



Tahoe Basin Broadband Feasibility Study

Prepared for Tahoe Prosperity Center
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Table of Contents

1. Executive Overview	1
2. Opportunities for Industrial Diversification	2
2.1 Overview of the current situation.....	3
2.2 Environmental innovation.....	4
2.3 Health and wellness.....	4
2.4 Hi-tech Business.....	5
2.5 Emerging technologies.....	5
2.6 Public safety.....	5
2.7 Economic resiliency.....	5
2.8 Expected employment benefits.....	6
3. Feasibility Study	8
3.1 Communities in the Feasibility Study.....	8
3.2 Customer Perspective.....	9
3.3 Speed Test Survey.....	11
3. Broadband Market Trends	12
3.1 Evolving Broadband Technology.....	12
3.2 Rural Broadband Challenges.....	12
3.3 Major Broadband provider Strategy in Rural Areas.....	13
4. Estimated Capital & Operating Costs	14
4.1 Rural Broadband Construction & Costs.....	14
4.2 Modified Micro Trench.....	15
4.2 Network Operations & Support.....	16
5. Potential models for high speed broadband	17
5.1 Private Micro Broadband Network.....	17
5.2 Customer Funded Existing Broadband Provider Upgrade.....	18
5.3 Customer Funded Existing Broadband Provider Expansion.....	20
5.4 Customer Funded New Broadband Construction.....	20
5.5 Creation of Community Facilities Districts.....	22
6. Potential Funding Sources	23
6.1 CPUC: California Advanced Services Fund.....	23
6.2 Connected America Fund (CAF II).....	24
6.3 House Bill H.R. 6442 Broadband for All Act 2018.....	25

7. Potential Funding Mechanisms	25
7.1 Self-funded.....	25
7.2 USDA Rural Broadband Access Loan and Loan Guarantee.....	26
7.3 Local Authority Support.....	26
7.4 Neighborly.....	26
7.5 Example Funding Model.....	27
8. Recommendation	29
8.1 Proposed Implementation Program.....	29
8.2 Key Stakeholder Benefits	30
8.3 Implementation Pilot Communities.....	30
8.4 Anticipated Challenges.....	31
8.5 Next Steps.....	32
Appendix A	34

1. Executive Overview

According to the Federal Communications Commission (FCC), 39% of rural Americans (23 million people) lack access to 25 Megabits per second (Mbps) download and 3 Mbps broadband compared to 4% of their urban counterparts. Rural businesses struggle to meet the needs of the evolving digital transformation, large corporations seeking a skilled workforce outside high-cost urban areas can't keep telecommuters, and consumers suffer lacking the ability to get the next generation of media and entertainment.

Roll the clock back to the 1930's where the country was faced with a similar situation with electricity when it was recognized that private companies cannot provide the 'socially desirable good' because of a lack of return on investment. This was resolved when President Roosevelt created the Rural Electrification Administration, and 20 years later 96% of rural farmers had electricity.

Currently, the established telecom providers have naturally focused their working capital investments in the lucrative dense urban areas, and as the electrical companies in the 1930's, they are reluctant to expand their investment into lower density rural areas.

In recognition of the rural broadband challenge for telecom providers, the Federal Communications Commission created the Connect America Fund Phase II (CAF II) which was designed to provide an incentive for providers to deploy broadband in designated census blocks which currently have less than 10/1 Mbps. (maybe also explain download and upload speeds here)

The CAF II program has \$2 billion available over 10 years and in 2018 a total of 103 bidders won \$1.49B over 10 years to provide fixed broadband and voice services to 700,000 locations in 45 states. Specifically, California providers have been awarded \$14.9 million impacting 51,000 locations. In addition, the California Advanced Services Fund (CASF) has allocated \$645M in grants for rural broadband.

Despite the large amount of funding from the FCC and CASF, rural communities have not seen broadband deployed at the same speed as electricity almost 100 years ago. It is widely considered that the lack of coordinated federal and state policies has allowed major telecommunications companies to receive a large portion of these funds without much regulatory accountability and at the same time it has been difficult for communities to apply for funding to create their own networks. In summary, the telecommunication industry has been effective in discouraging the competition from community-centric broadband, yet is slowly expanding its network in rural areas.

The CASF broadband definition of 10Mbps download and 1Mbps upload for a household is woefully inadequate in today's society with a household of 3-5 people. This standard has been pushed by the telecommunications companies as it paints a rosy picture of well-served US broadband, when in reality much more needs to be done. It's also becoming evident that many providers are consistently failing to deliver the advertised bandwidth which continues to conceal

the real issue of having reliable high-speed broadband available to realize the potential for economic development in rural communities.

The economic development imperative to bring high-speed connectivity to rural communities is becoming a moral obligation to area leaders. The more progressive communities have recognized that broadband is a fundamental requirement for their community's future prosperity and public safety and have taken the bold step of creating various models of community or municipal broadband. California passed AB1999 in September 2018 that removes state restrictions limiting publicly owned options for rural Internet access signaling to big cable and telephone companies that they are no longer willing to bend over backward to protect incumbent monopolies that ignore their rural constituents.

This feasibility study confirmed that the community appetite for improving broadband is very high, and that very few individuals had any concerns about being limited to a single ISP such as AT&T, Charter Communications or Comcast. Many of the properties in these areas are second homes, and holiday rentals which will become more desirable with improved broadband, and we would also expect to see new properties built on vacant lots with the availability of high-speed broadband. Many can afford the capital cost, but for widespread adoption, we must have an option to spread the cost over time. The message is clear "we need reliable high-speed broadband, and we need it now!"

Whilst community-owned municipal broadband is growing in the United States, a pragmatic approach should be taken to build relationships with existing large ISPs to upgrade or expand into adjacent areas, which focus efforts on raising community capital for constructions but leverages existing customer support and operations, thus avoiding the complexity and cost of setting up support and operations for a small group of users. This will serve to accelerate the availability of broadband stimulating economic development and it will build confidence with key business and community stakeholders. When the opportunity arises for a community-owned municipal broadband network and there is a track record of successfully engaging with property owners to collaborate on a community-centric program, we will have quantifiable information to assess risk, learn best practices and have measurable community benefits for predictable success.

2. Opportunities for Industrial Diversification

The Tahoe economy sustained significant structural dislocations during the early part of the 2000's due to lack of investment in visitor serving attractions and services. This downward trend was exacerbated by the 2008 recession and more recently has been affected by the long-term drought that reduced winter tourism through the 2015-2016 season, more recent colder wetter winters has seen improvements in winter tourism, the variable being the recent unpredictability of weather patterns.

The key challenge for the region is to gain continued investment in enhancing the facilities and services offered in the visitor services sector to maximize its economic benefit, while at the same time seeking ways to better support the workforce and develop higher wage employment opportunities. There remain critical issues for a regional economy based overwhelmingly on

tourism. Wage growth is slow and wage levels are not adequate to support home ownership for much of the workforce. While construction of new housing has begun to occur, the share of housing devoted to second homes has been increasing in many parts of the region and little if any of the new housing coming on the market is priced for the local workforce. Consequently, more than half of the jobs in the Basin are filled by workers living outside the area. This is not conducive to family formation and long term workforce prosperity. It also inhibits business expansion due to the difficulty of retaining a workforce. Seeking new higher wage-based industries and employers that can supplement the primarily tourist driven basin economy is critical for the basins economic diversity and prosperity. The basin needs to diversify its economic focus because, the current low wage, service-based tourist industry does not afford the potential for broad based economic growth.

An attractive avenue would be to promote increased entrepreneurship and self-employment, so called “untethered talent”, which could be housed at home or in small scale co-working and incubators spaces. This would not only reduce the environmental footprint of job growth in the region, but would take advantage of employment opportunities in many high paying sectors including information technology, professional services, and financial management, among others. A key factor to attract this talent is strong broadband capacity, which is an ongoing focus of the Tahoe Prosperity Center and others around the region.

2.1 Overview of current situation

The Tahoe Basin region is in desperate need of better paying jobs that are less dependent on the seasons. Currently, the Tahoe Basin relies heavily on the tourism industry, as this is its primary economic driver. However, most jobs associated with that industry are low paying, making it difficult for those employed in that industry to live in an area with a substantially high cost of living.

The Tahoe Basin is a \$5 billion regional economy, of which Tourism and Related Services contributes \$1.98 billion. Despite Lake Tahoe’s unparalleled beauty and robust tourist economy, this region has endured intense environmental degradation and economic decline. Between 2015 and 2016 the average unemployment rate in the Tahoe Basin was 6.1%, which was 1.6% above the national unemployment rate.

Due to deficiencies in local broadband infrastructure, there has been elevated rates of businesses closing. Many move to more urban areas, namely Reno Nevada, for faster and more reliable internet services because they simply couldn’t compete effectively due to reduced internet bandwidths.

A lack of reliable broadband is a deterrent for some businesses who are considering the Tahoe Basin, some businesses choosing to locate in Truckee or Reno rather than Lake Tahoe.

The recently completed Measuring for Prosperity Report shows that due to Lake Tahoe’s lack of Broadband infrastructure over the past ten years, our economy has become more reliant on tourism from 42% to 62%.

2.2 Environmental Innovation

It may be surprising to many that broadband has direct environmental benefits. Telecommuting, material avoidance, and teleconferencing are broadband uses that can significantly reduce the impact to the environment. Reducing the emissions from commuter vehicles by eliminating the need to drive to work for many occupations is a obvious environmental benefit to reduce harmful greenhouse gases.

Studies have shown that e-commerce, as compared to conventional shopping, generates 36% less air pollutants, 23% less hazardous waste, and 9% less greenhouse gases. Electronic grocery shopping with e-delivery generates 18% to 87% less greenhouse gases than conventional grocery shopping.

In addition to reducing emissions there are also reductions in vehicle operating costs, reduction road maintenance, less traffic congestion and elimination of non productive commuting time. It is estimated that environmental innovation could contribute ~\$857M to the local economy.

Additional areas of environmental innovation include renewal energy from solar, hydro & wind, efficiency of water usage, recycling/reuse of products, and energy efficiency from improved management and insulation.

The environmental benefits to the natural beauty of the Tahoe Basin are obvious and complimentary the heavy investment that have already been made to keep Lake Tahoe healthy for future generations.

2.3 Health and Wellness

In the health and wellness sector, the use of telemedicine is hampered by the slow connection speeds. It is this sector, however, that has the most stable current workforce needs and high wages and is projected to grow in the next five to ten years. Without reliable, high-speed connectivity, this sector will not reach its growth potential.

High-speed broadband can significantly reduce the costs of healthcare by providing near real-time collaboration and monitoring of patients, often eliminating the need for an office visit and supplementing emergency services.

The ability to provide improved low cost remote monitoring of chronic conditions such as arthritis, cancer, depression, diabetes, heart disease and obesity will lower costs. It is also expected to improve the quality of life and life expectancy of patients.

Studies have indicated that reliable remote monitoring and near real-time patient/hospital interactions can generate up to 30% saving in hospital, drug and out patient costs and a reduction of hospital stays from an average of 14 days to 10 days. It is estimated that health and wellness could contribute ~\$357M to the local economy.

Emerging broadband applications will allow senior citizens to remain in their homes longer.

Studies have indicated that with monitoring and near real time interactions, that seniors are likely to stay in their homes 6 months longer before needing to relocate to a nursing home. This translates to improved well being, better quality interactions with remote family members, and a significant reduction in the cost of long term care.

2.4 Hi-tech Business

Lake Tahoe is strategically located along a major highway corridor (Highway 80) in between the larger economic regions of San Francisco/Silicon Valley and Reno, NV. Yet, the region has not been able to thrive or grow despite this location due to lack of both high speed broadband and cell coverage/capacity.

The Tahoe Basin has struggled to attract, create, and maintain contemporary industries, namely hi-tech, because of the regions poor broadband speeds and reliability. Well known Silicon Valley business’s have considered developing satellite offices. This would allow opportunities for improved work life balance for their employees to take advantage of the natural beauty and lifestyle amenities. The absence of low latency, high speed fiber optic networks to connect to their major corporate office has limited progress.

2.5 Emerging Technologies

The Tahoe Basin needs to bolster its broadband in order to make way for future technologies and the jobs that come. Technologies, such as 5G wireless, autonomous vehicles, and products associated with the Internet of Things (IOT). A pervasive fiber optic network is a prerequisite for all of these technologies. The close proximity to Silicon Valley could lead to areas within the Tahoe Basin becoming pilot sites for these emerging technologies, for example imagine if there was an automated electric mass transit system between hotels and ski areas, or the ability to share the beautiful beach experience in real-time with friends and family over 5G wireless.

2.6 Public Safety

The increased bandwidth will also galvanize public safety. Allowing first responders to coordinate faster so that catastrophic events are prevented from impacting the regional economy. With low latency broadband new technologies could be deployed such as ‘active shooter detection’ to accelerate the police response to a major public safety issue, and updating the public to ensure their continued safety. Cameras and sensors for the early detection of wild-land fires can be more easily deployed with the availability of reliable high speed broadband.

2.7 Economic Resiliency

Economic resiliency is of major concern to this area, the ability to bounce back after devastating winter storms or large-scale wildfires requires us to diversify beyond the tourism industry, which is heavily impacted by such disasters. Without a robust array of job sectors to fill the voids

created by such disasters, this area would experience intense economic decline.

The Tahoe Basin relies heavily on its natural beauty and recreational amenities, if that were to be scarred by natural disaster there would be very few options for employment. Broadband is the driver to diversifying our economy so that we can attract, train, and retain workers for current and emerging industries.

It is imperative that continuity of broadband access and operations is maintained during these events so that the regional economy can continue to rebuild in the event of a major disaster.

2.8 Expected employment benefits

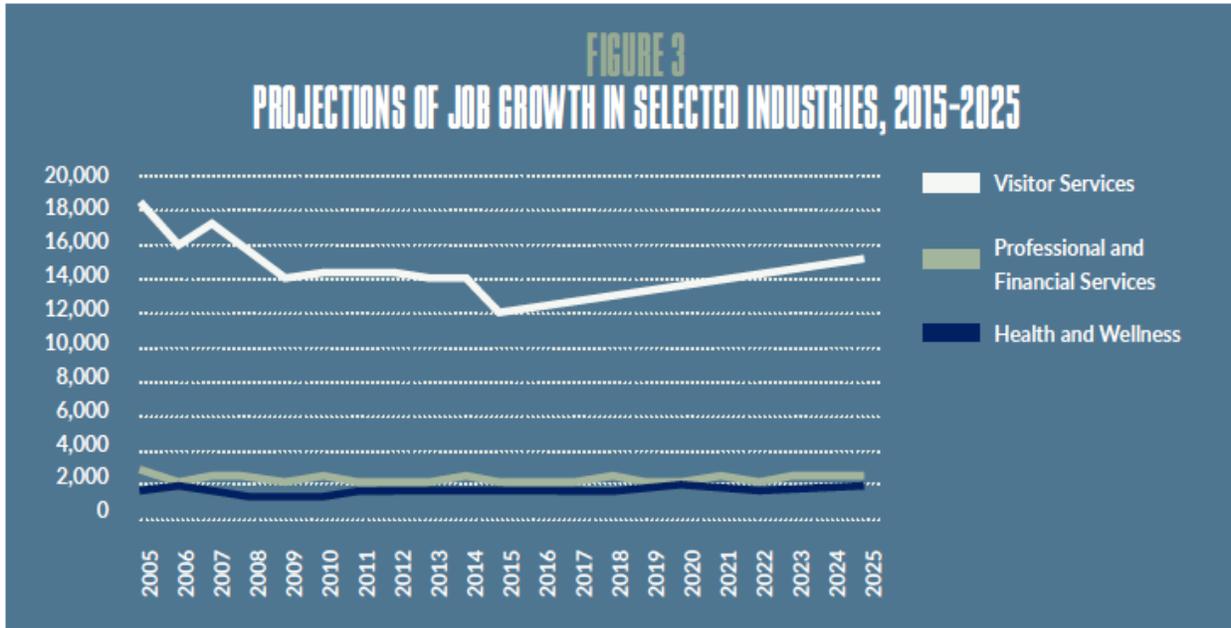
When the Tahoe Basin achieves its goal in making low latency, low cost, reliable high speed fiber optic broadband available to the entire community is projected to add the majority of jobs in the Visitor Serving sector, Health and Wellness and Professional and Financial services.

Availability of affordable high-speed broadband is expected to be a major factor in fueling job growth in the Tahoe Basin. The largest growth is expected in Visitor Serving Sector which to expected to

PROJECTIONS OF TAHOE BASIN JOBS AND WAGES IN SELECTED INDUSTRIES, 2015-2025

INDUSTRY SECTOR	2005	2015	2025	JOBS	2015-2025 GROWTH		
					PERCENT	ANNUAL WAGES (\$MIL)	PERCENT
Visitor Serving Sectors	17,877	11,879	14,822	2,943	76.1%	\$65.9	55.1%
72 Accommodations and Food	13,629	8,443	10,926	2,483			
71 Arts, Entertainment, Rec	4,248	3,436	3,895	459			
Health and Wellness	1,747	1,729	2,203	474	12.3%	\$65.9	\$25.5
Professional and Financial	2,881	2,311	2,762	451	11.6%	\$28.1	23.5%
52 Finance	782	504	551	47			
51 Information	558	344	387	43			
54 Professional Technical	1,440	1,322	1,672	350			
55 Mgt. of Companies etc.	101	141	151	10			

Source: ADE, Inc., based on county level job projections from CA Employment Development Dept. and Nevada Dept. of Employment, Training and Rehabilitation. Wage data from BLS Weekly wages by industry by county.



3. Feasibility Study

The Lake Tahoe Basin is a \$5 billion regional economy of which \$1.98B is Tourism and related services. The region is in need of better paying jobs and less dependent on seasonal tourism employment. The continued lack of broadband infrastructure over the past 10 years has resulted in more reliance on tourism as opposed to diversification into environmental innovation and health and wellness which bring greater economic resilience to the Tahoe Basin. The area is susceptible to devastating winter storms and increasingly deadly and destructive wild land fires which have severe social and economic impacts. Unless we can attract a greater diversity of well paying jobs, remote work and economic opportunities, it will hamper the community to recover from these natural disasters.

This feasibility study will identify how to accelerate the availability of reliable, affordable, high speed broadband. The study will evaluate how to collaborate with key private and public stakeholders, build positive community engagement and develop a scalable model that can be expanded to optimize the growth potential over the next 5-10 years.

2.1 Communities in the Feasibility Study

This feasibility study focused on three areas that have previously been identified by Tahoe Prosperity Center as being in dire need of improved high speed broadband. See Appendix A for detailed parcel maps.

Kingswood Estates, Tahoe Vista. This is an established community of 334 parcels of which 221 are developed and occupied and are experiencing an average of 1.8Mbps download speeds from the AT&T DSL service. The combined assessed property tax value is \$107.6M.

Alpine Peaks, Tahoe City This is a similar community to Kingswood Estates with 75 parcels with an assessed property tax value of \$35.2M and also served by AT&T DSL.

Rubicon Meeks Bay This is a larger community located adjacent to the lake and is more diverse in the style of homes and is again served by AT&T DSL, but it is known that a few properties have been able to obtain high speed fiber optic service from AT&T.

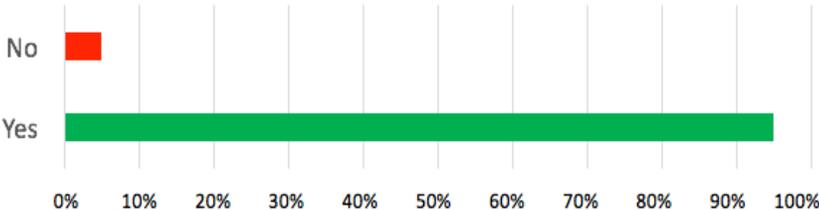


2.2 Customer Perspective

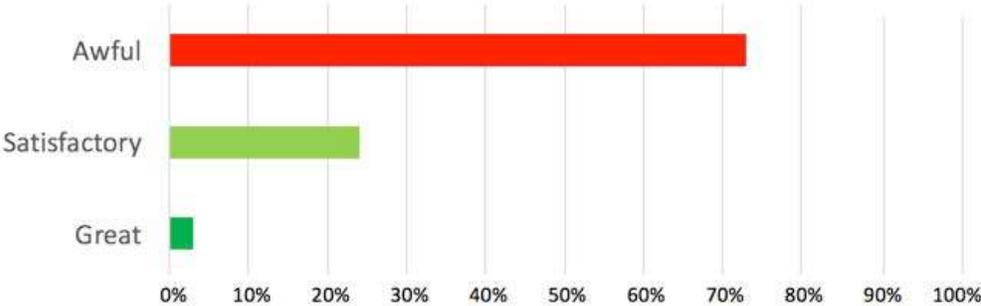
A survey of customer perspectives in the Kingswood Estates neighborhood was implemented with the help of a local resident who has a video production business and is a strong and active advocate for broadband improvement. He has been evaluating a diversity of options, but has yet

to find an affordable and reliable solution to meet his business needs. The findings of the survey are representative of the three communities that were reviewed during the feasibility study.

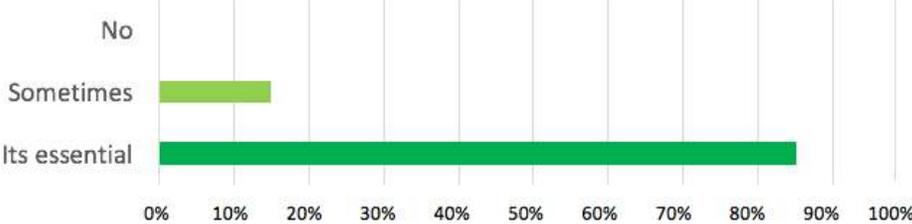
Do you have internet access at home?



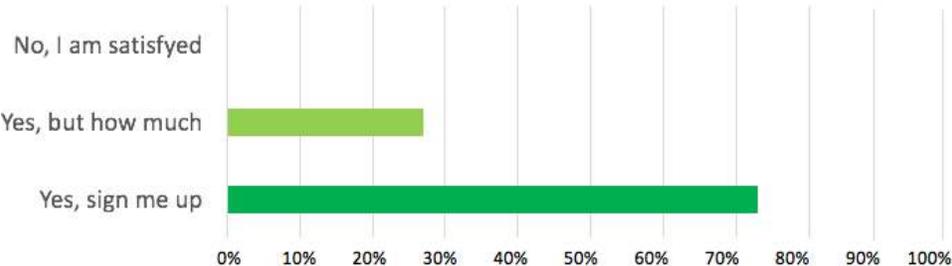
How do you rate the quality of your internet service?



Do you use the internet for work?



If available would you consider a reliable high-speed internet service for your home ?



The results are as expected for customers that are paying around \$50-60/month for the advertised speeds of 6Mbps download and 1Mbps download, but at peak hours of 6pm-9pm are on average

achieving only 1.8Mbps. The message is clear that everyone is using the internet, most use it for work, everyone is dissatisfied and all are looking for an affordable improvement.

2.3 Speed Test Survey

To gain deeper insight into the Kingswood Estates situation we created a flyer which asked the community to conduct a speed test that its available at the Tahoe Prosperity Center web site under the Connected Tahoe section <http://speedtest.tahoeprosperty.org/>

We received 65 tests between August 31st and Sept 4th 2018.

The lowest speed was 0.13Mbps download with an average of 1.8Mbps and 0.41Mbps upload.

Most customers are subscribed to the highest data rate service of 6Mbps download and 1Mbps upload AT&T DSL service.

Recently, the California Public Utilities Commission (CPUC) has started to implement a CA Statewide speed test verification program which will monitor actual performance over a two week period. This will establish the actual performance that property owners are receiving from their ISP which will help to differentiate between advertised and actual speeds. The Mobile version of this verification program with five years of data found that a majority of users were not receiving the level of service that providers were advertising. In fact, the study found that rural users receive 3/5ths of the service that urban users receive. A copy of this data can be found at: <https://www.dropbox.com/s/mf9zt2qtssezqxf/>

We anticipate much of the same when the broadband speed test verification is done this year.

Give 5 minutes Kingswood Estates HIGH SPEED BROADBAND



What is this about?

Tahoe Prosperity Center is sponsoring an initiative to bring high-speed broadband to Kingswood Estates in Tahoe Vista.

It is possible that this area may qualify for a grant from the California Public Utilities Commission that will help offset some of the cost to make this more affordable.

To qualify for a grant we need to demonstrate that this area is underserved, which is currently defined as less than 6Mbps download and 1Mbps upload.

How can I help?

We are asking for residents in Kingswood Estates to take 5 minutes to complete a speed test to get a complete and accurate evaluation of the current broadband speeds.

The more residents who complete the speed test the better chance we have of qualifying for a grant so be sure to share this with your neighbors!

For more information please contact:
Chris Fajkos at (415) 309 8227 or chris@tahoeprosperty.org

How to conduct the speed test survey:

1. Visit www.tahoeprosperty.org
2. Navigate to Projects > Connected Tahoe Project.
3. In the Speedtest section scroll to the bottom and click on the "GO TO SPEED TEST" button.
4. Provide your contact details and address and start the speed test.
5. You will see your results displayed which will be automatically added to the survey database.

Best practice: We recommend taking speed tests at different times of the day to get an accurate evaluation of the bandwidth you currently have. There are no limits to the number of tests you can make.

For Direct Access to the speed test please use <http://speedtest.tahoeprosperty.org>

Having difficulties with the speed test?...don't give up, give Chris Fajkos a call (415) 309 8227

Tahoe Prosperity Center
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Connected Tahoe
Uniting Tahoe's Communities to Strengthen Regional Prosperity

3. Broadband Market Trends

The majority of broadband in the US is provided by cable, covering some 62% of consumers. With Data Over Cable Service Interface Specification (DOCSIS) 3.1 standard more cable customer are receiving 1 Gigabit per second (Gbps) service, the trend of unbundling continues to grow with consumers abandoning home phone lines and bundles of media in favor of mobile phones and selecting the media that they consume, for example Netflix, Hulu, etc. Comcast serves 26.5M customers, Charter Communications a close second with 24.6M and AT&T with 15.7M which is the largest DSL/Fiber provider in the US.

The US ranked #10 out of 28 Countries in fixed broadband download speeds at 55Mbps with Luxemburg as the leader at 375Mbps. The US is #14 on broadband pricing at an average of \$58/month, compared to #1 Finland \$49/month.

3.1 Evolving Broadband Technology

Fixed high-speed broadband has traditionally been delivered by coaxial cable (Cable) and Digital Subscriber line (DSL). Infrastructure upgrades and new broadband builds are typically now using fiber optic as it allows for much higher bandwidth, longer service runs, and lower operating costs.

Fixed wireless can be very effective in open flat terrain, but has limitations with tree cover, steeper terrain and in storm and snow conditions, which defines the Lake Tahoe Basin.

Satellite can be used almost anywhere but has limitations with latency, data volumes, and cost.

Mobile broadband has recently returned to offering unlimited data plans that were available when 3G first became available for phones and tablets which allow users to access video content without the risk of exceeding data plan limits. The definition of unlimited does include the ability for a provider to slow speeds as needed once a prescribed data volume has been consumed.

The promise of 5G ultra high speed and low latency mobile data is enticing. But in reality, it only has an effective range of 300-500 feet from the transmitter, and is dependent on fiber optic connection to transmitters, and is expected to take many years to deploy even in the denser urban areas.

3.2 Rural Broadband Challenges

When expanding broadband networks telecommunications companies pay close attention to two primary metrics. The first consideration is the cost per property that is passed by the main arterial

supplying broadband, and the second is how many of the properties that are passed will subscribe and continue subscribing to the service that is being offered - this is commonly referred to as 'take rate'.

By definition, rural communities have a lower density than urban areas which is why it is not common for another telecommunications company to consider building infrastructure into an area that is already being supplied by a competitor. This often leaves the rural community locked into a monopoly situation. For example, in the Tahoe Basin, Kingswood Estates in Tahoe Vista is served with AT&T DSL internet. It is highly unlikely that another service provider would consider investing several million dollars to build out new broadband service as they cannot ensure that enough customers will adopt the new service to justify that level of investment.

Whilst cost per property passed and take rate are key factors for rural broadband we also have to consider topology as open flat areas with few trees can be effectively served by fixed wireless, whereas in the Tahoe Basin steeper terrain, tree cover and storm/snow conditions make fixed wireless less effective as distance increases.

There is some good news for rural broadband as unlike the urban areas when it comes to underground construction there is minimal existing infrastructure to avoid, and fewer sidewalks, roads, and concrete areas to repair which can result in lower construction costs as compared to urban areas.

Another impediment to rural broadband is the greater travel time when it comes to providing service and support to customers which drives up operating costs. Rural broadband is ideally located underground which protects the service from damage during weather events, wildland fire, and rodents, but if it is deployed on poles the additional costs of repair and maintenance can be another impediment to expanding networks further into rural communities.

3.3 Major Broadband Provider Strategy in Rural Areas

AT&T DSL

As previously mentioned, DSL is a technology which is in slow decline, this means that for all of the current AT&T DSL customers there is no relief in sight to improve the 6Mbps service that once was state of the art 20 years ago. Some customers were migrated to U-verse which is a similar technology and has higher performance. We also know that at the peak usage hours between 6 pm and 10 pm that the DSL service is heavily oversubscribed due to the increased use of streaming media such as Netflix, Hulu and Amazon Video, often leaving a customer with less than 1.5Mbps bandwidth and very high latency making it effectively unusable for a traditional family home of 3-5 people. AT&T is continuing to deploy fiber optic service in high-density urban areas and are offering some fixed wireless for CAF II grant areas, but its widely understood that AT&T is focused on growing its mobile data networks, not residential broadband.

Charter Communications

Charter provides broadband internet service under the brand of Spectrum. Tahoe Prosperity Center coordinated a site visit with Charter Communications who provided an estimate for

deploying broadband service in Kingswood Estates. It was notable that it took many months to confirm the estimates as with many large ISP's they are not organized to easily facilitate such community requests.

Comcast

The predominant cable company is Comcast and they have recently revised their strategy to recognize that their revenue growth cannot be from just media and that they must continue to expand their base of internet customer. Hands-on experience with a local project for approximately 100-120 homes has shown that the costs they would charge for expanding their service would be approximately \$8,000 per home. Every property owner would need to make full payment to Comcast before construction begins which is a tough challenge, but if there was a mechanism to spread the cost over 20 years it would likely be more feasible for customers to bear this cost.

4. Estimated Capital & Operating Costs

In all models that have been evaluated it is clear that significant capital investment will be needed. Some capital requirement may be offset by grants such as CASF which can subsidize 40% of the capital costs. Identifying methods to reduce the cost of construction will have a profound impact on customer affordability and minimize the capital requirement, which in turn will help to minimize risk to the investors. Broadband is increasingly viewed as a utility model like, water or sewage where it is expected that a customer will continue to need the service for the foreseeable future. The longer the repayment period the greater the risk that a new technology or competitor will offer a better service and lower price. It is widely accepted that fiber optic will remain the preferred choice due to low latency, reliability and its ability to scale from 1GBps to 10Gbps and beyond which should make this a solid choice for private and public funding entities.

4.1 Rural Broadband Construction & Costs

In the Tahoe Basin the ideal method for deploying broadband is with underground conduits as it provides for a network that is more resilient to extreme weather and wildland fire. This improves the economic resilience and reduces the time it takes a community to recover from the inevitable natural disasters that are part of the way of life in the Tahoe Basin. It is also understood that deploying affordable high-speed broadband on existing poles is better than not deploying anything at all if undergrounding is not feasible.

Within the US the predominant method for deploying underground high-speed broadband is to use line boring. This is a technique that uses a steerable direction drill to bore a hole and pull through a long flexible plastic conduit, typically from 2"-4" diameter in lengths up to 600' or more at one time. Underground boring presents many challenges such as locating and avoiding existing underground utilities such as gas, electricity, sewer, and water. Additionally, when underground boring encounters rock or springs costs can spiral quickly. Typically, underground boring costs \$45/linear foot for common soil conditions which can easily double when encountering unexpected rock – common in the Lake Tahoe Basin.

4.2 Modified Micro Trench

In Europe broadband is often deployed using a technique called micro trenching which, as the name suggests, is a small shallow slot about 1" wide created along sidewalks, or in roadways where the fiber optic conduits are placed and the narrow trench is then resealed. This technique is fast, low cost, and involves minimal disturbance to traffic and the environment. Results in the US have been mixed - some have experienced the upward migration of the sealant in the roadway which has continued to keep this lower cost technique from being more widely adopted. Recently the Google Fiber project in Louisville, Kentucky is being shut down in April 2019 as their 2" deep micro trench was simply too shallow and the cable started to become exposed, and the cost to reinstall were unaffordable. A similar Google Fiber project in San Antonio, Texas placed the fiber at a 6" depth and so far this seems to be performing as expected.

A modified micro trench may be more widely accepted by local highway departments as a viable alternative to the more costly traditional boring technique. The modification is to create a 2-3" slot which can be easily backfilled with a concrete slurry and will be both heavy enough and suitable grouted to the existing asphalt to avoid the upwards migration that has been seen with the European micro trench. Lastly, a 6-12" wide strip of asphalt is removed to allow for a more effective repaving cap that is well sealed to the existing surface. Initial estimates inside a cost of \$27.00/linear foot which is significantly lower than boring and is also very predictable as the maximum depth is 14" which passes all existing utilities.

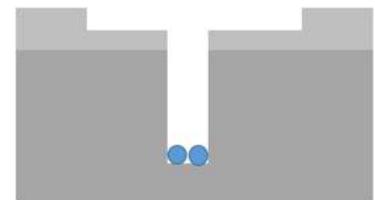
1. Grind 12"x1.5"



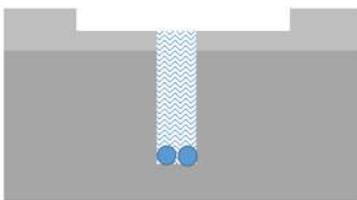
2. Rock saw 14"x2.5"



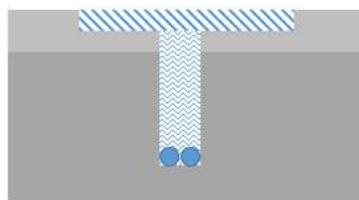
3. Place Conduits



4. Concrete slurry backfill

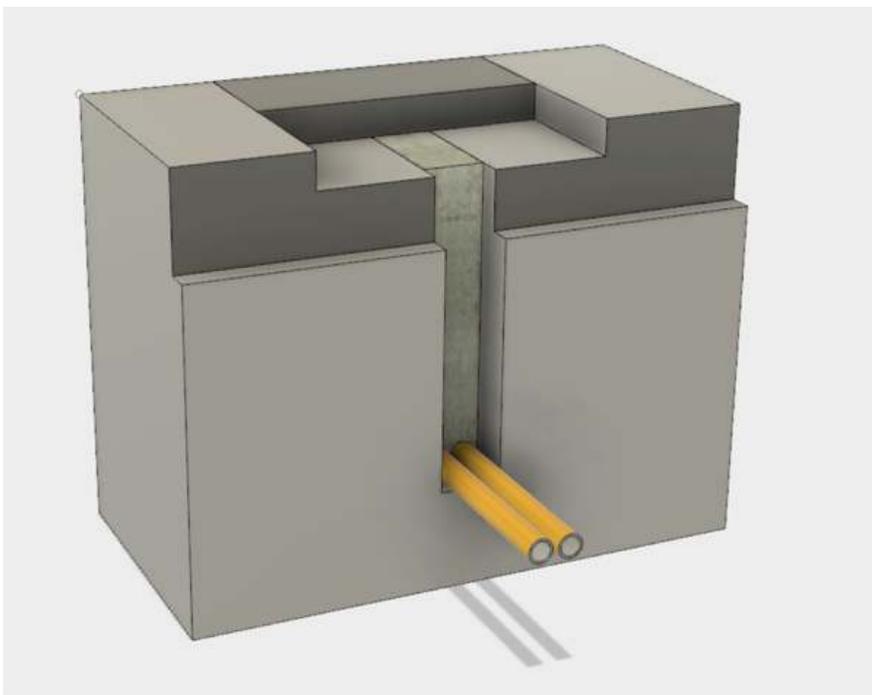


5. Repave



Construction Benefits

1. Avoid uncertain costs of line boring
2. Avoids existing utilities
3. Predictable construction costs
4. Minimal public disruption
5. Commonly available equipment & expertise
6. Mitigates micro trench limitations
7. Avoid CEQA review



Summary Advantages

- Conduits 14" deep
- Above existing services
- Minimal disruption
- Predicable cost
- Low skilled local labor

Despite the risks of weather and wildland fire, it may be necessary to utilize existing poles. The CPUC requires pole owners to provide access to their poles for other utilities such as broadband. However, it is not always as straightforward as some poles are already at load capacity, some poles may require replacement, and managing this with the Northern California Joint Pole Association (NCJPS) can be a time-consuming process.

4.3 Network Operations & Support

High-speed broadband requires a networks operation facility where the equipment to deliver and manage broadband is facilitated. It is not uncommon for this to be in a large above ground cabinet located in the proximity of the properties that are being served. The key elements are the ‘backhaul’ which is typically a dedicated fiber optic connection to middle mile or backbone carriers such as Cenic, Vast, or even AT&T.

Within the facility there is equipment to distribute broadband to each home and business, historically GPON (Gigabit Passive Optical Network) has been the dominant technology which uses passive optical splitters to deliver broadband to multiple locations, typically up to 32 from a single fiber.

The newer approach is to use Active Ethernet which uses a dedicated fiber for each location and is significantly more future proof and is capable of traveling a greater distance. One of the major providers of both GPON and Active Ethernet is Calix, who also provide a cloud management suite for operations, support, and billing which allows a provider to centralize administration which helps to further reduce costs.

When designing fiber optic networks it is best practice to design for a loop which means that if one part of the loop is broken service can be maintained for users beyond the breakage. With smaller rural networks a loop may not always be financially viable in which case consideration should be given for the same day break fix agreement with a repair contractor to minimize disruption to service. Typically damage to underground fiber optic occurs during subsequent excavation either when USA North 811 has not been used and the existing utilities have not been marked, or when they have been marked, but damage has still occurred due to operator error, or inaccurate marking. To expedite repairs the installers coil extra fiber optic in splice boxes that can be used during repairs to reconnect the broken fibers and avoids having to replace long sections of fiber optic cable.

Typical costs for providing rural underground fiber optic service typically range from \$3,500-\$7,000 per home passed. The closer the homes are together the lower the cost, additional factors are the soil conditions and distance from the road to the point of service at the home.

5. Potential Models for High Speed Broadband

When homes and business are first constructed the utilities such as power, water, sewer, gas etc are included as part of the overall cost of construction and as such a property owner rarely understands or learns the individual costs associated with each utility. As anyone who has built their own home and had to pay for PG&E to bring primary power 250' from the street to their home they are likely to tell you that it was perhaps \$12,000-\$25,000 or more. There are similar experiences with communities where municipal sewer or water has become locally available and a homeowner can decide if the capital cost to utilize a new utility is a cost that they can afford and if the return on their investment makes sense for them.

High-speed broadband is probably the first major new utility that our communities have seen in many decades, and as previously identified when private companies cannot provide the 'socially desirable good' because of a lack of return on investment we need to motivate the community to rally behind a solution that will enable this new broadband utility to be available just like electricity in the 1930's.

5.1 Private Micro Broadband Network

The most basic way to extend broadband is where there is a small group of 2-5 property owners with some knowledge of networking technology who own property that is adjacent to a willing middle mile provider. A good example of this is in Nevada County where a property owner happened to discover that Vast Networks had a fiber optic line passing next to his property. He was able to negotiate with Vast Networks to obtain a 500mb connection for \$500/month which he shared with his 12 neighbors using microwave links. The benefits are that he and his neighbors are able to enjoy very high-speed broadband in an area that is currently poorly served with AT&T DSL. However, he is responsible for their technical support and collecting monies from his neighbors. Not everyone adjacent to a fiber optic line would be willing or able to manage that process. One of the Kingswood Estates residents has been contemplating a similar

approach, however the cost for AT&T is \$1,835/month for 500Mbps and an astounding \$2,255/month for 1Gbps connection. This is to connect to the fiber optic line which is passing right by his house and is currently serving a Verizon cell tower. The key criteria with both of these scenarios is that there is close access to a middle mile provider who was willing to work with them. The main difference is in the affordability of the access to that fiber optic line.

The downside to this approach is that technical support is reliant on one or two homeowners and that this is challenging to scale. It would not likely work with 25 or 100 homeowners for example.

5.2 Customer Funded Existing Broadband Provider Upgrade

Where a community has an existing provider who has higher speed broadband in their portfolio of services it's worthwhile creating a community group that can ask the provider for a cost to upgrade. For example, at Kingswood Estates in Tahoe Vista, Tahoe Prosperity Center has developed a relationship with AT&T and received an initial estimate for \$1,700 per property to provide AT&T fiber optic to each home as an upgrade to the existing DSL service. AT&T would provide 100Mbps for \$50/month, \$70/month for 300Mbps and \$90/month for Gigabit.



Why AT&T Fiber?

You'll get our fastest upload and download speeds and the latest Wi-Fi® technology, all for a price you'll love – plus:

- ✓ AT&T Internet is #1 in customer satisfaction over other major cable internet providers.*
- ✓ Equipment included
- ✓ Over 99% reliability**
- ✓ 100% fiber network

*Claim based on 2018 ACSI survey of customers rating their own internet provider's performance.
**Excludes DSL. Based on wired connection to gateway.

[Check availability](#)

As part of this feasibility study, the Tahoe Prosperity Center used the below visual to advocate for the community of 300+ property owners with AT&T Executive leadership.



Now is the perfect time to switch to AT&T Fiber

Use the internet, don't wait for it. With internet powered by AT&T Fiber, get the ultimate online experience with our fastest internet for multiple users, non-stop streaming, and gaming.

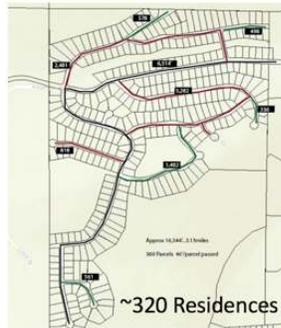
INTERNET 100	INTERNET 300	INTERNET 1000
\$50 /mo. Plus taxes for 12 mos.	\$70 /mo. Plus taxes for 12 mos.	\$90 /mo. Plus taxes for 12 mos.
Get a \$50 AT&T Visa® Reward Card with online orders. Redemption req'd.	Get a \$50 AT&T Visa® Reward Card with online orders, plus 2 Wi-Fi Extenders. Redemption req'd.	Get a \$50 AT&T Visa® Reward Card with online orders, plus 2 Wi-Fi Extenders. Redemption req'd.

Tahoe Prosperity Center
948 Incline Way
Incline Village, NV 89451
Phone: (775) 298-0267

Kingswood Estates Broadband Initiative



- Existing AT&T underground conduits to each home ✓
- AT&T Fiber Optic backbone passes through the area ✓
- Residents willing to contribute to upgrade ✓
- Positive AT&T public relations win!! ✓
- Average current AT&T DSL 1.8Mbps download ✗



\$4.3M
Est AT&T 15 year revenue

Tahoe Prosperity Center Uniting Tahoe's Communities to Strengthen Regional Prosperity

Initial analysis indicates that many in the community would be willing to make a capital investment, but we believe some would require monthly financing which AT&T is not prepared to facilitate. With a 90%+ take rate we believe that we can close the capital funding gap by uplifting the cost per property to allow the upgrade to proceed. There would be a mechanism that compensates the original property owners as the remaining 10% eventually choose to upgrade. We would also consider asking Placer County for financial assistance on the basis that there would be no net cost to taxpayers. It is also unique in this community that AT&T has its own existing conduit infrastructure serving each home which they are not prepared to make available to another provider.

Key learnings are that most large telecommunications companies do not have a customer friendly process that encourages property owners to express interest in broadband upgrades and their internal processes are not designed to process such requests in a timely manner. It also ties the property owner to a single broadband provider, and history has shown that this can be a poor choice, for example, AT&T's decision to abandon DSL technology has left many rural customers without any reasonable option to access high speed broadband.

5.3 Customer Funded Existing Broadband Provider Expansion

Similar to the customer funding upgrade, this option would be approaching an existing adjacent broadband provider and requesting that they expand service. As previously stated it is almost certain that none of the providers will be prepared to make the full capital investment, however many do have algorithms that evaluate the potential revenue, the number of customers utilizing the service and are prepared to carry a portion of the capital costs.

A good example is Charter Communications who operates in the Tahoe Basin and has fiber optic service to the north of the Kingswood Estates community. We were able to schedule an on-site meeting with their field staff and engineering resources from Placer County and they proposed an initial estimate of \$1.35M which would equate to \$4,000 per property, both developed and undeveloped or \$6,100 per occupied property.

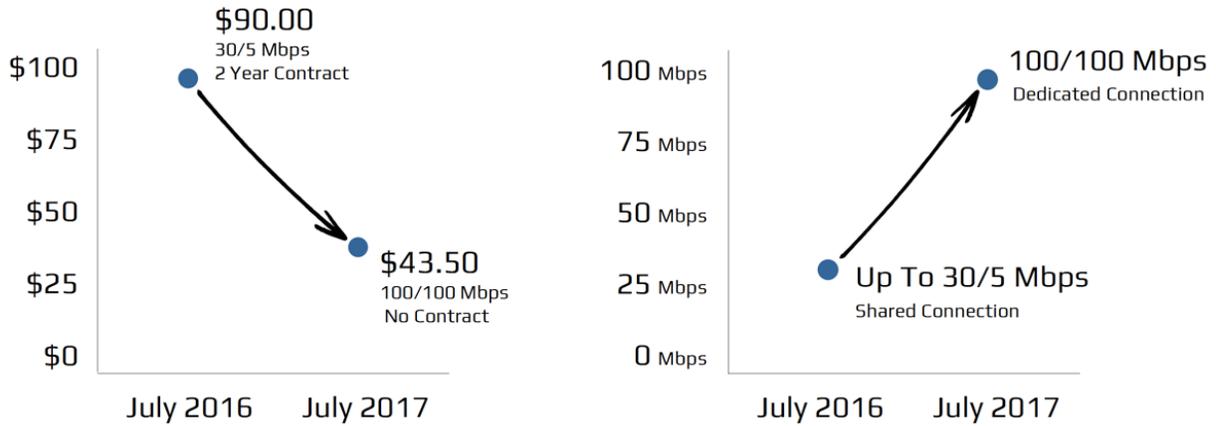
As with the customer funded upgrade the community would effectively be contributing \$1.35M towards the operating capital of Charter Communications and are locked into having to only use Charter Communications services.

Another example is with Comcast, who until recently were rarely interested in being approached for broadband expansion projects. In this case, there are approximately 120 properties which are adjacent to an existing service area. The estimate provided by Comcast was \$8,000 per home and they indicated that this was a partially subsidized cost.

5.4 Customer Funded New Broadband Construction

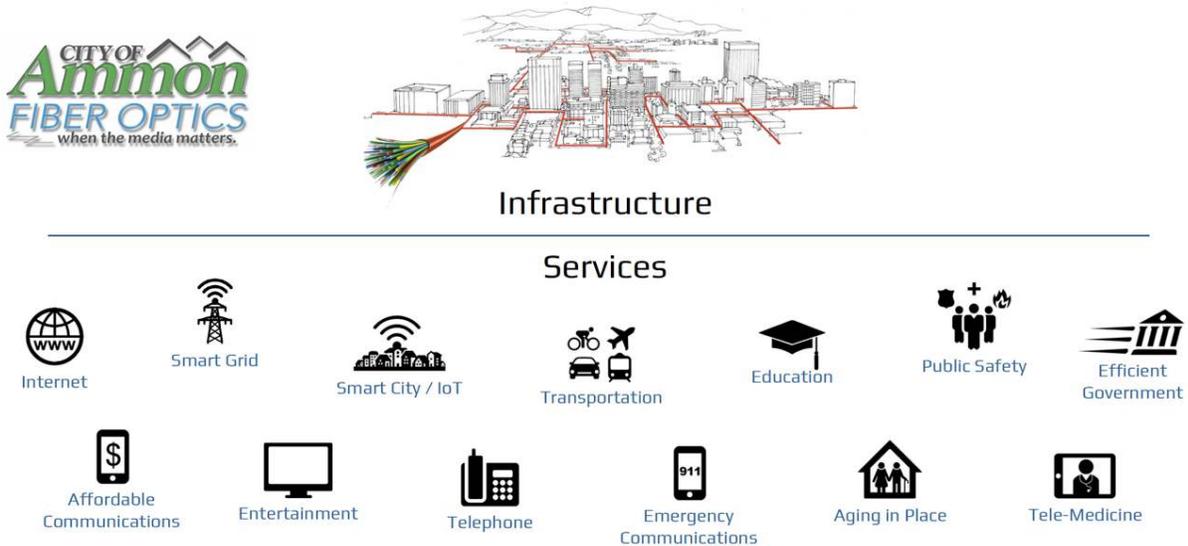
This is a new and growing area of broadband growth which resolves some of the above issues. Firstly it allows the community to have a choice as to which broadband providers they can use, and many such models are operated for co-operative or a non-profit 501(c)(12). Secondly, the capital invested by the community remains as an asset for the community. Lastly, there are many examples where the costs of broadband have declined due to competition between providers which are allowed to offer service over the fiber optic network that the community has constructed.

A good example is in the City of Ammon, Idaho where the open access model developed by EntryPoint Networks has been deployed to more than 1,000 properties. The key factor in making this possible was the willingness for the City of Ammon to utilize municipal bond financing to pay for the necessary infrastructure.



Ammon, Idaho Lowers Subscriber Monthly Cost from \$90 to \$27-\$45, While Increasing Available Speeds from 30/5 Mbps to 100/100 Mbps

The bond raised by the City of Ammon is being repaid by the broadband customers as part of their monthly service fee along with an operations fee and cost of the internet service. What is particularly transformational is that this model has demonstrated that the cost of broadband to residents declined due to the competition between ISP who are all delivering service over the same fiber connection to the home, and the customer is able to dynamically change ISPs and add services using a cloud-enabled portal.



There are many similar examples of successful city owned fiber optic networks, such as City of Sandy, Oregon who provide 1Gbps for \$59.95/month. City of Idaho Falls, Idaho also offers 1Gbps for between \$70-\$100/month including a \$30/month infrastructure fee and choice of ISPs. Owensborough Municipal Utilities in Kentucky is offering 1Gbps for \$99.99/month. City of

Longmont, Colorado provide 1Gbps for \$69.95. These are representative of many City owned broadband networks that continue to operate successfully, and there are many more being planned as the political will continues to grow that reliable low cost broadband is a necessity for community and economic development.

5.5 Creation of Community Facilities Districts

Traditionally, Community Facilities District (CFD) have been created to address specific community utility needs such as sewers, parks, or stormwater systems. The proposed project typically needs a 2/3 majority vote from the property owners that will be receiving the new utilities. If the CFD has approved an assessment, that amount is levied on the property owners which is used to repay the capital needed for the project. It is common for the capital needed for the project to be raised using a municipal bond, with repayments terms for such utility infrastructure as long as 30 years.

Traditional CFD infrastructure investments remain under the ownership of the local authority, and it is not uncommon for public-private partnerships (3P) to be formed where agreement for long term operations may be facilitated by a private company. An example would be large upgrades to domestic water systems where the bond is repaid from revenues collected by a privately operated organization. Companies such as Table Rock have successfully implemented many 3P solutions which has been a significant advantage to resource-constrained local authorities who need to make improvements, but lack staff and some of the specific skills needed. In preliminary discussions with Placer County on potential funding mechanisms the concept of creating a Joint Powers Authority (JPA) was raised which would allow for greater flexibility with the structuring, funding and operations of a broadband 3P model which would allow services to be provided more efficiently and in a cost-effective manner.

Given the administrative overhead a JPA/3P model would only be viable for larger projects, or come into play once a series of smaller projects have been successfully completed.

The JPA model allows two or more public agencies to form a separate legal entity. One of the advantages is that the new entity has independent legal rights, including the ability to enter into contracts, hold property and sue or be sued. Forming a separate entity can be beneficial because the debts, liabilities and obligations of the JPA belong to that entity, not the contracting parties.

It is important to understand that California Labor Code requires employers engaged in public works projects to pay the prevailing wage to their employees if the project is "paid for in whole or in part out of public funds which has a significant impact to construction costs, for example 2,000 feet of the modified micro trench would cost \$75,000 when using prevailing wage, but only \$50,000 under a private contract.

California passed AB1999 in Sept 2018 that removes state restrictions limiting publicly owned options for rural Internet access signaling to big cable and telephone companies that they are no longer willing to bend over backward to protect incumbent monopolies that ignore their rural

constituents. Prior to the adoption of AB 1999, a CFD would first have to engage in a process to determine that no person or entity was willing to provide Internet access before the CFD could offer it to customer. Additionally, if a private sector entity came along after the infrastructure was deployed and expressed a willingness to do so, the CFD had no choice by law but to sell or lease the infrastructure they had developed rather than operate it themselves.

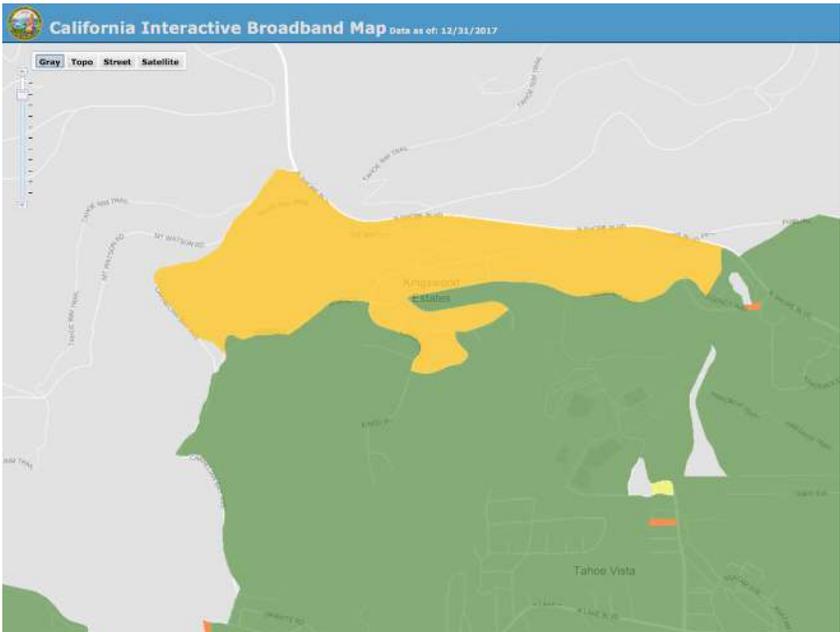
6.0 Potential Funding Sources for Broadband Deployment Upgrades

In this section identifies where State and Federal funds could be obtained to help lower the cost of construction to make high-speed broadband more affordable for rural communities.

6.1 CPUC: California Advanced Services Fund

California Advanced Services Fund Infrastructure grants available for both new broadband construction and line extension projects. There is a renewed commitment to streamline an expedited review and grant approval process. It is being recommended that all potential broadband projects be presented to the CPUC to evaluate whether grants are available in the census blocks being addressed and that the application process and approval process is clearly defined and documented. CASF grants can meet up to 40-50% of the cost which has a substantial impact on the affordability to the community.

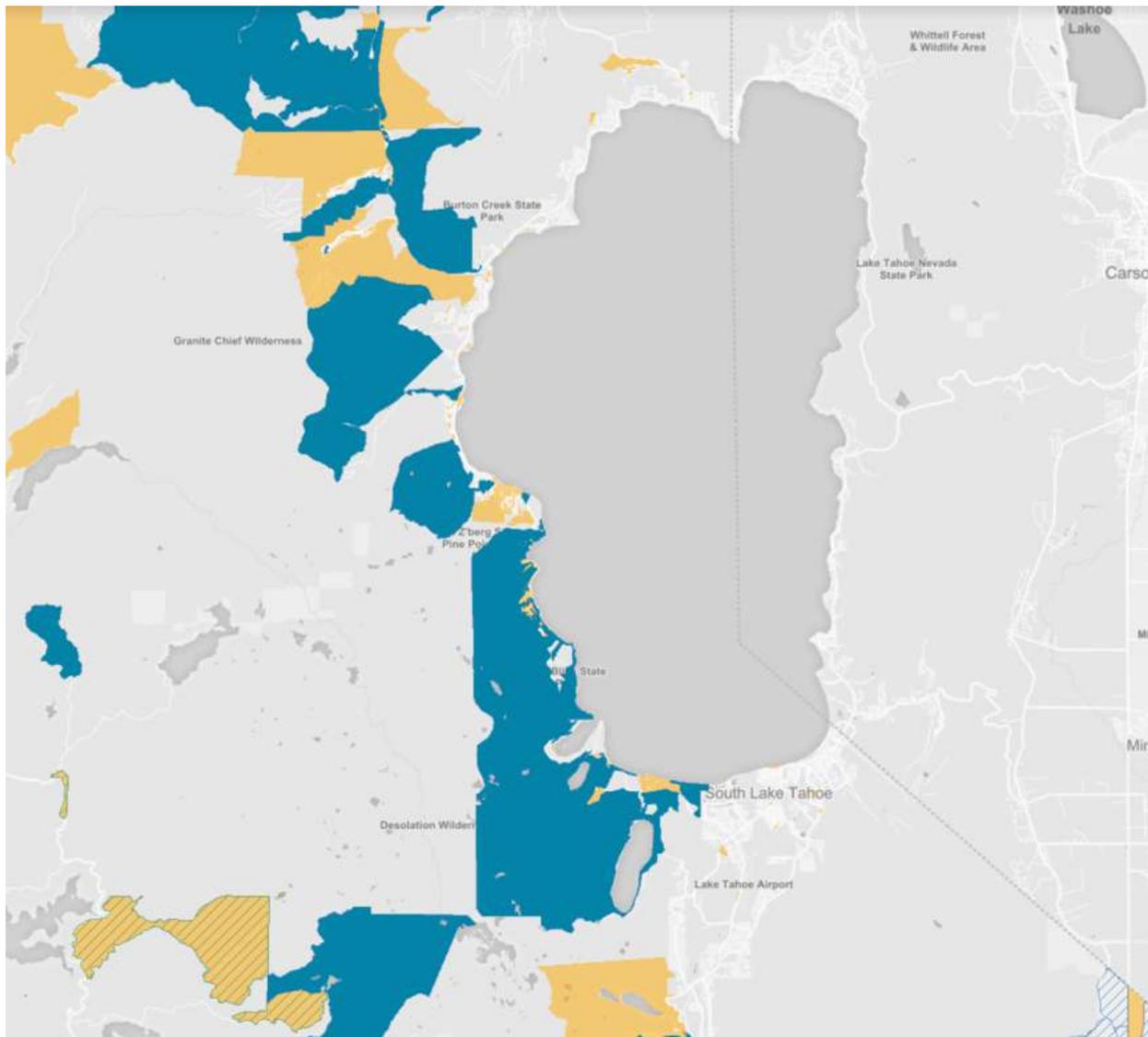
The image below is from <http://www.broadbandmap.ca.gov> and shows that the Kingswood Estates (area shown in yellow) is eligible for a CASF grant.



6.2 Connected America Fund (CAF II)

These grants are only available to existing Incumbent Local Exchange Carriers (ILEC). In 2015 AT&T accepted \$427M per year for six years, and more recently CAF II areas indicated in blue in the Tahoe Basin have been awarded to AT&T who will be deploying fixed wireless.

To meet the grant obligations the speed must be at least 10Mbps down and 1Mbps upload, less than 100-millisecond latency, at least 150GB/month data allowance and be less than apex (or cost the consumer less than) \$72/month.



AT&T is leveraging CAF grants to expand mobile data cell towers while delivering fixed wireless. It's unlikely that Tahoe residents would secure funding for the types of broadband

improvements we have identified during this study, but monitoring of the Connected America Fund should continue and evaluate opportunities to partner with incumbents to achieve the goal of expanding broadband availability. Tahoe Prosperity Center will continue to monitor deployments and the actual speeds that property owners are receiving to ensure that the standards are being achieved

6.3 House Bill H.R. 6442 Broadband for All Act 2018

This bill was introduced by Derek Kilmer in July 2018 who serves as the United States Representative for Washington’s 6th Congressional District . The bill proposed Internal Revenue Code be changed to allow a refundable tax credit of up to \$10,000 per year for 75% of a taxpayer's payments for broadband infrastructure in certain areas that are not served by a providing at least 25 megabits per second and upload speeds of at least 3 megabits per second. Unfortunately, the bill has made little progress, but the concept would be ideal for community-centric broadband construction as it would more than meet the capital needs for underground construction and implementation of a broadband network in most situations.

7.0 Potential Funding Mechanisms

This section addresses the operation mechanism to gather the capital for construction and facilitate repayment mechanism for those able to make recurring payments as opposed to a single capital payment. In all of these potential mechanisms, there will likely be a need for an entity to facilitate the process. In the near term, it is proposed that this could be a sub-entity of Tahoe Prosperity Center or a function within its operations. The scope would be facilitating program management, collection, and distribution of funds, the orchestration of property easements and operating agreements.

7.1 Self funded

Where there is a high degree of participants desiring improved broadband, and the majority of the property owners have the ability to make a one-time capital payment from an existing home equity line of credit, savings, or other liquid capital it would be feasible to use a mechanism that uplifted the individual property costs to allow the construction to start, and when other property owners eventually utilized the service they would be repaid.

For example, if it will cost \$300,000 to provide service to 100 properties, and 90 of the property owners are willing to make a capital payment there would be a shortfall of \$30,000. However, if the property owners increased their capital payment by just \$333 with the agreement that as each of the remaining 10 property owners received service that they would each be repaid \$33.30 plus accrued reasonable interest thus allowing the project would be able to proceed without all of the property owners being required to make the initial payment. This model could be adapted to support a smaller number of property owners who cannot make a capital payment and require a monthly payment.

7.2 USDA Rural Broadband Access Loan and Loan Guarantee:

These loans are available for the construction, improvement, and acquisition of facilities required to provide broadband service. There is a stipulation that 15% of the proposed service area must be unserved and the project must be in a defined rural area. This could potentially be used to help fund the community conduit infrastructure for those without the means for an upfront capital payment but have the ability to make monthly payments.

7.3 Local Authority Support:

Where there are a majority of property owners who need a series of payments over several years, another model is similar to the Property Assessed Clean Energy (PACE) program that has been designed to help property owners with making capital improvements for energy efficiency with the repayments being made via a property tax assessment. The program has recently come under criticism as unlike mortgages and home equity loans the program is not as diligent in ensuring that property owners have the ability to make the repayments. Combined with aggressive vendors overselling the value of improvements, this has resulted, in some cases as an excessive financial burden on the less diligent property owner. The risk and cost of bad debts are significantly reduced with this program as it is well established, but a lengthy process that will ultimately recover past due property taxes when a property is ultimately sold. Modification to the existing PACE program to include broadband would require changes in the state legislature that is likely to be time-consuming.

The PACE concept and key learnings from this program can be used to make capital available from the municipality with the monthly repayments collected from the property owner by the ISP. For smaller projects, the funds may come from funds on deposit, whereas for larger projects such as the City of Ammon, ID example the funds would come from a bond. In all cases, such a mechanism should generate additional income for the municipality as opposed to a cost, and risks associated with potential bad debts can be heavily scrutinized.

7.4 Neighborly

Neighborly is a relatively new online platform, started in 2012, that connects communities with the capital they need to fund vital public projects like schools, libraries and parks, and next-generation resilient infrastructures like solar micro-grids and community broadband networks. Neighborly makes it easier and less expensive for communities to reach investors; easier for investors to direct their dollars towards the world positive projects that matter to them, and more seamless for investment institutions to maximize impact portfolios for their clients. With Neighborly, individuals and businesses can invest directly in their communities and the civic projects they care about. The Tahoe Basin broadband next stage of implementation would be an ideal candidate for a Neighborly application.

7.5 Example Funding Model.

The below model for Kingswood Estates describes the commitment threshold to implement a broadband upgrade, a projection of the number of property owners able to make a capital payment, numbers willing to make monthly payments, and those expected to defer participating.

As the capital costs increase we expect more property owners to prefer monthly payments for the construction costs, and we anticipate that some will not be willing to participate for one of three reasons:

- 1) They are skeptical that the program will succeed.
- 2) They are not currently interested in an upgrade and have limited needs for broadband, such as part-time residents.
- 3) They are not high speed technology users.

Overtime we expect all properties will eventually utilize the high speed broadband and prior to connecting to the new broadband system, the property owner will be required to pay the connection fee with compounded interest.

It is also worth noting that we would expect to see an increase in property tax revenue as typically home values increase by 4-7% with reliable low latency broadband. This could translate to an additional \$8.5M in assessed value for Kingswood Estates, which does not include the additional assessed value for homes that have yet to be built on vacant lots.

There is a potential increase in the number of vacant lots being developed with the availability of high speed broadband which will increase community development revenues as well as property tax revenues to the County.

Construction Cost Funding Model

Broadband cost per property	\$2,000			
Number of properties	320			
% Needed to start project	90%	288	properties	
One time payment	70%	202	properties	\$403,200
Monthly Payment Plan	30%	86	properties	\$172,800
Deferred connections (see below)	10%	32	properties	\$64,000
Total project cost				\$640,000

Monthly Payment Plan

Capital requirement \$172,800

Payment amount	\$2,000	
Admin fee	\$150	
Total funded	\$2,150	
Payment term	10	years
interest	6%	
Annual payment	\$292.12	\$24.34 /month

Deferred connections

Capital requirement \$64,000

Deferred Group	%	Count	Primary Adoption driver	Time frame
Skeptics "We will see if it happens"	60	19	Successful deployment, satisfied neighbors	1-4 years after construction
Elderly "I don't really use the internet"	30	10	Pressure from family or sale of home	even spread over 10 years
Technophobe "I don't like the internet"	10	3	Sale of home to new owner	even spread over 10 years

Skeptics	Elderly	Technophobe	100%	Adjusted Cost	Total Repayment
60%	30%	10%	32		
19	10	3			

Year	Skeptics	Elderly	Technophobe	Count	Adjusted Cost	Total Repayment
2020	8			8	\$2,110	\$16,880
2021	6	1		7	\$2,226	\$15,582
2022	3	1	1	5	\$2,348	\$11,742
2023	2	1		3	\$2,478	\$7,045
2024		1	1	2	\$2,614	\$4,955
2025		1		1	\$2,758	\$2,614
2026		1	1	2	\$2,909	\$5,515
2027		1		1	\$3,069	\$2,909
2028		1		1	\$3,238	\$3,069
2029		1		1	\$3,416	\$3,416
2030		1		1	\$3,604	\$3,604

Key Assumptions

- Over next ~10 years ALL properties will require high-speed broadband.
- Accrued 6% compound interest is fair model for deferred connections.
- No lower cost, higher speed broadband option will be available in the next 10 years

8.0 Recommendation

It is widely understood that to stimulate economic development and reduce dependency on lower paid tourism jobs in the Tahoe Basin homeowners and business owners in Tahoe must have access to affordable high-speed broadband as soon as possible.

As previously mentioned during the course of the feasibility study we have made significant progress with facilitating a fiber optic upgrade for the Kingswood Estates community of 320 parcels, of which 220 are developed and occupied. Currently AT&T is delivering DSL via an existing underground conduit system, and they have already made a commitment to offer this community a fiber optic upgrade with an initial estimate of \$1,700 per home, that was recently increased to a similar cost as Charter Communications. Further discussions are in progress to determine the driver for the increase and options to reduce this back to a more affordable level.

The current close collaboration with AT&T and Tahoe Prosperity Center has been possible due to the long term positive executive level engagement between organizations and helps improve the opportunity to implement a program that will provide a viable path to high-speed fiber optic for the thousands of existing AT&T DSL customers in the Lake Tahoe Basin.

With many established and successful muni/community broadband models across the US there is opportunity to focus effort implementing a City of South Lake Tahoe fiber optic network which would be large enough to have positive impact in the community, and serve to demonstrate to other local cities and towns that such investments deliver on community needs. As highlighted in section 5.4 the Ammon, ID model would be a very good fit for the City of South Lake Tahoe.

8.1 Proposed Implementation Program

The new program would leverage the existing AT&T fiber optic connectivity that is present at most of the DSL remote terminals to deliver AT&T high-speed fiber optic service to the neighborhood that is currently receiving DSL. The underground conduits that will carry the new AT&T fiber would be installed and paid for by the local community with support from the local municipality.

Why focus on AT&T DSL customers? We know from speed test results that DSL technology is currently oversubscribed due to the growth in unbundling of media service and the addition of stream services such as Netflix, Hulu, as well as the large number of users on the system during peak hours. We also know that a majority of customers is increasingly motivated to look find a better solution. Once the first successful implementation has been completed, we believe that the program can be easily expanded to add more AT&T DSL communities. Along with customer demand, it could easily expand the footprint to include poorly or non-served customers beyond the current 12,000 foot-15,000 foot range for DSL. Lastly, the program leverages existing AT&T customer support and operations which mitigates the cost and risk with setting up a small community ISP for a relatively low number of customers.

The City of South Lake Tahoe fiber optic network will require support the City of South Lake Tahoe with the allocation of staff to support the implementation and a program of community engagement. Leveraging experiences and key learnings from similar successful projects will help to build confidence with the community and justify the viability to the City of South Lake Tahoe.

8.2 Key Stakeholder Benefits

AT&T Benefits: This model would allow AT&T to retain and grow their broadband revenue and leverage their existing fiber-optic network, avoid the high capital cost of constructing the ‘last mile’, and accelerate the sun setting of the legacy DSL technology and further improve customer satisfaction by delivering on community needs.

Community Benefits: Communities who have a strong desire to upgrade their DSL service to fiber optic will have the option for the lowest possible cost of construction, the ability to collaborate with a local program facilitator who will guide the community on the successful implementation.

Placer County Benefits: Expansion of high-speed broadband is a key enabler of economic development and properties typically increase 4-7% in value which, over time translates to increased property tax revenue back to the County.

Tahoe Prosperity Center Benefits: Tangible delivery on the vision for uniting Tahoe’s Communities to Strengthen Regional Property. The goal for the Connected Tahoe project of the Tahoe Prosperity Center is to bring gigabit level service to the entire Tahoe Basin as a means to catalyze economic development, galvanize public safety, healthcare, education and to position the Tahoe Basin to receive the most advanced technologies for internet access now and in the future.

8.3 Implementation Pilot Communities

This feasibility study has focused on three specific areas in the Tahoe Basin - Kingswood Estates, Alpine Peaks and Meeks Bay. (see Appendix A)

We have made great progress on facilitating an upgrade for the Kingswood Estates that started during the feasibility study. It will make sense to follow through with an implementation program. This will impact 334 properties of which 221 are developed and occupied and represents \$107.6M of assessed property value. One recommend is that we include an implementation pilot at Alpine Peaks which will impact approximately 75 properties and has many broadband evangelists who would be willing to embrace the proposed community program. This will continue to expand the relationships with AT&T and if successful this program could scale to hundreds of other AT&T DSL communities in the Tahoe Basin.

Meeks Bay remains of interest, but it should be noted that it is located within AT&T CAF II area for fixed wireless. Tahoe Prosperity Center will work to ensure that AT&T meets its CAF II funding requirement by serving this currently under-served community.

The City of South Lake Tahoe covers approximately 10 square mile and has 22,000 residents and approximately 2,600 businesses and lends itself to a municipal network similar to Ammon, Idaho.

8.4 Anticipated Challenges

The proposed implementation pilot is a bold step forward to bring much-needed change to the community and has financial win/wins for the key stakeholders. We have to be aware that facilitating change in large organizations can be slow and at times frustrating, but with the potential to positively impact our community we must be persistent and be prepared to adapt to reach the goals. Below are the expected key challenges for each of the stakeholders.

AT&T: We have established from the progress at Kingswood Estates that AT&T is willing to bring on more fiber optic customers, and we have heard first-hand from their executives that DSL is a sunset technology. Therefore, there is a sound business case for leveraging the fiber optic that is deployed to most of the DSL facilities. We do not yet know the degree of technical challenge and cost to repurpose the existing fiber optic, and how much effort AT&T is willing to take to collaborate on the pilot proposed for Alpine Peaks.

Placer County & City of Southlake Tahoe: We have received great support from Placer County Public Works on reviewing construction methods to reduce cost and improve predictability, GIS systems for maps and data and the Treasurer reviewing financial mechanism. The challenge we could face is the allocation of personnel from both Placer County and the City of South Lake Tahoe who like many public agencies have limited resources.

CPUC: We know that the pilot implementation is within eligible CASF grant areas, and more recently that CASF has indicated it will fast track smaller grant. The challenge is that our collaborative program may not exactly fit within their grant guidelines.

Tahoe Prosperity Center: The leadership TPC is providing to the Tahoe Basin and their partnership with the Economic Development Agency (EDA) has enabled the completion of the feasibility study and brings us close to delivering real results for Kingswood Estates. The challenge may be the ability to continue to fund an implementation pilot or delays that will result in a loss of momentum or continuity if funding for managing the program is unavailable or uncertain.

Community: Surveys and feedback confirm the appetite for improved broadband. The challenge comes when residents are required to make an investment of time and money. It may be that the community is not yet really feeling enough pain from lack of consistent and high speed broadband and we have much lower real commitment than expected.

8.5 Next Steps:

The feasibility study has identified multiple solutions for delivering reliable high-speed broadband in the Lake Tahoe Basin, which is applicable to other communities in California and Nevada and beyond. The measure of success will be the number of individuals that the proposed solutions can positively impact, the number of jobs created and retained and the time it takes to implement the improvement along with the social and economic benefits that follow.

Broadband service benchmark: It is proposed that the minimum acceptable broadband speed which qualifies as “advanced telecommunications capability” that will meet the economic, educational and quality of life goals is 100 Mbps download and 20 Mbps upload (100/20 service)

The adoption of this service benchmark is aligned with Central Coast Broadband Consortium who made this recommendation in their response to the Fourteenth Broadband Deployment Report Notice of Inquiry (NOI) adopted by the Federal Communications Commission on 8 August 2018.

In addition, the broadband service benchmark must also factor in affordability as if residents and business cannot afford 100/20 service, then such access is effectively unavailable. The 2018 Monterey Bay Economic Partnership (MBEP) Broadband Consumer Survey determined that majority of customers would be willing to spend \$40-\$99/month to receive a 100/20 service.

Further parcel level GIS mapping should be implemented to show where the 100/20 service is currently available in the Tahoe Basin. This will serve to reinforce the need for continued investment in broadband and assist the community when considering employment in the areas identified in the section on Opportunities for Industrial Diversification, or those starting or expanding business's in the Tahoe basin.

Rural Tech Hub The Rural Innovation Initiative is currently providing support to nine communities to build a tech hubs that are located in the down town areas of rural cities. This creates small pockets of density and collaboration, which is the catalyst for creating jobs and startups and takes advantage of the lower costs of living associated with rural communities. To qualify for financial support each ‘Micropolitan’ area needs to meet several criteria including have an existing high-speed broadband which is not present in much of the Tahoe Basin.

Once high-speed broadband is more available it is recommended that applying for a Rural Innovation Initiative grant is considered as matching awards up to \$500k are available to bridge the gap in rural areas by helping communities build the capacity of create resilient, innovation-based jobs. There is opportunity learn from the nine communities that were selected from 130 applicants, and whilst there is no guarantee that an application would be successful its likely that best practices could be applied to create a similar local program.

The Rural Innovation Initiative is made possible with a cooperative agreement between Rural Innovation Strategies, Inc (RISI) and U.S. Economic Development Administration.



Typical rural digital economy ecosystem <https://ruralinnovationstrategies.com/>

It is common for very large companies such as Amazon to receive significant incentives to locate large facilities in urban areas, and there are now great examples of much smaller incentives being offered which are successfully creating rural jobs. Starting in 2019 Vermont is offering a \$10,000 incentive for people willing to relocate and work remotely in Vermont, similar incentives in Connecticut and Oklahoma. Traverse City, Michigan is already showing results with 12 new jobs generating from their Rural Innovation Initiative which is now generating for more than \$1M of salary which is now flowing into the local community. This is helping to bring balance to the rural brain drain where local talent is staying the community rather than relocating to large cities for work.

The bottom line is that without the cornerstone of reliable affordable high-speed broadband such innovative programs are very unlikely to succeed.

Existing Broadband Provider Upgrade. Great progress has already been made with engaging AT&T to develop a proposal for an upgrade of the Kingswood Estates Community. The driver for this project is the existing AT&T underground conduits and fiber optic service that is passing through the community providing bandwidth for the local cell phone tower. This should be considered a quick win that would positively impact 221 existing households and likely to trigger the development of additional vacant parcels. It is estimated that this would impact more than 500 individuals and could be completed in 12-18months and allow for residents to expand their opportunity for remote working or starting small businesses.

AT&T Rural Community Fiber. Almost all AT&T DSL remote terminals utilize fiber optic to serve their DSL customers. It is logical to partner with AT&T to build a business case for leveraging their existing fiber optic investments, whilst avoiding any expectation that AT&T would be required to build the ‘last mile’ to the properties they are already serving with DSL. With high demand and frustrated customers, the opportunity for the community to build conduits to meet the AT&T fiber service at the remote terminal looks promising. Where possible construction of the new underground conduit should primarily be on private property to keep costs low and when crossing public highways close collaboration with public works departments can help to also keep costs low. With any community model clear communications, effective leadership, efficient planning and operations make the difference between success and failure. AT&T has indicated that they are very interesting is finding a solution to address their DSL, and there is every reason to believe that this model can impact 10,000-100,000’s of individuals as every ‘DSL community’ becomes a potential for the proposed new AT&T Rural Community Fiber program.

Municipal Fiber Optic. The City of South Lake Tahoe is very similar to many other communities that have successfully deployed municipal fiber-optic networks. Whilst existing telecommunications companies are already providing service in the City of South Lake there is opportunity for a municipal service that can provide differentiated services that will bolster tourism, smart city technology, and provide the basis for diversification of employment and attracting new business to the area and increasing employment. The city has approximately 22,000 individuals and 2,600 businesses and with pervasive fiber optic could easily become a showcase for 5G technology due its proximity to Silicon Valley, perhaps even becoming an area for autonomous vehicle testing and deployment. Showcasing smart city technology to optimize the efficiency of city operations, services, and connection to citizens, and ensure rapid recovery during periods of extreme weather or wildfire.

With the extensive existing local connections and solid track record Tahoe, Prosperity Center is the logical choice as a co-originating entity to continue this program into implementation to bring reliable high-speed broadband to the Lake Tahoe Basin, and expand its learnings and best practices to other communities in California, Nevada and beyond.

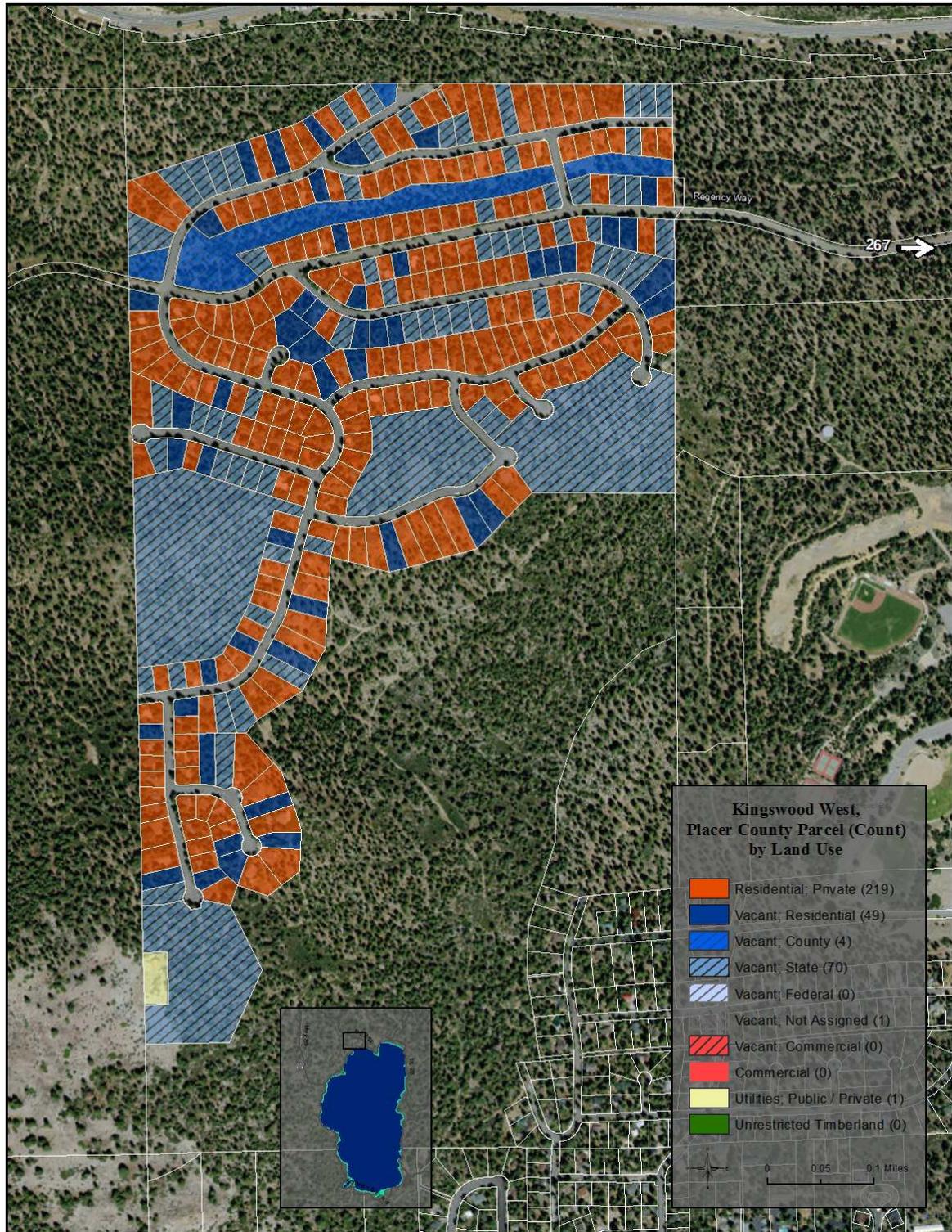
Summary of proposed approach for delivering improved high speed broadband to the Tahoe Basin

	 Employment	 Social Impact	 Difficulty	 Primary Challenge
Existing Broadband Provider Upgrade				Obtain CASF Funding
AT&T Rural Community Fiber				Influence AT&T Strategy
Municipal Fiber Optic				Political will & community support

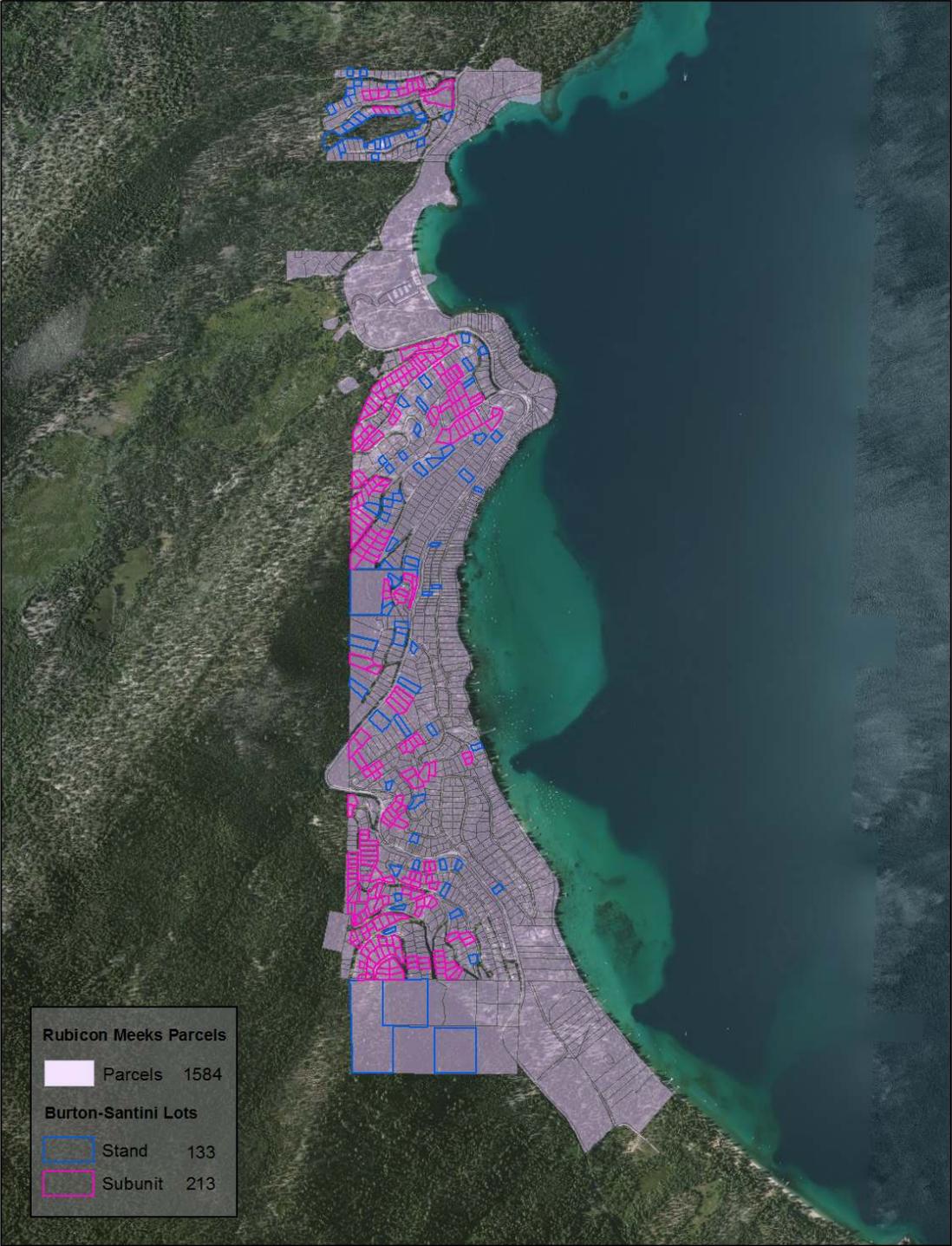
About the author: Andrew Wilkinson is living the reality of rural broadband, having collaborated with AT&T in 2004 to upgrade the local central office to enable DSL in more than 10 remote terminals he has continued to work within the local community as an advocate for high speed broadband. With a 20 year career at Hewlett Packard which started in the networking business and now as VP Sales & Marketing for startup focused on cloud networking technology he has been able to combine his experience of business, networking, financing and engineering construction to continue to find pragmatic ways to bring much needed broadband to rural communities.

Appendix A

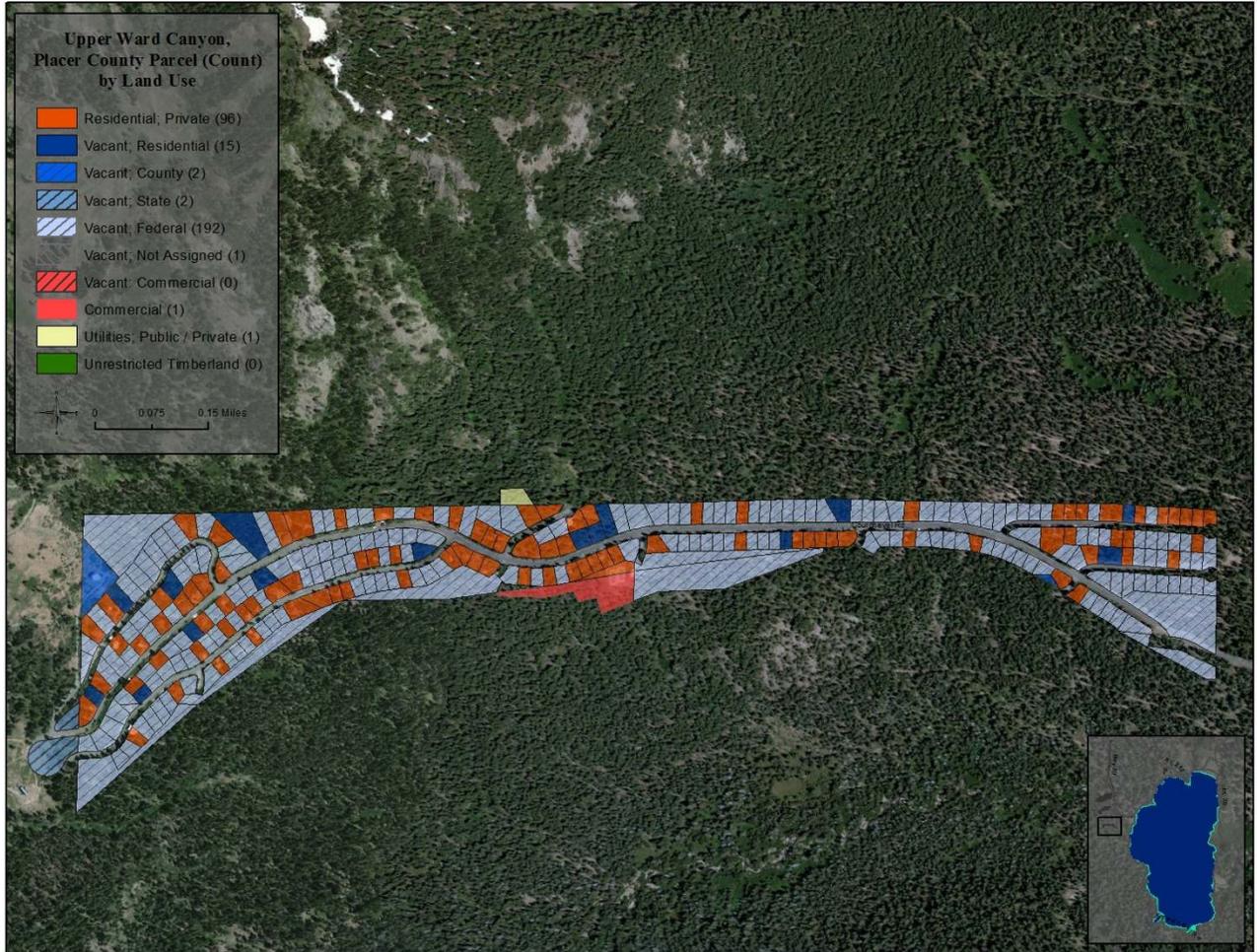
Kingswood Estates Community.



Rubicon Meeks Bay Community.



Alpine Peaks Community



Tahoe Basin Census Tracts

