



Lake County Broadband Assessment and Request for Proposal

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February 12, 2014

**Lake County Broadband
Request For Proposals**

Proposal Deadline – March 07, 2014

I. PURPOSE

Lake County Governments are soliciting proposals from qualified Service Providers to offer broadband services in the two counties. It is highly recommended any respondents carefully consult the **Broadband Assessment for Lake County** (attached Appendix A) in preparation of any response.

II. PROPOSAL REQUIREMENTS

A. Proposal submittals shall include:

1. Cover sheet: The cover sheet shall list the name of the Service Provider with names, email address and phone numbers of persons who may be contacted to answer questions. Also, the cover sheet shall state who prepared the submittal and how that person(s) can be reached.

2. Qualifications: The Service Provider qualification information shall include a brief history of the firm including organization structure, qualifications of the firm to provide the services described herein. Include number of years in business, number of employees, and location of office or offices.

B. Questions regarding this RFP shall be submitted to Lake County Government contractor, Internet3, LLC, attention: Frank Ohrtman, frank@wmxsystems.com, no later than **5:00 PM, February 17, 2014**.

C. **All correspondence including submission of responses are via email to Frank Ohrtman frank@wmxsystems.com**

III. SCOPE OF WORK

Questions are due by February 21, 2014.

Proposals are due 5:00 PM MST March 07, 2013.

Question/Factor	Your Response
1. What technology type(s) do you propose?	
2. How will your middle mile solution be redundant (east-west) and offer 99.999% availability in support of your last mile services?	
3. Does your solution enable an end user to subscribe to speeds of up to 1 Gbps services?	
4. What price range would an enterprise customer expect to pay in \$/Mbps/month per location for your services if buying:	
a. 10 Mbps?	
b. 50 Mbps?	
c. 100 Mbps?	
d. 500 Mbps?	
e. 1 Gbps?	
5. How do you propose to service the community anchor institutions of Lake County (see attached Broadband Assessment for names and addresses)?	

	<p>6. What public sector concessions would assist you in service delivery? If yes, how would you use those assets to bring better internet services to these communities? Please explain.</p>
	<p>a. Access to light poles?</p>
	<p>b. Access to rights of way?</p>
	<p>c. Roof rights on public sector buildings?</p>
	<p>d. Access to public safety wireless towers?</p>
	<p>e. Access to a publicly-owned space for a carrier neutral location (CNL) as alternative to central office? If so, please describe.</p>
	<p>f. Local government assistance in obtaining pole rights from electric service provider?</p>
	<p>g. Access to existing indoor Distributed Antenna System (DAS) in public buildings?</p>
	<p>7. Does your solution include publicly accessible Wi-Fi solution? If so, please describe.</p>
	<p>8. Does your solution include or support a Distributed Antenna System (DAS, Wi-Fi/cellular or Wi-Fi only)?</p>
	<p>9. Does your solution include or support 4G cellular services?</p>
	<p>10. Can you deliver service to community anchor institutions and leading businesses in Lake County by September 01, 2014?</p>
	<p>11. In addition to servicing the enterprise customers of Lake County, how does your solution bring improved last mile internet and mobile (cellular) services to the residential and small business markets of these counties?</p>
	<p>12. Can your last mile service provide low cost internet</p>

<p>access for students enrolled in Lake County school district? If so, what is your suggested subscription price for families with students on free and reduced lunch?</p>	
<p>13. Please provide a proposed service level agreement for enterprise/community anchor institution customers of Lake County.</p>	

The primary goals of the RFP are to provide the following:

1. Redundant broadband service to the region
2. Expanded broadband capacity
3. Broadband services at a reasonable price
4. Improved mobile voice and data

IV. EMPLOYMENT DISCRIMINATION BY CONTRACTOR PROHIBITED

During the performance of a contract awarded pursuant to this advertised "Request For Proposal", the contractor agrees as follows:

A. The Service Provider will not discriminate against any employee or applicant for employment because of race, religion, color, sex or national origin, except where religion, sex or national origin is a bona fide occupational qualification reasonably necessary to the normal operation of the Service Provider. The Service Provider agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.

B. The Service Provider, in all solicitations or advertisements for employees placed by or on behalf of the Service Provider, will state that such contractor is an equal opportunity employer.

C. Notices, advertisements and solicitations placed in accordance with federal law, rule or regulation shall be deemed sufficient for the purposes of meeting the requirements of this section.

D. Contractor shall be in compliance with the applicable provisions of the Americans with Disabilities Act of 1990 as enacted and from time to time amended and any other applicable federal, state, or local laws and regulations. A signed, written certificate stating compliance with the Americans with Disabilities Act may be requested at any time during the life of this Agreement or any renewal thereof.

V. AWARD OF CONTRACT

A. This RFP is an effort to aggregate demand for broadband services in Lake County. Respondents are encouraged to sell to the community anchor institutions (CAIs), businesses, Service Providers, businesses and residents of Lake Counties. Proposals will be made publicly available especially to participating community anchor institutions, Service Providers, businesses and residences in an effort to educate consumers (demand) regarding Service Provider offerings (supply).

B. Lake County Government will evaluate responsive proposals for consideration for future purchases by Lake County Government.

C. Lake County Government reserves the right to reject any or all proposals, to waive informalities or irregularities in the proposals received, and to reject non-conforming, non-responsive, conditional or qualified proposals.

VI. GENERAL CONDITIONS

A. Proposals must be received by contractor for Lake County Government (Internet3, LLC) offices via email frank@wmxsystems.com by **5:00 PM MST, March 07, 2014**. Late proposals will be returned unopened.

B. Proposals shall be firm for a period of 365 days commencing March 07, 2013.

C. Any person or agency on the US Attorney General's list of ineligible contractors will not be considered.

D. The Service Provider certifies by signing this proposal that this proposal is made without prior understanding, agreement or accord with any other person submitting a proposal for the same product or service and that this proposal is in all respects bona fide, fair and not the result of any act of fraud or collusion with another person engaged in the same line of business or commerce. Any false statement hereunder constitutes a felony and can result in a fine and imprisonment as well as civil damages.

E. The company and equipment awarded this contract or purchase order shall be required to comply with all State and Federal requirements related to the contract.

F. Proposals shall be considered public information unless advised otherwise by the Service Provider. Service Provider shall include a separate letter stating which parts of the Proposal are deemed confidential and/or proprietary information not to be released.

Executive Summary

This report provides an assessment of the broadband environment for Lake County, Colorado. The methodology for this assessment involved 3 elements: a) speed mapping b) resource mapping and c) demand mapping.

Speed Mapping

Speed mapping refers to a process of gathering a) advertised speeds (internet speeds reported by service providers to state and federal authorities) and then comparing them to b) actual speeds or what the subscriber actually receives from the service provider. This assessment found a wide disparity between advertised and actual internet speeds. Of note, broadband, as defined by the Federal Communications Commission as 4 Megabits per second downstream, 1 megabit per second upstream, is available only in downtown Leadville (population 2,600 of a countywide total of 7,800) only.

Resource Mapping

Assessing the resources that comprise potential broadband infrastructure provides an explanation for a) deficiencies in the broadband network and b) resources that might improve the broadband environment. This assessment found few middle mile resources, which could contribute to an improved middle mile market. In short, the middle mile market is not “redundant, abundant nor affordable”.

Demand Mapping

Any business case would take potential sales (demand) into account in synch with any potential investment in infrastructure. Surveys of both residential as well as enterprise (community anchors and businesses) indicate that demand exceeds what is available from service providers.

Analysis

Lake County is in dire need of significant investment in its broadband environment including:

1. Redundant, abundant, affordable middle mile
2. Ubiquitous broadband last mile infrastructure serving as many residences, businesses and community anchor institutions in Lake County as possible

Recommendations

It is recommended that this report be made to the public (demand) and service providers (supply). In conjunction with publishing this report, Lake County Governments should issue a Request for Proposal inviting service providers to provide information on how they would improve the broadband environment in Lake County.

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Table 1 Why downtime matters: "five nines" or 99.999% up time is the standard for the industry. For comparison, a household in Denver can expect 99.999% uptime where Gilpin and Clear Creek county homes and businesses may suffer as low as 99.9% uptime-a significant difference in telecom standards..... 9

Table 2 Commercial towers in Lake County20

Table 3 Last mile providers in Lake County have access to 1 middle mile resource.20

Table 4 Inventory of last mile providers by town.....22

Table 5 Location of CenturyLink central office for Lake County. Almost all speed tests that met FCC definition of broadband occurred within 1 mile of the central office. Charter’s cable plant is limited to Leadville city limits and buys middle mile services from CenturyLink.22

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Introduction

A three-part mantra drives rural broadband development in Colorado:

- (1) No one size fits all
- (2) The best solutions are local
- (3) It does NOT cost millions of dollars to bring broadband to any rural Colorado community

Further more, a methodology known as “the 5 A’s” provides a robust means for community planners in improving their broadband environment. Those “5 A’s” are:

- (1) Aggregate Experience
- (2) Assess Broadband Environment
- (3) Assess and Aggregate Demand
- (4) Adopt Existing Resources and Solutions
- (5) Adapt for Sustainability

This Assessment is comprised of three mapping processes

- 1) Speed Mapping
- 2) Resource Mapping
- 3) Demand Mapping

The data gathered, summarized and reported is designed to help community leaders and service providers alike understand the current broadband environment and guide them in making decisions to improve the broadband environment.

Speed Mapping

Broadband is defined by the Federal Communications Commission as being a downstream speed of 4 megabits per second (Mbps) and upstream speed of 1 Mbps. Until that condition is met, a subscriber does not have broadband. Monitoring of internet speeds is the first step in assessing one's broadband environment.

Internet speeds are classified in two categories by the FCC and national Telecommunications and Information Administration (NTIA): a) advertised speeds or that which the service provider advertises as being the speed available in a given market b) actual speeds based on internet speed tests. The following figures provide contrasts in advertised speeds for Lake County as gathered by Colorado Broadband Data and Development for the Colorado and National Broadband Maps versus speed test data gathered in a survey by Lake County, Internet3 and Mobile Pulse.

Advertised Speeds

The following figures detail advertised speeds for Lake County.

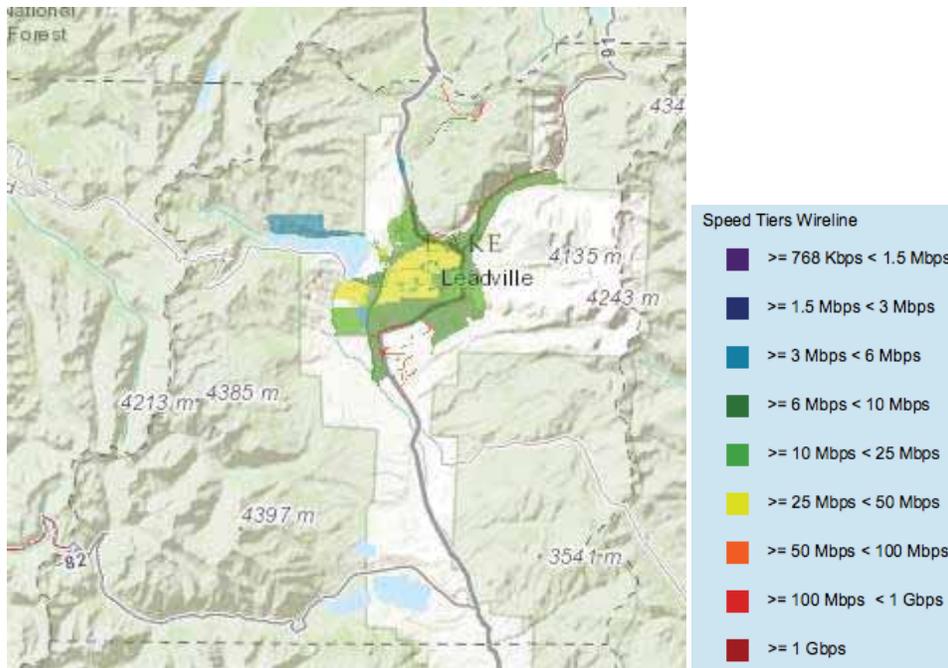


Figure 1 Advertised speeds for Lake County indicate Leadville has access of up to 50 Mbps internet speeds on wireline (telephone company infrastructure or cable modem)

Source: Colorado Broadband Data and Development Program
<http://www.colorado.gov/oit/broadband>

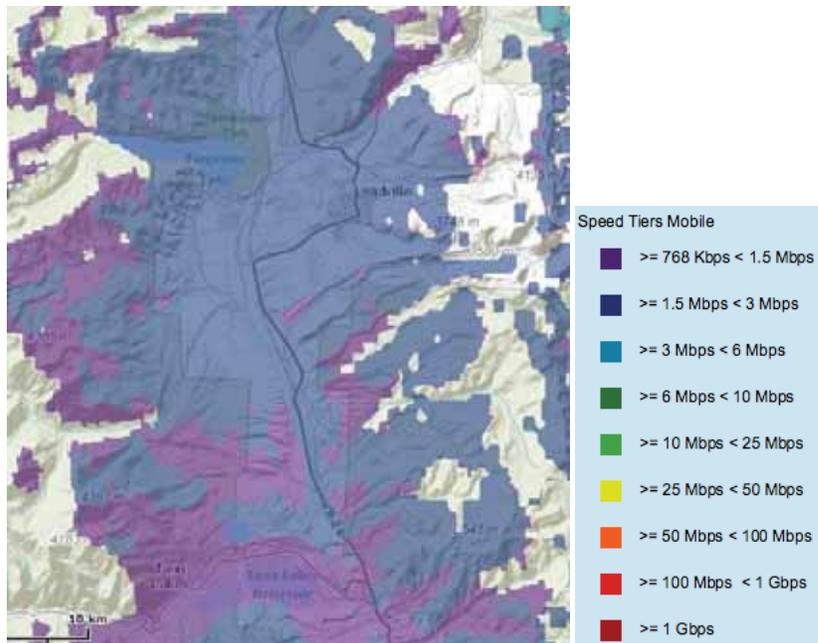


Figure 2 Map of advertised mobile (cellular) speeds for Lake County indicate speeds of up to 6 Mbps on mobile devices.

Source: Colorado Broadband Data and Development Program

<http://www.colorado.gov/oit/broadband>

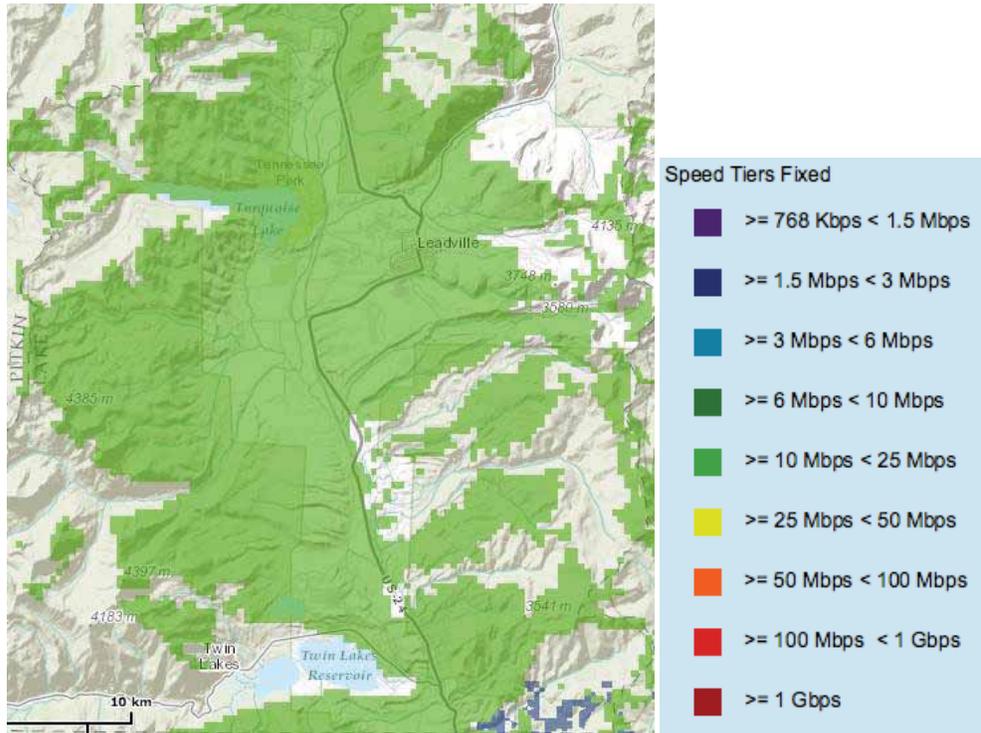


Figure 3 Map of advertised fixed wireless speeds indicates speeds of up to 25 mbps are available throughout Lake County. No actual tests collected support this.

Source: Colorado Broadband Data and Development Program
<http://www.colorado.gov/oit/broadband>

Actual Speeds

LakeConnect, the Local Technology Planning Team for Lake County, gathered speed test data in late 2012/early 2013. Almost 100 tests were analyzed to determine where broadband, as defined by the Federal Communications Commission (FCC) as 4 megabits per second (Mbps) downstream and 1 Mbps upstream, might be available. In contrast to the “advertised” speed data gathered for inclusion in the National and Colorado Broadband Maps, the map that follows is based on the data gathered.

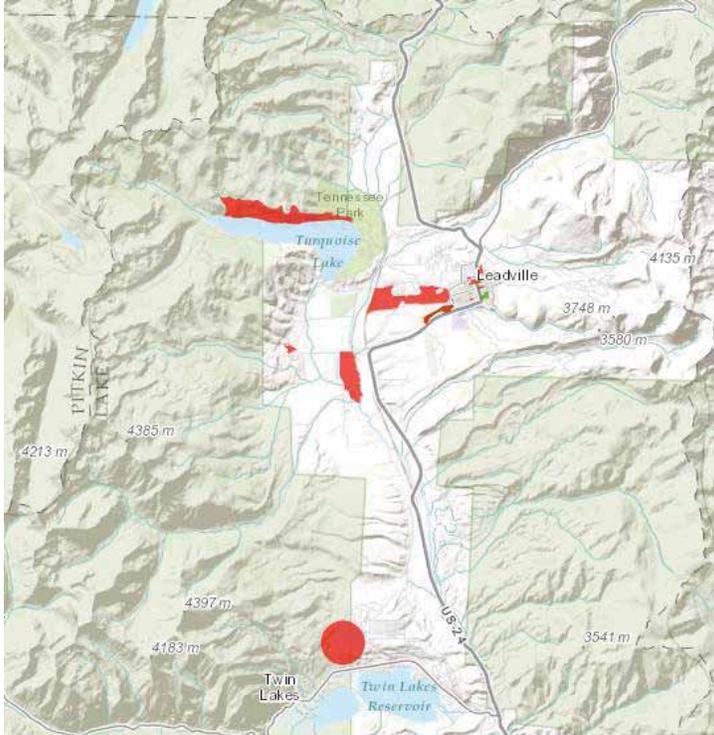


Figure 4 Speed tests gathered by Colorado Broadband Data and Development Program. A green dot represents a speed test where the subscriber got 3 Mbps downstream and 1 Mbps upstream. A red dot indicates a test that did not achieve those speeds.

Source: Colorado Broadband Data and Development Program
<http://www.colorado.gov/oit/broadband>

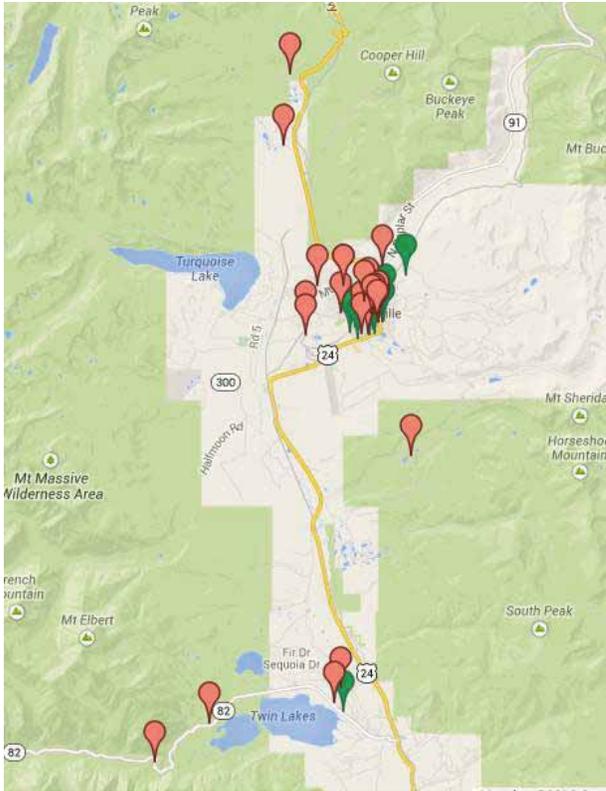


Figure 5 Actual speeds for Lake County as gathered by LakeConnect. Each point represents a speed test that met FCC definition of broadband (4 Mbps down, 1 Mbps up). Of almost 100 tests, less than 10% met the broadband criteria. Median download speed is 5.425 Mbps, median upload speed is 1.755 Mbps

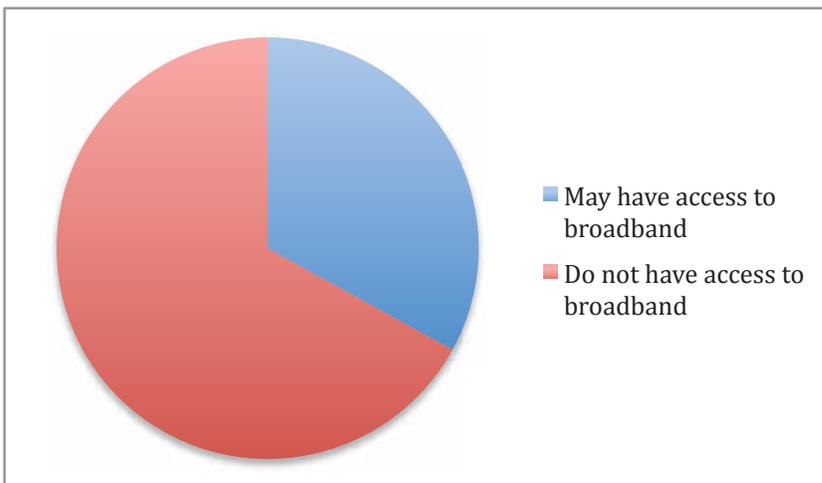


Figure 6 At least two-thirds of the population of Lake County have no access to broadband

Identify and catalog most challenged communities

Based on actual speed testing, all communities of Lake County are challenged in terms of internet speeds and reliability of the infrastructure.

Outages

Many respondents to the LakeConnect survey reported frequent network outages.

Of note, Chaffee County's Mountain Mail reported the following outage of June 2012:

Cut cable kills internet, phone

Posted: Thursday, June 7, 2012 8:52 am

Joe Stone, Mail News Editor | [0 comments](#)

Internet and phone service went down in Chaffee County Wednesday afternoon when a fiber-optic cable was inadvertently cut Wednesday afternoon along U.S. 285 in southern Chaffee County.

Mark Bittle, CenturyLink spokesperson, said a nearby work crew responded almost immediately, restoring service in less than 2 hours.

Verizon Wireless spokesperson Bob Kelley said the damaged cable caused service outages at four Verizon cellular towers between Salida and Leadville.

Bittle said this and other recent service interruptions underscore the need for redundancy in the regional fiber-optic network, an issue the Chaffee County Economic Development Corp. has identified as a top priority.

Bittle said CenturyLink has listened to concerns expressed by the CCEDC and has diverted funds to build a redundant fiber-optic path that will prevent service outages when completed.

Bittle estimated that the new cable will be complete "within a year for sure."

While it might be an interesting exercise to determine the cost of a CenturyLink network outage in dollars per hour in a) lost sales by retailers, b) lost productivity in the public sector (schools, city and county governments) and c) the private sector (\$/hour/employee), suffice it to say that the outage of October 31, 2011 cost Steamboat Springs retailers at least \$100,000/hour for 8 hours or \$800,000 in lost sales. From a community perspective, the expenses (capital and operating) of the CNL pale in comparison to the cost of just one more CenturyLink middle mile outage.

COST OF NETWORK OUTAGE IN LOST SALES OCT 31, 2011 (\$100,000/HOUR X 8 HOURS)	COST OF NETWORK OUTAGE IN LOST PRODUCTIVITY (# WORKERS X \$30/HOUR X 8 HOURS)	TOTAL COST OF OUTAGE 31 OCT 2011	ONE TIME COST OF CNL	SAVINGS TO COMMUNITY OVER ONE NETWORK OUTAGE
\$800,000	1,000x\$30x8=\$240,000	\$1,040,000	\$70,000	\$940,000

Table 7 Worksheet for determining cost of network outages for Steamboat Springs

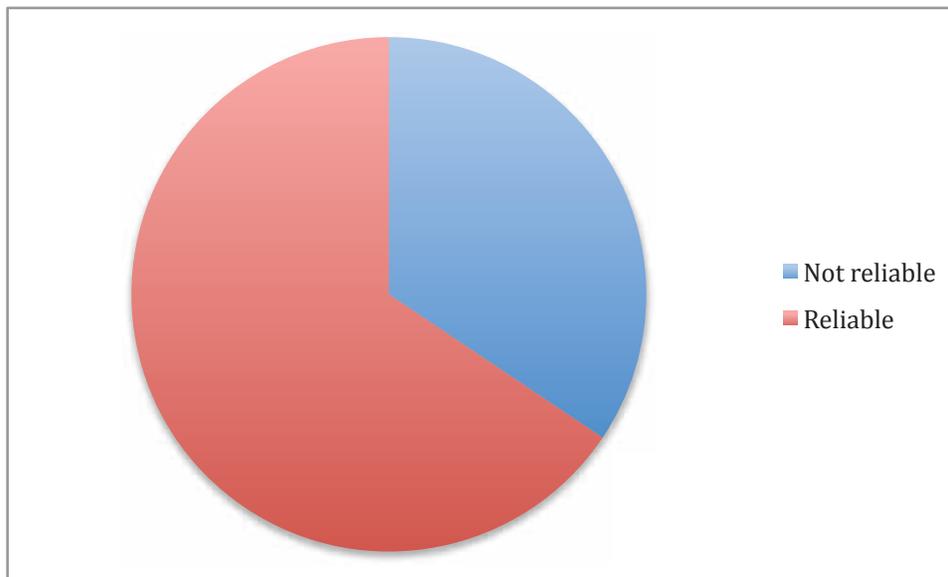


Figure 8 One-third of respondents reported their internet service is not reliable

Availability %	Downtime per year	Downtime per month*	Downtime per week
90% ("one nine")	36.5 days	72 hours	16.8 hours
95%	18.25 days	36 hours	8.4 hours
97%	10.96 days	21.6 hours	5.04 hours
98%	7.30 days	14.4 hours	3.36 hours
99% ("two nines")	3.65 days	7.20 hours	1.68 hours
99.5%	1.83 days	3.60 hours	50.4 minutes
99.8%	17.52 hours	86.23 minutes	20.16 minutes
99.9% ("three nines")	8.76 hours	43.8 minutes	10.1 minutes
99.95%	4.38 hours	21.56 minutes	5.04 minutes
99.99% ("four nines")	52.56 minutes	4.32 minutes	1.01 minutes
99.999% ("five nines")	5.26 minutes	25.9 seconds	6.05 seconds
99.9999% ("six nines")	31.5 seconds	2.59 seconds	0.605 seconds
99.99999% ("seven nines")	3.15 seconds	0.259 seconds	0.0605 seconds

Table 1 Why downtime matters: "five nines" or 99.999% up time is the standard for the industry. For comparison, a household in Denver can expect 99.999% uptime where Gilpin and Clear Creek county homes and businesses may suffer as low as 99.9% uptime-a significant difference in telecom standards.

Resource Mapping

Why does a community's internet "stink"? Most likely it is due to inadequate infrastructure and other resources. The next step in solving the problem is to list and map telecom infrastructure resources. The most critical of which are middle mile resources, i.e., the connection to the outside world.

Inventory of Middle Mile Assets

Middle mile, the "pipe" that connects communities to the outside world, comes in two technology types: fiber optic cable and microwave (wireless).

Fiber Optic Cable Routes

Fiber optic cable is generally deployed in two "flavors": aerial (strung along power transmission or distribution lines) and terrestrial (trenched in conduits usually along highway rights of way).

Aerial Routes

Electric utilities' infrastructure can be used for broadband services. Fiber optic cables can be attached to electric utility poles to deliver both middle and last mile services.

Sangre de Cristo Electric Association

South Lake County is served by Sangre de Cristo Electric Association, a not-for-profit electric co-operative. Sangre de Cristo Electric Association has no aerial fiber deployed on their assets in Lake County. Sangre de Cristo management is enthusiastic to work with Lake County to improve the broadband environment.

A search of US Forest Service filings indicates CenturyLink uses (or used) aerial fiber at a one-mile stretch of their middle mile serving Lake County.

Qwest Corporation dba Centurylink QC CE	- Special use management	In Progress: 215 Comment Period Legal Notice 06/29/2012	Expected:08/2012	08/2012	Jon Morrissey 719-486-0749 jmorrissey@fs.fed.us
Description: Proposed action involves issuing a new special use permit for placement of 6622.2 feet of aerial fiber optic cable on existing power poles.					
Location: UNIT - Leadville Ranger District. STATE - Colorado. COUNTY - Chaffee. LEGAL - NE1/4 Section 21, Township 12 South, Range 79 West ,and the W1/2 and SE1/4 Section 27, Township 12 South, Range 79 West, all in the 6th Principal Meridian. Just off Highway 24, approximately three (3) miles south of Granite, Colorado..					

Figure 9 Sample of Forest Service filings by CenturyLink for aerial fiber work near Granite, CO
Source: <http://www.fs.fed.us/sopa/components/reports/sopa-110212-2013-04.html>

Xcel Energy

Xcel Energy is the electric provider for Leadville and north Lake County. Per the Telecommunications Act of 1996, for-profit electric utilities such as Xcel, must make their poles and other facilities available to telecom service providers. Additional rulings from the FCC have set pricing for use of utility poles at about \$5/year.

As a result, any Xcel Energy pole could be used for middle mile services. For example, fiber optic cabling attached to Xcel poles could bring competitive gigabit

per second speeds to Leadville, Twin Lakes and any other cluster of businesses and residences.

Utility poles can also support last mile broadband where aerial fiber optic cables attached to utility poles delivering fiber-to-the-home broadband services. Of note, San Luis Valley Rural Electric Cooperative is currently planning such a network.

Terrestrial Fiber Routes - CenturyLink

There is only 1 commercially operated middle mile fiber optic service provider in Lake County: CenturyLink. As the route map below indicates, this route should provide north-south route diversity such that in the event of a cut in the line, traffic should be rerouted in the direction opposite the cut. Recent CenturyLink fiber optic cable cuts (NW CO October 31, 2011, Chaffee County June 06, 2012) do not support that claim.



Figure 10 CenturyLink fiber optic cable route in Lake County

Colorado Department of Transportation (CDOT) and Comcast

One possible solution toward ensuring middle mile services to Lake County are “redundant, abundant and affordable” is to connect to fiber optic route(s) on Interstate 70.

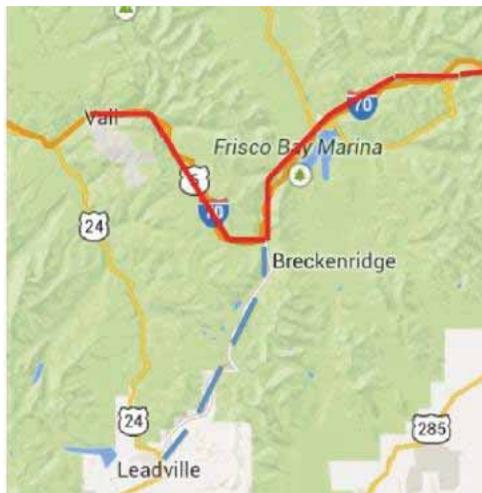


Figure 11 CDOT operates a 144-strand fiber route Golden to Vail of which 2 strands are leased to Comcast. Leadville could connect to that route via Xcel energy utility poles along Hwy 91

CDOT-ITS Fiber Sharing Policies and Primary Agreements

Colorado Department of Transportation has a fiber optic route stretching from Golden to Vail along I-70. That route has 144 strands of fiber. Comcast has use (lease) of 2 fibers for 20 years. Comcast provides all maintenance, including locates, on the line and Comcast pays CDOT ITS \$300,000/year cash (\$6M total) + consulting services over the term for a total contribution of approximately \$15M.

CDOT maintains control of our existing fiber asset to use, lease, etc. “The department shall not enter into any exclusive arrangement, lease, or other agreement for use of

the public rights-of-way by a telecommunications provider that in any way discriminates or prevents a similar arrangement being made with any other telecommunications provider.”

Any public or private entity may approach CDOT or any party to discuss availability and terms for use of that entities asset. Public sector requests to CDOT may be considered based on in-kind services and/or matters of public safety. In short, all ITS fiber optic strands are open for public or private use, provided that there are fiber strands available for use, and if a partner is able to provide in-kind benefit to CDOT, as noted in the statutes referenced above.

EAGLE-Net

The most recent map from EAGLE-Net (\$100.6 million federal grant to build fiber optic routes to Colorado's 178 school districts) shows a planned terrestrial fiber optic cable route from Interstate 70 to Leadville. Earlier versions of the same map indicated that route would be completed by August 30, 2013 (the end date of federal funding). The planned route was to have been constructed along CO 91 connecting to a yet-to-be-constructed (or leased) route along Interstate 70.

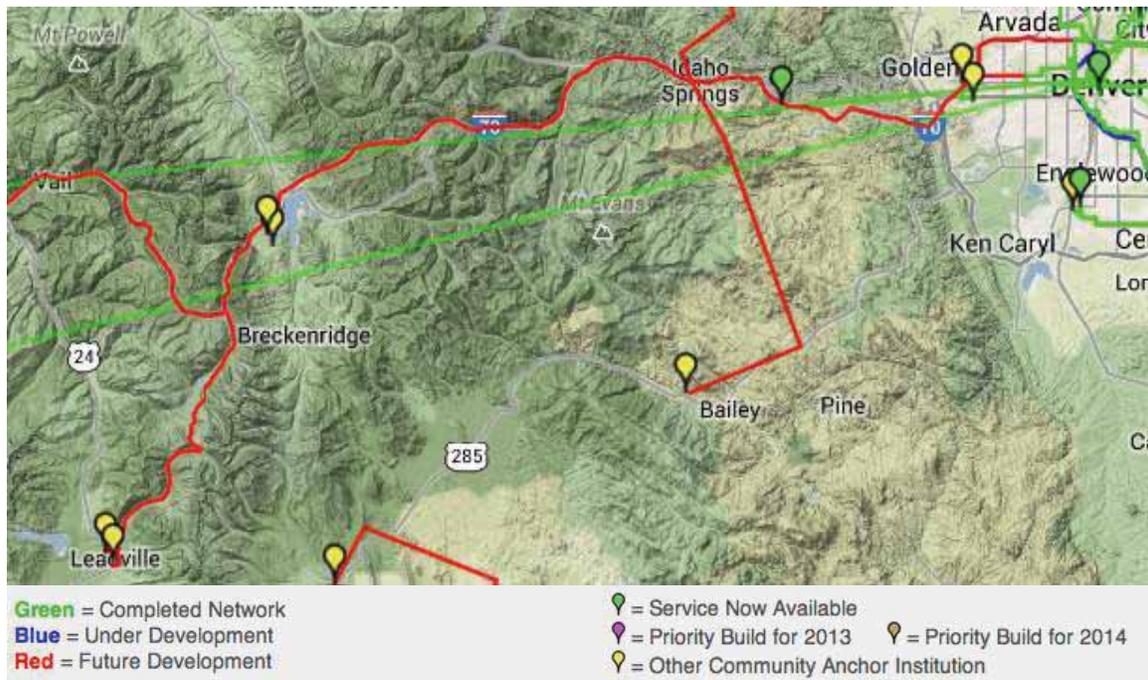


Figure 12 EAGLE-Net's December 2013 map of facilities for Lake County (or lack thereof). It is unlikely EAGLE-Net will build to Lake County.

Microwave

Microwave radios can transmit multiple gigabits per second at ranges of over 50 miles at costs of less than \$5,000/mile (compare to trenched fiber which starts at \$25,000/mile and aerial fiber at \$15,000/mile). Microwave is a relatively low cost middle mile solution for many rural and remote communities.

American Tower



Figure 13 American Tower, a leading cell tower operator, has a tower in Leadville that can support microwave operations.

Consolidated Communications Network of Colorado (CCNC)

Colorado is home to the nation's largest public safety two-way radio network, the CCNC with 216 tower sites and over 60,000 public safety subscribers. The figure below illustrates CCNC microwave sites in Lake County and Denver. The microwave towers illustrated are often located on "antenna farms" where commercial space can be had by commercial service providers who could contribute to improved middle miles services in Lake County.

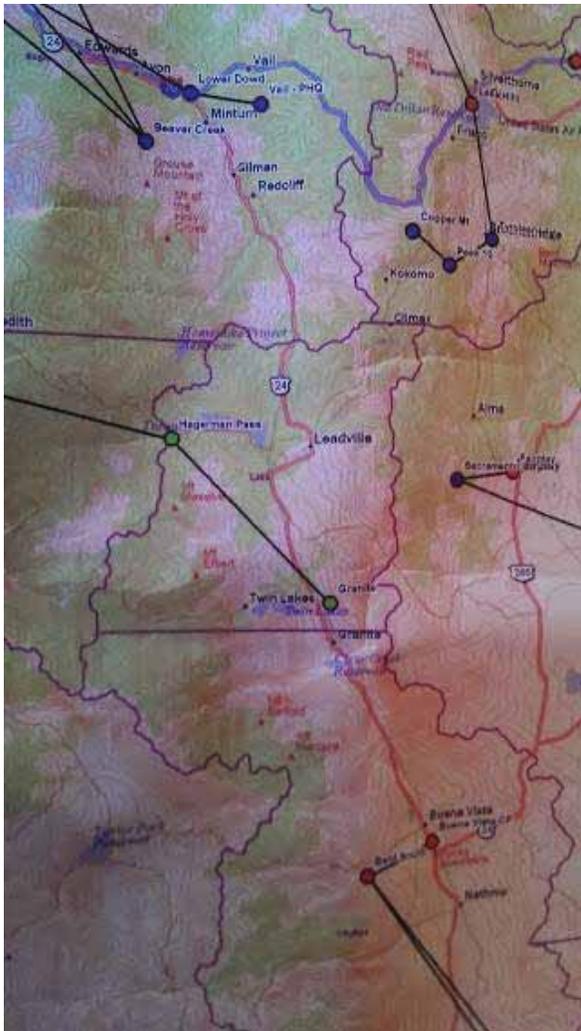


Figure 14 Map of CCNC site in Lake County. If not available for commercial use, near by towers can be used for commercial purposes

http://ccncinc.org/images/stories/maps/jan2011_sites.gif

Lake County Wireless Towers

Lake County Government owns and operates 2 radio towers: Quail Mountain and Lake County Courthouse.



Figure 15 Lake County Government owns towers at Quail Mountain and Lake County Courthouse

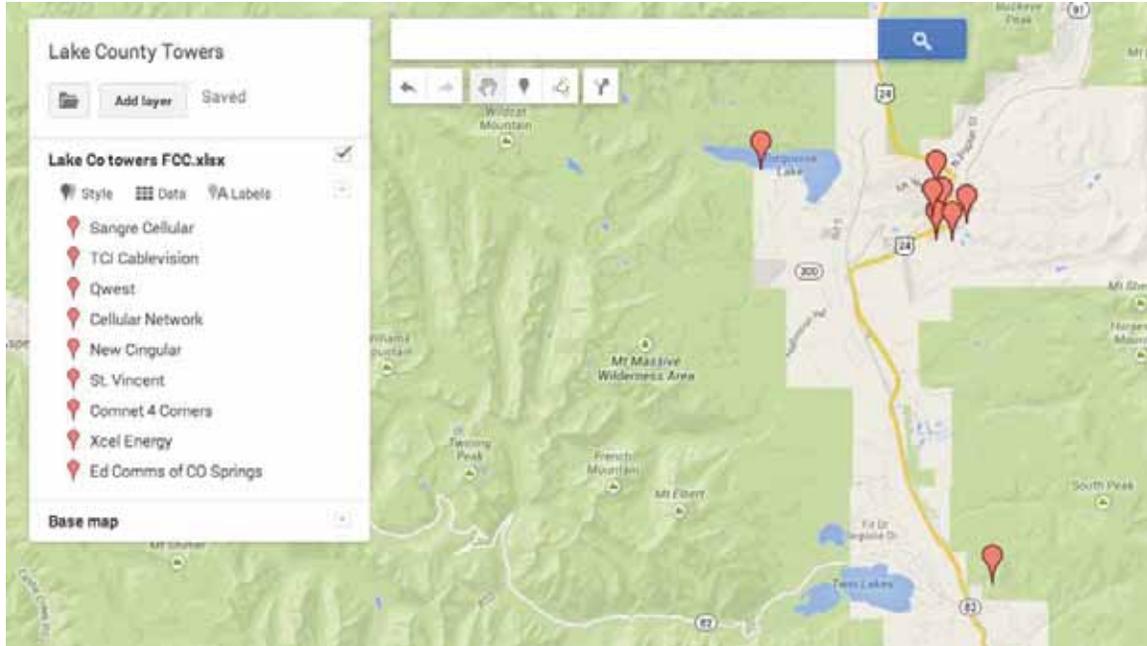


Figure 16 Commercial towers in Lake County per FCC

Address	Operator
39 05 10N 106 16 05 W	Sangre Cellular
39 14 48N 106 17 51W	TCI Cablevision
39 14 5N 106 17 23W	Qwest
39 14 44N 106 18 09W	Cellular Network
39 15 32N 106 23 25W	New Cingular
39 14 04N 106 18 01W	St. Vincent
39 14 32N 106 16 54W	Comnet 4 Corners
39 15 31N 106 17 40W	Xcel Energy
39 14 04N 106 18 01W	Ed Comms of CO Springs

Table 2 Commercial towers in Lake County

Summary of Middle Mile Resources

Middle Mile Technology	Route/Location	Vendor/Operator
Fiber optic cable	Hwy 24 and 91	CenturyLink

Table 3 Last mile providers in Lake County have access to 1 middle mile resource

Inventory of Last Mile Providers by Community

Last mile providers connect subscribers to the Internet. A survey conducted by Lake Connect in February, 2013, gathered responses from 23 respondents.

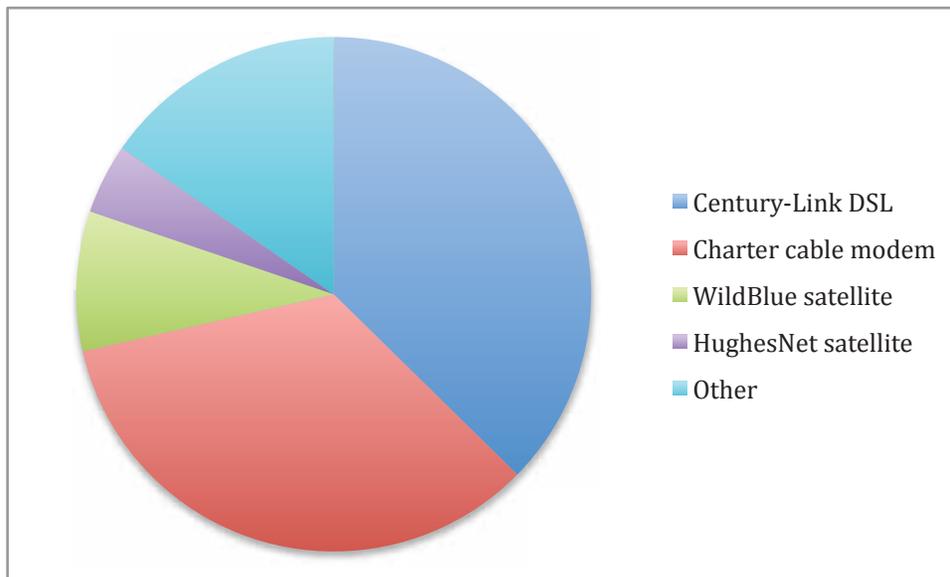


Figure 17 How Lake County accesses the Internet

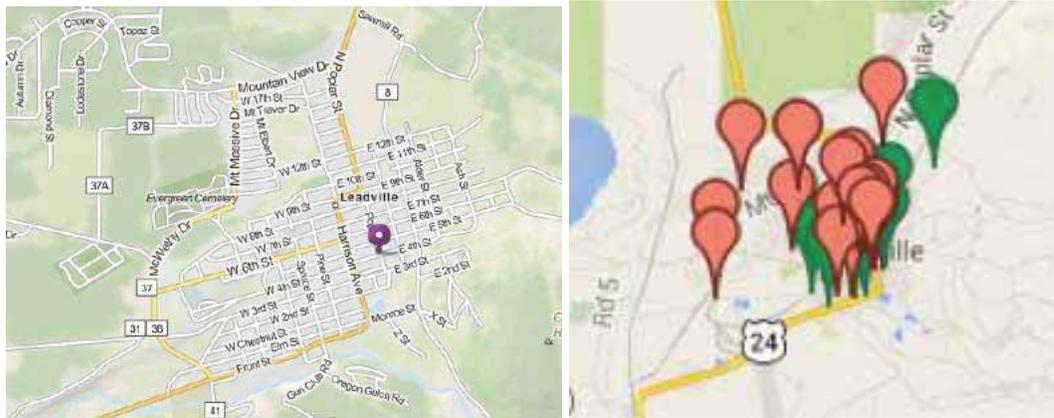
Almost half of respondents reported subscribing to cable modem service. This is probably due to a) small footprint for coaxial cable infrastructure (Leadville only) b) aging coaxial cable infrastructure c) the cable modem provider (now Charter Communications) probably buys middle mile services from CenturyLink. It is not clear why Charter does not offer Denver-area speeds (50 mbps and 100 Mbps packages) in the communities it serves in Lake County.

Town	Providers
Leadville	CenturyLink Charter AT&T Verizon Amigo net
Twin Lakes	CenturyLink AT&T Verizon

Table 4 Inventory of last mile providers by town

Inventory of Switching Facilities

Traditionally, telecommunications services have been routed through the telephone company’s central office. Leadville’s broadband environment is no exception.



Town	Street Address
Leadville	411 Poplar St. Leadville, CO

Table 5 Location of CenturyLink central office for Lake County. Almost all speed tests that met FCC definition of broadband occurred within 1 mile of the central office. Charter’s cable plant is limited to Leadville city limits and buys middle mile services from CenturyLink.

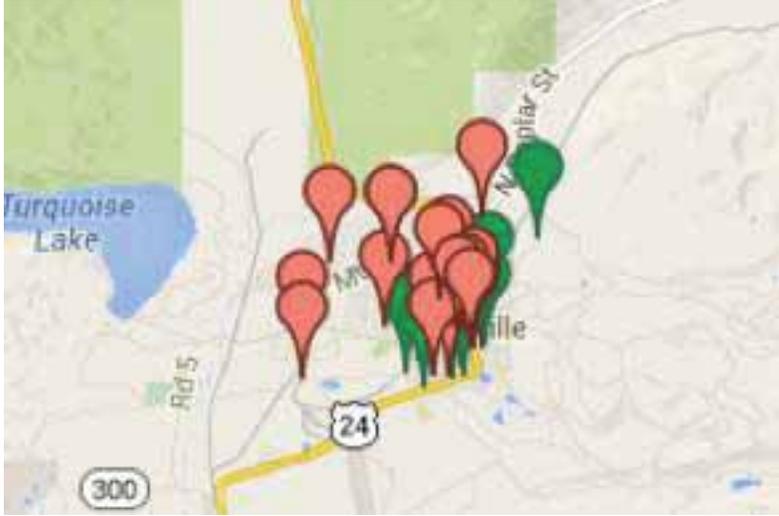


Figure 18 Actual broadband speeds that meet the FCC's definition of broadband occur only in close proximity (less than 1 mile) from the CenturyLink central office. Charter buys its middle mile services from CenturyLink's central office.

Demand Mapping: An Assessment of Needs

In January and early February 2014, a demand survey was performed to gauge overall demand by a) enterprise market (businesses and community anchor institutions) and b) a limited residential survey.

Lake County Enterprise Demand Survey

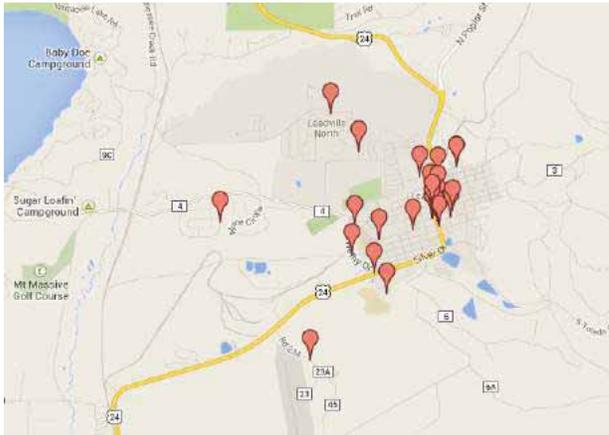


Figure 19 Enterprise survey respondents are clustered largely in Leadville. Improvements in middle mile and last mile delivery would provide better broadband at low cost

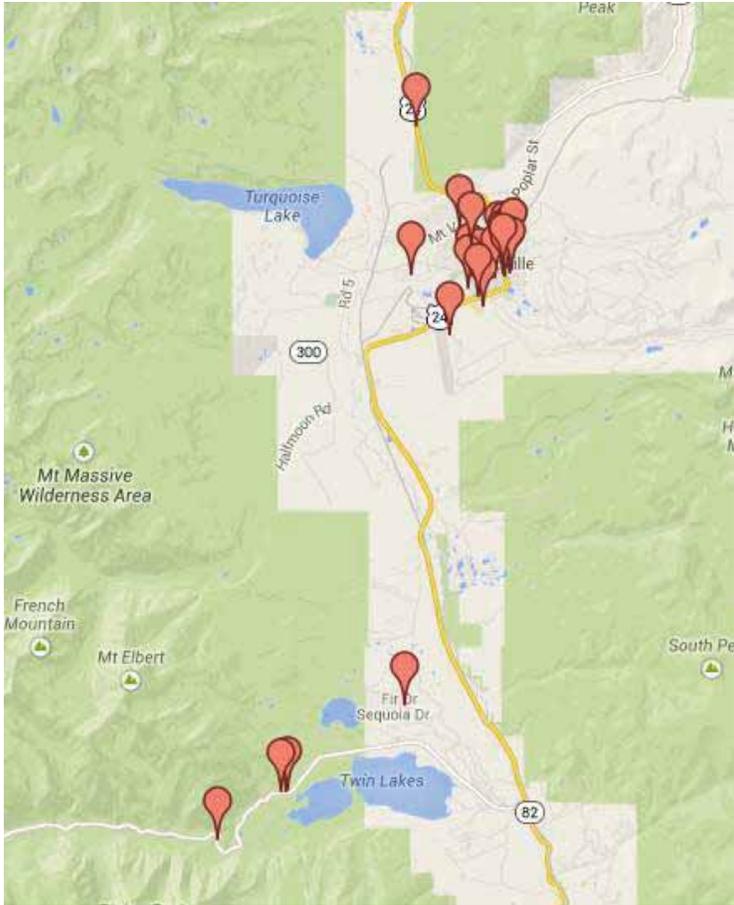


Figure 20 Responses to the demand survey for businesses and community anchors indicate demand is clustered in Leadville and Twin Lakes. See also <https://mapsengine.google.com/map/edit?authuser=0&hl=en&mid=zPDFjKKhVKL8.k8Mr6cEALkLA>

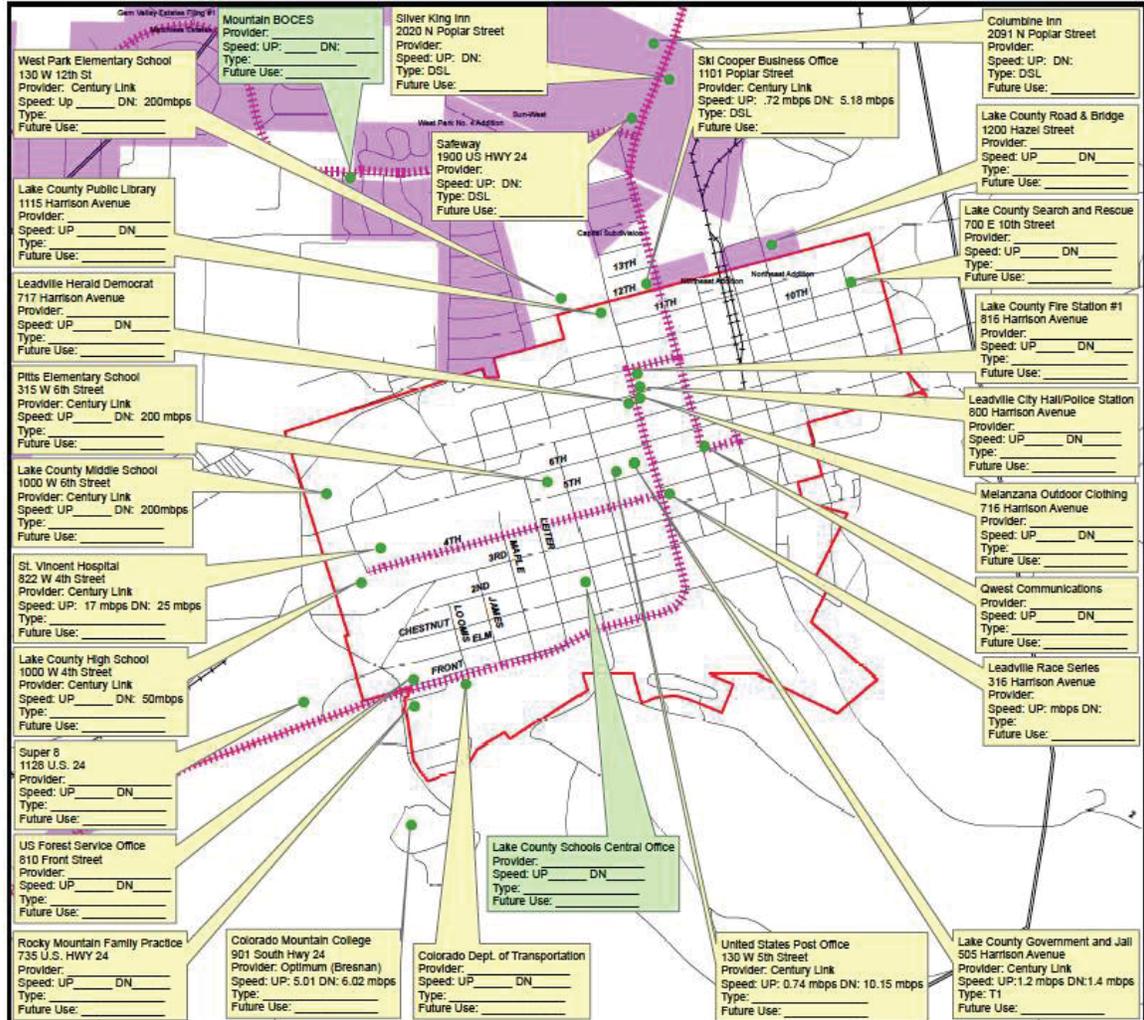


Figure 21 Inventory of community anchors in Leadville that subscribe to relatively large quantities of bandwidth representing relatively high levels of demand for last mile services. Not all such enterprises responded to the demand survey indicating there is considerably more demand than what was revealed in the demand survey.

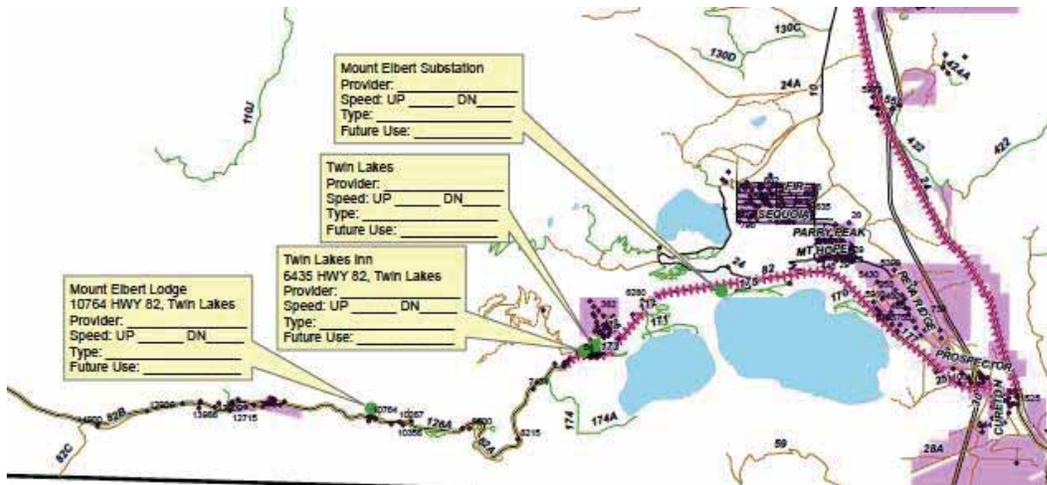


Figure 22 Additional enterprises in south Lake County

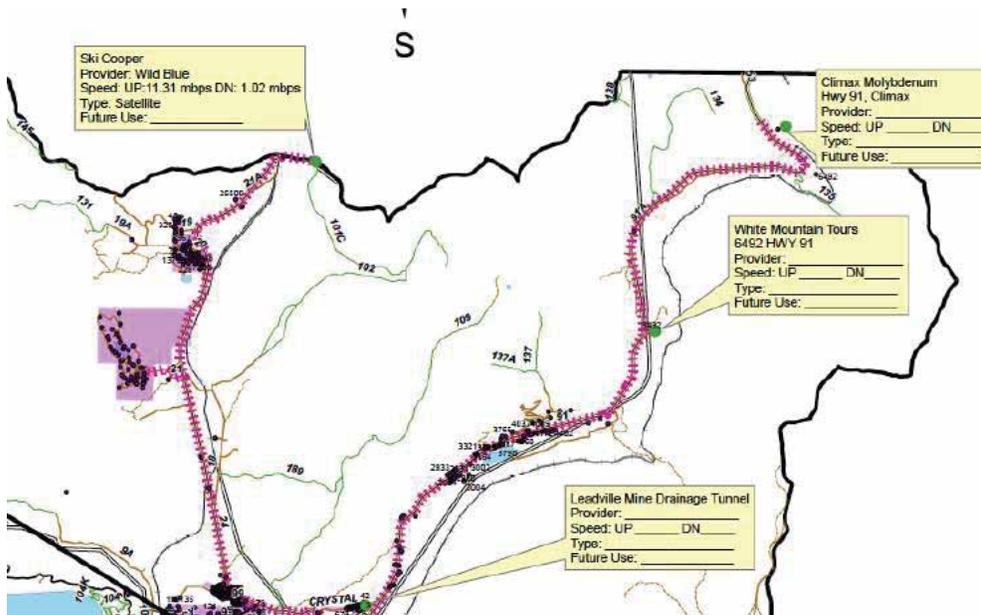


Figure 23 Enterprises in north Lake County

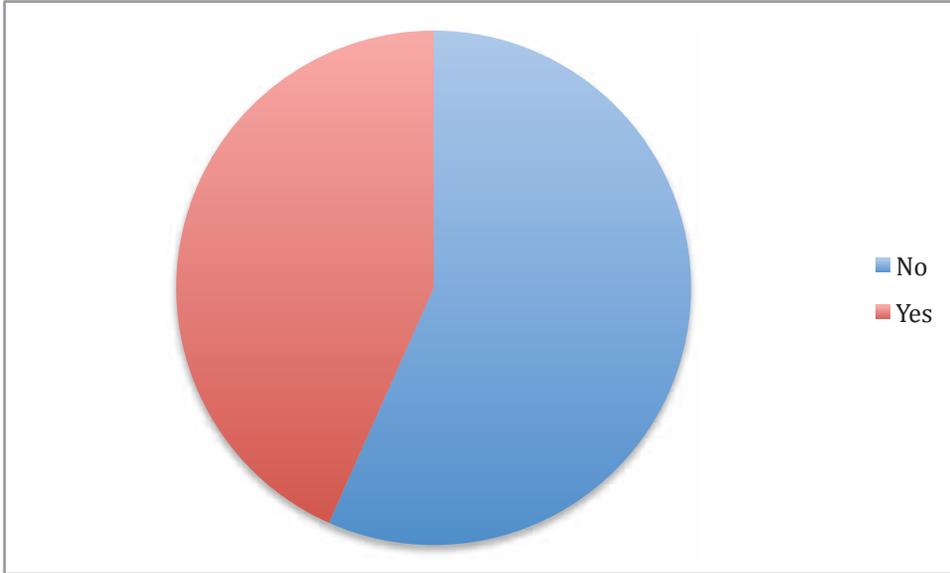


Figure 24 Over half of respondents are not satisfied with their internet service.

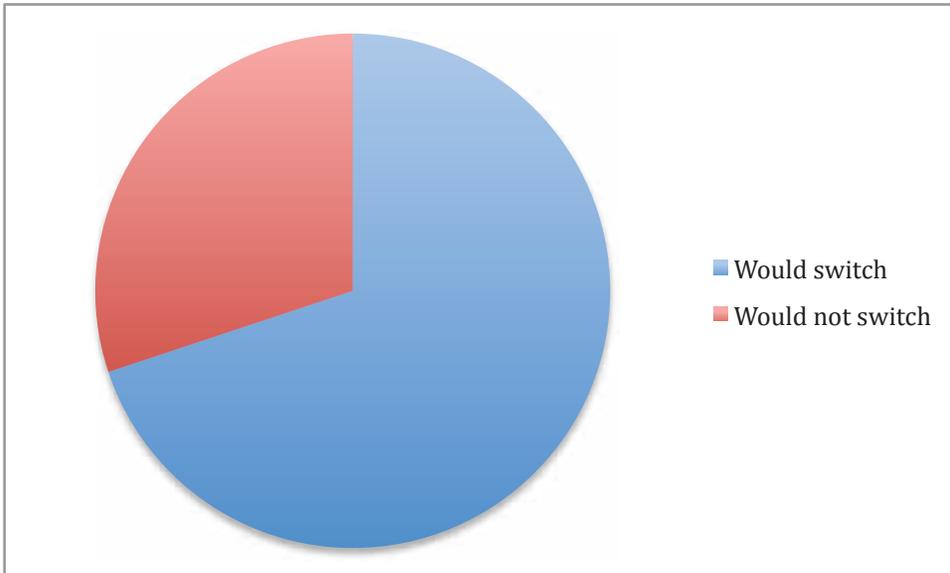


Figure 25 Two-thirds of respondents would switch to a new service provider if it offered faster speeds at about the same price

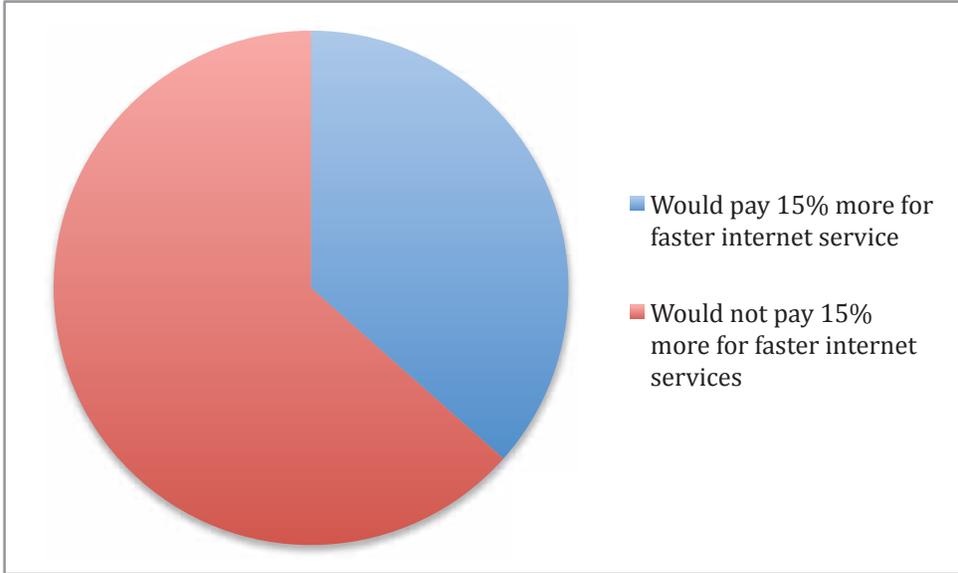


Figure 26 One-third of respondents said they would pay up to 15% more for faster internet service

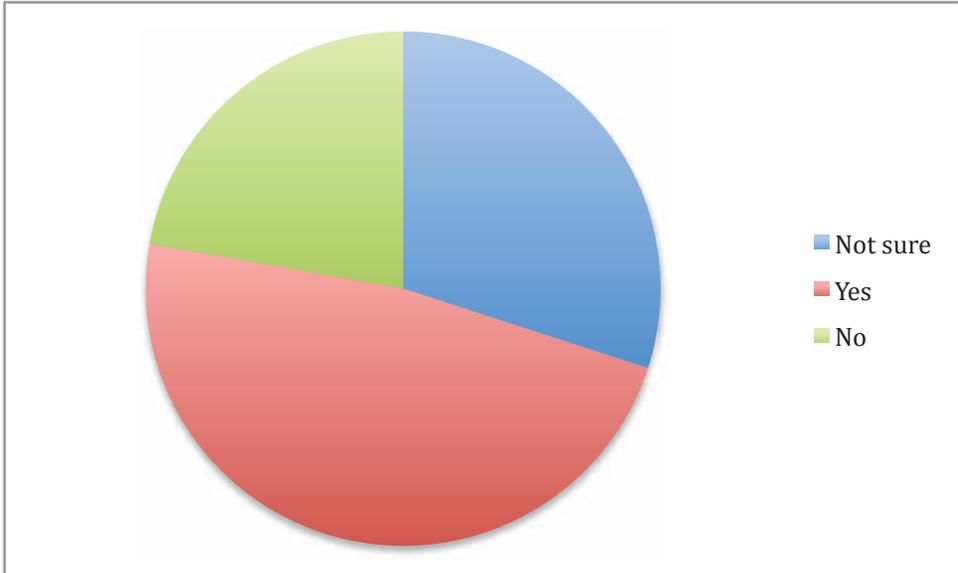


Figure 27 About half of respondents are subscribed to the fastest speeds possible for their market

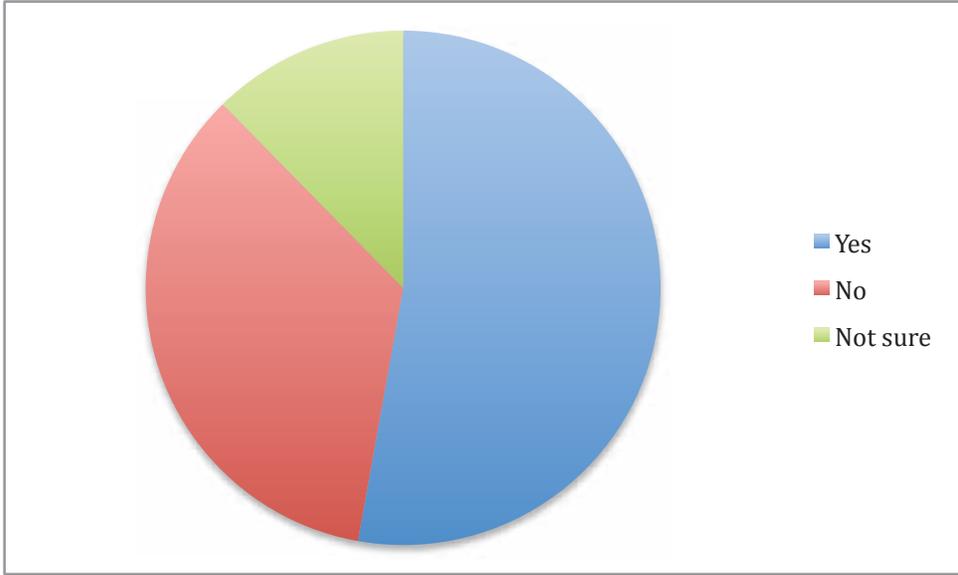


Figure 28 About half of respondents report they have a choice in service providers

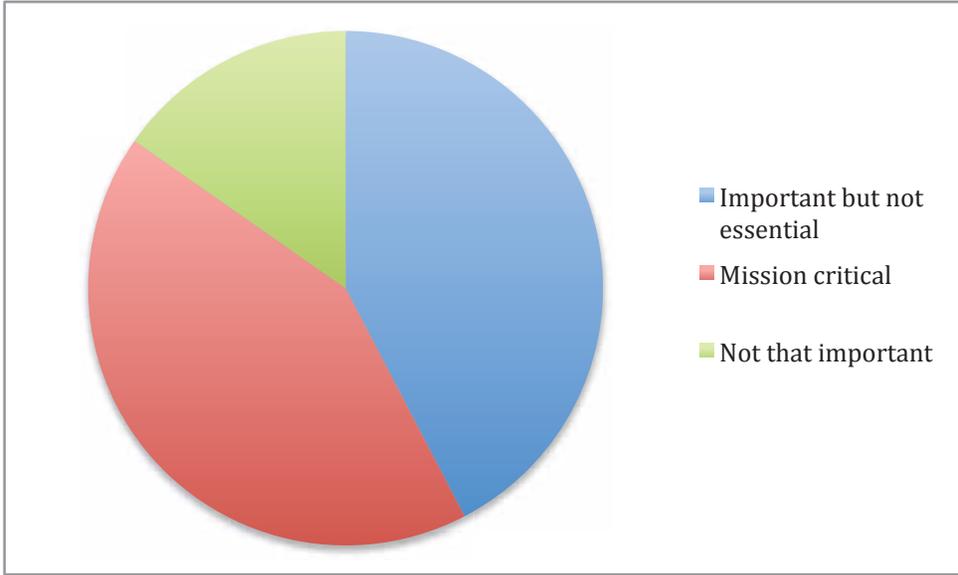


Figure 29 Half of respondents consider faster internet service to be mission critical for their business

Most businesses and community anchor institutions pay (relative to Denver prices) extremely high prices for (relative to Denver) for very slow internet speeds and unreliable service (frequent outages).

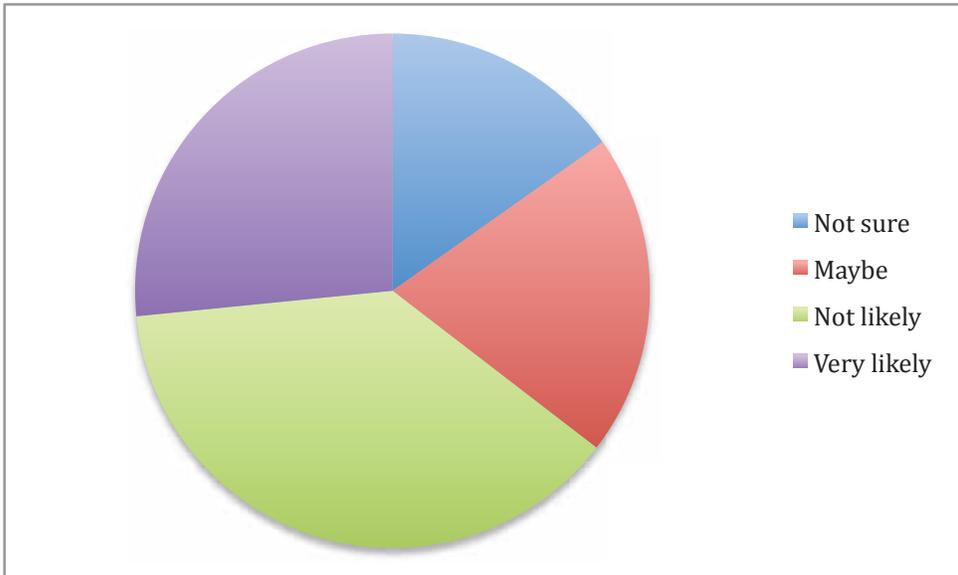


Figure 30 About one-quarter of respondents would be very likely to expand their business if they had access to faster internet services

Communication between suppliers and potential subscribers detailing a) availability of services b) speeds of services c) pricing of services and d) reliability of services might remedy the differences between expectations and what's available in this market.

Recommendations: Next Steps

1. Once approved by Lake County government, this report and especially the results of the surveys should be made available to the public (downloadable from county government websites). Issuance of a press release to local and state media will lay the foundation for Recommendation #2 below.

2. A Request for Proposal (RFP) should be issued by Lake County to local and national service provider communities inviting proposals to better serve the communities of Lake County. This leverages market forces to bring better broadband to Lake County at little expense to Lake County Government.

Appendix A Survey of Business and Community Anchor Demand

Location	Address	Provider	Download Mbps	Monthly cost	Would Like to Buy Mbps	Contact
Lake County Courthouse	505 Harrison St. Leadville CO	Charter	30	132.8	50	Chris Weis cweis@graceglobalinc.com
Lake County Courthouse	505 Harrison St. Leadville CO	Charter	30	132.85	50	Chris Weis cweis@graceglobalinc.com
Lake County Courthouse	505 Harrison St. Leadville CO	Charter	30	53.25	50	Chris Weis cweis@graceglobalinc.com
Lake County Courthouse	505 Harrison St. Leadville CO	Century Link	1.5	805.87		Chris Weis cweis@graceglobalinc.com
Lake County Aquatic Center	1000 W. 6th St. Leadville CO	Charter	15	53.25	15	Chris Weis cweis@graceglobalinc.com
6th street gym/maintenance	124 E. 6th Street Leadville CO	Century Link	7	106.58	15	Chris Weis cweis@graceglobalinc.com
Road and Bridge	429 E. 12th Street Leadville CO	Century Link	7	255.2	15	Chris Weis cweis@graceglobalinc.com
Road and Bridge	429 E. 12th Street Leadville CO	Charter	30	132.85	50	Chris Weis cweis@graceglobalinc.com

Build a Generation	711 Harrison St. apt 1b Leadville CO	Charter	15	50.3	20	Chris Weis cweis@graceglobalinc.com
Lake County Landfill	1501 CR 6 Leadville CO	Century Link	7	106.58	10	Chris Weis cweis@graceglobalinc.com
Lake County Airport	915 County Road 23 Leadville CO	AmigoNet	12	49.95	50	Chris Weis cweis@graceglobalinc.com
Leadville Race Series	316 harrison Ave Leadville CO				50	
USPS	130 West 5th St Leadville CO	CenturyLink	10			
CO Dept of Transportation	Hwy 24 Leadville CO	CenturyLink	1.5			
CO Mountain College	901 South Hwy 24 Leadville CO	Charter	30	75	50	Jim English jenglish@coloradomtn.edu 970-945-8691
St. Vincent Hospital	822 West 4th Street Leadville CO	CenturyLink	40	\$1,000		
Ski Cooper	232 County Rd. 29, Leadville, CO 80461	WildBlue	15	\$160	40	Patrick Torsell, Director of IT 719.486.2277 x116 ptorsell@skicooper.com
Wells Financial	130 W 5th St Leadville CO 80461	CenturyLink	15	\$70	15	wfservices1009@qwestoffice.net

Cloud City Victorian Cottage and Silver Rush Inn	211 East 4th St Leadville CO	Charter	10	\$50	10	
Mt Massive Golf Course	259 CR 5, Leadville CO 80461	CenturyLink	4			Craig 719-486-6670
KW Construction	1001 poplar, 617 hwy 24 Leadville CO 80461	Charter	15		1000	Patty Hockett
Kirk's Coffee	752 Turquoise St Leadville 80461	CenturyLink	0.85	\$45	50	
Governor's Mansion Guest Suites	129w 8th St Leadville CO 80461	Charter			100	719-486-1865
ReMAX	318 West 4th - Leadville, 80461	CenturyLink	10	\$50	10	
Peoples National Bank	400 Harrison Avenue, Leadville, CO 80461	CenturyLink	1.54	\$450		
Peoples National Bank	400 Harrison Avenue, Leadville, CO 80461	Charter	30	\$60	30	Interbank1 / Peoples National Bank Mark Bye, VP 888-589-7758
CO Dept. of Labor and Employment	115 W. 6th St. Leadville, CO 80461	CenturyLink	1.54		100	Kim Rodriguez 719-486-2428
Mountain BOCES	1713 Mount Lincoln Drive West	Charter	10	\$100	100	Jenny Gifford 719-486.2603

	Leadville CO 80461					
Colorado Insurance	500 McWethy Drive, Leadville 80461	Wild Blue	15	\$80		Jack Saunders saunderscompany@wildblue.net
Tabor Opera House	308 Harrison Ave, Leadville CO 80461	Century Link	7	\$30		Bill Bland 303-550-1048 bill.bland@gmail.com
Erickson Property Management Twin lakes Roadhouse Lodge	6411 E. Hwy 82 Twin Lakes 81251	WildBlue		\$85		Steve Erickson info@twinlakescolorado.com
Cabbott	48 Lang Street Twin Lakes CO 81251	Starband		\$69		cccabbott100@gmail.com m 719 486 3500
High Peaks Payroll	616 Harrison Ave Leadville CO	Charter		\$85		Lisa McGuinness - 303-319-0888
Mt. Elbert Lodge	15904 Highway 82 Twin Lakes Colorado 81251	WildBlue	5	\$130	10	
Twin Lakes General Store	6451 e hwy 82, Twin Lakes CO 81251	Verizon		\$20		Info@twinlakesgs.com
Healing Through Care and Touch	616 A Aspen AVE TWIN LAKES COLORADO 81251	Verizon		\$135		corneliapatti@hotmail.com

The Bicycle Brewing Co. The Double J Trust Barbed Wire Enterprises	10356 Highway 82, Twin Lakes, CO	WildBlue	10	\$75		
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Appendix B: Residential Survey of Broadband Demand

Subscriber	Address	Provider	Download Mbps Advertised	Monthly cost	Would Switch to Faster Service?
James Dougherty james@thetwinlakesinn.com	5430 CR 10 Twin Lakes CO 81251	Wildblue		50	in a NY minute
Ahmad Ghais phone 719 486 1875 e- mail: aghais@me.com	6000 County Road 10 Twin Lakes, CO 81251	WildBlue/ Exede	12 Mbps download, 3 Mbps upload	\$50	Yes
joanweber@wildblue.net	236 Parry Peak Drive, Twin Lakes, CO 81251	Wildblue	10	49.99	Probably
Alanesava@comcast.net	124 parry peak Twin lakes, co 298 county road 26 Twin lakes, CO 81251	Wildblue	10	68	Yes
Epicopus@aol.com	739 Edward E HILL DR TWIN LAKES, CO 81251	Version	Unsure		Yes
	124 mt hope Dr Twin Lakes, co. 81251	Verizon	don't know	50	yes
	47 Aspen Dr, Twin Lakes, CO 81251	Wildblue	5	54	Perhaps
	530 Peak View Dr	Century Link		\$41.00	Yes!

	Twin Lakes 81251 10356 E. Highway 82, Twin Lakes, CO	WildBlue CenturyLink in Santa Fe, NM location Do not have service in Twin Lakes, CO at this time	10 Mbps +	\$75	Yes! Yes! Yes!
			12 Mbps	25.99	Twin Lakes home is a second vacation home not used all year
lailadawson@yahoo.com	655 Reva Ridge Rd. Twin Lakes CO 81251 12707 east State Hwy. 82 Twin Lakes, CO. 81251	Hughes.net		75	yes
Barbara Paarz 719-486-2922 bpaarz@yahoo.com	298 CR 26 Twin Lakes, Co 81251	Wildblue/ Exede	10 Mbps	\$62	Yes!!
Jwkdenco@aol. Com		Verizon	Unsure		Yes
robkeldive@aol.com	410 CR 26, Twin Lakes, 81251 12265 E HWY 82, Twin Lakes, CO 81251 12088	Verizon	not sure	50	yes
Lawson Gagnet ylgagnet@gmail.com		Hughes Gen4	up to 10Mbps		Maybe
I'm interested in new, inexpensive providers. jleaming@justice.com	Highway 82 Twin Lakes, CO 81251 11978 E. Hwy 82	Wild Blue	Very slow (the least expensive)	\$56	In a heartbeat

	Twin Lakes, CO 81251 815 Lodgepole Dr. Twin Lakes 81251	spot.	kpbs			
			don't know	50	NO	
		Dish	5g ?	0	yes	
		Will	none			for faster efficient, dependable service,
	48 Lang Street Twin Lakes, CO 81251	this also as I work out of my home				Starband
Carolyn cccabbott100@gmail.com	165 Lang Rd. Twin Lakes Village 81251	Starband	1 Mbps	69	yes	
	Reva Ridge Road 81251	telephone hotspot	?	50	yes, if reliable	
stepmonty@Hotmail.com	12140 East State Highway 82 Twin Lakes, CO 81251	No contract, probably Verison			Yes	
Richard Dahl beekbuddy@gmail.com 719-486-7275	83 Access Road 84a Twin Lakes CO 81251-7502	Dish Network	Up to 15 Mbps	80	Yes	
	245 Baby Doe Drive, Leadville 80461	Exede / Wildblue	UP TO 12 MBPS	50	Perhaps	
	815 Harrison Ave Leadville, CO 80461	Charter	don't know	80	yes	
Bill Bland, 303-550-1048 bill.bland@gmail.com		Century Link	1.5 Mbps	38	yes	It's a bundle. \$104 for TV,
	81					

	80461				phone & interne t.
John McCarty mccartyj@alum.mit.edu	County Road 99 80461 612 West 8th St Leadville CO 80461	Century Link	2MBS	50	yes
		Century Link	7mbps	34	yes
		Century Link	10 mbps	30	yes Absolutel y! Consideri ng switching to Charter. Would like to pay less since I just have internet
Jenny Gifford jmgiff@msn.com	131 S. Toledo, Leadville, CO 80461	Centurylin k	Unknown	57	

Appendix C: Comments from Survey Respondents- Enterprise

Our biggest needs are larger data capacity and no lag so that conversations via internet sound like conversations.

fast and affordable
speed and affordability

all are important especially redundant if you are dealing in banking, hospital or a business whose service is threatened if the internet goes down. Affordable is also important to any business today. Great customer service is important too as that is in short supply these days.

abundant and affordable

redundant and affordable, with high capacity

Broadband must be affordable to individuals as well as businesses
Abundant south on US 24 and e, W of Harrison Ave. Send survey to Lake County Internet customers (residential)
Improve upload speed and reliability.
CenturyLink is still the least stable for services.

It would be great to have alternatives!

Sure

What I'd really like is competition and choices for cell service. We're pretty sadly limited, and it is much more expensive than it could be or is in urban areas.

is fiber optic an option, if so, I would suggest improving to fiber optic. But I know very little about any of these technologies.

Our business is not currently operating in Lake County, so the questions above do not apply to us. However, we do plan to build beginning this summer a 170-room hotel with all the supporting broad-band needs for a first-class facility like that. The projected opening date is summer, 2016.

Appendix D Comments from Survey Respondents - Residential

The most valuable data collected from surveys comes in the “Comments” section.

We have 2 services: CenturyLink T-1 1.5M symmetric not stable enough for comfort Optimum 35/5M Assym. quite stable enough for HTTP Traffic and guest WiFi Optimum seems to be the more stable of the two.

Too slow. Not reliable

We subscribed to the slowest speed because of the price factor.

Minimal outages.

We have difficulty streaming channels and movies. Many times we have difficulty using Skype

Yes, I am satisfied.

I would prefer to have faster service but this is the fastest I know of for now.

Can't Skype or download movies!!!

no enough bandwidth

hard to stream movies

works well

I work from home for a major computer company in the US and rely heavily upon the broadband connection for collaboration, presentations, email, and other remote work.

My service is pretty good.

We work part-time from home with 2 small start-up businesses, and we pay \$65/month to have an internet speed that can keep up with 3 computers and 1 cell phone, and what we have is crap. We've called and asked what's going on why our service is so slow, considering we are paying for their highest speeds, and they say it's our equipment. (brand new equipment, the modem THEY provided, which they told us at installation would be able to handle the highest they offer if we upgraded, which we did) I call BS.

Only satellite available Hughes net much better than Wildblue

too slow and drops alot. I cant watch videos like youtube or netflix with out it stoping and buffering for a long time every few minutes.

I would like faster internet, but there are no other options where we are. We are at the end of Century Link's line and it was faster to downgrade from the 1.5 Mbps for us. We would like 20 Mbps. We are trying to run a business from home that relies on the Internet. One of us is working on a doctorate and takes mostly online classes. Connectivity is critical for us.

My internet drops periodically for brief times each day. I've been told it is my wireless router - I've bought 2 different ones and continue to have the same problem. When that didn't work I was told it was electrical surges, which I can't do anything about. It has been frustrating.

Upload speed is waaayyyy to slow, can't upload large documents as it times out. Download speed is not anywhere near as fast as I can type. Also the Harrison Avenue free service does not even

work inside the door of my business, it is very undependable and loses connection constantly. If it cannot work 6 feet inside the door, right off the sidewalk of Harrison then someone is wasting \$.

My service will sometimes stop working when the phone rings.
It is way slower than promised, unreliable, not enough speed to service our customers with business needs and movie streaming etc.

requires modem resets, unresponsive tech assistance, speed varies widely

It is quite often slow and has to be reset often.

I would like the 15 that I'm paying for

I don't feel I wait

Gets the jobs done. Wait time is minimal.

no such thing as too fast

Don't require high speeds, just reliability

For the most part - we haven't experienced any significant problems... Yet...

would like less delays in sending & receiving

Because it is faster than it used to be, and is faster than what I have at home (in Buena Vista, same provider) it seems fine. But I know it is much faster and more reliable in urban areas.

At night the service can be noticeable sluggish.
Download is OK. Upload speed is undependable resulting in dropped calls (network extender).
For the amount I pay CenturyLink should be able to compete with others..I've already joined and have modem so it's easier to stay and wait for CenturyLink to improve their connections and upgrade satellite systems

Way too slow for the price. I ordered the new faster service with speeds to 15 Mbps last November and have yet to have it installed.

It goes up and down constantly. VERY frustrating!

slow.

I would like it to be faster.

Speed varies daily.

My husband has the ability to telework here, however, due to the slow speed of our service and others that I have heard about, it does impede his ability to seamlessly work up here.

explain what?

It is adequate for what we do.

speed is too slow when downloading larger documents or files

Adequate for our business needs.

Seems to deliver the service that we require. We are not yet a NetFlix subscriber. The internet in the county courthouse is unreliable and inefficient. Often going down once or more per week.

Speed is ok, would like more wireless options within the main strip of town
It is slow and the bandwidth is used up very quickly only allowing basic browsing and reading of email.

Yes, but I need higher speeds

too many outages for a business to operate

Too Slow and access drops frequently

I don't think the internet speed is the problem. I think the problem is the enormous amount of advertising on nearly every internet page. The current plan is fast enough to run netflix. For a few years we had Amigo. At that time they changed some of their equipment and the service became unreliable and slow. We then went to HughesNet for a few years. We kept bumping up against their Fair Access Policy max and it would shut down our speed to that of dial-up when we reached our daily limit (also, they were expensive for what we were getting). We are now operating three computers off of one Verizon card. Its speed depends on the time of day and how many people in Lake County are using their system. Sometimes it is pretty fast and some times it is pretty slow.

Our house is located out by the county gravel pit south of Halfmoon Road We have wanted wireless high speed internet service with a static IP address for years Amigo.net was promising for years to point a antenna from the airport tower south towards us down in the valley but it never happened. Century Link does not have DSL service available to our location.

We live in PanArc. The only internet access is dial up, wireless or satellite. We only live here five months a year and satellite providers son't want to provide part tine service and equipment, wireless is very expensive for internet and dial up is almost uaeless today.

this is the fastest we've had so far, and we can stream mvies and such, usually, but not always. I'm a work from home computer programmer. As the solo employee on my network at home, the speed is sufficient, but higher bandwidth is always welcome.

very

Some times it is slow

Runs all streaming services (Netflix, Sports, Youtube in all formats offered, including HD or 3D with no dropouts. I do have my own high end cable modem, dual band wired/wireless router, gigabit switch and 3D TV and 3D Blu Ray Player (all networked). All computers are either MS System 7 or XP Pro with an NAS for remote file access, FTP site, web server, 5 camera(1 PTZ) security system remotely accessible thru a static IP address and protected by McAfee Security Suite.

Seems to be inconsistent

It satisfies our needs. We pay bills & surf, nothing major.

it is fairly quick most of the time. of course it could be better and i would pay more if we had fiber. I am not sure what you want me to explain in this box. Very slow. Intermittent. Company keeps blaming my router and laying the blame on my equipment instead of researching the problem. They have the market cornered so there's nothing I can do....for \$57 a month. I have actually toyed with going to a different provider for much more money because I am so dissatisfied.

This bussiness does not rely on the internet at this time.

Works fine

At work the speed is pretty good. However, at home through Optimum it stinks. It's unreliable and slow most of the time.

Internet service too slow

faster is better but I presently pay for the fastest service that i can get as far as I know

Usually slower than these test results at 6am

I live out South of Leadville, But I can't get cable or quest/centurylink via phone. I would be available as a Hot Spot if need Be?

I'm not satisfied with the speed of my Internet service.

OK but would like to consistently get the speed I'm supposedly paying for.

Most useage for me is email, answering and sending. Reliability for me is number one priority, speed is secondary.

The speed is satisfactory for my needs.

I can't effectively run a business with this limited bandwidth. There is no other option available to me.

It's difficult to use more than one computer at the same time--speeds slow.

Our biggest problem is that the internet shuts off and is difficult to turn back on

Service is sporadic in summer, speed varies all other times.

Faster internet is not essential to the museum.

I had Century Link before but like Bresnan better

Its fine

It's fairly fast (downloading) and works with my old desktop email software (Netscape) and my Foxfire browser and other gmail email, etc. account on a Mac. It chokes a bit on bigger files when uploading.

My current need is adequately met.

For the most part reliable, so slow periods

Qwest, now Century Link has a great speed for my personal use.

It works better than what Leadville currently has and is more reliable!!

By and large, reliable, but expensive.

It is reliable and seves our needs

Speed varies greatly from minute to minute. At times I give up on a site coming up and walk away from computer to return after a few minutes to see if the site has appeared.

I had faster service when living in town and had physical line options.

It's very low end in terms of speed - at least what's offered in Front Range communities in Colorado. And I can always tell when users increase: speed slows during times when there are more people in town, more smart phone users during high tourist times, etc. Or when more locals are online during certain times of the day, speed also decreases. I am not getting what I pay for!