not apply to local municipal entities. These terms also connote whether

[1] Much of the content in this section was collected and codified from the work of Jim Baller and his firm Baller Stokes & Lide. In addition to our thanks for his service over many years, we would like to direct you to www.baller.com as an excellent source of this information. Additionally, much can be learned by visiting the FCC's website at https://apps.fcc.gov

the service being offered is "the transmission among points … without change of the form or content" (i.e. telecommunications) or is being offered to users for a fee (i.e. telecommunications service).

There is no formal definition of "interconnected VoIP" in the Communications Act or in current FCC regulations. However, in recent past years distinction arose between VoIP (not connected to a Public Switch Telephone Network [PSTN]) and "interconnected VoIP" which is so connected. Generally VoIP services are those that: (1) enable real-time, two-way voice communications: (2) require a broadband connection from the user's location; (3) require IP-compatible customer premises equipment (e.g. in Buena Vista's case this would occur in the Optical Network Terminal or ONT); and (4) permit users to receive calls from and terminate calls to the PSTN. What is intended is to reflect that VoIP is a technology that simulates a traditional phone connection such that the use and behavior of this technology is transparent to the end-user.

Within State law reside regulations for Competitive Local Exchange Carriers (CLEC). CLECs, including municipalities, are contained required to obtain a "Certificate of Public Convenience & Necessity" (CPCN). State law does not cover video franchises, leaving that to local municipalities and sometimes Counties. As such we will only enumerate CLEC concerns.

Regulation Content – Voice Requirements

When telecommunication services are offered there are a series of regulations such as "refraining from activities that harm disabled Americas (Section 251); filing of various annual reports (Section 254); protection of consumer privacy (Section 222); and specific concerns such as Communications Assistance to Law Enforcement Act (CALEA)[2]. These various reporting requirements are extensive covering activities from construction and initiation of services to the manner and process of their discontinuance. There are annual fees to be paid *for which government entities are exempt* (e.g. public bodies with elected or appointed officials).[3] Whether excluded from requirement or not, it will serve you well to understand these requirements.

Most importantly, the spirit of these regulations took many years, and much argument, to form. As such they do represent "good practice." Imposed on all providers of "telecommunication services" is the general duty to "(1) to interconnect directly or indirectly with the facilities and equipment of other telecommunications carriers; and (2) not to install network features, functions, or capabilities that do not comply with the guidelines and standards established pursuant to section 255 or 256."[4]

The concerns we are addressing first relate to voice services, whether traditional PSTN technologies called Time Division Multiplexing (TDM) and Signaling System & (SS7) or more current Internet Protocol (IP) based services such as Voice over IP (VoIP). Arguments may exist between different interest groups about which regulations apply only or specifically to one technology or another, but that discussion is clearly beyond our needs here. In truth, it often takes time for legal processes to catch-up with technological changes. For simplicity we will just

[2] See Baller Herbst web site: http://www.baller.com/calea.html.
[3] 47 CFR § 1.1162
[4] 47 U.S.C. § 251

call it voice. There are also pending changes to FCC reporting regulations based on the size of the carrier. When these are finalized they will probably modify some of the following reports. The following are currently the primary requirements or issues.

- **Universal Service Reporting and Contribution (Form 499-A)**
  - A FCC ruling in 2006, and another in 2010, determined that "interconnected VoIP" providers are generally subject to contribution requirements of the Universal Service (USP) Program and Telecommunications Relay Service (TRS) Fund. Certain differences in calculation of this fee were created in these acts that should be understood as they directly affect costs. Most often these fees are added to customer phone charges as a pass through expense. The actual rates are set quarterly and generally range from 12% to 17%. For the first quarter of 2017 the factor was 16.7%, modified by the characteristics for applicable revenues under "interconnected VoIP" rules. USP is highly complex and has been undergoing significant changes during the past number of years. We encourage careful review of these regulations.

- **Local Telephone Competition and Broadband Reporting (Form 477)**
  - This form collects information about wired and wireless local exchange telephone and broadband connections. It is voluminous and must be submitted twice a year. It is off of these reports that information about eligible census blocks needed to administer the Connect America Funds (CAF) is created, amongst others.

- **Customer Proprietary Network Information (CPNI)**
  - FCC rules require service providers to take certain steps to safeguard customer information. In turn providers must notify customers of their rights to privacy and maintain strict compliance with their wishes. Annually providers must file certification acknowledging compliance with CPNI rules, summary of customer complaints related to unauthorized release of such data and identifying and proceedings files against data brokers. Here again the FCC has modified these for "Small Entities" (FCC 07-22, DA 08-1321, June 6, 2008).

- **E911 Service and Backup Battery Obligation**
  - All voice providers must meet several 911-service requirements including location information and service levels. The detail of these requirements can be found in 47 CFR § 9.5. Location is generally acknowledged in FTTH networks as the location of the Optical Network Terminal for most residential entities.

  - A recent corollary ruling requires providers to offer new subscribers the option to purchase, for themselves at their own cost, a backup power solution, such as a UPS, that provides at least eight hours of standby power for use during power outages. By August of 2019, providers must offer at least one option that provides 24-hour backup or, should such a capability not exist, three 8-hour batteries.

  - As a new regulation (8/11/2016) we can assume that there will be some responsibility to notify and/or replace these batteries as they age.

- **Disability Access**
  - Section 255 of the Communications Act has long required providers to make their services "accessible to, and usable by," individuals with disabilities, unless doing so is not achievable, which the FCC defines as available with "reasonable effort or expense." New sections were added in 2010 covering "advanced communication services" and equipment manufacturers for those services that include all forms of VoIP, messaging services, and interoperable video conferencing services. Additionally providers must certify compliance with these provisions annual by April 1st.

- **Local Number Portability**
  - Local Number Portability (LNP) is required for VoIP providers as well. Customer issued telephone numbers that are issued to certify telecommunication carriers from the North American Numbering Plan (NANP) must be transferrable to other providers within a given Local Access Transport Area (LATA). Being such a "certified" carrier is a function of State CLEC law (see below).

- **Communications Assistance for Law Enforcement Act (CALEA)**
  - CALEA's purpose is to enhance the ability of law enforcement agencies to conduct lawful intercept by requiring carriers and equipment manufactures to have built-in capabilities for targeted surveillance. This statue was originally enacted in 1994 and has subsequently modified in 2004 and 2006. More information about CALEA can be found at www.calea.org.

State Regulation to certify Competitive Local Exchange Carrier Status (CLECs)

The State of Colorado, through the Commission, regulates who is allowed to provide landline local telephone services (Colorado Title 40). The authority is conveyed to the Commission under § 40-15-503(2) (f), C.R.S., while the specifics are identified in the Code of Colorado Regulations (CCR) 723.1 and 723-2 primarily. There are 410 CLEC/LEC providers in the State with 2 pending applications and 2 applications have been revoked. The specific application procedures are identified in CCR 723-1 2102. And include an agreement to contribute to the funding of:

- The Fixed Utility Fund;
- The Colorado High Cost Support Mechanism;
- The Colorado Disabled Telephone Users Fund;
- Emergency Telecommunications Services (e.g. 9-1-1 and E-9-1-1); and,
- Any other financial support mechanism created by § 40-15-502(4), C.R.S., and adopted by the Commission, as required by § 40-15-503(2) (b) (V0, C.R.S.

Prior to an application for a "Certificate of Public Convenience & Necessity" (CPCN), Buena Vista, if the application is for itself, must first pass by voter referendum an opt-out of SB 152. This voter referendum is also required for Buena Vista to pursue the building of the physical infrastructure and/or services other than voice.

VIDEO SERVICES

Video services are regulated by the FCC when operating a "cable" service. In most cases this will not apply to IPTV. The State of Colorado franchise agreements are under local authority.

Buena Vista is able, and has, constructed franchise agreements first with Heritage Communications, then with Bresnan Communications a wholly-owned subsidiary of Cablevision and that agreement was finally transferred to Charter on March 26, 2013. The town should review this agreement as was proposed by Jefferson Parker, Town Attorney, on March 22, 2013. The specifics of this agreement were not reviewed for this study. Future franchise agreements will, most likely, be required to offer no fewer criterions for any future franchisee.

BROADBAND INTERNET ACCESS SERVICE (BIAS)

In March 2015, the FCCs *Open Internet Order* fundamentally changed the regulatory classification of broadband. Broadband became subject to Title II of the Communications Act and, hence, could be regulated as a "telecommunication service" with all that pertains. This reclassification only pertains to the core or primary service of capacity of providing the capacity in access networks. It does not apply to ancillary services such as email, storage, or other applications – just the transfer of bits themselves. The current FCC, under the chair of Ajit Pai, is seeking to reverse that order. This has been a long and troubled period struggling with issues of the rights of end-users to a free, unobstructed and open internet (aka: net neutrality) and the rights of carriers to market the use of such services in the manner of their choosing. As of this writing BAIS remains the law and this section will identify the pertinent issues.

Definition

The *Open Internet Order* define BIAS as: "A mass-market retail service by wire or radio that provides the capability to transmit data to and receive data from all or substantially all Internet endpoints, including any capabilities that are incidental to and enable the operation of the communications services, but excluding dial-up Internet access service. This term also encompasses any service that the Commission finds to be providing a functions equivalent of the services described in the previous sentence, or that is used to evade the protections set forth in this Part."[5]

Regulation Content – BIAS

It must be remembered that Title II of the Communications Act is that which regulates "common carriers." More specifically in our context here it regulates "telecommunication services." In this regard an important distinction was made by the FCC in the *Open Internet Order* to forbear certain regulations. Specifically, Universal Service (USP) contributions, rate regulations, tariff filings, cost accounting, duty to interconnect, unbundling of services, resale and those regulations related to pole, conduit and rights-of-way were all forborne.

Other obligations, more germane to BIAS, do apply.

- **Net Neutrality**
  - Three bright lines were established as they pertained to keeping the Internet open: no blocking, no throttling and no paid prioritization. The FCC order said: "[BIAS providers] shall not unreasonably interfere with or unreasonably disadvantage (i) end user's ability to select, access, and use broadband Internet access service or the lawful Internet content, applications, services, or devices of their choice, or (ii) edge providers' ability to make lawful content, applications, services or devices available to end users."[6]

[5] Open Internet Order, ¶ 364
[6] Open Internet Order, ¶ 136

- **Transparency**
  - BIAS providers must disclose "(1) the price of monthly service, any promotional rates, and other fees the consumer may incur; (2) data caps or allowances that are part of the consumer's plan; (3) actual network performance, including packet loss, in addition to speed and latency, measured in terms of average performance and during peak usage; (4) practices related to congestion management, applications=specific behavior, device attachment rules, security, and practices applied to traffic associated with particular attachment rules, security, and practices applied to traffic associated with a particular user or user group; and (5) direct notification to end users of their individual use will trigger a network practice."[7] On February 23, 2017, the FCC exempted "smaller" providers from these enhanced reporting requirements for a period of five years, where "smaller" meant a carrier with 250,000 or fewer connections.[8]

  - Clearly, this inclusion applies to Buena Vista. In the spirit of the open internet, some attention to these issues may still apply.

- **Infrastructure Access Rights**
  - The infrastructure access rights granted to BIAS, under Section 224, as telecommunication carriers have a right of access "to poles of local exchange carriers and other utilities at just, reasonable, and nondiscriminatory rates."

- **Consumer Privacy/ CPNI**
  - The *Open Internet Order* applied privacy protections, Communications Act Section 222, to providers of BIAS. These rules separate the use and sharing of information into three categories: opt-in, opt-out, and exceptions to consent requirements. Sensitive personal information requires "opt-in" (e.g. locations, financial information, health information, information about children, social security numbers, browsing history, app usage and content of communications). For non-sensitive information consumers can "opt-out" by taking specific action.

  - Providers must give clear, conspicuous, and persistent notice about the information they collect and its use. They must maintain reasonable data security practices and must notify customers on the event of a data breach.

  - These privacy practices were to go into effect on December 2, 2016. Currently the fate of these rules is now in question under the current FCC. Whether we will see a modification of these rules (Chairman's Pai's position) or a complete removal (certain Members of Congress) is yet to be determined as of this writing.

- **Disability Access**
  - See under Section 1.1 Regulation Content – Voice Requirements.

[7] Open Internet Order ¶¶ 163-171
[8] *In the Matter of Small Business Exemption From Open Internet Enhanced Transparency Requirements*, GN Docket No. 14-28, *Order*, FCC 17-17 (rel. March 2, 2017).

- **Filing and Reporting Requirements**

  BIAS providers must also comply with:

  - Form 477 as now applied to broadband competition. See Section 1.1 Regulation Content – Voice Requirements number 6.
  - CALEA laws now related to broadband. See Section 1.1 Regulation Content – Voice Requirements number 7.
  - Digital Millennium Copyright Act (DMCA). DMCA of 1998 provides certain "safe harbors" for service providers from potential liability of contributory copyright infringement if they act in two primary ways. First, they must implement and inform customers of acceptable use policies and terminate violators. Second that must register a designated agent with the U.S. Copyright Office to receive notifications of claimed infringement.

Grant and Alternative Cost Reduction Options

When considering financing alternatives for a broadband network build, it is important that the Town evaluate all possible sources of funding. In many cases, the availability of federal or state grant or matching dollars can have a significant impact on a community's ability to meet its strategic goals for the program.

- **Colorado Department of Local Affairs (DOLA)**

  DOLA has set aside $20 million from its Energy and Mineral Impact fund to assist with the study and deployment of broadband in the state. DOLA funds were used by Buena Vista to complete this study, and there are subsequent grant opportunities available under DOLA programs. It is our understanding from recent conversations with DOLA representatives that a significant portion of the original funding under this program has been exhausted, but that some funds remain for projects that fit this scope.

  - Middle Mile Infrastructure Grants: These grants encourage the deployment of connectivity from available backhaul to the community and local loops connecting key anchor institutions. Last mile connectivity is not an eligible service under this program. Applicants for these funds would be required to provide 50% matching funds for these connections. Funds are focused on projects that encompass at least county-level impacts and must be consistent with the regional broadband plans for the proposed areas. This implies that continuing to evaluate county and regional options may open up this funding stream for future benefit of the town.

- **Colorado Broadband Grants**

The Colorado Broadband Office is administering a new broadband grant program with $2.1 million in state funds. These funds are targeted to last-mile deployments in areas where broadband at the FCC level of 25Mb/s down and 3Mb/s up are currently not available. These awards are targeted at current network operators, but may be available in future year funding cycles should the city pursue a private partnership with a provider.

- **E-Rate (FCC Schools & Libraries)**

  E-Rate was established by the Federal Communication Commission and funded by Universal Service Fund fees to bring broadband services to rural, underserved communities. This $3.9 billion national program targets schools, libraries and universities and provides discounts ranging from 20 to 90% of the cost of networks and ongoing expenses. This program can be leveraged by Buena Vista via a cooperative agreement with an eligible institution. In many cases, a significant portion of the cost of fiber installation can be funded via E-Rate monies, while overcapacity (or additional fibers) can be piggybacked into the build at a fraction of the cost of a standalone deployment. We would encourage Buena Vista to explore opportunities to partner with the school district and/or the library.

- **Healthcare Connect Fund (FCC Hospital Program)**

  Created by the FCC in 2012, the Healthcare Connect Fund provides support for broadband connectivity to eligible health care providers and encourages the formation of state and regional broadband networks. Under the HCF Program, eligible providers can apply as individual Health Care Providers (HCPs) or as part of a consortium. Approved grantees will be able to receive a 65 percent discount on all eligible services and equipment. Consortium applicants will be able to receive this discount on HCP-constructed and owned network facilities. As is the case with the E-Rate program, HCF dollars can fund the construction of networks, with excess fiber capacities allowed at significant cost savings. Applications are typically accepted from March to June each calendar year.

- **Colorado Department of Transportation Fiber**

  There is a significant discussion occurring today at the state level regarding the use of unused or dark fiber in the state's transportation and other agency systems.

  While there are no CDOT fibers in Buena Vista, we have confirmed that CDOT has executed intergovernmental fiber optic agreements with other agencies, including Summit County. There, the county has gained access to about a dozen strands of fiber optic cables from Breckenridge to I-70, then along the corridor into a point of presence (POP) in the Denver area. This is valuable long-term asset for Summit County which, if leveraged correctly, could result in 70% to 90+% savings over the cost of purchasing commercially available backhaul (as included in the Buena Vista business cases below).

  During our review, we met with one of CDOT's senior fiber optic program managers. He explained while there is no funding for a CDOT-owned fiber optic cable through Buena Vista, Chaffee County and the entire area is a high priority for them and suggested with adequate funding, CDOT may consider constructing that segment in the next few years.

  We also recently learned that internal to a number of branches of the state government, there is not a clear, common approach to allowing the use of dedicated state-owned fiber optics for carrying "commercial telecommunications traffic." Under a best-case

scenario, unused CDOT fibers could be granted to the Town to provide commercial traffic; worst case may be the Town would have to lease capacity on the existing highly limited "single string" (not-redundant) commercial fiber optic cables. Given the magnitude of the issue, we expect a resolution to this issue in the coming months.

We recommend the Town evaluate several possibilities to capitalize on this program:

- Develop Intergovernmental Agreements: If nearby Counties have excess backhaul fibers, it may be possible to negotiate an arrangement with them for, a number of their unused strands or wavelengths on existing strands.
- CDOT Service Swaps: If CDOT brings fiber to the county, the Town could develop swap exchanges for free fiber. From our discussions with CDOT officials, it might be possible to offer to operate some of CDOT's infrastructure (e.g., the CDOT traffic signal in Buena Vista) in exchange for free fiber. This alternative would have a side benefit of giving the Town control over the CDOT signal to better manage peak-hour traffic, especially during the peak season and special events. The Town could probably offer a number of other kinds of services, as well.
- CDOT Leases: Depending on the broadband operational model the Town decides to pursue, it should be possible to leverage a lease agreement to reduce traffic costs.

- **USDA Telecommunications Infrastructure Loans & Community Connect Grants**

  The USDA administers a program to provide low cost loans to rural communities (defined as less than 5,000 residents). They also administer a smaller program for grants to rural communities to provide deployment into rural areas where 5/1 Mb/s is not currently available. Inside the Town limits, the Community Connect Grant may have limited applicability due to the broad availability of CenturyLink DSL meeting the 5/1 standard.

- **HUD Community Development Block Grant Program**

  HUD has confirmed that communities can apply for CDBG funding for broadband programs, providing another alternative funding source should the Town consider. This program provides grants at both the state and federal level.

- **Chaffee County Dark Fiber and Conduit Resources**

  Discussions with Chaffee County officials led to the discovery that CenturyLink is planning to install conduit/fiber during planned CDOT construction over Cottonwood Pass. Chaffee County officials sought IRU rights from CenturyLink, but these were not accepted by CenturyLink, nor were requests for co-trenching of county conduit as part of the construction.

  If/when CenturyLink lights the planned fiber, this would provide a physically-redundant fiber path. The potential interconnections resulting in redundancy should be explored by the Town as construction on this project is completed.

Section 8 Develop Market-Driven Demand Planning Tools

Developing Demand Management tools can aid in countless ways. Buena Vista requested that such tools be based on Esri GIS systems and that is sound thinking. Three differing tool types can be identified beyond Esri itself. Most basic is a fiber management system (FMS) that keeps track of all fiber, splice locations, Optical Time-Domain Reflectometer (OTDR) quality measurements and more. The second are systems that track where customers have pre-signed demand and serve as a guide to decisions on where to build the next service area. Included in the Capex analysis (see Business Models) is the pricing for COS Systems software that does exactly that and more.

Finally, in the current SDI architecture there is great emphasis on automating functions through operational support systems and attached virtual network functions designed for such tasks.

OSS systems are a set of software tools that are under much disruption today. We have included PacketFront's software for these tasks. As valuable as these systems are, in small networks much can be done by hand with simple Excel spreadsheets.

In the financial analysis described in the next section, we found that removing capital costs for these tools was necessary. There are two models created. The first model contains these systems the second does not.

Section 9 Develop Sound Business Models

BUSINESS MODELS

There are five business models to explore that cover a range of policy and town commitments. Clearly on one end of the spectrum is a less active set of town policies that serve to enable development, or create a climate that makes development possible and less burdensome and on the other end actually builds a FTTH system and provides services. The four primary objectives sought by the Town of Buena Vista through this study were:

- inclusivity for all businesses, residents, governmental and educational stakeholders;
- provide capacity of 1 gigabit residential and 10 gigabit non-residential symmetrical services;
- ensure reliability of service and the at-least-near-elimination of network outages; and,
- provide these capabilities at reasonable and affordable costs.

Many communities nationwide have sought these objectives. Pursuit elsewhere and here derive from a keen understanding that in the twenty-first century a communities economic development, indeed survival, is dependent on advanced communications. This is no less than what the network of roads did in the prior century. Buena Vista's goals are to encourage economic development and enhance quality of life. The town has expressed a strong preference for private sector involvement and competition.

We should be clear that private sector involvement is difficult. Buena Vista has three primary providers whose current service offerings do not meet any of the town's objectives. In fact, the nationwide groundswell for ubiquitous, high-speed, reliable services at reasonable costs is because in smaller communities the attraction by private sector companies is almost non-existent. Even large communities such as Denver do not currently receive such service. Even with strong demand and active lobbying, it will take time. In conversations with local businesses two firms expressed some interest; however, the capacity of these firms to shoulder all costs is not present. The strong preference for private sector involvement, while completely understandable, is extremely difficult to achieve without significant financial involvement of the town.

The models explored are those that we know of today bounded by current lessons learned. In the past two or three years private sector interest has increased in terms of financing and shared public/private investment. This is new and the issues that have come forward are also new. Most importantly, communications technology is undergoing the most disruptive change in perhaps thirty years. The newer architectures are cheaper to build, cheaper to operate, and more agile and responsive to new applications. Open Access has matured from cumbersome leasing of individual end-user drop cables and dark fiber to one that embraces future applications and multiple providers serving any given endpoint simultaneously. Communications is essential to most activities whether simply connecting traffic lights or providing homes with gigabit class connections. Communications is essential to education, business, governmental functions, utilities and day-to-day living. The evolution towards "smart cities" is in full bloom. The movement to fiber optics is very strong in both the public and private sectors as a resource that can accommodate everything. The manner of tightly wedding some function, say connecting schools, or public safety, much less triple-play, to isolated and specialized networks refer to business models of the past. We encourage you to think forward.

It is likely that whichever model, or combination of modeling components, you choose will require agility and flexibility to address the needs of tomorrow.

FIVE MODELS

Public Policy

Much has been written about policies that enable the private sector interest and even some further public sector efficiencies. Currently, the most pressing public policy issue for communities surrounds an area called "small cell deployment." Other "hot" topics deal with the use of telephone poles or pole attachment issues or exclusivity in multi-dwelling environments. We touch more on these later. When thinking about policy, it is helpful if you cast this in similar context to other major infrastructures – roads, water systems, schools and the like. In each of those cases it is normally considered standard to cast decisions with an eye to future use. How many cars will this road need to support in ten years? What is the annual cost of repair for school buildings? What is the behavior of traffic if too many entrances or exits are allowed in a given area? If a developer receives a permit to build, it normally comes with terms for roads and utilities that must meet town standards. So three criteria are always present.

- Current use must morph into future use efficiently.
- Public and private issues comingle and accommodation to both is an art.
- Supporting technologies must be well understood over the period of investment.

These are criteria you manage every day in other infrastructure projects. We encourage you to apply the same type of thinking.

Each of the policies listed below deserve careful thought well beyond the brief sketch we offer here.

Things that help the private sector:

Explicit policies, with clear and easy to follow procedures, can save carriers and/or the Town time and money.

- **Permitting:** Permitting can be the most time-consuming process for the fiber builder. Construction usually involves multiple permits, documentation standards, and time variances that are difficult for both parties to manage. Smoothing out these processes with clarity, being realistic in requirements and allowance for unforeseen issues goes a long way toward making this efficient and attractive.
- **Locating:** Many cities do the locating of existing utilities. This is the process of making rights-of-way available and safe prior to the actual digging up of streets.
- **Traffic Control**: Towns can facilitate construction by placing signs and enforcing parking restrictions in areas where construction is expected. Responsiveness to changes, such as weather delays, if done easily is a boon to efficient builds.
- **Record Keeping and Asset Management:** More commonly these days are digital files, but in either case the Town should be clear about expectations for detailed engineering drawings that show what was built and where – known as "as-builts." Today most cities have these captured electronically in an Esri format to integrate into their GIS systems.

Subsequently, having good documentation facilitates many of these issues (locating, inspection, dig-once policies, etc.).

- **Placement of Devices:** Clear information about the rules and approval process of any hut, cabinet, pedestal whether underground, above ground or on poles should be part of the Town's zoning regulations. This is becoming particularly critical for "small cell deployments" – see below.
- **Inspection:** The Town should have a well-documented process for construction inspection. The rules need to be clear and available prior to construction. As construction moves forward such processes ensure that specifications listed in the permitting process are being met. This includes all aspects of remediation to ensure that debris and dirt are cleared quickly and that streets, sidewalks, and lawns are returned to their desired state. Inspection needs also to be timely as the "in-process" work often requires stoppage of work until the inspection, and any inspection notices, is complete. Such oversight is often contracted to private companies, yet Town oversight needs to be certain that that work meets the Town's requirements. When building FTTH, the remediation work performed has marketing impact.
- **Rights of Way:** Cities normally require that anyone wanting to construct any utility, now including fiber, first get permission to use rights-of-way. This is an area under much discussion at the Federal and State levels today. These agreements are often called a franchise agreement (different from a cable or video franchise, which usually includes right-of-way as well). Contained are a series of specifications and often-onerous costs, or even access to a few pairs of fiber strands, that can deter or enable construction (see: pole attachments, small cell and dig-ones policies).
- **Building Codes:** Cities usually define codes to ensure that building construction is safe and meets requirements for insulation, fire protection, etc. Most often codes only minimally entail internal building wiring. This can be improved, particularly for multi-dwelling environments. With developers it also entails aspects that define how utilities are to serve a neighborhood as in the just mentioned rights of way. Preparation for fiber access internally in structures or along rights-of-way is very smart policy.

Each of these aspects of building a fiber network, or any network, affects the costs and timing of projects. Many unforeseen issues arise such as rain delays, accidents or simply supply problems that can affect timing and cost. Cities that are actively involved with the success of projects usually do well and everyone is much happier. Having a known point of contact, which facilitates and helps address issues as they arise, is good. Having a well-crafted document, electronically and hard copy available, that itemizes every aspect that a company needs to know goes a long way towards helping them and the Town.

Things that help the Town:

- **Aesthetics:** Buena Vista is a beautiful community. That beauty is an asset. Aesthetic qualities in construction are valid considerations. This is becoming even more important as cellular telephone infrastructures place devices in neighborhoods and business areas (see small cells below). Even FTTH is deployed with varying pieces of equipment throughout the community. Buena Vista is small enough to avoid many of the considerations with poles, vaults, huts and pedestals, but this might change as the community expands and/or homes immediately surrounding town limits are added to the network.

There are considerations that can be made. Pedestals come in differing sizes, with the smaller units being less obvious. The use of underground construction versus is aerial has become an insistence in most newer communities. While underground is more expensive, citizens prefer it. Over time the cost differences are lessened as unneeded pole rental fees and maintenance due to weather and other accidents reduce costs.

- **Dig Once Policies:** Increasingly popular town policies are Dig-Once regulations. The intent here is multiple. When cities build and repair roads, construct new developments, build commercial zones or business parks or when utilities are placing services underground there is opportunity to place conduits for the eventual placement of fiber. In Santa Monica, substantial justifications for their fiber network were savings accrued from not re-digging up streets. Stockholm invented an excellent policy. They place three conduits under streets such that one conduit is always empty – when two are full that number of strands are blown into the third conduit and the original two are emptied. Smart. But Dig-Once done without forethought and planning are arguably worse than not doing it at all. In Colorado, HR Green staff pioneered this technique and has overseen installation of fiber optic infrastructure.

  Today we have a pretty good idea how to construct the physical side of networks with topologies that should last thirty 30 years or more. Laying this out on a Town Esri GIS system, developing a plan accommodating multiple parties, and then properly placing conduit when events occur can bring multiple benefits. Made a part of the permitting process allows that even when private concerns wish to construct a path, the town can benefit its future and perhaps facilitate completion. We would encourage the Town to develop a number of procedures to ensure it takes full advantage of fiber optic infrastructure opportunities should they present themselves. They are explained more fully in Section Ten of this report.

- **Street Cut Management Recommendations:**
  - Assign the review of every proposed street cut to a single individual or agency (often Public Works) examining them for a co-location opportunity and arranging an agreement to install empty conduit when appropriate
  - Examine the Town's street cut regulations to ensure they mandate full cost recovery – Typically, these arrangements require 100% of the cost, for example of inspection, staff technical review and time to include records into the Town's GIS system are paid fully by the "cost causer"- or installer. Likewise, these arrangements are now known to include an advance fee to cover the future cost of pavement degradation. Our staff has advised other clients on the benefits of such systems – and allowing the revenues from such initiatives to cover many of the added costs of co-locations. In short, it could be argued that the full burden of installing any utility infrastructure should be borne by those requesting access to the Town's rights-of-way.

- **Create Regional Alignment with Public and Private Influencers**
  Among the best management practices, we recommend:

  - Coordinating with Sangre De Cristo and other utility providers on future system expansions, requiring co-locations and possible joint-use of any fiber optics installed. Typically, providers may allow a municipality to pay 100% of the "up-charge" to increase, for example, the fiber count from 12 strands for utility purposes to, perhaps 96 strands, with the added 84 strands owned by the Town. The cost increase for this is usually less than $1 per linear foot and can literally pay major dividends in the

future allowing the town to sell or lease these assets – installed for "pennies on the dollar" to others desiring access. Our staff can assist in specific tasks related to reviewing plans and structuring the kinds of agreements needed to advance these programs.

- Develop a cooperative agreement with Sangre de Cristo to create mutual advantage as Sangre de Cristo builds its fiber to the substation network. Review other Colorado arrangements like that between Delta, Montrose and the DMEA to gather best practices and lessons learned.
- Structure an on-going working group with Chaffee County, Salida, the CDOT Regional Director, Economic Development interests and other potentially affected interest groups and public agencies in the area. Your Economic Development officials are extraordinarily well positioned and motivated to assist.
- Structure an on-going working group with Chaffee County, Salida, the CDOT Regional Director, Economic Development interests and other potentially affected interest groups and public agencies in the area. Your Economic Development officials are extraordinarily well positioned and motivated to assist.
- Develop a funding strategy aligned with regionalized efforts. DOLA has indicated it is shifting funds into builds, and a regional effort would help you to attract dollars that could make a deployment more financially affordable for the Town and its residents.

Hot Topics Today:

- **Pole Attachments:** Streamlining the right-of-way is key to enabling competitors and alternative providers. Most notably was Google's decision to temporarily suspend growing their fiber networks, which in part arose from complications with pole attachment processes. Nashville Tennessee, Lake County Minnesota and Louisville Kentucky are just the latest cities focused on pole attachments and embroiled in lawsuits. Locally, the poles are owned by the Sangre De Cristo utility. Multiple carriers are on those poles: CenturyLink, Charter and CCT in addition to the utility itself. When new providers – the Town or private concern – wishes to be on-the-pole, engineering must determine if the pole can handle the load and then everyone needs to move their lines to accommodate the new. This process is called Make Ready and has led to a new policy phrase called One-Touch-Make-Ready (OTMR). OTMR has not been welcomed by most carriers who own poles. Carriers often see the hurdles they can present, via pole attachment delays and costs, as competitive barriers, competitive tools. Indeed, it stopped Google in Nashville, so it works.

  Much can be said about OTMR and the practices that move cities to adopt these policies, but suffice it to say there is plentiful argument here. The FCC has developed policies in the past and in March issued a Notice of Proposed Rulemaking (NPRM) seeking comment, once again. The exponential demand for communications has continued to make this a focal point for carriers, pole owners and cities. It is an area we encourage Buena Vista to address, particularly as it will be impacted by this next issue – Small Cell.

- **Small Cell and 5G Deployments:** According to this study, the percentage of Buena Vista citizens that own cell phones is 86.7% versus 28.4% for landline phones. Nationally, people who own any cell phone is a striking 95% (more than TVs) and smartphones have reached 77% penetration. It is no wonder that engineers sweat performance issues as congested "macro-towers" fail to provide responsive service. In the early days, cell towers were 75 to 200 feet tall and supported a radius of six miles. Today that would mean one tower for everyone in and around Buena Vista. Congestion, dropped calls, and pixelization on video all accompany these large diameters and ever increasing use. The immediate answer is a smaller cell radius supporting fewer end-users per antenna. The pending deployment of 5G wireless technologies has a radius of from 300 *feet* to 300 meters. It transmits only via line-of-sight. Importantly the minimum backhaul defined in the current ITU draft specification is 20Gbps, per antenna. The 4G LTE Advanced technologies require similar small radiuses to forestall congestion and other performance issues.

Figure 13 - An example of a small cell cellular deployment.

In short, that means a lot of fiber-connected antennas -- about one or more every block will be coming to Buena Vista. Currently providers are lobbying the FCC and the States to take away individual cities rights to control their right-of-ways when it applies to small cells. Depending on what you do may mean the difference in these to pictures – a nice compact form on a street light and/or a rather ugly consolidation of equipment elsewhere.

Beyond the aesthetic issues of course are the needs for fiber connectivity. That in turn leads back to the other policy issues addressed above: permitting, dig once policies, planning and the granting of rights-of-way. Smart cities are actively working on this as they get more and more requests for small cell deployment.

Finally, many persons outside of the technical communications fields have the mistaken notion that 4G LTE Advanced and 5G – neither of which exist yet – will provide the services and capacity of fiber to end customers. That is not true. Going forward we need them both – both high capacity wireless and fiber connectivity.

Figure 14 - A heavily encumbered pole inside the Town limits.

- **Exclusivity:** This is a sensitive issue for Buena Vista because you have had this issue arise. CCT claims exclusive access to two areas in town through agreements with developers. The history of this issue is long and painful. Building owners and developers have long sought exclusive contracts as a vehicle to gain revenue from carriers. Carriers too like it as it gives them a customer base that has no choice. Obviously the people hurt by these arrangements are the customers themselves. The FCC's regulations in October 2000 and again in 2007 and 2008 "prohibited providers from entering into or enforcing exclusive agreements to provide services to customers in commercial and residential MTEs [multi-tenant environments]." This four-part finding in 2000 has been continually strengthened. Unfortunately the practice continues and enforcement has largely been left up to the cities, as they are the ones that hear customer complaints.

This FCC issue suffers having only one-sided authority. The FCC has authority over carriers, but not building owners and developers. In other words, the FCC can enforce proper practices on carriers, but building owners and developers can and effectuate their deals by simply not talking to other carriers. In March the FCC issued a NPRM seeking comment on ways to solve this thorny issue.

For Buena Vista exclusivity presents another difficult issue. In the sub-sections below, we discuss the financial issues for business models of Open Access, Municipal Retail and Public-Private Partnerships (P3s). It is a truism in provider networks that aggregation is the path to success. Today, BV is a small community and you will see in the financials what impact that has on achieving your goals. Making the community smaller, by losing households to these exclusive arrangements, only makes this problem worse regardless of "who" attempts to better the community.

Open Access

Open Access has multiple definitions and multiple technical and operational concerns. Those approaches can be generalized to the following:

- **Origin, early 2000's:** (Examples: Utopia, Stockholm, and multiple, primarily, European cities) A town or region builds an infrastructure and seeks multiple providers that can be selected by end customers. The idea was that multiple providers would create competition for services and, hence, improve quality and reduce prices. Usually this is accomplished via VLAN differentiation (provider tags). Although effective in some European cities, it has not fared as well in the US. This approach does have advantage over the next approach in that provider changes can be accomplished more quickly and without physical installs.

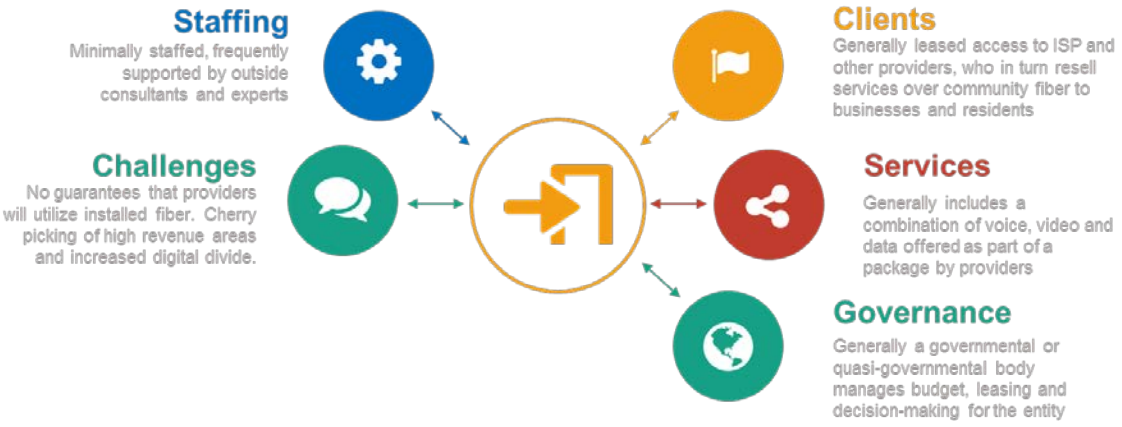

Figure 15 - Open Access model requires the evaluation of a number of key areas of concern to ensure alignment of service providers with Town goals.

- **Common Notion:** (Examples Cortez and Durango CO; Huntsville AL) A town constructs at its cost the physical fiber infrastructure, and then allows differing providers to own the final connection to the home or business usually composed of the drop cable and ONT The longevity of these approaches has not been tested. Currently, the

drawbacks occur when a customer wishes to change, as the originally selected provider owns the physical connection. Operational costs may overwhelm benefits, but that is yet to be seen.

- **Modified Common Notion, Dark Fiber Leasing:** (Examples Danville VA; South Bend IN) A town constructs at its cost the physical fiber infrastructure, then sells or leases individual strands from a central office to some location in the town. These approaches normally involve only business connections. The costs of dark fiber varies throughout the country, but were BV to use $400 per mile that would be a good first approximation. It is unlikely that Buena Vista could recover its capital costs, even with that higher per mile fee. Other sources of revenue would be required.
- **Multiple Providers with Simultaneous Provision to any given end-point:** (Closest example Ammon, ID) Newer system architectures known as Software Defined Infrastructures (SDI) are paving the way towards truly important new services and different ways to monetize networks. The original idea of driving better and cheaper services through Open Access has largely failed in the US. Past approaches are static and hard to change. They are also expensive due to certain technical and operational issues. Finally, what "multiple providers" mean has morphed into the many uses that networks perform today. Historically, Open Access was primarily concerned with "triple-play" services from telephone and cable companies.

  Fiber is different. It has huge capacity allowing the combination of previously soloed networks serving endpoints on a single fiber strand. Today multiple providers may include utilities accessing homes to measure and inform of electrical or water usage; educational systems once confined to connecting schools are now connecting pupils at school, in the parks and at home; remote health care serving people at home as well as clinics; and newer applications and uses will come from a variety of providers. "Provider" now refers to companies that provide any service, not just those that compete on telephones, television and Internet. No longer do we need to separate fiber strands dedicated to a single purpose be those education, traffic lights, utilities or public safety.

  This is the new Open Access enabled by SDI. It is significantly cheaper to build and cheaper to operate. It is flexible and accommodates many providers at any end-point simultaneously. It is a dynamic, not static, network. Given the direction towards P3 and Open Access structures this approach may benefit Buena Vista the most over the long run. However, this is an exploration beyond the scope of this paper. SDI is a conversation that we will share with Buena Vista should you wish to purse this path, but first we'll discuss the more traditional approaches.

In summary we can make these general statements concerning Open Access.

- First, in traditional Open Access, there needs to be enough customer mass to attract multiple providers. Utopia is the best example of this type of network and they have available more customer passings than Buena Vista – 16 cities, 160,000 households. They have also struggled with providers, much less sustainability over the years. Cortez and Durango both received DOLA grants to facilitate their networks. At the same time, they are three to five times bigger than Buena Vista. Individually they are large enough to justify a retail enterprise. Montrose is also beginning to go down this path. They too have more passings.
- Second, the notion of dark fiber sales to multiple providers is not likely to offset the build cost of the network. Such an approach could be a component of other models, but would necessarily need to rely on other sources of revenue to be sustainable.

- Finally, the newer SDI architectures could provide an infrastructure that would provide long-term benefits to Buena Vista. But again, this would still require offsets from, or combinations with, other strategies.

Municipal Retail – Businesses and Residences

This is the path that most successful FTTH networks have pursed. In this subsection and the next we address the assumptions, various services and pricing, operational expenses including staffing (i.e. management, technical, customer services and supportive services) and marketing. The outputs of these assumptions are two financial proforma.

- **First Model:** The first was constructed to meet the objectives given: ubiquity or inclusiveness, capacity, reliability and affordability. Criteria were used in terms of probable take-rates and service pricing that is found in successful communities. Operational expense (OpEx), Cost of Goods (GoGs) and Capital Investment (Capex) were aligned with standard practices. With these criteria, and take-rates of forty-percent 44% residential and 30% business at the end of three years – to culminate with the network build – and growing to 54% and 55% respectively in ten years, ***this proforma fails. It is not sustainable.***

  Key values:
  - Third Year cumulative Capital Expense: $3,088,414
  - Bond Requirement (capital plus first 3 years operational expense): $5.8 million

Key Incremental Values	Year 3	Year 10
Annual Revenues: Voice and Internet	**$979,107**	**$1,541,205**
Cost of Goods: (Internet transit, cloud services, etc.)	**$213,607**	**$280,537**
Operational Expense (staff, marketing, etc.)	**$981,582**	**$940,717**

Bonding and Cash	5.0% Interest	25 Year Term
EBITDA Positive	Year 7	
Annual Cash Flow Positive	Never after Year 2	
Net Cash from Operations	$(264,220) Year 3 -- Year 10 $ 216,771	
Annual Debt Payment (P&I)	$406,875	
Debt Coverage	**-180% in year 4 continuing negative**	

- **Second Model:** The second construct maintains ubiquity of coverage, offers gigabit and ten gigabit symmetrical services, is near reliable and is more robust and affordable then Buena Vista carrier's current offerings. Revenue increases from $345,167, per year, in year 3 to $527,521 in year 10. Capital decreases $498,770. Operational expenses remain roughly the same although additional manual methods may increase this slightly. CoGs remains constant between models.

Key values:

- Third Year cumulative Capital Expense: $2,669,644
- Bond Requirement (capital plus first 3 years net EBITDA): $4.3 million

Key Incremental Values	Year 3	Year 10
Annual Revenues: Voice and Internet	**$1,324,274**	**$2,068,726**
Cost of Goods: (Internet transit, cloud services, etc.)	**$213,607**	**$280,537**
Operational Expense (staff, marketing, etc.)	**$981,582**	**$940,717**

Bonding and Cash	5.0% Interest	25 Year Term
EBITDA Positive	Year 3	
Annual Cash Flow Positive	Year 1 (Bond affects through Year 3)	
Net Cash from Operations	$64,170 Year 3 -- Year 10 $ 709,332	
Annual Debt Payment (P&I)	$301,648	
Debt Coverage	**30% in year 3; increasing**	

Financial Proforma covering Open Access, Municipal Retail and P3

The Proforma models are used for the three model types: Discussed in this section are:

1. Organization – for three models.
2. General Assumptions Made:
   i. Household Counts and relevant demographics
   ii. Build timings assumed
   iii. Take-Rates and Marketing assumptions
   iv. Roll-Out assumptions
   v. Service Plans – packages and pricing
3. Content of the input and output worksheets

Organization

The two models developed assume an organization that has oversight by the Town. This organization may be owned by the Town; maybe owned by a non-profit established by the Town; or, maybe owned by a for-profit organization in with some financial arrangement who ensures the repayment of any Town obligations. No necessary claim is made here that the Town would operate, even own and control this entity. But again, it may. The point is that organization ownership and operation is not a critical variable to the business case itself. In the P3 section following is discussed the financial requirements, and other considerations, for such an arrangement.

Should the Town build and offer services, whether as a utility within government or as a standalone non-profit, the component operations and indeed services can be separately contracted. This type of arrangement – contracting operational responsibilities, for example – is a variant of the Retail Model as it is not quite what is thought of as a P3 model. Often services such as voice and video are purchased as “cloud-based” software options today. In fact the business case developed here employs a cloud-based voice offering instead of requiring Buena Vista to purchase voice switches and hire supportive staff. Again, these variants do not necessarily modify the core business case analysis.

General Assumptions Made

Town Data: For household and business counts the 2016 Census data was used.

RFP		Confirming Data	2016 Census
Population	2,724	2,734 [1]	2,778
Households	1,500	1,082 [2]	1,239
Businesses	n/a	n/a	680

[1] Current Google Search 5-9
[2] Current Town Data

Other Relevant Census Data

Poverty Rate	4.5% (applicable to digital inclusion and Lifeline services)
Median Income	$43,429

Build Assumptions

- Build starts in spring (May) 2018. Pace is moderate with approximately 90 to 100 homes passed each month from May until November (weather dependent).
- Build is completed April through August 2019.
- Service areas will target approximately 96 to 200 households. This pertains to fiber counts on distribution paths. The Town may choose to contain split functions within the data center for aesthetic reasons.
- Equipment will be selected and tested in the late 2017 and 1st Qtr. 2018. A pilot area will be defined by a pre-signup campaign. Pilot begins with 48 homes in July 2018. Roll out proceeds immediately thereafter.

Take Rates and Marketing Targets

Goal at three years:	
44% of residences	498 households within 3 years, growing to 54% in 10 years
30% of businesses	105 businesses within 3 yrs. Growing to 45% in 10 years

For businesses: Of 680 businesses there are likely a smaller subset that we would count in this category. We are using a count of 300 businesses based on communities of similar size. The remaining 380 businesses are most likely single person, home based, companies that we will account for in the residential market. This can easily be revised.

Note: In the survey 72 percent (72%) said they were likely to switch. This is slightly less than other communities that range toward the high seventies when asked this question. Nationally, municipal networks fair significantly better than normal commercial providers gaining 54% in a few years on average. In a cluster of seven like sized and large communities in Iowa, the average take-rate is 72.8%.

Roll Out Assumption

Models are driven assuming builds are preceded by pre-signups. Service areas (clusters of 90 to 200 homes) will be identified and those service areas with the greatest percentage of customers pre-signing will go first. Initial pilot is scheduled for July 2018.

Services: Individual Package Take-Rates & Assumptions

Broad Assumptions

- Internet services will deliver a range of symmetrical offerings: 5M/5M, 25M/25M, 100M/100M and 1G/1G for Residential. Business service is similar with a 10G/10G high-end offering and currently popular services.
- Buena Vista may obtain federal guidelines and financial offsets for digital inclusion/lifeline as they mature. Currently, "Lifeline" is being eliminated by Ajit Pai's directives at the FCC, yet there is still some contention here.
- Service take rates reflect those currently experienced in Buena Vista. For example, the current use of landline telephones is 28.4%, while the current use for Internet is 91.7% and 33.3% for linear broadcast video. In each grouping, take rates for various offerings are aligned either with data from the survey, or if not present, aligned with experience from other municipalities offering similar services.
- Bundling discounts, assume that the "least taken service" will determine the number of likely applying for a combination of services. For example, in the analysis for voice and Internet bundling, voice services were the "least taken." Therefore, 28.4% of customers received bundling discounts.

Internet

Percentages noted inline for each service are estimated based on experience in similar communities. The assumption is to be read as a percentage of subscribers within the overall take rate (e.g. if 40% of total subscribers were 500 customers and Digital Inclusion is 2% then that would mean 10 customers take this service).

Suggested Residential Services:				
	1st Model	2nd Model	Service	Take-Rate
Digital Inclusion	$ 9.95	$15.00	5M/5M	2%
Thrifty User	$ 39.00	$59.00	25M/25M	30%
Active User	$ 59.00	$99.00	100M/100M	60%
Gigabit User	$ 89.00	$139.00	1G/1G	8%

Suggested Business Services:				
SMB (small, retail)	$ 95.00	$ 105.00	25M/25M	29%
SMB (more medium)	$ 150.00	$ 250.00	100M/100M	64%
Business (normal)	$ 450.00	$ 650.00	1G/1G	6%
Large Business	$3,000.00	$3,000.00	10G/10G	1%

Ancillary Services: E-LINE, E-LAN, SD-WAN and variable bandwidth are priced and included at $149.99, $650, $2,000, $225 and $224.97 respectively.

Voice

Suggested Residential Voice Services:				
	1st Model	2nd Model Service		Take-Rate
Lifeline	$ 9.95	$15.95	No LD, no features	8%
Basic Package	$19.95	$19.95	(up to 10 features)	30%
Premium Service	$29.95	$29.95	(LD, plus services array)	62%

Suggested Business Services:				
Single Line	$ 49.95	$ 69,95	Single line with LD	10%
SMB (3 lines)	$180.00	$240.00	Up to 3 lines	32%
SIP Trunk	$250.00	$350.00	Trunk services/VoIP	55%
PRI	$499.00	$599.00	Hosted PBX or PRI	2%

Spreadsheet Sections

The spreadsheets are available for discussion, and should Buena Vista proceed additional "what if" scenarios can be modeled. The detail contained in the spreadsheets is extensive. Key indicators are listed above to avoid getting to bogged down in detail. As such it is not pictorially presented here. As Buena Vista proceeds, discussions with financial staff and outside parties can be productive, although lengthy. The basic contents of these worksheets are as follows:

Individual Spread Sheets used in these pro forma –

Input Worksheets

- Revenue: In this area of the financial analysis, the general phasing of the network build was determined, how many homes and businesses the network passed as it is built and how many become customers. "Standard" service offerings were quantified, and market priced (see services above). Estimates were made of the up-take of these offerings to the customer base. Please see the previous sub-sections for detail.
- Cost of Services (CoGs): In this area of the financial analysis, the costs of the services were estimated. This is primarily transport and transit charges for Internet connectivity and voice cloud services.
- Operating Expenses (OPEX): In this area of the financial analysis, expenses associated with the on-going operations were determined: day-to-day resources required to operate, service and maintain the network, software upgrades and service contracts, staff education and marketing. Estimates again were determined by Lookout Point experience and include such work functions as support for new customer additions (added and served) and the number of service engines delivered by the entity, management and technical personnel.
- Capital Expenditures (CAPEX): In this area of the financial analysis, all of the capital requirements for the initial build were determined: also any on-going capital required to replace equipment (paired with depreciation schedules) or to accommodate additional customers were included. Capital expense includes both the fiber network and all network and services electronics. Although those may vary with the type of approach

modeled. Depreciation schedules were established and developed so that they could be integrated with the standard financial statements. Capital pricing in this project was determined from "budgetary" price quotes received from vendors on this and recent projects. Individual sections of capital expense include:

- Employee Support: computers, furniture, and tools (both inside and outside plant),
- Vehicles: trucks primarily,
- Service Layer Infrastructures: routers, servers, storage, test equipment, workstations and the design engineering expenses to implement it,
- Software: Operational Support Systems, Billing Systems, Network Management and Element Management Systems and associated design and engineering costs,
- Fiber access networking equipment: Optical Line Terminals, Optical Network Terminals and customer premise equipment.
- Outside Plant: feeder and distribution network costs and fiber drop cables and their implementation and oversight costs. Modeled, as distribution fiber only, since network diameters were will within a twelve-mile radius.

- Debt Calculations: For this analysis we assumed twenty-five year Municipal Revenue Bonds at 5% for Model 1 and retail Model 2. For P3 models we assumed a slightly higher interest rate of 6.5%

Output Worksheets

- Income Statement: In this area of the financial analysis, three years of monthly income and annual statements were developed along with twenty-five years of annual income statements.
- Cash Flow: In this area of the financial analysis, three years of monthly and annual cash flow statements were developed along with twenty-five years of annual cash flow statements. This is likely the most useful set of numbers as represented here are EBITDA, ending cash balances, debit payment, and debit coverage analysis. These are the primary key indicators that were represented earlier.
- Balance Sheets: In this area of the financial analysis, three years of monthly and annual balance sheet statements were developed along with twenty-five years of annual balance sheet statements.

Financial Summary

This then is the standard municipal retail model. With the completion of the financial statements, conclusions can then be made as to the financial viability of model that was analyzed. Video services were not included in this model. There are options listed in the next section, should Buena Vista wish to include that service. Today's video markets are simply too volatile to recommend the expenditures to build a video headend. This would add capital costs from $1.5million to $3million or more and could not be sustained in this sized community.

In summary we can make these general statements concerning the Municipal Retail models:

- A Municipal Retail option (i.e. Model 2) is viable for Buena Vista, but with service pricing slightly above the lowest national standards. Service pricing will be less than currently available, but of the initial four objectives, affordability while still good, suffers a bit.
- This model provides the most control over Buena Vista's future. Maintenance of ever increasing requirements at affordable pricing is optimized. The addition of services – for

education, healthcare, smart city functions, and more – is optimized through this model. New opportunities will continue to add revenue to the Town. Small cell and 5G wireless is only one such new revenue example.

- Options for the operations of this network are still available. The town can build, own and, should it wish, contract functions to the private sector. In pursuing this governance model, the Town maintains needed flexibility to address problems, seek new opportunity, and enable economic development.

PUBLIC PRIVATE PARTNERSHIPS (P3s)

P3s have become more popular in the last few years. Nowhere are they as popular as in Colorado. Yet with all the enthusiasm towards P3s, there are less than a handful of implementations and most come with an early set of hard earned lessons learned. P3s arrive with a variety of approaches, but are normally driven by the desire of cities to avoid operational responsibilities and perhaps a caution about the proper role of governments, a particular ideology. It has often been said that Open Access (aka: a type of P3) is the solution to a political problem, while being rife with technical and operational issues. There are two key categories to understand when embarking on a P3. The first is how financing is to be shared and the second are the many issues around governance.

P3 Financing

There are different financial packages that can be worked out. Of those, the most common approach involves the Town using its ability in long-term financing to pay for the fiber infrastructure. Then private partners generally provide services and, sometimes, operational capability. The extent of what is paid for by the town varies. For example, some cities stop short of the final connection to the house or business (i.e. drop cable and ONT). Cities sacrifice long-term flexibility, but private providers enjoy the monopoly on the end customers they connect. For Buena Vista such an approach may limit goals such as economic development, enabling business start-ups, citizen choice and other quality of life aspects. Approaching the financial issues considered here, this model assumes, that the Town owns the entire fiber infrastructure and core electronics. It then contracts for operations and services.

The scaled down capital spend in the second model (see previous section) had these primary components that would be assumed by the Town (generally book value at three years without consideration for depreciation or replacement costs).

Capital Tools and Work Equipment:	$ 64,935
Internet Routers	$ 252,000
NOC/OAM Equipment (servers, software, etc.)	$ 355,766
Minimal Operating and billing software	$ 90,000
Physical Equipment (racks, cables, etc.)	$ 66,476
Access Electronics (five years until take rate is met)	$ 234,541
Drop Cables installed (five years)	$ 293,742
Physical Fiber Infrastructure	$ 1,530,327
Total Town Spend	**$ 2,594,246**

In this capital spend items not included here, but in Model 2 under Municipal Retail, include those that pertain to personnel support: computers and software; furniture; and vehicles. These would be the responsibility of the operator or private provider.

Bonding requirement, or bank loans, for the Town would likely require three elements. A debt reserve fund equal to one year's principal and interest payment. Bond issuance costs usually around two percent (2%). Finally, the bond will likely require and annual appropriation from town funds that guarantees payment in the event of short falls. Such and appropriation is hopefully never exercised, but needs to be the Town's financial disclosures and Council actions. This latter item is not necessarily mandatory, but it is common.

Assuming that the Town was to include the debt reserve ($243,075) and placement fees ($120,000) in the bond, the bond would be issued for $3,000,000 at 6.5% (slightly higher than were the Town to finance and build Retail). In this financing construct analysis, delayed are principal and interest payments for two years. In 2020 (2 years) yearly revenues are slightly greater than $1,344,372, bond P&I yearly payment is $243,075 (monthly $20,256), CoGs is $213,607 and Opex is $981,582 leaving a small loss of $93,892. This improves by the fourth year with a net of $63,185 and continues to improve. In the tenth year net is $660,101.

Making the Town's bond payment must come from revenue received by the private partner(s). This can be constructed in a number of ways and is, of course, dependent on the deal structure that Buena Vista would ultimately pursue. By example, Buena Vista might construct something like this:

Total customers served at this point (2020) are 500 households (40% of total passings) and 90 businesses (13%). Average Revenue Per User (ARPU) as of January 2020 is $83.86 for residences and $635.22 for business with the later assuming newer business services. Under this construct the Town might charge the private provider twenty percent (20%) of residential revenue and twenty-five percent (25%) of business revenue for access to the fiber network. This would return $22,786 per month and cover the bond payment.

Naturally, there are many ways to construct the method to recover the initial investment. These might include assessing homeowners and businesses for their connection (the Ammon ID model). The Town could pay for the network with property taxes or sales tax levies (an early Colorado model). It could also begin to assess providers at day one, building a small savings account, hence lowering the revenue charge (creative math). Applying for DOLA grants, RUS loans, FCC Healthcare Pilots or a series of economic development, transportation assistance and other grants is also an option (and is further discussed in depth elsewhere in this report). If grants are received the entire picture becomes better.

The core issue here is that such a partnership can provide for the Town to move forward. It must be kept in mind that this analysis, lowered costs and improved services, but prices are not as low as the national "bests." Additionally, this model removed close to a half a million from Capex that providers might wish to employ. *This is doable, but very tight.* There are various risk elements: do customers sign-up and continue to stay happy; does the Town and its partners execute the plan well; do competitive providers elect to overbuild with fiber; are providers interested; or something as yet unforeseen.

P3 Governance

P3s by design bring two or more parties together that have vastly different goals and objectives. Private concerns have a responsibility to make a profit, while government does not. Public entities have a responsibility to their citizens, while private companies do not. Private companies invest to return profits. Public entities invest for the public good, for economic development, to create an environment that provides for private investment and quality of life. This is all well known, but it is important to remember that this is more than just a deal constructed to create a few jobs in trade for tax breaks. This is an infrastructure that will last at least thirty years and is foundational to every aspect of a town's viability.

A few things to remember as you proceed to consider P3s:

Planning

- Before any real planning begins determine the nature of your legal authority.
- Ensure that you have consulted with legal and financial consultants to know the effects of Colorado Law and impacts on financing.
- Establish the procedural steps require to meet the above and incorporate them in your plans (e.g. RFPs for the Town, but should you ask private companies to select equipment under your rules, etc.).

Pre-negotiations

- Establish your "must haves," desired level of involvement, the extent of reliance on outside technical expertise, attitude towards risk, and benefits sought.
- Establish milestones.
- Establish those elements that you are willing to contribute (e.g. data center space in the Public Works building; alignment with the issues in Section 1.1 Public Policy; types of financing; and, writing of grant applications, etc.).
- Establish issues of importance concerning control over infrastructure:
  - Who decides on additional infrastructure builds (inclusiveness)?
  - Are there controls over pricing, if so what are they? How and under what conditions can prices increase (affordability)?
  - Do you have an oversight body ensuring compliance? What is their authority? What mechanisms are available to enforce decisions?
  - What happens should a private party be sold, or go out of business?
- What is the desired organizational structure?
  - One partner, two partners or many?
  - How to divide partner responsibilities – one for operations, others for services?
- What technologies are do you need to affect the goals and objectives you seek?
  - Fiber optics is assumed. Wireless overlays are most likely.
  - Do you proceed with advanced technologies like SDI (Software Defined Networks using Network Function Virtualization – SDN/NFV).
  - Who is responsible for architecture? Who is allowed to make the call?

Success in the actual negotiation will depend on how well you do your homework. The very best negotiators know not only what they want, what they are willing to let go of and when, but even more importantly understanding those same aspects for those that they are negotiating with. Doing at least cursory due diligence on potential partners is mandatory. Do they have the financial strength to handle variances in revenue and expense? Do they have deep technical backgrounds and current skills?

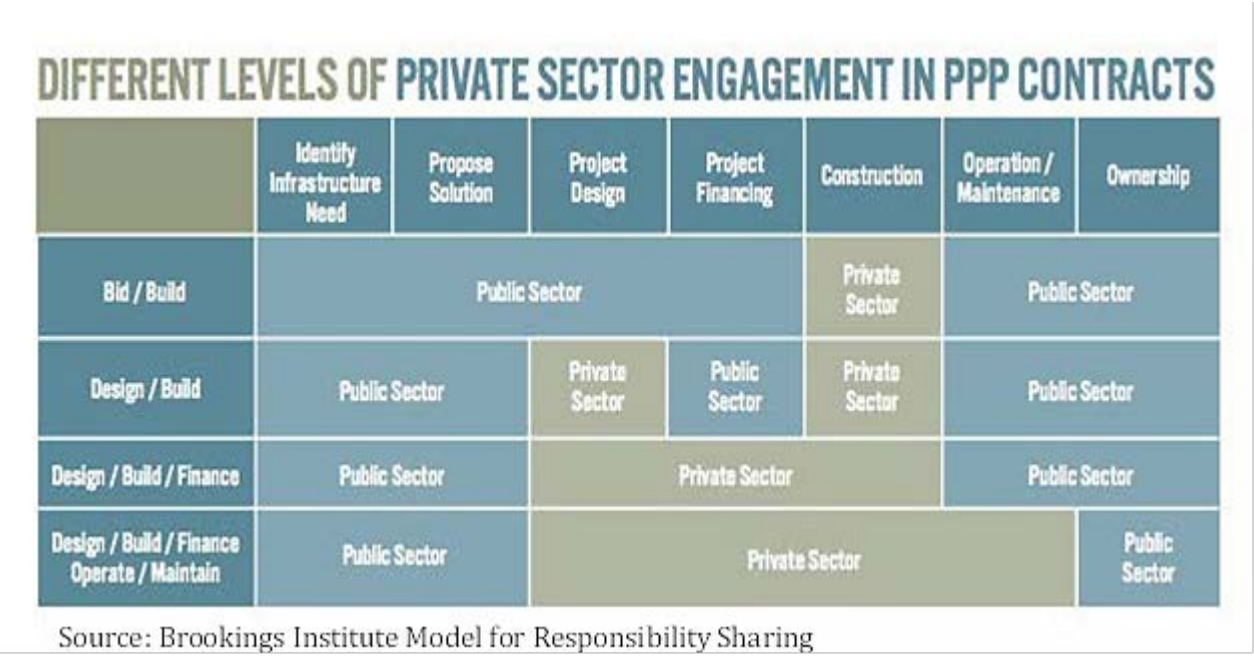

Figure 16 - Public Private Partnerships can take many forms. This graphic reflects a number of common alternatives frequently evaluated by communities considering a cooperative model.

Buena Vista should take care to ensure that any P3 governance agreement also carefully lays out the roles and relationships of Town staff and the Private sector providers. Our interviews indicate that there have been periods of tension between the parties that should be addressed carefully before considering the execution of a P3 arrangement.

Section 10 Recommendations on Strategy

Recommendations are always difficult as they reflect positions of the authors, not necessarily those of the community. The community itself has asked for guidance as local knowledge of the field and applicable technologies are not deep enough to arrive at sound decisions. At best then, we can offer observations from which we hope you will continue your pursuit.

OBSERVATION #1: Addressable market is a challenge for Buena Vista

Buena Vista is a small community, 1,239 households. This is the most important issue that you face. Infrastructure equipment is constructed and ***priced*** for larger environments. Aggregation of endpoints is central to feasibility and profit in the carrier business.

- It underlies why Buena Vista, like so many small communities, don't gain the attention of legacy providers. Money and profits are elsewhere.
- It underlies why attractiveness by any private sector company will continue to be weak. It is why P3 approaches will have difficulty meeting the objectives of ubiquity/inclusiveness, and reasonable cost (defined here as similar to the best prices nationwide).

Strong Suggestion: Work with surrounding communities. Include the homes just outside of the Town limits. Discuss this with the County, with Salida, Poncha Springs and even smaller communities. Build mass and increase aggregation wherever possible. Those communities have the same issues that you do.

OBSERVATION #2: Deepen your community's technical knowledge base

Currently Buena Vista and its providers do not leverage technologies that have *long-term* sustainability.

- The wireless networks installed and planned will not serve you for long. Even with the advent of 5G cellular, newer Wi-Fi standards and various proprietary wireless solutions are no replacement for fiber optics. Radios need continual upgrading to accommodate capacity demand. And all long-term, even short-term, wireless environments require fiber backhaul.
- The core carrier architectures are undergoing disruptive change as we move to more dynamic structures based on software versus proprietary hardware equipment. This has already brought forward new services, new monetization (pricing) and reduced costs capital and operational costs. Once again, greater benefits are seen with aggregation.
- Care must be taken not to invest in older technologies, which then need replacement sooner than feasible. Safe trends are fiber for 30 years or better and software defined architectures that appear to have a life of ten or twelve years before replacements are needed. Remember that capacity of 1G that you desire will likely be insufficient in eight to ten years.

Strong Suggestion: Develop a standing technology group of community committed persons, fund ongoing work and continue to learn and plan. Chattanooga Tennessee is considered to have the finest network in the country. They spent nine years in planning and implementation.

They are augmenting their earlier work with new technology today. They constantly seek out technology trends from consultants, vendors and other communities. You won't need to work this long, but you need more than you currently have.

OBSERVATION #3: Develop procedures to take full advantage of private and public sector opportunities related to fiber optic infrastructure.

The Town should be credited with the foresight used recently with CDOT to arrange a number of crossings of Highway 24 during their reconstruction project. The value of these conduits cannot be underestimated in terms of future uses and possibly even sale/lease to others should the need arise.

As stated above, the Town would be well suited to develop a vision or master plan of its future needs for publically-owned fiber optic infrastructure. Often, these plans follow the major collector and arterial streets and include references to future development and are coordinated with development plans as they are proposed.

Among the best management practices, we recommend a number of fiber-ready policies and regional partnerships be reviewed and implemented:

- Make Buena Vista "fiber ready" by adopting fiber-friendly policies outlined in Section 9 of this report.
- Create mutually beneficial relationships with Sangre de Cristo, private providers such as Colorado Central Telecom and Blue Tail Technology, and public partners such as Chaffee County, Salida, and the CDOT Regional Director.
- Develop a funding strategy aligned with regionalized efforts. DOLA has indicated it is shifting funds into builds, and a regional effort would help you to attract dollars that could make a deployment more financially affordable for the Town and its residents.

OBSERVATION #4: Step carefully when considering P3 solutions

Leveraging private sector capital is often a preferred alternative for communities studying the broadband issue. It is totally understandable, but you need some realism. Currently, you have no provider that is offering inclusivity, high-speed, reliability and reasonable cost. The services and pricing in Buena Vista are unsatisfactory. No question about that. Why?

- The feasibility analysis performed did not initially work. Using nationally acceptable best pricing and services and appropriate equipment, software, cost of services and operational expense, the output of that analysis failed feasibility. Only by raising prices and reducing Capex did we find a model that brought a solution that worked. This would be no different with a private provider.
- The second model did provide a sustainable solution. By increasing service pricing somewhat and removing $498,770 in Capex expenditures, a long-term solution arose. Using this model we structured an approach where a private partner would assume operational and services costs and responsibility. A private provider entering this agreement would not turn EBITDA positive until the third year and during these first three-years they would have lost $1,064,029. Net profit would only occur after five and

one half years – July 27, 2023, if you began building next spring. Not very attractive from a risk perspective.

- Look at your goals: economic development, business retention, business startups, facilitating private sector competition and enhancing the community's quality of life. Good goals. But are they shared by a private provider? Probably not.

Strong Suggestion: Pursue your goals; purse your objectives. What you are trying to do is both good and necessary. Gather help from State and Federal governments. Accept the first two suggestions. The old line is "it takes a village." Buena Vista's village might include Chaffee County. We know they are interested. Continue speaking with CCT and other locals who have expressed interest – but confine these village members to things they can do and don't be surprised if they don't love more competition. The viability of Buena Vista community need not rest on the viability of just the communications sector. Nearby are developments in Montrose and some talk in Colorado Springs. Maybe there is value in talking to them. Learn who the local champions are and gather them together. Build a structure to contain your work. Build your network because what you are trying to do is very, very good.

FTTH is feasible over the long term in Buena Vista. Like most long-term projects that have goals like yours, it falls to the local government to make it happen. All but a small handful of communities have been successful. Over 400 communities nationwide have found themselves in your position and prospered through persistence and hard work. Each of those communities has stories to tell, lessons to offer. Each and every one of those cities has seen enhanced economic development, enabling private sector and improvements in the community's quality of life. It can be yours too.

Appendix I – Summary of Residential Broadband Survey Findings

205 total responses

Q1. Home address (n=192; 13 skipped)

Q2. Do you live in Buena Vista on a year-around basis? (n=201; 4 skipped)

Yes	167	83.1%
No	34	16.9%

Q3. How many internet users currently reside in your home? (n=199; 6 skipped)

1	31	15.6%
2	110	55.3%
3	22	11.1%
4	26	13.1%
5	6	3.1%
6	4	2.1%

Q4. What is highest level of education completed by the head of household? (n=202; 3 skipped)

Some High School	1	.01%
High School Diploma/GED	11	5.5%
Some College/Associate's Degree	44	21.8%
Bachelor's Degree	76	37.7%
Graduate Degree	70	34.7%

Q5. What is the current annual gross income of your household? (n=189; 16 skipped)

Below $20,000	13	6.9%
$20,001 to $40,000	24	12.7%
$40,001 to $60,000	32	17.0%
$60,001 to $80,000	42	22.3%
$80,001 to $100,000	33	17.5%
Greater than $100,000	45	23.8%

Q6. Does your home subscribe to each of the following services? (n=60; 49skipped)

Note: This question had to be revised in the middle of the survey period. The initial version did not allow for multiple answers. For the summary, we are only using the results from the revised version.

Internet Service	55	91.7%
Cellular Telephone	52	86.7%
Internet Video (Hulu, Netflix, etc.)	32	53.4%
Cable Television/Video	20	33.3%
Telephone (Landline Voice Phone)	17	28.4%
Satellite Cable	14	23.4%
Cellular Internet Hotspot	8	13.4%

Radio Services	5	8.4%

Q7. Do you currently received all of the these services from one provider (a bundled product), or do you pay multiple providers for these services? (n=114; 91 skipped)

One Provider (bundled)	32	28.1%
Multiple Providers	82	71.9%

Q8. Which company do you currently use to provide your internet service? (n=107; 98 skipped)

Charter Communications	51	47.7%
CenturyLink	34	31.8%
Central Colorado Telecomm	16	15.0%
Dish Network	4	3.8%
DirecTV	2	1.9%
Other (13 comments) ▪ AT&T ▪ HughesNet ▪ Spectrum ▪ Cell phones as hotspots ▪ Verizon mobile hotspot ▪ AT&T hotspot ▪ AT&T wireless ▪ Verizon for cell ▪ Cannot get internet service ▪ Survey only allowed on item to be selected ▪ Includes internet, land line phone, TV ▪ AT&T ▪ Still research providers. Soon as the house is built we will subscribe.		

Q9. How much do you currently pay per month for the internet portion of your communications bill? (n=108; 97 skipped)

Less than $20.00	3	2.8%
$20.00 to $39.99	21	19.5%
$40.00 to $59.99	37	34.3%
$60.00 to $79.99	30	27.8%
$80.00 to $99.99	6	5.6%
$100.00 to $124.99	8	7.4%
$125.00 to $149.99	1	1.0%
$150.00 or more	2	1.9%

Q10. What type of internet service do you currently receive? (n=112; 93 skipped)

Cable	37	33.1%
DSL	29	25.9%
Fixed Wireless	20	17.9%
Cell Phone or Cellular Connection Only	9	8.1%
Satellite Internet	5	4.5%
Fiber Optic Connection	3	2.7%
None	1	.9%

Dial Up	0	0%
Don't know/Not sure	8	7.2%

Q11. If you answered "None" to the previous question, what are the primary reasons you do not have internet services in your home? (n=41; 164 skipped)

Not interested/Don't need	0
Price	2
Access necessary services via free Wi-Fi at locations outside my home	0
Services are not available in my area	5
Not applicable	34

Q12. How many devices do you have in your home that connect to the internet (include computers, laptops, smart phones, tablets, and any other home devices that have a connection. (n=113; 92 skipped)

1 device	1	.9%
2 devices	8	7.1%
3 devices	10	8.9%
4 devices	13	11.5%
5 devices	13	11.5%
6 devices	24	21.3%
7 devices	8	7.1%
8 devices	20	17.7%
9 devices	2	1.8%
10 devices	2	1.8%
More than 10	12	10.7%
Average Number of Devices:	**6.2**	

Q13. In what ways does your household use the internet? (check all that apply) (n=113; 92 skipped)

Checking Email	113	100.0%
Shopping	106	93.8%
Banking or Bill Paying	101	89.4%
Research Products and Services	100	88.5%
Social Networking	97	85.9%
Streaming TV	81	71.7%
Downloading Music	65	57.6%
Home Based Business	45	39.9%
Gaming	38	33.7%
Home Healthcare	24	21.3%

Q14. Please rate your level of satisfaction with your home internet service? (n=113; 92 skipped) - Maximum Possible: 6.0

Service Reliability	4.13
Speed as advertised	4.12

Customer and technical support	3.87
Relevant service offerings	3.80
Price or value for services received	3.50

Q15. How important is each of the following to you for your home internet service? (1=Unimportant; 6-Very Important) (n=114; 91 skipped) - Maximum Possible: 6.0

Service Reliability	5.71
Speed as advertised	5.53
Price or value for services received	5.57
Customer and technical support	5.11
Relevant service offerings	4.59

Q16. How frequently is your current internet service unavailable for at least an hour due to interruptions in your connection or slow/inoperable speeds? (n=109; 96 skipped)

Never	18	16.6%
1 hour or less per month	51	46.8%
1 hour or less per week	28	25.7%
1 hour or less per day	9	8.3%
More frequently than 1 hour per day	3	2.8%

Q17. Overall, how satisfied are you with the speeds and options available from local internet providers, including your own? (1 = Very Unsatisfied; 5 = Very Satisfied (n=113; 92 skipped)

Satisfaction Level	3.08

Q18. If your answer to the previous question was a 1 or 2, what are the key issues you have with your current provider? (n=36; 169 skipped)

- Cannot get internet
- Price and business interface
- Charter is very expensive, but there are no other providers available with high speed internet in our area
- I would like a higher speed available and a stronger signal so when using all of my devices, they are all working at optimum speeds. (I get a lot of lag)
- Interruptions and disconnects
- Some aspect or another of our service is out at least for awhile every day. The Spectrum app will be down entirely, or speed so slow there is frequent stops, reloads, heavy tiling/pixilation, etc., or the internet speed is unsatisfactory.
- Really isn't fast enough for when my son visits to do his business so I'm thinking that might be an issue for others too
- Not a 1 or 2 but I have concerns about in appropriate price increases, unknown future upgrade schedule for the future of our town infrastructure
- Internet speeds are ridiculously slow in the valley. Constant interruptions to service, regardless of company used, no fiber optics outside of town limits. Need I go on? Best place to work from home my foot!
- Available speed
- It's usually fine, but not blazing fast. Occasionally goes out, but not frequently.

- We have to keep prices down. I cannot afford housing in this area. so must have something done
- They charged me $50 just to add my internet service to my existing cable service. This was in addition to the installation fee. I feel a bit ripped off.
- Reliability, 2. Latency/bandwidth consistency, 3. Price/speed ratio
- Our LAND LINE works good. Service & technical support w/ CenturyLink are terrible. We use our Cells to check email, e/a Verizon MiFi. Otherwise, it's sporty, but we luv in the ponderosa forest, Part time. Cell I town I not good. If Verizon had a tower In Town, maybe would be better. We will not get DSL line in BV house, as it's a second home, part time residents. So, a landline is all we need.
- Low speeds high price
- Lack of bandwidth
- Unknown at this point.
- Not enough for gaming
- Speed as advertised, service drops, rebooting router
- Service unreliable
- Slow speeds; unreliable during storms and snow - we often lose complete service until snow melts.
- We don't have an internet provider. Charter won't continue their line to our house (we're 1/2 mile away). I've even offered to pay them to build it.
- Fiber optic High speed not available, always spooling
- Not fast enough, data cap
- I think it's overpriced
- The speed does not match what we are paying for in the plan that we pay for.
- I have no issue with using Verizon and my cell phone as a hot spot, it is very reliable and extremely fast. I do not subscribe to local service due to it being an extra expense and I already pay for a data package that I never use.
- I would like cable internet because it is more reliable and faster at a much lower price than what I currently pay. I upgraded my service to a higher speed package and still buffers and gets latent at the most opportune times.
- slow and intermittent
- Extended Outages
- Lack of speed, affordability, spotty service
- Only 7mbps, not stable, price for service is a joke
- DSL is all that is available and it is weak. Considering changing to microwave.
- Internet is too slow. Internet quits. Company continues to raises the price. To get the price lowered I have to call and threaten to switch providers. I plan to switch when I get back.
- The internet is so slow. Often so slow it is hard to work. Hours for an upload/download. Sometimes it is impossible to watch a movie or TV.

Q19. Upload and download speeds are important to many people. In some cases, providers will advertise "up to" speeds as part of your subscription package. What speeds were you told you would receive when you signed up for your service? (n=112; 93 skipped)

Less than 10 Mb per second	18	16.1%
Between 10 Mb and 25 Mb per second	16	14.3%
Between 26 Mb and 50 Mb per second	10	9.0%

Between 51 Mb and 100 Mb per second	16	14.3%
More than 100 Mb per second	2	1.8%
Don't Know/Not Sure	50	44.7%

Q20. Please use the link below to report your internet speed. Once you click the link, you will see a new web browser window appear that goes to speedtest.net. You will see a "Begin Test" icon in the middle of your screen. Click this icon to begin the speed test. Wait a few moments while the test runs and measures your upload and download speeds. Once the test finishes, please record these speeds in the boxes below. (n=68; 137 skipped)

	High	Average
Upload Speed	5.32 Mb	3.95 Mb
Download Speed	67.32 Mb	24.71 Mb

Q21. If it was available, would you be interested in a broadband service that allowed you to receive internet service with greater reliability and speed for a cost which was comparable (+/- 10%) to your current internet service bill? (n=113; 92 skipped)

Yes	107	94.7%
No	6	5.3%

Q22. Does anyone in your home currently telecommute (work from home)? (n=115; 90 skipped)

Yes	47	40.9%
No	68	59.1%

Q23. If you answered "yes" to the previous question, approximately how many days per month, on average, does that person telecommute? (n=46; 169 skipped)

Average	15.3 days per month

Q24. Do you currently have children in your home who need to access the internet to complete homework, research, or other assignments? (n=114; 91 skipped)

Yes	21	18.5%
No	93	81.5%

Q25. What else would you like Town officials to know about your current internet service? (n=37; 168 skipped)

- CenturyLink incrementally increases monthly cost, relying on customer inertia to prevent switching suppliers. Long term agreements or arrangements not possible.
- I think it is very important for the future of BV to have high speed internet service because the world is changing very rapidly and rural areas will be left behind or left out if high speed internet is not available.
- I think having free Wi-Fi in the downtown area is what this town needs. For the tourists - it would be a big draw. Some businesses say they have Wi-Fi, but it is too slow & doesn't really work.
- We live in a remote location so it meets our expectations
- They need to stay out of the internet service.....
- Could only answer on option on question number 6.

- Greater reliability at a better price
- It's substandard. There need to be more signal amplifiers throughout the town.
- Would like more reliable video streaming. Live webinars are difficult as well as movies.
- It's kind of expensive for the slower speed compare to big metro areas but this is BV but a faster service for the same cost would be great
- It's adequate today but there are no competitive providers who are offering real future capacity and speeds. Town currently has no significant say in our network infrastructure. The Public needs to have a say in what kind of infrastructure gets built and when. Public involvement in building, owning and managing communications infrastructure is crucial to remaining a competitive and attractive community for business and residents.
- The fact that the town even considers 10Mb as good is indicative of the problem. Approximately $90/month for speeds that would be laughed at in most communities is the town's goal! If this town wants to be taken seriously, they need to get serious about improving ALL services, not just internet speeds.
- I like it bundled with phone, but if I got a better deal unbundled, I would take it.
- It is none of their business, they need to stay out of it.
- I like spectrum. No changes are necessary. Just officials need to make housing a priority. Real affordable housing for the service persons to be able live in the area. We cannot afford housing. Please please help us service persons.
- Fiber optic type speeds through the valley that would be accessible to rural residents would greatly enhance livability, property values, and communications for residents.
- Century Link stinks, whatever you do- do not use them or allow them to block your efforts. 10 Mbps is setting the bar too low. Can barely stream at that rate.
- We would like a better faster internet, but like the company and the staff very much.
- The real problem is lack of redundancy. We don't need more providers all selling space on the same fiber optic cable. We need a second fiber optic cable running into town from a different direction/source.
- Question #6 doesn't allow you to answer completely. We have both internet and land line service.
- I don't currently have a choice of providers. Colorado Central Telecom is the only provider that can service my house. I would prefer to have another option.
- Ours seems to be ok for our use
- We need much better service, consistent and with faster speeds.
- Please bring a high-speed cable (preferably Charter since they are the best) to our house. I had Charter for 15 years with no complaints in Leadville. I would do anything to get them to our house here in BV. We are inside town limits and have nothing.
- My service seems to be less reliable on weekends & evenings.
- Too expensive. There are discounts for new customers that shoot up over 100% after the promo period and no discounts for loyal customers. Now that the Salida office is closed their customer service is terrible.
- We are in town limits. Our is options are 1.5mbps DSL, satellite, or Verizon data (which we use and is faster than AT&T at our location)
- In south main there currently is only one internet option - charter cable. There are no phone lines so DSL is not an option. I think fiber was laid but there is not provider using them. We need competition/options to keep prices and service levels fair.
- I highly encourage the Town to provide internet options for citizens and visitors.
- Limited options available unless you bundle with a bunch of stuff you don't want.
- Not what we were told it would be. Tried 3 different companies.

- Because the internet is now required to take part in our society it would be great if it was provided as a municipal service.
- I don't have a service at my residence just use cell hot spot. I'd love to have a reliable moderately priced alternative so that when I leave the house still has service.
- Frustrating that there aren't many options. CenturyLink is horrible to deal with.
- Faster, please!
- Charter rocks and we used to have Colorado Telecom where cable isn't available and they provided good service too.
- Century Link claims and I pay for 20Mb service. However it never reaches 7Mb

Q26 through Q30. We would like to better understand your interest in increased internet speeds for your household.

How likely would you be to pay the following amounts for (10 Mb, 25 Mb, 50 Mb, 100 Mb or 1,000 Mb) per second service?)1 = Very Unlikely; 2 = Somewhat Unlikely; 3 = Neither Unlikely or Unlikely; 4 = Somewhat Likely; 5 = Very Likely) (n=97 to 105; 100 to 108 skipped)

Weighted Average (5.0 is maximum possible)

N=	**105**	**101**	**99**	**97**	**101**
	10 Mb	**25 Mb**	**50 Mb**	**100 Mb**	**1,000 Mb**
$20 per month	**4.03**	**4.36**	**4.55**	**4.68**	**4.68**
$40 per month	**3.36**	**3.86**	**4.09**	**4.41**	**4.37**
$60 per month	2.25	2.75	**3.26**	**3.46**	**3.63**
$80 per month	1.60	1.93	2.30	2.56	2.95
$100 per month	1.21	1.44	1.64	1.89	2.32
$125 per month	1.13	1.26	1.38	1.44	1.88
$150 per month	1.10	1.16	1.26	1.26	1.66

Q31. Moving on to other communications services in your household, we would like to understand how you feel about services and provider alternatives.
Which services do you pay for today? (check all that apply) (n=108; 97 skipped)

Internet	103	95.4%
Voice/Telephone	62	57.4%
Streaming Video	62	57.4%
Video/Cable	53	49.1%
Other	10	9.3%

- Cell phone
- Mobile phones
- NPR
- Satellite
- Cellular
- 2 cell phones
- Cellphone
- Dish Sat.
- Satellite for TV, no landline-VOIP, cell phones
- Cell phones service

Q32. What is your current total monthly expenditure on all communications services? (do not include cellular phone or cellular data services) (n=108; 97 skipped)

Less than $50.00 per month	12	11.2%
$50.00 to $99.99 per month	30	27.8%
$100.00 to $149.99 per month	32	29.7%
$150.00 to $199.99 per month	16	14.9%
$200.00 or more per month	18	16.7%

Q33. How important is it to you that you are able to access multiple services from a single provider (bundling)? (1 = Very Unimportant; 5 = Very Important) (n=109; 96 skipped)

Level of importance	3.05 weighted avg.

Q34. How likely would you be to purchase internet services as a standalone service (unbundled)? (1 = Very Unlikely; 5 = Very Likely) (n=109; 96 skipped)

How likely or unlikely	4.17 weighted avg.

Q35. If the Town of Buena Vista, or one of its partners, were to provide reliable, high-speed internet services, how likely would you be to switch internet providers? (1 = Very Unlikely; 5 = Very Likely) (n=107; 98 skipped)

How likely or unlikely	4.14 weighted avg.

Q36. Do you feel it is appropriate for the Town of Buena Vista, or one of its partners, to offer internet services, even if they compete with private sector companies? (n=107; 98 skipped)

Yes	86	80.4%
No	21	19.6%

Q37. Do you consider internet to be an essential service in the same way you consider water, electricity and roads to be essential services? (n=109; 96 skipped)

Yes	92	84.4%
No	17	15.6%

Q38. Is there anything else you would like to share with Town officials about this subject? (n=35; 170 skipped)

- I think having community based internet service would be great. So far competition among private sector internet providers has not been very beneficial.
- Appropriate to provide it free downtown. Not so much to provide it to homes/businesses. Maybe give members of the Chamber a discount from Colorado Central Telecom or something.
- Do not get into the internet service. Stay out of it.....
- I stated many of my concerns with broadband in the business version of the survey that I took, citing the fact that most businesses likely are experiencing issues with their own equipment rather than actual outages. For residences this is probably even more

applicable. Add to that the fact that many homes are located in extremely rural areas where it is unreasonable to expect broadband, when their only real option is satellite. (technically broadband, but high latency) As someone who owns and has operated a successful internet-based business since 2003, feel free to reach out to me. I doubt anyone will.... but though I'd offer.

- Internet service everywhere in town (blanketed) is important to me. Century Link is more reliable than your previous questions allow for--outages less than 2 hours per year--so BV would have to at least be this reliable.
- I don't fully understand some questions, and I suspect I'm not the only one. I'm not sure how the connection gets INTO our house - cable or DSL or fiber optic - but it IS a fixed wire. Once it's in the house, we're wireless. Question 6 above will let me provide only one response, but we have internet, internet land line phone, iPhones with VOIP, personal hotspots on our iPhones. We stream all our video via a Roku, including local channels via Spectrum app. We have to have a "cable connection" to use the Spectrum app, but we don't have "cable TV." We also stream lots of music via Sirius app and Apple Music.
- Reliable connectivity is key to growth, home values, and education.
- Public Broadband Infrastructure is the right way forward. Town should invest in Fiber infrastructure similar to Rio Blanco County and make it available for private providers to serve residential, business and community anchor institutions over the public infrastructure.
- It is NOT the responsibility or obligation of a government entity to offer private services or to compete with local businesses. And "affiliates" sounds like cronyism and the 'good 'ol boys club'- distasteful to say the least.
- Having the town involved in actually providing Internet service will be detrimental in the long run. It will be similar to the early days of cable when municipalities had a monopoly.
- I pay $30 per month for Internet. There was no option for $30 in your how likely to pay questions. I would, of course buy in at $30, if I were to get a higher speed with reliability. And probably $40 if the speed were a nice jump up.
- Stay out of private business. If the town gets into the internet services I will not rent any services from the town!!!!!!!!!
- Please be competitive but fair and I do not care if we get another service. I am very happy with Spectrum. There are more important matters that officials need to deal with.....
- Limited internet and poor cell service currently limited business communications throughout our area. Better service, reliability and price competition would be very welcome.
- Good internet to town and surrounding areas is key to future high paying jobs for the area.
- We live in BV about half the time. We are satisfied with CenturyLink but would be open to anything.
- No one should be required to pay for anyone else's internet service through taxes.
- Love this community and love the progress it is making. So happy to be here. As a new resident appreciate so much the welcome attitude. Very grateful.
- The town of BV offering internet service does not solve the problem. The problem is redundancy. Think of internet like water in a hose. Water is moving through the hose; businesses sell internet usage and consumers consume - the water is flowing through the hose. If the town starts selling water and adding it into the hose the hose just gets more clogged. We need a second hose. We DON'T need Town competing against

businesses. How do you not understand this problem? Why even ask us about 1,000mbs service? NASA may need that speed but we don't.
- Due to our location the commercial availability and bandwidth are limited with frequent slowdowns in commercial download speeds. The town would have to supply enough bandwidth to ensure both speed and reliability.
- Would like to help design system, former engineer manager for computer systems with Intel. Relocating to BV May 1
- Question 6 does not allow multiple answers. I did not answer Questions 26 to 30 because I do not have a way to compare the speeds in the questions to what I receive currently
- Town doesn't need to be involved in internet services
- We will support any service that is reliable and reasonably cost.
- High Speed internet is such a "norm" now that it helps you function in life. I look up health information daily, I also like to research various subjects.
- I came from the east coast where fiber optic access has been available for 20 years, it is an important piece of infrastructure, should help local businesses be more streamlined and competitive
- Town should enable/help private sector but not compete as a provider
- This survey is too "techie" - I have no freaking idea how much MB of data I get or how much I pay b/c my landlord pays these and then I pay them. This survey seems oriented to people who rely on the internet for home-based businesses rather than the general internet user.
- Thank you for your foresight in this matter! Great Town and moving this matter forward will make it even better.
- Not just speed but data caps are a huge hindrance
- Would make decision based on price. If we can save money that is what we would do.
- The town only cares about what happens with in the town limits if you live just a couple of minutes in the county you are pretty well screwed
- In your survey about internet speeds, my answers are based on those being REAL speeds. Century Link has me on a 20Mbs plan but never delivers more that 6 or 7 Mbps. I am will to change and pay for REAL High Speed Internet.
- I am not sure if it is appropriate for the Town of Buena Vista, or one of its partners, to offer internet services even if they compete with private sector companies. I don't have enough information to answer this question.
- Hope that you can work with existing local providers and businesses to find meaningful public-private partnerships. Town on its own does not have the capacity to offer broadband as a true services utility

Q39. If we have additional questions, may we contact you? (n=110; 95 skipped)

64 respondents said they could be contacted with additional questions.

HRGreen

HRGreen.com
Phone 855.900.HRGC (4742)
Email dzelenok@hrgreen.com
102 South Tejon Street, Suite1100
Colorado Springs, CO 80903