THE NEVADA BROADBAND TASK FORCE

ANNUAL REPORT TO THE GOVERNOR

PURSUANT TO EXECUTIVE ORDER 2015-23

JUNE 30, 2016

LETTER FROM THE CHAIR AND VICE CHAIR OF THE TASK FORCE

On July 1, 2015, the Nevada Broadband Task Force ("Task Force") was created by Executive Order 2015-23. The Task Force was to evaluate current and future needs of broadband in Nevada, the capacity of existing broadband infrastructure, regulations and state policies for conduciveness for broadband build outs, and provide recommendations to the Governor.

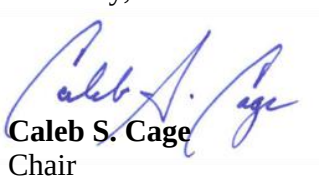
The Task Force consisted of members representing state agencies, the private energy and data sectors, counties, and broadband/telecommunications sectors. In the short time the Task Force was convened, it reviewed broadband policies and practices in Nevada, assessed broadband access and adoption in key sectors of education, transportation and public health, and examined model policies and practices in other jurisdictions. The recommendations set forth herein are a culmination of those efforts.

Of the nine recommendations provided herein, two have the potential to make transformative changes in the state. First, is the recommendation to grant the Nevada Department of Transportation (NDOT) authority to install excess conduit in certain highway projects, and allow the Department to engage in public-private partnerships with telecommunications providers. Second, is the creation of a state E-rate consortium to maximize federal E-rate funding, which helps pay for broadband to, and within, K-12 schools and libraries. Both recommendations will require the state to assume a more proactive role in supporting broadband deployment opportunities which will help drive broadband expansion, particularly in our smaller or rural communities, where limitations on broadband availability and services continue to exist.

Broadband, and the infrastructure that supports it, is a critical driver of the state's economy. It impacts commerce, education, transportation, public safety, health care and so much more. Broadband infrastructure, and specifically, fiber optic cable, is quickly becoming an essential form of infrastructure – a digital highway of the 21st Century – necessary to transport the massive quantities of data used by consumers, and to provide near instantaneous communications throughout the state. The state has witnessed transformative changes in technology in the last 10 years, as well as exponential demands for faster and faster broadband. This is a demand that will only continue to grow. In order to prepare the state to meet the needs of the New Nevada in 2020 and beyond, steps must be taken now that will help increase broadband connectivity, adoption, and expansion throughout the state.

On behalf of the Broadband Task Force, we hope this report will prove to be informative and urge the state's policymakers to initiate the first step in a long journey towards the creation of a truly robust, expansive fiber optic network that will extend to, and benefit, all 17 of Nevada's counties.

Sincerely,



Caleb S. Cage
Chair

Britta T. Kuhn
Vice Chair

EXECUTIVE SUMMARY

In 2015, Governor Sandoval authorized the reinstatement of the Nevada Broadband Task Force to carry on the work of the 2008 Broadband Task Force. Pursuant to the Executive Order, the Task Force was charged with:

- Evaluating the current and future needs of broadband in Nevada
- Evaluating the capacity of the existing broadband infrastructure
- Assessing state policies for conduciveness for broadband buildout and expansion
- Assessing local policies for conduciveness for broadband buildout in commercial and residential applications
- Providing recommendations on improving coordination between local and state entities, and examining regulatory burdens, and
- Providing recommendations to the Governor

In the last six months, the Broadband Task Force examined policies and practices in other jurisdictions to see what worked, what did not, and what could be implemented in Nevada. Members spoke with community leaders throughout rural Nevada to better understand the real gaps and challenges in bringing broadband services to these areas. Task Force subcommittees were formed to address broadband specific issues affecting key sectors, including education, health care, broadband policy and mapping.

Of the nine recommendations set forth in this report, two will have the greatest impact if adopted, and provide the greatest challenge to implement. First is the recommendation to leverage the state's rights-of way to incentivize private telecommunication providers to partner with the Nevada Department of Transportation (NDOT) and reduce the cost of broadband construction. This recommendation includes giving NDOT the authority to install excess conduit in its rights-of-way and to enter into public-private partnerships with broadband/telecommunication providers. The second recommendation is the creation of a state education consortium to pursue federal E-Rate funding. The federal E-rate Program helps ensure that schools and libraries can obtain high-speed Internet access and telecommunications at affordable rates. E-rate funds can also be used to help pay for broadband services in a school as well as broadband construction projects that can bring fiber to a school. A state E-rate consortium could help leverage economies of scale that will help districts secure better pricing for broadband equipment and services, improve E-rate efficiencies, and enable the state to receive more federal funding that it currently does.

Planning now to address the expansion of broadband infrastructure is critical. One key issue facing the state is how to best promote and facilitate broadband expansion into underserved and unserved areas of the state. Contrary to oft cited reports, Nevada is not one of the most "connected" states in the nation. While Nevada has been ranked as the "8th most connected state in the nation"[1] by the National Telecommunications and Information Administration (NTIA) for broadband access, this statement only addresses Nevadan's "access" to broadband. It does not reflect the actual adoption or utilization of the Internet by consumers. Nevada does score high in the access category mainly because the majority of the state's population resides in two main urban centers. Of the state's 17 counties, four scored high on "access," but the remaining 13 counties remain mostly underserved or unserved.

It should be noted that, since the conclusion of the previous Nevada Broadband Task Force in 2014, the FCC has since changed the definition of "broadband," such that "high speed Internet" service is now considered 25 Mbps (megabits per second) upload and 3 Mbps download. Using this latest definition, eight percent of Nevada residents do not have access to "fixed advanced telecommunications capability."[2] And with respect to wireless technology, there are large areas of the state that remain unserved or marginally served by wireless coverage.

A summary of the latest data collected by the Federal Communications Commission (FCC), NTIA and other sources shows: [3]

- 144,000 people in Nevada are without access to a wired connection capable of 25 Mbps download speeds;
- Of the144,000 with *access*, there is only one wired provider (no significant competition);
- 8% of the entire population, or 249,722, is without access to the current broadband standards;
- 5% of the urban population, or 151,168, is without access; and,
- 65% of the rural population, or 98,554, is without access as compared to the national average of 39%. [4]

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[1] http://broadbandnow.com/Nevada, based on data collected via the FCC, NTIA and other sources. This ranking reflects the percentage of Nevada's population *with access* to 25+ Mbps down and 3 Mbps up, wired broadband. It should be noted this ranking reflects access to, not actual use by, Nevada's population. While 25/3 Mbps may be available, it may also be cost prohibitive for many.

[2] https://www.fcc.gov/reports-research/reports/broadband-progress-reports/2016-broadband-progress-report

[3] *Id.*

[4] Federal Communication Commission, *2016 Broadband Progress Report*, Appendix E – Americans without Access to Fixed Advanced Telecommunications Capability by County, January 26, 2016; *See also* https://www.fcc.gov/reports-research/reports/broadband-progress-reports/2016-broadband-progress-report

Other findings by Connected Nation and the NTIA include:

- Construction of a robust fiber "information" highway in Nevada is particularly expensive given the state's geography, distances between rural communities, and the limited return on investment realized by Internet Service Providers (ISPs). There is little incentive for ISPs to assume the high cost of construction beyond Nevada's primary urban hubs.

- The majority of our rural counties remain underserved or unserved. If the state continues to allow "market forces" to drive broadband expansion, the status quo will remain, these communities will likely see little to no improvement in broadband services for their schools, local governments, public safety providers, local businesses or residents.

- Even with counties that have a high percentage of broadband adoption, there are still schools and public services in these areas that lack adequate broadband service. For instance, Clark County is well connected, but the schools in Mt. Charleston and Sandy Valley still have extremely limited broadband service.

Years ago, states recognized the importance of investing in their highway infrastructure in order to facilitate the movement of people and commerce. This infrastructure became the foundation of a healthy economy. Today, broadband can be thought of in the same way – the movement of data and the ability to instantaneously communicate information is fast becoming a requirement for a healthy, thriving economy and community. There is an increasing realization that broadband is no longer a luxury, but a necessity. As such, it is important that our state establish policies which will support and promote investment in, and expansion of, broadband infrastructure capable of delivering these services and meeting consumer expectations. It will also be necessary to establishing a funding mechanism to support broadband; one that will allow the state to qualify for federal funds to help pay for the new "information highways," just as we once did with our road and highways.

In considering potential policy changes, the Broadband Task Force examined best practices in a number of jurisdictions, and imposed those model policies and practices against the realities and limitations existing in our state in order to arrive at recommendations that can work for Nevada. These recommendations include:

1. Facilitate broadband expansion by allowing the Nevada Department of Transportation (NDOT) to install conduit and fiber systems in the state rights-of-way that support telecommunication facilities, and allow NDOT to enter into public-private partnerships for cooperative fiber and conduit trades.

2. Promote "Dig Once/Joint Trenching" policies at the local levels through the creation of local model policy guidelines.

3. Establish a state broadband in education consortium and recurring funding to provide a state match to school district funds to more effectively leverage federal E-rate money, thereby creating an organized process for improving broadband connectivity to, and within E-rate eligible entities.

4. Adopt specific broadband goals for the state and create a state strategic five-year broadband development plan for Nevada.

5. Continue the Broadband Task Force through executive order beyond June 2017, or otherwise establish an ongoing broadband body to coordinate and collaborate on broadband adoption and deployment efforts, review and develop broadband policies, and assist in efforts to implement strategic planning goals.

6. Develop model policies and incentives for deployment of broadband in certain commercial and residential developments (e.g. create "certified" broadband or "fiber-ready" residential and/or commercial sites).

7. Assign one agency to house all Indefeasible Right of Use (IRUs) and/or Trade Agreements executed by state agencies and higher education regarding the state's broadband and fiber assets, and initiate legal review of state IRUs and/or trade agreements by counsel at least three years prior to the expiration of same.

8. Include certain broadband fiber assets on the list of critical infrastructure documents that could potentially be deemed confidential at the Governor's discretion pursuant to NRS 239C.210.

9. Establish a state funding source to provide matching funds required to enable Nevada's non-profit rural health clinics and hospitals to competitively pursue annual federal grants to help expand the use and delivery of telemedicine and distance learning.

MEMBERS OF THE GOVERNOR'S TASK FORCE ON BROADBAND

Caleb S. Cage, Chair	Chief and Homeland Security Advisor Department of Public Safety, Division of Emergency Management
Britta T. Kuhn, Vice Chair	Broadband Manager Governor's Office of Science, Innovation & Technology
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Todd Radtke	Chief Information Officer, Nevada Rural Hospital Partners Representing Nevada Rural Health Care

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I. INTRODUCTION TO BROADBAND

A. Broadband – An Overview

Broadband now affects virtually every aspect of our lives, whether we realize it or not. Broadband allows for the nearly instantaneous communication of information and data, and has become essential for economic growth and the delivery of critical services. From e-mails to cellular service, data storage to financial transactions – all of these operations depend on broadband and fiber optics to transmit that data. The number of public and private users, and demand for bandwidth, shows no signs of slowing down. Recent studies by Cisco Systems shows Internet Protocol (IP) will grow at a compound annual growth rate (CAGR) of 22 percent from 2015 to 2020. Telephone land lines, as well as the use of personal computers is declining, while the use of mobile devices is increasing. By 2020, wired devices will account for 34 percent of IP traffic, while Wi-Fi and mobile devices will account for 66 percent of IP traffic (in 2015, wired devices accounted for the majority of IP traffic at 52 percent).[5] Demand will only continue to increase, particularly as computers are tasked to do more and more, and as we become increasingly reliant on machine-to-machine and machine-to-infrastructure applications, known as the "Internet-of-Things."[6]

Broadband capacity will constantly need to improve in order to accommodate this demand. Because fiber optic cable has so much capacity, it has become the backbone of the Internet, cable TV networks, telephone (including cellular) networks, private business networks and data center networks, and the state's Land Mobile Radio (LMR), a radio communication system that transmits both voice and data from one end of the state to the other, allowing for intrastate communications for more than 6000 users of the system. Without a capable fiber backbone, none of these systems could operate or be cost-effective.[7]

The fiber optic corridors that stretch across our nation, and across our state, were constructed in the last 30+ years, primarily by the private sector, who then sold broadband services to both the

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[5] http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/complete-white-paper-c11-481360.html

[6] The Internet of Things (IoT) is the network of physical objects—devices, vehicles, buildings and other items—embedded with electronics, software, sensors, and network connectivity that enables these objects to collect and exchange data. The IoT allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit when IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also encompasses technologies such as smart grids, smart homes, intelligent transportation and smart cities. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing Internet infrastructure. Experts estimate that the IoT will consist of almost 50 billion objects by 2020. *See also* https://en.wikipedia.org/wiki/Internet_of_things

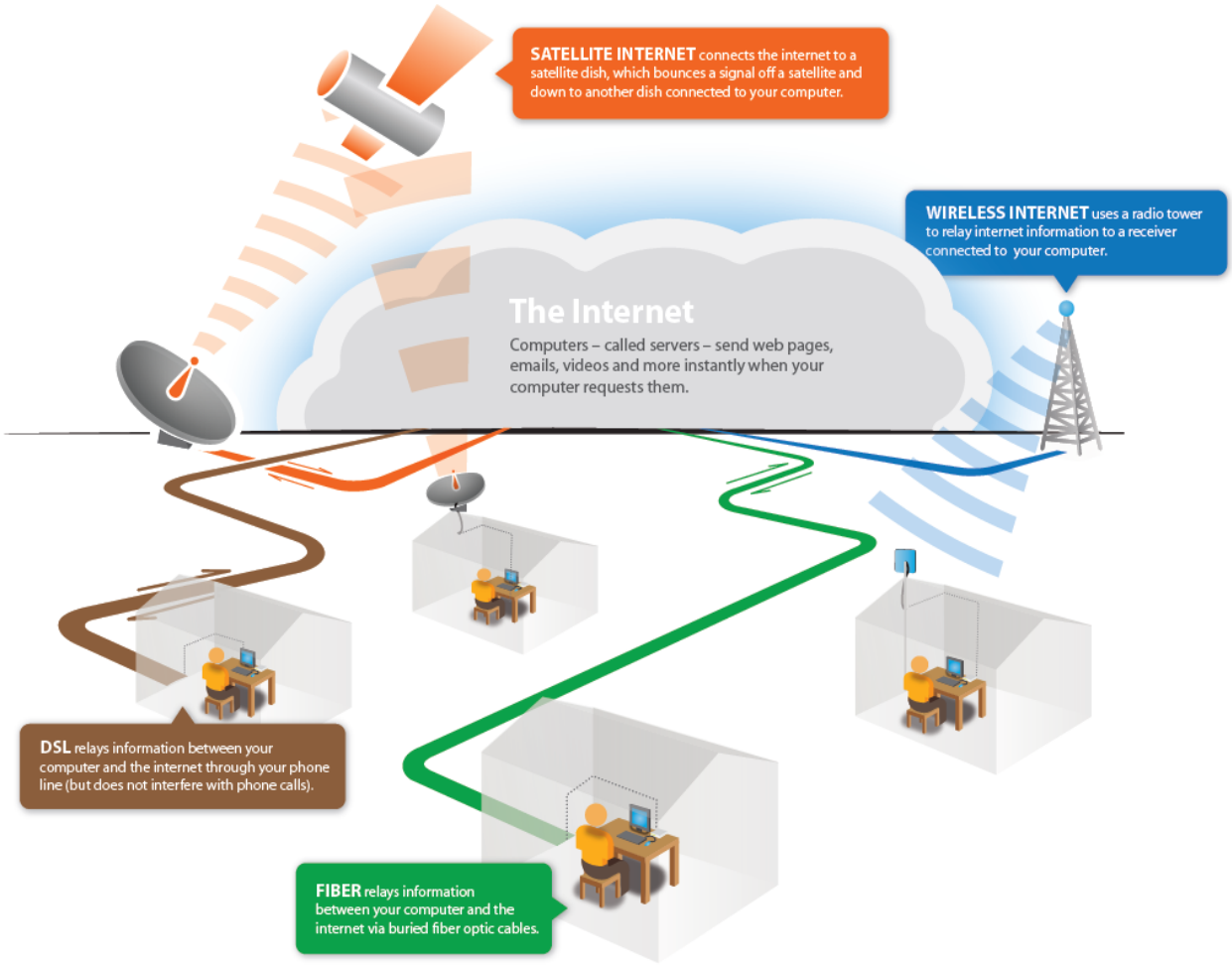
[7] http://bbcmag.com/Primers/BBC_Nov15_Primer.pdf

public and private sector. Some public sectors elected to build, operate and finance their own networks, while others chose to lease services from Internet Service Providers (ISPs). Some were unable to acquire any service because the location or population made it cost-prohibitive to construct and deploy fiber. So the private sector constructed fiber where it made economic sense – primarily in larger urban areas. However, 30 years later, the state still lacks a fiber corridor between our two major urban centers, Reno and Las Vegas, many rural communities still have limited or no broadband service, and there are still large areas in the state with limited or no cellular coverage. In fact, in applications relying on long haul transport, all of our north/south information traffic must be routed through California or Utah.

B. Broadband – What is it?

In telecommunications, broadband is a wide bandwidth (or broad band width) data transmission with an ability to simultaneously transport multiple signals and traffic types (radio, voice, etc.). It represents the amount of data that can be sent through a connection - to access high-speed Internet. The more bandwidth, the more information a user can send or receive at any given time. The medium used to transport these signals can be coaxial cable, optical fiber, radio or twisted pair (copper).

In the context of Internet access broadband is used much more loosely to mean any high-speed Internet access, but it can also involve the transmission of data and voice.

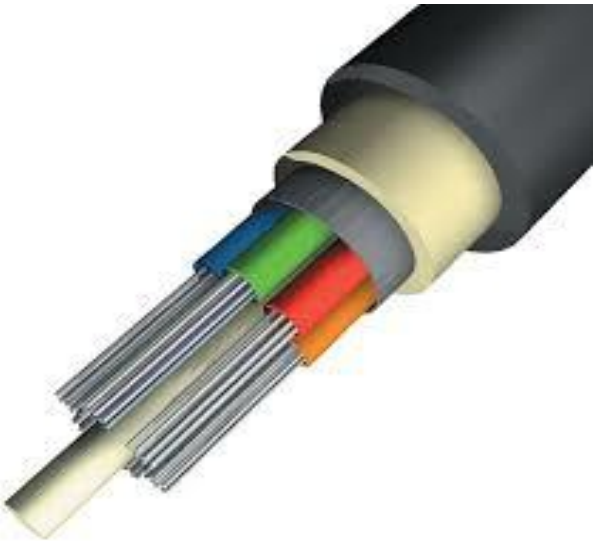


The definition of "high-speed" broadband has evolved throughout the years. At the time of the last Nevada Task Force, broadband was defined as the ability to download 4 Megabits per second (Mbps) and upload at least 1 Mbps. In January, 2015, the Federal Communication Commission (FCC) changed the definition of broadband by raising the minimum download speeds from 4 Mbps to 25 Mbps, and increasing the minimum upload speed from 1 Mbps to 3 Mbps. The FCC recognized that new applications and needs (e.g. video streaming and data storage) placed a greater demand on bandwidth. As a result of this change by the FCC, many of Nevada's rural communities no longer have true "broadband" connectivity.

C. Broadband – How is it Delivered?

Access to broadband is supplied through a number of different sources. It can be split into two types: fixed and mobile. Fixed access usually involves a faster and more reliable method than mobile, and is used for connecting homes and offices. It includes DSL, cable and fiber. Mobile broadband operates on a 3G or 4G network, public or private Wi-Fi, and satellite. Of these different methods, the gold standard at this time is fiber, as it can carry the greatest capacity at the greatest speeds, with the best quality. Unlike copper cables, there is no electromagnetic interference, so signals are sent with greater reliability and better signal quality. They can also carry far more data than copper cables of the same diameter.[8]

1. **Fiber Optics 101:** Fiber optic cable is composed of multiple packs of 12 strands of glass fiber. These 12 strand packets are then bundled together into a cable line, so when talking about fiber, the size of the cable is referenced in multiples of 12 (e.g. 72 or 144 strand cable). Fiber technology has seen major changes throughout the years, particularly in terms of its capacity. Years ago, at least two fibers were needed – one to transmit and one to receive. Advances in electronics now allow for information to be sent and received on the same strand of fiber. It is also now possible to place multiple users into one fiber optic strand using a technology known as wavelength-division multiplexing. The best way to describe this technology is to think of each user having its own assigned color. You can send multiple colors down the same fiber line, and keep the data separate. This means that the bandwidth of one single fiber can be divided into as many as 160 channels. [9] [10]



[8] http://www.explainthatstuff.com/fiberoptics.html
[9] https://en.wikipedia.org/wiki/Fiber-optic_communication
[10] Picture taken from AFL.com; https://www.aflglobal.com/Products/Fiber-Optic-Cable/Loose-Tube.aspx

What is sent through these fiber strands is light. These light signals are capable of traveling along these glass strands with lesser amounts of loss/attenuation. Optical fiber is used by many telecommunications companies because it is capable of transmitting telephone signals, Internet communications, and cable television signals.[11]

Fiber optic cable can either be buried underground, or run along utility poles ("aerial" placement). A power source, and certain electronic components are also necessary to transmit and receive light signals and turn "dark fiber" into "lit fiber." In addition, because signals can lose strength over long distances, amplifiers are needed approximately every 40 miles to improve the signal.

Fiber optic cable operators are divided into "Tiers." A Tier 1 network is a network that can reach every other network on the Internet without purchasing Internet Protocol (IP) transit. One can think of these providers as the "long-haul" providers. There are also regional Tier 1 networks that operate within a specific region. AT&T, Level 3 Communications, Zayo and Verizon are some examples of Tier 1 networks. These networks then provide service or transport to other Internet Service Providers for a fee.

The terms "middle mile" and "last mile" refers to certain components of broadband infrastructure. Middle mile provides broadband service from an Internet Point-of-Presence, or POP, to more centralized facilities (i.e. the central office, the cable head end, the wireless switching station or other centralized facility), which allows a last mile provider to provide Internet access to a home, business or institution. Services that are sold by one service provider to another service provider are considered "wholesale," while services sold directly to end users are "retail." Where ISPs make money is in the markup between the capacity they can acquire (at a wholesale rate), and the re-selling of that at a retail rate.

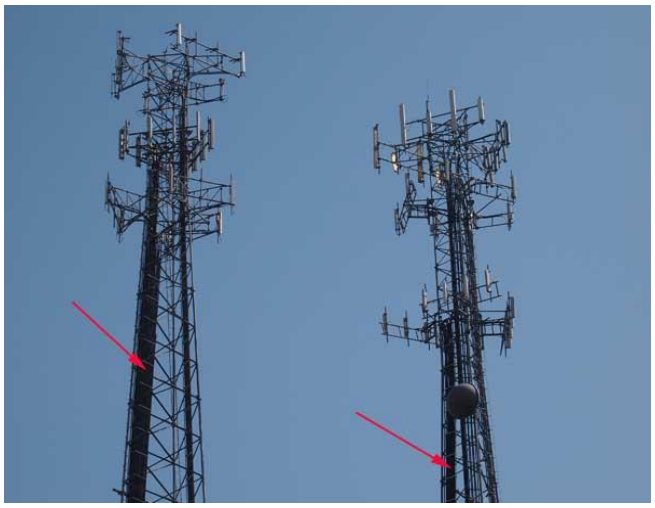
2. **DSL**: This stands for Digital Subscriber Line. It uses existing 2-wire copper telephone line connected to one's home service and is delivered at the same time as landline telephone services. Users can still place calls while accessing the Internet. DSL, which uses the phone systems' twisted pairs of copper wires, is more susceptible to radio-frequency interference.

[11] Fiber Optic Communications, https://en.wikipedia.org/wiki/Fiber-optic_communication

3. **Cable Modem:** Cable Internet connection is a form of broadband access. Through the use of a cable modem, users can access the internet over cable TV lines. This technology relies on copper to transmit and receive the signal. Cable modems can provide much faster access to the Internet than DSL. The technology is changing quickly in this field, leading to significant improvements in the amount of data that can be transmitted over cable. [12]

While cable modems deliver Internet access to residential users by drawing information from the same coaxial cable that delivers information to their TV's, DSL modems use the copper wiring in telephone lines.

Wireless/Cellular: This relies on radio waves to transmit data to a customer's location and the service provider's facility. It requires a direct line of sight between the wireless transmitter and receiver. Transmission of a signal long distances still requires the use of fiber optic assets, as cellular towers are connected to the wireless communication networks by fiber optic cable. Wireless towers have small huts at the base that connect to a "fiber backbone" which connect two towers to the various phone companies. As wireless cellular traffic grows, towers need more antennas. The first picture (below) shows the coaxial cable that carries both signal and power to the antenna. One small fiber cable can replace all of the coax cables. The second picture shows antennas attached to a building. [13]



[12] Picture provided by http://www.simplehelp.net/2006/07/04/cable-modem-troubleshooting-motorola-sb5100/
[13] Fiber Optic Association Guide to Fiber Optics & Premises Cabling, http://www.thefoa.org/tech/ref/appln/wireless.html

In the cellular world, there is 3G, 4G and 5G, which refers to the type of technology. Most cellular phones now use 4G, or fourth generation technology. 4G is synonymous with Long Term Evolution (LTE) technology, which is an evolution of the existing 3G (third generation) wireless standard. In fact, LTE is an advanced form of 3G that marks a shift from hybrid data and voice networks to a data-only IP network.

5G networks are still in development. The wireless industry is broadly targeting the early 2020s for the widespread deployment of 5G networks.[14] This network is anticipated to allow data access speeds of 1 Gig or faster. There are approximately three different versions of 5G being developed, so it is unclear which version will be deployed or how this will look or operate in the future.[15]

4. **Microwave:** This is a communication system that can move large amounts of information at high speeds and can thus provide Internet access. Microwave links carry cellular telephone calls between cell sites. Wireless Internet Service Providers (WISPs) use microwave links to provide their clients with high-speed Internet access without the need for cable connections. Telephone companies transmit calls between switching centers over microwave links, and they are also tied into fiber-optic cables. Another important quality of microwave links is that they require no equipment or facilities between the two terminal points, so installing a microwave link is often faster and less costly than a cable connection. Finally, they can be used almost anywhere, as long as the distance to be spanned is within the operating range of the equipment and there is clear path and line of sight (that is, no solid obstacles) between the locations. Microwaves are also able to penetrate rain, fog, and snow, which means bad weather doesn't disrupt transmission. Because of these attributes, it is sometimes the only solution in certain rural areas.

[14] http://www.androidauthority.com/4g-and-5g-wireless-how-they-are-alike-and-how-they-differ-615709/
[15] https://en.wikipedia.org/wiki/5G

5. **Satellite**: Satellite broadband is another form of wireless broadband and it is often times the only form of Internet access in remote or sparsely populated areas. It is dependent on a line-of-site to the orbiting satellite and weather. Download and upload speeds are much slower than DSL or Cable modem, and the service is usually quite expensive.

D. National Broadband Goals

The National Broadband Plan has identified a number of broadband goals which should help provide guidance when planning Nevada's future needs. These goals include:

Goal No. 1: At least 100 million U.S. homes should have affordable access to actual download speeds of at least 100 Mbps and actual upload speeds of at least 50 Mbps.

Goal No. 2: The United States should lead the world in mobile innovation, with the fastest and most extensive wireless networks of any nation.

Goal No. 3: Every American should have affordable access to robust broadband service, and the means and skills to subscribe if they so choose.

Goal No. 4: Every American community should have affordable access to at least 1 Gbps broadband service to anchor institutions such as schools, hospitals and government buildings.

Goal No. 5: To ensure the safety of the American people, every first responder should have access to a nationwide, wireless, interoperable broadband public safety network.

Goal No. 6: To ensure that America leads in the clean energy economy, every American should be able to use broadband to track and manage their real-time energy consumption.[16]

II. BROADBAND UTILIZATION IN NEVADA

A. Broadband Trends

The following broadband trends reveal how data is being used, as well the demands being placed on broadband systems. These trends reflect increasing demands on capacity, and that consumers

[16] http://www.broadband.gov/plan/executive-summary/

require that data be transferred quickly, safely and reliably. These trends should be factored in to future planning initiatives.

- Big Data: The term "big data" refers to several trends involving data intensive applications. At the heart of it is the capacity to access and analyze massive amounts of information from different sources. It is integral to the successful operation of Machine-to-Machine (M2M) communications and the Internet of Things (IoT).[17]

- Application Hosting and Cloud Computing: With the greater adoption of broadband, the economics and infrastructure of hosting software in a central location and letting users access it remotely (instead of selling it to them on a disk or data storage device) has become more and more common.

- Remote Sensing, Monitoring and Tracking: This refers to devices that are linked to distance diagnostic or data processing centers, such as transponders, close-circuit cameras, telemedicine carts, automated vehicles, and processors that gather, sense and track data. This has applications in operating energy grids, drones, and autonomous vehicles.[18]

- Public Safety: This refers to devices used in furtherance of public safety. This can include computer systems, Land-Mobile Radios that provide both voice and data capability as well as the ability to receive and transmit data from locations, persons or coordinate emergency responses.

- Cellular and Wireless Solutions: This refers to the increase adoption of wireless solutions, and a growing trend to drop home broadband in favor of wireless options because high-speed data is more affordable on wireless phones and home broadband is becoming more expensive. In addition, a recent study found that adoption of traditional high-speed Internet in the U.S. has fallen to 67 percent, the lowest level since 2012.[19] Along with growing trend towards smart phones and other mobile devices, the use of landlines is likewise decreasing.

- Mobile Backhaul: Exploding demand for mobile bandwidth is prompting wireless providers to upgrade the connections from their cell sites to the Internet. More than half of cell sites are now served by fiber and the next generation of wireless architecture will move all baseband processing from cell sites to the cloud. These cell sites will have to be connected via fiber to the hubs where processing takes place.[20]

  Broadband back haul is also essential for use by the following:

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[17] *See* Footnote 5, Infra, or Appendix A for explanation of the Internet-of-Things.
[18] http://maine.gov/connectme/about/docs/taskforce/broadbandfullreport.pdf
[19] www.pewinternet.org and http://www.ecommercetimes.com/story/82926.html
[20] *What Fiber Can do For Your Community*, 10th Ed. Nov. 2014; *See also* www.bbcmag.com/Primers/BBC_Aug13_Primer.pdf

1. Department of Defense
2. Homeland security
3. Local radio networks
4. First responders
5. Monitoring for energy, sewer and water and other utility facilities
6. Data centers/cloud computing
7. Large scale business enterprises

B. Broadband Adoption in Nevada

While Nevada has been ranked as the "8th most connected state in the nation"[21] for broadband adoption, this statement is somewhat misleading in that it focuses on Nevadan's "access" to broadband, rather than the number of Nevada's who are actually connected, or *receive it* (and thus, can afford it). Indeed, the ranking reflects the majority of the population has access, but the reality is the majority of the population also resides in only two of the state's 17 counties. If the question were rephrased, "what percentage of the population in each county receives broadband services," the majority of our *counties* would be considered "underserved" or "unserved".

Data collected in 2015 by the Federal Communications Commission (FCC) and the National Telecommunications and Information Agency (NTIA) reveals: [22]

- 95.2% of Nevadans have access to wired broadband (25 Mbps or faster).
- 98.2% of Nevadans have access to wireline service
- 95.1% of Nevadans have access to cable service or DSL service
- 143,000 are without access to a wired connection capable of 25 Mbps
- 144,000 have only one wired provider leaving them no option to switch, and in some cases leaving them to pay more for access.
- More than half of Americans have only one choice of Internet provider at speeds of 25 Mbps[23]

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[21] http://broadbandnow.com/Nevada, based on data collected via the FCC, NTIA and other sources. This ranking reflects the percentage of Nevada's population *with access* to 25+ Mbps down and 3 Mbps up, wired broadband. It should be noted this ranking reflects access to, not actual use by, Nevada's population. While 25/3 Mbps may be available, it may also be cost prohibitive for many.

[22] *Id.*

[23] https://www.washingtonpost.com/news/the-switch/wp/2015/02/26/the-fcc-rules-against-state-limits-on-city-run-internet/

There have been changes to this data over the last year. The most recent data released by the FCC in 2016 concerning broadband access reveals:

- 8% of the entire population, or 249,722, is without access
- 5% of the urban population, or 151,168, is without access, and
- 65% of the rural population, or 98,554, is without access, as compared to the national average of 39%. [24]

A summary of Nevada's ranking, as compared to the rest of the United States, can be seen here:

	All Areas				Urban Areas			Rural Areas		
	Pop. Without Access	% of Total Pop.	Pop. Density	Per Capita Income ($2014)	Pop. Without Access	% of Urban Pop.	Pop. Density	Pop. Without Access	% of Rural Pop.	Pop. Density
United States	33,981,660	10%	91.57	.	10,551,623	4%	2,437.73	23,430,037	39%	17.478
Nevada	249,722	8%	26.776	.	151,168	5%	3,633.05	98,554	65%	1.39

The following shows access to broadband (25/3 Mbps) on a county-by-county basis.[25]

Carson City	99.9%
Clark	99.2%
Churchill	89.0%
Douglas	96.1%
Elko	68.9%
Esmeralda	2.3%
Eureka	0.0%
Humboldt	0.0%
Lander	0.0%
Lincoln	77.2%
Mineral	0.0%
Nye	3.3%
Pershing	3.5%
Storey	18.8%
Washoe	98.8%
White Pine	43.8%[26]

Nevada cities with the best connectivity and cellular coverage are, as follows:[27]

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[24] Federal Communication Commission, *2016 Broadband Progress Report*, Appendix E – Americans without Access to Fixed Advanced Telecommunications Capability by County, January 26, 2016; *See also* https://www.fcc.gov/reports-research/reports/broadband-progress-reports/2016-broadband-progress-report

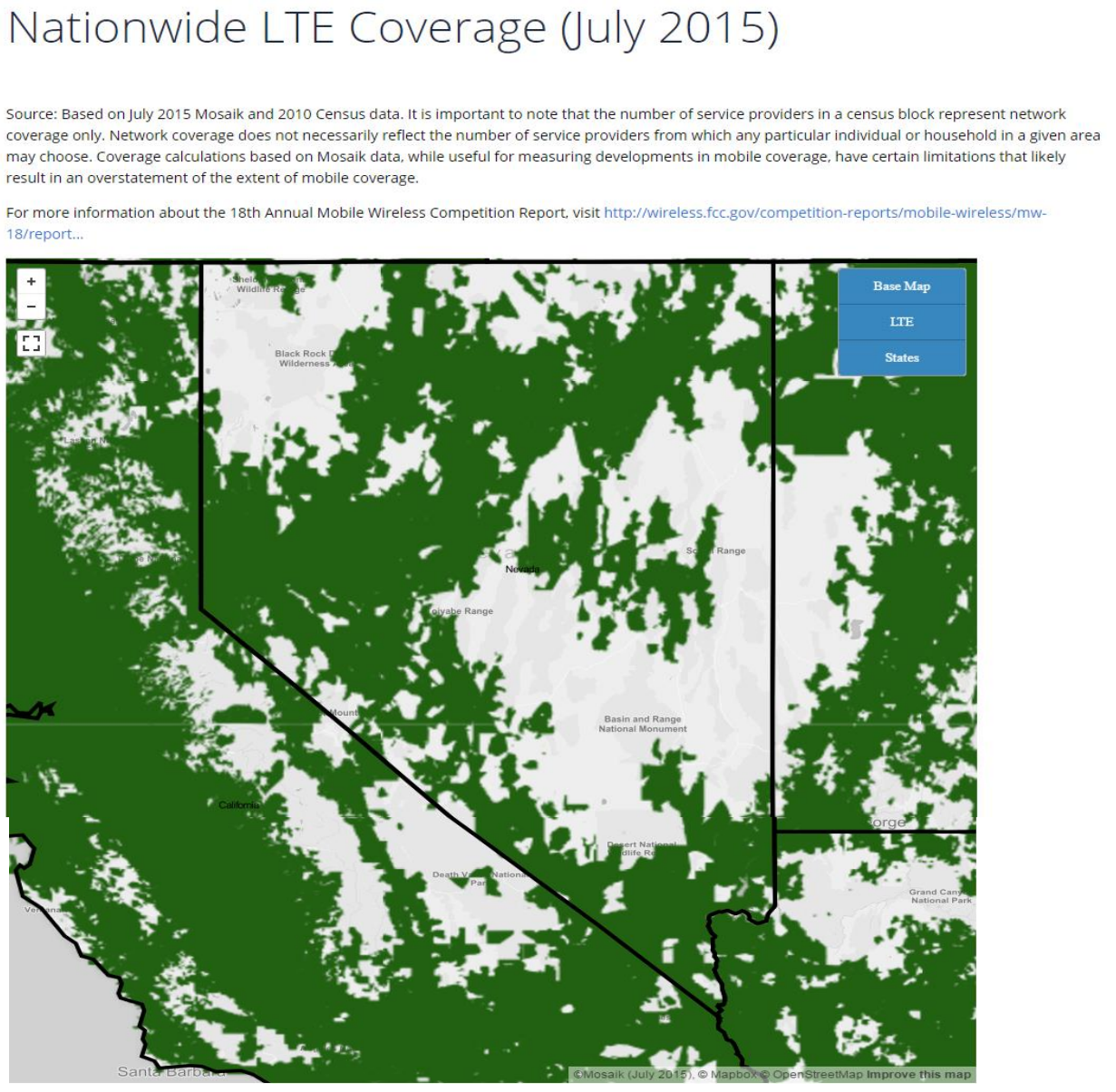
[25] http://broadbandnow.com/Nevada#citylist

[26] Green represents counties with the best connectivity. Red represents counties with the worst connectivity.

[27] Reese, Nick. "Nevada's Broadband: Stats & Figures." *Broadband Now*, 17 Sep. 2015. Web. Accessed 10 Jun. 2016. http://broadbandnow.com/Nevada#citylist

City	Broadband Coverage	# of Providers
Carson City	99.9%	23 providers
Henderson	99.8%	23 providers
Las Vegas	100.0%	46 providers
North Las Vegas	99.7%	21 providers
Reno	100.0%	25 providers
Sparks	100.0%	20 providers

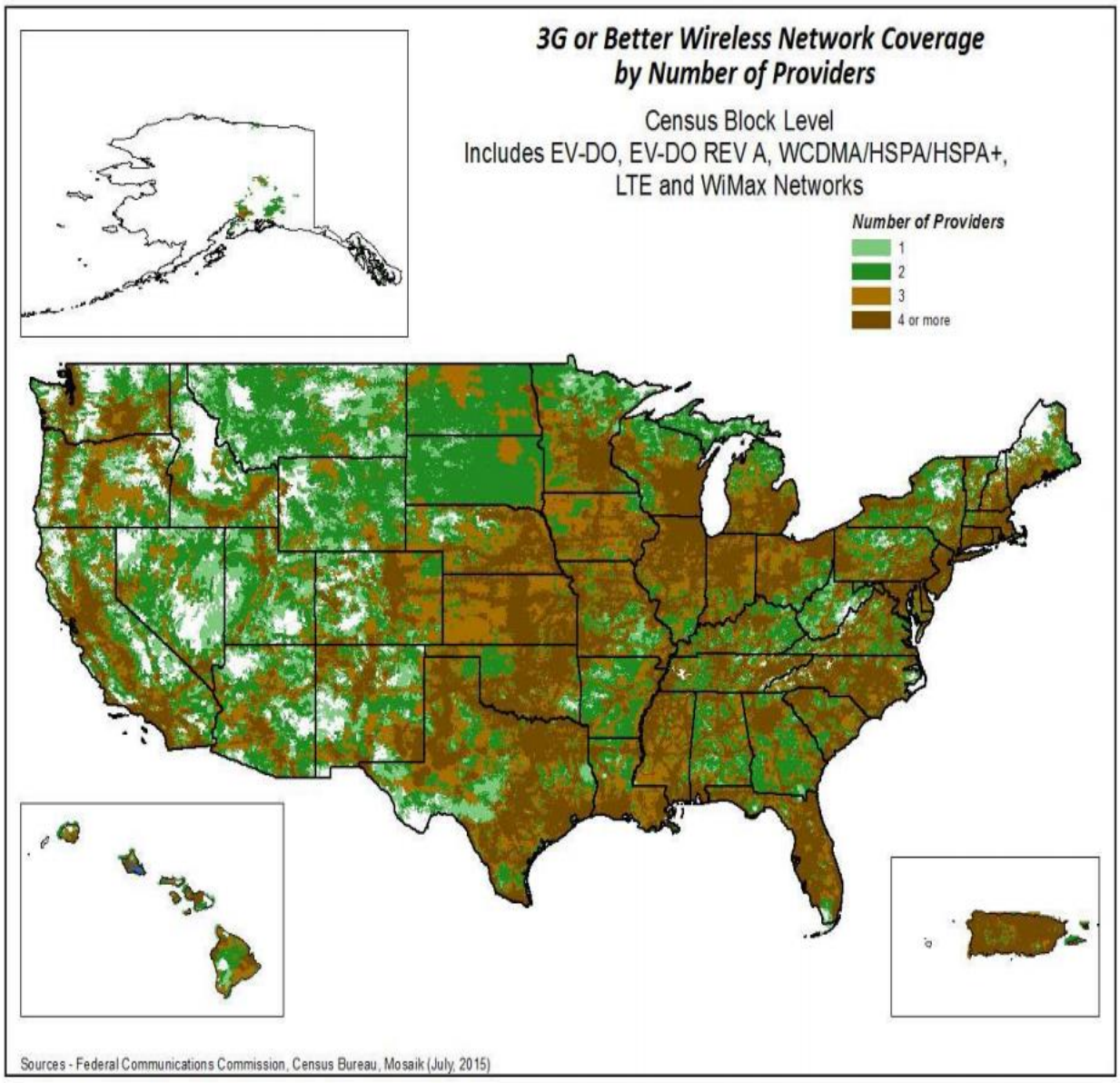
With respect to wireless technology, this map demonstrates there are still large areas of Nevada that lack any LTE coverage in Nevada (July 2015).[28]



[28] https://www.fcc.gov/reports-research/maps/nationwide-lte-coverage-july-2015

The most recent FCC data suggests the majority of the area in Nevada is served by no more than two carriers. Robust competition of wireless providers is occuring primarily in the state's urban centers and surrounding areas.[29]

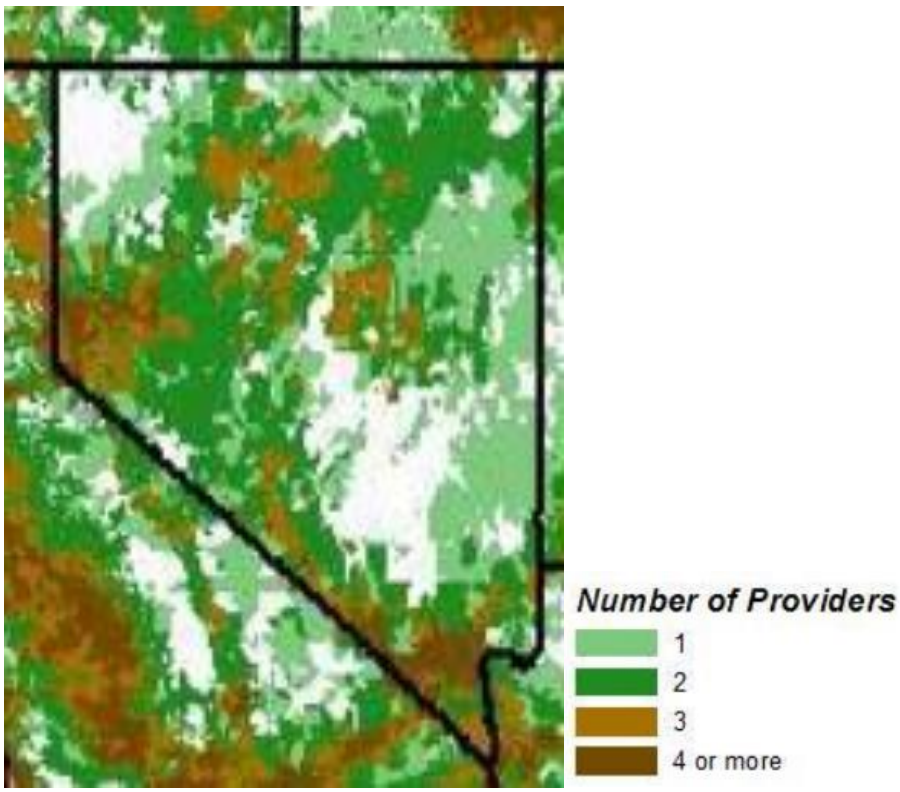
MOBILE WIRELESS 3G OR BETTER COVERAGE BY NUMBER OF PROVIDERS[470]



[29] Federal Communications Commission, *Annual Report an Analysis of Competitive Market Conditions with Respect to Mobile Wireless, Including Commercial Mobile Services,* Adopted December 23, 2015, p. 101; https://apps.fcc.gov/edocs_public/attachmatch/DA-15-1487A1.pdf

The FCC also noted that while this map provides information on mobile cellular coverage, there are limitations to its accuracy and that the number of service providers in a particular census block does not necessarily reflect the number of choices available to a consumer. As such, their findings should not be considered evidence of actual competition:

> *"Note: The percentages of population located in census blocks with a certain number of mobile service providers represent network coverage, which does not necessarily mean that they offer service to residents in the census block. In addition, we emphasize that a service provider reporting mobile wireless coverage in a particular census block may not provide coverage everywhere in the census block. For both these reasons, the number of service providers in a census block does not necessarily reflect the number of choices available to a particular individual or household and does not purport to measure competition. In addition, calculations based on Mosaik data coverage . . . have certain limitations that likely result in an overstatement of the extent of mobile wireless data coverage."*[30]



[30] *Id. See also* Appendix C, *Advertised Speeds of at Least 10 Mbps Downstream, and 1 Mbps Upstream,* Connect Nevada, 2016.

C. Factors Affecting Broadband Growth and Investment in Nevada

1. Cost of Deployment – Geography, Regulations, Permits

High costs of deployment, particularly in rural communities where an Internet Service Provider (ISP) must install long stretches of fiber at considerable cost, only to serve a limited customer base, means that an ISP will not realize a return on their investment within a reasonable timeframe. For other carriers with some type of existing infrastructure in place and delivering service, the incentive to switch to a different technology in order to deliver a larger, faster or different service is often difficult to justify. To expand to a fiber network and build a backbone that can provide service to smaller areas, the cost of building fiber can be upwards of $25,000 per mile. In addition, other components must be constructed to "light" the fiber. Since fiber requires power to transmit the signal, it must be located near a source of power (signals require amplification every 35 to 40 miles). Points of Presence (POPs) must also be constructed.[31] Cost will also vary depending on the type of terrain to be traversed, whether the fiber is run on poles or underground, and if underground, whether trenching occurs in rock or soil, and finally, the time and cost it takes to get permits and complete environmental requirements from the Federal Highway Administration (FHWA), Bureau of Land Management (BLM) or any other federal or state agencies.

2. Statutory Restrictions on Local Solutions – Municipal Networks

Statutory restrictions on local solutions also create a barrier. Due to the high cost of deployment, and inability to get an ISP to serve an area, some local communities have elected to create and run their own municipal networks. Municipal broadband refers to a broadband network that is owned, operate and maintained by a local government or entity. Essentially the local entity or government becomes the Internet Service Provider for the county or community. Throughout the nation, there has been a movement by smaller underserved areas to solve their broadband issues by creating their own network. This effort requires capital and technical expertise to design, fund, manage and operate the network. In very small communities, this can be particularly challenging. In those area where municipal networks have been allowed, there have been a number of successes, as well as a few expensive failures.

Whether local entities should be able to create their own network remains a highly politicized issue, with vigorous debate on both sides.[32] At least 21 states have laws in place that restrict or ban municipal networks, arguing government should not be competing with the private sector, nor should taxpayers assume the risk of loss. The FCC has been reviewing some of

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[31] *Id.*

[32] The primary detractors of municipal networks are the phone companies and TV cable operators, who argue that municipal broadband would lead to the government monitoring of website usage through regulatory policy, limitations on access or that taxpayers will have to pay for, or assume the risk of, failure of a municipal network. The research on this subject is divided. While there are many examples of successful networks in a number of states, there are also those that failed, due to lack of money, expertise, or that simply could not provide the necessary service. One such example was the Utah Telecommunication Open Infrastructure Agency, or UTOPIA. It was eventually purchased by Google for $1. See also, https://en.wikipedia.org/wiki/Municipal_broadband

these laws to determine whether or not states can ban them, or whether the FCC should support local efforts to find local solutions.[33] While Nevada does not prohibit municipal networks, it does restrict them. Nevada has what is known as an "If-Then" law, meaning if the county has a population greater than "X", then there can be no municipal broadband.[34]

Specifically, Nevada Revised Statute (NRS) 268.086[35], and 710.147[36] provide that municipalities with populations greater than 25,000 and counties with more than 50,000 are not allowed to offer telecommunication services directly to the customer. NRS 710.147 provides that a governing body of a county with a population more than 55,000 cannot sell telecommunication service to the public can start a cable utility, unless the governing body can establish, after conducting a cost/benefit study that it is in the best interest of the general public. Other requirements must also be met; however, the rationale behind Nevada's restriction is that a municipal network should not be needed in a community larger than 55,000. Presumably a community that size should be able to attract an ISP.[37]

Churchill County is one of the few counties that has successfully created and operated its own county-owned network. In recent years, Churchill Communications (CC Communications) upgraded the vast majority of the county from copper to fiber, offering a gigabit connection to the Internet, without using any local taxpayer dollars. CC Communications also recently connected the community library to fiber, and it now receives 1 Gbps service. They were able to do this because it was the Incumbent Local Exchange Carrier (ILEC), and was able to use Universal Service funds for a high-cost area to provide this service, as well as use earlier loans based on the revenue generated by the phone company.[38] Elko has explored the creation of a municipal network in order to address their own broadband needs, but whether this will occur remains to be seen.

3. State Laws Limiting Public-Private Partnerships and Fiber Trades

As part of the Federal Highway Administration's (FHWA) efforts to accelerate broadband infrastructure deployment, the agency has encouraged partnerships between state departments of transportation (DOTs), as a way to help draw telecoms to underserve. This is a type of resource sharing that provides for bartering or trading of assets, between a state DOTs and a service provider in exchange for access to, and use of, the right of way (ROW) or existing infrastructure, such as conduit, for the use of fiber optic services. These services often provide state DOTs with connections to Intelligent Transportation System (ITS) infrastructure, such as operations facilities, cameras and message signs along the roadway, and have proved

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[33] Koebler, J., *The 21 Laws States Use to Crush Broadband Competition*, January 14, 2015; The article can be found at http://motherboard.vice.com/read/the-21-laws-states-use-to-crush-broadband-competition
[34] https://roisforyou.wordpress.com/2015/01/08/tearing-down-anti-muni-broadband-barriers-in-2015/
[35] http://www.leg.state.nv.us/NRS/NRS-268.html#NRS268Sec086
[36] http://www.leg.state.nv.us/NRS/NRS-710.html#NRS710Sec147; NRS 711.175 and NRS 711.420 are also affected.
[37] http://broadbandnow.com/report/municipal-broadband-roadblocks/#PopulationCaps
[38] Transcript: Episode 204 of the Community Broadband Bits Podcast, June 1, 2016. The transcript can be found at https://muninetworks.org/content/transcript-community-broadband-bits-episode-204

successful in many areas of the country for both expanding ITS networks, and bringing fiber resources into rural areas to facilitate deployment. States that have not entered into resource sharing agreements have identified barriers in state statutes that do not allow for barter/trade agreements and/or state utility accommodation policies that discourage the longitudinal installation of utilities in controlled-access highway ROW.

The Nevada Department of Transportation (NDOT) has not engaged in public-private partnerships with broadband providers or Internet Service Providers (ISPs) because there are two statutes that impede its ability to enter into partnerships that could allow for fiber trades or bartering. Nevada Revised Statutes 408.5475 and 408.5483 (governing NDOT), and NRS 338.168 (governing public works), set limits on the Department's ability to enter into public private partnerships in that Department is precluded from soliciting or seeking a partnership with any private entity. The statute requires that the private entity initiate a partnership, and provide certain information concerning the proposed project first before NDOT may even consider a partnership. Accordingly, this statute hinders NDOTs ability to enter into any public-private partnership.

4. No Dedicated State Funding or State Match for Federal Grants or Loans

Nevada lacks a policy or mechanism for providing dedicated funding for broadband initiatives. Of the federal funding opportunities that currently exist, virtually all require some type of state match to qualify for the grant or program. In 2008, the State of Nevada was the beneficiary of a number of broadband-related grants and awards through the federal Broadband Technology Opportunity Program (BTOP) and Broadband Initiatives Program (BIP), however these broadband initiatives, and the generous funding for them, have expired. A summary of all BTOP and BIP awards showing broadband projects funded in Nevada is provided in Section VI of this report.

More and more states are making broadband access and expansion a priority.[39] As part of this mission, they are also finding ways to generate funding to help pay for deployment of broadband infrastructure and support other broadband growth initiatives. These funds are necessary not only to provide the state match for federal grants, but also be used to help offset costs of construction or fund state grants to incentivize fixed and wireless broadband solutions to areas in need. Unfortunately, Nevada's economic recovery has been slow, and the state's General Fund has only recently seen growth. Given the many competing demands on the General Fund, it is unlikely that dedicated funding can be secured unless expanding broadband access and deployment becomes a priority. Until then, a comprehensive study of how other jurisdictions have funded broadband initiatives should be conducted and options examined for future consideration.

[39] Notable states include Utah, California, New York, Minnesota and Kentucky.

D. Factors Affecting Broadband Adoption

1. Cost

In a 2013 Residential Technology Assessment conducted by Connect Nevada, the number one factor affecting broadband adoption was cost. This cost includes both the cost of the hardware (computer, laptop, and tablet) as well as the cost of services. The Connect Nevada research also revealed that in 2011, 31percent cited cost as the reason for not subscribing, whereas in 2013, that number dipped slightly to 29 percent.[40] These numbers are in line with a more recent 2015 study conducted by the Pew Research Center, which showed 33 percent of non-broadband users likewise cited to cost as their most important reason for not having a broadband connection.[41]

Competition, or the lack thereof, also influences broadband costs. In areas where there is one provider, there is greater likelihood of poor quality, and performance of service, as well as higher costs. Further, higher costs for services are not uncommon in rural areas, leaving many low income individuals and families simply unable to afford it. In fact, high costs disproportionately affects rural populations, whose populations tend to have a greater percentage of low income individuals and families.[42]

2. Digital Literacy & Relevance

Other obstacles to broadband adoption are digital literacy, and relevance. Digital literacy, at its most fundamental level, concerns user capability. It includes a user's basic literacy – the ability to read and write – as well as the ability to navigate and effectively use a computer. This is particularly applicable to the older populations. Relevance addresses how users in these populations view the Internet, and whether it provide a service, or adds value. In the 2013 Connect Nevada survey, 27 percent of Nevadans cited the perceived lack of relevance as a reason for non-adoption.

An example of how consumer demand can drive build-out is the small town of Baker, Nevada. Baker is a small community that had no mobile service. Through the collective efforts of Connected Nation, the community, and Commnet (a wireless provider), a cell tower was constructed on land made available by a private individual. Prior to the construction of this tower, no one in this community had a cell phone. After construction of the tower, almost everyone in the community purchased a cell phone, providing the residents with a link to the rest of the state and country.

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[40] http://www.connectnv.org/sites/default/files/connected-nation/Nevada/files/nv_2013_residential_survey.pdf

[41] http://www.pewinternet.org/2015/12/21/3-barriers-to-broadband-adoption-cost-is-now-a-substantial-challenge-for-many-non-users/ ; http://pellcenter.org/wp-content/uploads/2015/09/State-Level-Broadband-Policy-FINAL.pdf

[42] http://www.mckinsey.com/industries/high-tech/our-insights/offline-and-falling-behind-barriers-to-internet-adoption

E. Findings & Conclusions

- More than half of the state's counties lack broadband services at current FCC standards and more than half of the state's total area either lacks cellular or only has one provider.

- There is no north-south intrastate fiber connector between Reno and Las Vegas. This will be solved with the construction of the super loop through a partnership with Supernap/Switch. Services for the community institutions identified in the grant will continue to be monitored.

- There is a lack of an intrastate diverse network path, specifically between White Pine and Lincoln County. Connect Nevada and the Governor's Office of Science, Innovation and Technology (OSIT) are identifying possible solutions that could create this loop through a partnership with Network Solutions and Lincoln County Telephone. Such a connection, if it can be established, would provide Ely with direct access to the Las Vegas center.

- Zayo, a Tier 1 network, recently added additional fiber infrastructure along Highway 50; however, this will need to be further monitored as the state seeks to identify last mile partners who can take advantage of this additional middle mile infrastructure. There are many local communities that could potentially benefit from this, but a strong business case will need to be developed.

- The state is geographically challenging. Numerous valleys, high mountain ranges, long fiber runs, and roads with limited right-of-way greatly increase the cost of deployment. In other areas served by microwave or towers, these assets are located on mountain summits, accessible only through difficult terrain or by primitive roads. Servicing these assets can be extraordinarily costly, particularly in the winter, thus making a viable business opportunity for providers difficult. In order to help reduce these costs, the state must look towards federal funds, public-private-partnership, or other means, to help augment and support both middle and last mile deployment.

III. THE NEVADA BROADBAND LANDSCAPE

A. Evolution of the State's Fiber Network

The state currently has a video/data network known as NevadaNet, which uses fiber and is operated by the Nevada System of Higher Education (NSHE), System Computing Services (SCS). The network's first fiber assets were acquired by NDOT in 1999. NDOT received four strands of fiber

from Williams Communication (now known as "Level 3") in exchange for granting Williams the right to place long-haul fiber optic cable in the state's right-of-way (ROW) along Interstate 80 (hereinafter "I-80" fiber). NDOT acquire this fiber asset through a type of contract commonly used with fiber optic lines, known as an IRU, or an Indefeasible Right to Use.[43] An IRU is something more than a lease, in that it confers a property right in the fiber for a specified term.

Three years later, another company, known as Sierra Touch America, LLC, sought to install a long-haul fiber optic cable across Nevada, along Highway 50 (hereinafter, "Highway 50 fiber"). Sierra Touch was a subsidiary of Touch America Holdings, who was constructing and operating a telecommunication system. Sierra Touch America sought access to the state's ROW and, like Level 3, agreed to give the state four strands of dark fiber in exchange for access to the ROW. The parties to the IRU included the Office of the Attorney General, DoIT (now known as Enterprise Information and Technology services, or "EITS"), NDOT and the Board of Regents of the University and Community College System of Nevada (UCCN, now known as NSHE). This fiber was also used for the NevadaNet network, and it enabled NSHE to use fiber to connect to Great Basin College in Ely. Through a series of events, AT&T eventually came to acquire Touch America Holdings' assets.

Since then, NSHE has added to the network through additional IRUs and trade agreements.

B. The State's Fiber Assets – Who Owns, Operates and Controls It.

After acquiring these assets, there was no state policy in place to govern its use. There was also no single agency that could be placed in charge of operating and maintaining this asset because no one agency had the funds, technical skill and resources to support it. However, each agency had something to contribute. Consequently, a collaborative partnership developed between NDOT, NSHE and EITS, with each partner providing support for the network. This partnership continues to this day. The following explains how each agency now uses this fiber asset.

1. Nevada Department of Transportation

The NDOT was responsible for the initial acquisition of state-owned fiber. NDOT is also a partial owner of the Highway 50 fiber. NDOT uses this fiber to operate its intelligent transportation systems (ITS) network. The system gathers real-time data from roadside equipment that includes traffic volumes, closed circuit TV video, and other data sensors. It is used to develop best management and operational practices and policies. The fiber is also utilized in the operation of the NDOT production network, which includes connecting NDOT maintenance facilities and road operation centers or traffic management centers statewide. The

[43] IRUs are usually long-term agreements, between 20 and 30 years in duration. The IRUs set forth who may use the fiber, for what purpose, in addition to any restrictions on its use. In this particular case, the Williams IRU listed exactly who could utilize, or obtain transport, on this fiber. The IRU concerning the fiber along Highway 50 was somewhat more restrictive in nature, with respect to who the state could allow on the network.

state's land mobile radio (LMR) system, known as the Nevada State Radio System (NSRS) utilizes this fiber for backhaul. The NSRS has over 6,000 users and supports the Department of Public Safety, the Department of Emergency Management, the Division of Forestry, multiple county law enforcement agencies throughout the state and similar public safety entities.

2. Enterprise Information Technology System (formerly "DoIT")

Legislative findings state that a "state communications system is vital to the security and welfare of the state during times of emergency and in the conduct of its regular business, and that economies may be realized by joint use of the system by all agencies." (NRS 233F.080),[44] State communication systems also means microwave equipment and "associated facilities" controlled by the Division and leased or used by state agencies, except the state telecommunications system."[45] The Enterprise IT Service provides information technology services and support to agencies located in Nevada. With respect to this asset, EITS has provided both funding and tech support, particularly with respect to the LMR radio system, which relies on this asset for its operability.

3. Nevada System of Higher Education

NSHE is a signatory on the Highway 50 IRU, but not the I-80 fiber IRU. Over the last 15 years, due to the limitations in the funding, personnel, and expertise of the state agencies, NSHE stepped into the role of maintaining and operating the core of the state's network, known as NevadaNet. NSHE has also entered into other trade agreements in the south that have helped expand the reach of the existing state network. In addition to its responsibility to provide Internet service to the Nevada System of Higher Education, NSHE has also stepped in to provide services to certain schools and other state agencies or non-profit organizations.

4. Operation and Maintenance of the NevadaNet State System

The state system is comprised of a high-speed backbone network connecting geographic hub locations throughout the State of Nevada. From these main hub locations, individual "last mile" spur circuits, predominantly supplied by commercial carriers, extend to numerous individual site locations in communities throughout the state. It provides for video

[44] https://www.leg.state.nv.us/nrs/NRS-233F.html#NRS233FSec080

[45] NRS 233F.270 further provides that the telecommunications group (within EITS) shall administer a state telecommunications system, and shall "use the facilities of telephone companies providing local exchange service." This section also refers to "switchboards" to serve the state offices. Many of the statutes in this section have not been updated since 1997 or have not been updated for today's technology, nor do they reflect the realities of current state operations. In addition, EITS was charged with developing the "greatest efficiency in the joint use of existing communication systems" and the coordination of communication activities of state agencies. This task can be challenging given how many state agencies possess their own IT department. Finally, EITS is statutorily charged with managing "any machine or device designed for the automatic handling of information, including … recording, storage, transmission and retrieval (NRS 242.051) as well as managing the state's Information systems, which includes "any communications" or "computer equipment, computer software, procedures, or technology used to collect, process and distribute or store information." It is unclear whether this could include broadband services, given their control of the state communication systems (NRS 233F.060).

conferencing, and wide area intra-networks. NSHE has been able to successfully improve the capacity of this network throughout the years because of investments in the electronics used with the fiber.[46] However, in rural areas where it has been able to provide an Internet solution for certain schools, capacity has been limited because of the proximity of schools to fiber or some other broadband solution. Some of the solutions have involved using old technology (such as T-1 lines) to achieve any connectivity. Therefore, capacity on the NSHE network is a function of available technology and proximity to a fiber or other broadband source.

While a part of this asset technically belongs to the state by virtue of the IRUs entered into with various state agencies, it is controlled and maintained by NSHE, or more particularly the System of Computing Services (SCS) division of the NSHE.[47] The SCS has a staff of more than 50 individuals who operate and maintain this network. NSHE operates the network according to an "Interconnection Policy.[48]" Pursuant to this policy,

> *"[u]se of the NevadaNet network is restricted to NSHE institutions and NSHE affiliates that directly support the research, instructional, telemedicine/rural health, and administrative objectives of NSHE. Other Federal, State, and local governmental agencies may be allowed, on an exception basis, to interconnect with the NevadaNet network if such an interconnection is determined to be in the overall best interest of the State of Nevada. Eligibility will be determined on a case by case basis."*[49]

Since acquiring these fiber assets, what has evolved over the years is a statewide network that involves a partnership between state agencies and NSHE. The network supports not only Nevada's universities[50] and four community colleges,[51] but also a number of K-12 schools (including approximately 30 percent of our rural schools), rural health clinics and state agencies.[52] While there is no directive for NSHE to provide these services, either to schools, non-profit hospitals or other users, NSHE has done so based on its own policy, and has borne the costs for providing these services as well.

This arrangement has created both benefits and burdens for NSHE, schools connected to the network, and the state. The primary benefit is that NSHE has provided a number of rural schools with connection to the Internet – something they either could not afford, or could obtain through another other ISP. So NSHE has provided an important service to these rural schools

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[46] As noted in Section I of this report, the fiber optic cable remains the same. Capacity is a function of the electronics used to operate it.
[47] System Computing Services, Nevada System of Higher Education NevadaNet Interconnection Policy, Policy No. POL-001, Version 1.04, dated 08/01/2014. Document originally created 10/28/2008.
[48] *Id.*
[49] *Id.*, at pp. *2-3*.
[50] University of Nevada, at Reno, and University of Nevada, at Las Vegas.
[51] The state's four community colleges are in Carson City, Elko, Las Vegas and Reno.
[52] https://www.scs.nevada.edu/

in particular. However, this has had other consequences. For example, when a qualifying entity wishes to connect to the NSHE network, they only need to come up with the funds to pay to build out and connect to the network. Once on the network, they do not pay for the service. If NSHE operated like a private ISP, there would be a fee for this service, and a portion of this fee for service could be reimbursed by E-rate. But NSHE does not seek reimbursement for the services for two reasons: a) they cannot get reimbursed for what they do not charge, and b) if NSHE did charge a service fee, it would have to cost-allocate services for each school using the network as required by E-rate, an incredibly daunting task. Another issue is the implications for a community when NSHE provides services to a school or other anchor institution. When NSHE provides services to community anchor institution (CAI), it can have the unintended consequence of divesting the rest of the community of the opportunity to attract a provider who can sell services to the rest of the town. An ISP has little incentive to come into a community when a key customer is already being served by NSHE, thus reducing the pool of available customers for an ISP.[53]

Appendix F of this report provides a *draft* map showing the NSHE NevadaNet connections.

C. Recent Investments in the State Fiber on Highway 50

As noted above, IRUs govern who may use the asset, and how it may be used. At the time the Highway 50 fiber was acquired, NSHE was able to light this fiber to establish a connection to Great Basin College in Ely. It was essentially a point-to-point connection. However, the fiber could not be used by NDOT for ITS system or for the NDOT maintenance yards because it would have required NDOT to construct several Point of Presence (POP) stations along the fiber line and include other electronic upgrades. These POP stations are the "on/off ramps" or "access nodes"[54] to the fiber backbone. Because of the cost of these fiber components, NDOT has not made use of this asset.[55]

In 2014, NDOT allocated funds to improve this fiber asset by constructing four POP stations. This three-year project is scheduled to be operational by 2017. As with any technical project involving sensitive electronic improvements or upgrades, it will take time to test and troubleshoot the system upgrades before it can be used. When this project is completed, it will connect NDOT's

[53] While NSHE will help connect a school and provide Internet services for free, the school has to pay the cost to build out to the NSHE system. The cost to build out can be quite expensive and that is one reason why there aren't more K-12 schools connected to the NSHE system. However, it is important to recognize that NSHE currently connects approximately 30 percent of our rural schools to the Internet.

[54] Access nodes are also known as "Point of Presence" (POP) are the starting point for the optical fiber path to the subscriber. In other words, it is the access point to the Internet. On/Off ramps presents a somewhat better visual for the reader. The main function of the POP is to house all active transmission equipment (servers, routers, switches) from the telecom provider, to manage all fiber terminations and facilitate the interconnection between optical fibers and active equipment. http://fibertothehome.hubersuhner.com/en/Solutions/Outside-plant/Access-node-or-point-of-presence-POP

maintenance yards, expand NDOT's ITS system, and provide essential additional backhaul for Nevada's future P25 LMR system.

D. Issues:

The following highlights certain issues with the state's current fiber network:

- The State network is run by two state agencies and the NSHE, with no clear state vision or directive. NDOT and NSHE own certain fiber assets, in addition to certain towers and microwave equipment that work with the state's fiber assets. However, there is no clear vision for its future use, and operation and maintenance of this asset rests with NSHE.

- Governance: NSHE is constitutionally separate from the executive branch which can affect decisions on how the state can or should use the asset. Limitations or restrictions of this asset are imposed by either by the governing IRUs or NSHE's own policy.

- Cost of connection. Once connected, a state user or school does not pay for connection to the Internet. By providing what is essentially a free service, and using NSHE as the ISP, it can divest a community of the opportunity to attract a private ISP who could provide service not just to the school, but to the entire community.

- Limitations on who may use the network. Current IRUs place limitations on the use of fiber, which may affect the state's ability to use, expand, trade, barter or leverage this asset.

- No E-Rate Reimbursement: While NSHE connects a number of schools to the Internet, it does not seek federal E-rate reimbursement for its services to the schools. NSHE would have to charge a fee for the service, and then undertake cost-allocation required by E-rate.

E. Elements of a Robust Fiber Infrastructure.

Improving our current public and private infrastructure requires understanding what the state has, lacks and needs. Nevada has long haul fiber that runs east and west and has good connectivity in its urban centers. Nevada does not have long haul fiber that runs north and south, connecting Reno to the Las Vegas area. Nevada also has a number of rural communities that are located in close proximity to a fiber line, yet have no access. Nevada also has communities that are far removed from any broadband or fiber assets. Moving into the 21st Century, Nevada will need to develop a robust fiber infrastructure capable of supporting both the public and private demands throughout the entire state, not just our urban centers. Fiber infrastructure may be considered "robust" if it contains the following:

1. Access & Capacity

Does the fiber extend where needed and provide adequate access? In considering the state's future broadband goals, or fiber projects, the ability to improve access and extend fiber's reach into all of the state's 17 counties will be a key measure of success. Access also means little unless there is adequate capacity to meet the needs of the user(s). For instance, some areas have fiber, but the capacity is limited, either by virtue of an IRU, the ISP, or by the wireless provider.

2. Latency

This refers to the speed at which a data packet (information) travels from one point to another network. The lower the latency, the faster it is transmitted and received. Financial institutions, data centers, merchants and buyers, all rely on having their data transferred quickly. While it may not be critical for the needs of rural communities, it is essential for the future economic growth of institutions and businesses. One of the key deficiencies in the state's current fiber infrastructure is the lack of an operational north-south fiber line to connect the state's two main urban centers, Reno and Las Vegas. In order for an e-mail to travel from Reno to Las Vegas, it must be routed either through California or Utah, increasing its travel time and resulting in high latency. This remains a significant issue for large corporations, cloud computing, financial institutions and data centers. In the world of fiber optic communications, time is money and milliseconds matter.

3. Redundancy

Redundancy refers to having multiple ways to divert information traffic on the Internet. It creates a more secure system, and allows for traffic to be re-routed, rather than stopped, when a fiber cable is damaged or put out of service. Ideally, fiber optic cables should be constructed in rings, or "figure 8's" such that when a line is severed or damaged, information can still be rerouted and continue without interruption in service.

The state's long-haul fiber lines primarily east-west along I-80 and Highway 50. Consequently, when there are any issues with these lines, wide areas can be affected. Public safety, merchant and banking activity, are some of the key services impacted by the loss of connectivity. Creating key fiber lines to build redundancy in the existing fiber infrastructure is critical to ensuring broadband services will continue uninterrupted in time of emergency or if damaged.

The following map, demonstrates what a robust fiber infrastructure network would possibly look like for the state. The current and possible future fiber lines shown herein could provide access to many CAIs, improve latency, and create the necessary redundancy.

The red lines in this map represent what the state currently has (and the location of long-haul fiber lines). The thin blue lines represent what has been constructed or is being constructed, by the private sector. The thick blue lines show one suggestion for possible fiber runs to strengthen our current infrastructure. Construction of such lines would cost in the tens of millions of dollars, and it is extremely unlikely that any company would undertake this construction, unless a large portion of it were paid for with federal funds.

IV. BROADBAND ADOPTION AND UTILIZATION IN KEY SECTORS

A. Education

Nevada has over 630 schools, both public and charter. Nevada recently implemented a Nevada Ready 21 Plan, a multi-year plan for implementing one-to-one student computing, beginning with middle schools. The ultimate goal is to inject technology into every students' daily learning experience through the use of a digital device that will be connected to the Internet and able to provide more personalized training and education. The ability to implement this ambitious program rests on the ability to provide adequate connectivity to the state's K-12 schools.

Based on a 2015 survey of available school technology throughout the state, a majority of our rural school districts lack adequate connectivity to implement this program. Areas highlighted in yellow represent speeds to schools less than 50 Mbps.

Carson School District – 13 schools

Speed	No. of Schools
500 Mbps	2
100 Mbps	1
50 Mbps	1
20 Mbps	9

Churchill School District – 16 schools

1 Gig	6

Clark County School District – 360+ schools

At least 1 Gig	330
100-500 Mbps	14
2 – 10 Mbps	3
1 – 1.5 Mbps	3

Douglas County School District – 15 schools

500 Mbps	2
70 Mbps	13

Elko School District – 16 schools

1 Gig	4
100 Mbps	7
20-25 Mbps	5

Esmeralda School District – 3 schools

1.5 Mbps	3

Lincoln County School District – 10 schools

100 Mbps	Shared by 7 schools
50 Mbps	1
10 Mbps	1
6 Mbps	1

Lyon County School District – 21 schools

1 Gig	5
750 Mbps	1
500 Mbps	1
25 Mbps	1
15 Mbps	9

Mineral County School District – 4 schools

1 Gig	3
1.5 Mbps	1

Nye County School District – 14 schools

100 Mbps	1
45 Mbps	5
20 Mbps	2
25 Mbps	1
3 - 4 Mbps	4
1.5 Mbps	1

Pershing County School District – 4 schools

100 Mbps	2
45 Mbps	1
3 Mbps	1

Eureka School District – 4 schools

1 Gig	2
20 Mbps	1
1.5 Mbps	1

Humboldt School District – 12 schools

1 Gig	6
50 Mbps	1
6 Mbps	1
1.5 Mbps	4

Lander School District – 6 schools

5 Gigs	5
1.5 Mbps	1 (Austin)

Storey County School District – 4 schools

70 Mbps	2
6 Mbps	1
4.5 Mbps	1

Washoe County School District – 104 schools

250 Mbps	28
100-500 Mbps	75
1 – 1.5 Mbps	1

White Pine School District – 9 schools

24 Mbps	8
1 – 1.5 Mbps	2

Depending on how the broadband system is set up, this capacity may be shared by others, and the actual speeds will vary. This is a significant issue in some of the smaller communities in the state. Gabbs, Nevada provides an example of the issue. The school in Gabbs serves K-12 and receives its broadband via microwave. They receive about 3 Mbps, and up to 10 Mbps for the students and staff. However, when students head home, they access the Internet, which reduces capacity for all users. Teachers who remain at the school have a difficult time completing their work because the service is so slow they cannot upload or download anything. For some teachers, the only time they can do work is in the late evening. This same scenario was seen in Austin and Eureka, Nevada.

Another challenge is providing Internet access to students after school. In areas with low incomes, families simply cannot afford to pay for broadband. Other states have found creative solutions to address this issue. In some states, schools have purchased WiFi hotspots for the school buses, so students can do their homework on the bus. Other schools have sent a school bus with a hotspot to park in the mobile home park so students could access the Internet. In Seattle, a public library purchased mobile hot spots, and allows kids to check them out, in the same way they would check out a book.[56]

1. Improving Broadband Connectivity in Schools through E-rate

One mechanism for helping states drive broadband expansion, particularly to rural communities, is through the use of federal funds provided through the E-rate Program. The Task Force Subcommittee on Education examined how other states addressed some of their connectivity issues and found that in many states, the ability to leverage these funds

[56] http://www.seattletimes.com/seattle-news/seattle-library-patrons-can-check-out-wi-fi-hotspot-devices/

had a direct impact on extending broadband into communities. Meetings were held with the E-rate advisor for New Jersey and several meetings held with leaders of the Utah Education and Telehealth Network. These two states were more closely examined because each used different vehicles to leverage E-rate funds. Both states created E-rate consortiums to leverage their buying power, but how the consortiums were organized differed. Due to the number of school districts in New Jersey (over 600), they created buying consortiums based on regions. Whereas Utah, with fewer school districts, created one state consortium that was responsible for managing all aspects of the E-rate program.

The FCC's Schools and Libraries program, or "E-rate", was created as a part of the federal Telecommunications Act of 1996. E-rate is the largest federal education-technology funding program. The goal of the E-Rate program is to make telecommunications and information services more affordable for schools and libraries in America, by using federal funds to subsidize broadband for schools and libraries. The amount of broadband cost the federal government will subsidize to a school or library depends on its level of poverty and location. The discount is based upon eligibility of student population for the National School Lunch Program (essentially, poverty rate of school district) and the urban/rural nature of district. The discounts range from 20 to 90 percent. In certain situations, the E-rate program will also provide an additional match to the state match, meaning districts can increase the discount even further depending on the state match.

This funding source was originally capped at $2.3 billion, but it has been increased to $3.9 billion. Pursuing these funds requires an annual application process, where schools advise the FCC/Universal Service Administrative Company (USAC) of their request, and then issue a public RFP for service. Providers respond with a price quote and the school/library submits paperwork requesting the discount to FCC/USAC. If approved, USAC sends the discount/rebate funds to the provider; the provider bills the school/library for the difference. There are two categories of funding: Category One (previously known as "Priority One") refers to funds that pay for connections TO a school (Internet access, broadband, cost of construction to bring fiber to a school, etc.). Category Two (previously known as "Priority Two") refers to funds that pay for networks WITHIN a school (WiFi, Ethernet ports, modems, etc.).

Data collected by Connect Nevada in 2015 shows the amount of E-rate sought by each school district in the state, as well as the download speeds in each district. Pershing County is not listed as it did not file a request in 2015 according to the Universal Service Administrative Company (USAC).

DISTRICT	Total Amount Requested for Internet Service	Median download speed (Mbps)	# of Lines
Carson City School District	$127,901	50	26
Churchill County School District	$40,241	100	11
Clark County School District	$3,733,594	1000	360
Douglas County School District	$152,531	135	15
Elko County School District	$399,300	100	30
Esmeralda Co School District	$107,340	5.75	14
Eureka County School District	$61,680	10.75	2
Humboldt County School District	$186,598	1.5	22
Lander County School District	$2,064	1.5	1
Lincoln County School District	$166,301	175	4
Lyon County School District	$210,000	200	18
Mineral County School District	$32,400	75	2
Nye County School District	$700,509	20	50
Storey County School District	$68,193	90	14
Washoe County School District	$674,240	250	108
White Pine Co School District	$90,640	2000	14

Most districts requested more than one instance of Internet service or method. The average eligible amount per request was $80,086. By school district, the average total eligible amount per request (for all their lines) is approximately $422,096. The total eligible amount to be covered by Nevada schools for Internet connectivity totals about $6.75 million statewide.

By comparison, Utah's total eligible charges in 2015 were $33.86 million statewide, and it received approximately $31 million in E-rate funds. Because the Utah consortium requested funds for a number of school districts, it is difficult to parse out the eligible charges per district, but the average amount per request in Utah was $129,227 (as compared to the $80,000 noted above). What is notable is that Utah is eligible to submit requests for more than five times the amount of money from the E-rate program than Nevada. Additionally, in terms of speed, Nevada school districts that submitted applications for Internet connections did so for services with a median download speed of 100 Mbps. In contrast, the median download speed across all Utah schools was 1 Gbps—10 times faster.

A number of other states have benefitted from coordinating E-rate applications at the state level. Statewide purchasing maximizes buying power, helps drive down costs and can help deliver high-speed fiber services to places that otherwise would not have them. Based on preliminary surveys and information gathered by the Task Force's Subcommittee on

Education and Connected Nation, Nevada faces several issue with respect to how districts pursue E-rate funds:

- Each district applies for E-rate separately: There is little to no collaboration between districts for pricing either services or broadband components. Prices for certain broadband equipment can vary tremendously between areas/districts.

- There is limited data collected or shared between districts or the Department of Education. Little to no data is collected by the Department of Education with respect to the E-rate program or applications. Analysis of E-rate data could provide insight with respect to which districts are having successes or difficulties, and identify where improvements could be made.

- Most districts hire their own E-rate consultant: The E-rate program is complicated so many districts hire E-rate consultants, or share a consultant with another district, to help them navigate the E-rate rules, requirements and process forms. Smaller districts do not have funding to pay for E-rate. These consultants usually run about $5,000 for processing the initial forms, and if applicable, can receive a percentage of the E-rate award for Category One purchases. If the state were to pursue more Category One funding (which could help pay for fiber build-outs), a percentage of that contract would go to the consultant.

- Smaller school districts lack the technical expertise: Finding solutions to broadband connectivity issues requires IT engineers, or someone with adequate technical expertise to evaluate network systems and develop solutions. This IT experience is also necessary to prepare Requests for Proposals (RFPs) from broadband providers. Smaller, rural districts struggle to find personnel with this expertise to perform technical assessments or prepare RFQs.

- Individual purchasing among districts thwarts efforts to leverage economies of scale. As noted earlier, there can be a great discrepancy in pricing for similar equipment. What may cost $300 in Clark County, can cost $1000 in a rural district. Consortia buying would not only secure better pricing for all districts, but it would also enable smaller districts to hold providers to a higher standard of service.

- There is no E-rate reimbursement for schools on NSHE network. While NSHE has connected approximately 30 percent of our rural schools to the Internet, NSHE does not pursue federal reimbursement to pay for services it provides to these schools.[57]

[57] No reimbursement is sought because there is no fee for the service. If there was a fee charged to connect and use the Internet, NSHE would need to do cost-allocation to identify what percentage of the states fiber is being used for qualifying services.

2. The Case for a State Consortium

Utah, with approximately 40 school districts, created the Utah Education Network more than 30 years ago. It is now known as the Utah Education and Telehealth Network (UETN).[58] This network has been designated the primary provider of Internet access and Wide Area Networks (WANs) for public education within Utah. The UETN is the single largest applicant for E-rate funds in the state and it serves as the E-rate consortium lead in applying for and implementing broadband projects using E-rate funds. In addition to managing the E-rate consortium, the UETN also submits E-rate applications on behalf of all schools, performs technical assessments for individual schools and manages all aspects of the E-rate process on behalf of the schools, including negotiations with a third party Internet Service Providers (ISP) who provide services to the school.

By creating a consortium, UETN was able to leverage the economies of scale, establish service commitments, and negotiate multiple contracts that enabled the consortium to secure the best pricing for services, circuits and other broadband infrastructure across the state. By averaging the poverty levels of all of the districts, the consortium, as a whole, qualified for a 70 percent reimbursement.[59] This meant that E-rate paid for 70 percent of the costs of broadband TO the schools, as well as the services WITHIN the school. Using E-rate dollars, and providing the necessary state match, UETN was able to fund a number of fiber construction projects that brought fiber to their schools, as well as pay for Wide Area Networks and other in-school broadband services. As part of the projects involving construction of fiber to schools, UETN also recognized the importance of incentivizing ISPs. They did this by entering into longer service contracts (i.e. 5 years) to enable the ISP to be assured of a return on their investment. According to the UETN, an ISP does not begin to see a return on investment until the fourth year. More importantly, by bringing a private ISP into a small rural community, the ISP was able to also provide services to other anchor institutions and residents in the community.

This model presents several benefits. It creates a centralized method for pursuing E-rate funding. It establishes an office with E-rate dedicated personnel to manage all aspects of the E-rate process, thereby relieving schools of the responsibility to manage E-rate, and hire additional personnel to oversee the E-rate process. It eliminates the need for each district to retain their own E-rate consultant. More importantly, under this model, E-rate funds are leveraged to help pay the costs to construct new fiber lines to schools, and bring an ISP into a community. The end result of Utah's centralized, state-consortium model is that in the last 20 years, Utah has managed to connect every high school, middle school and elementary school in the state with at least 1 Gig of service.

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[58] The original E-rate consortium was managed by the Utah Education Network (UEN). Utah also had a separate Utah Telehealth Network that was also charged with connecting the state's rural hospitals and clinics. In 2014, the Utah legislature merged these two entities into the Utah Education and Telehealth Network (UETN).

[59] The reimbursement at 70% is for service costs (subsidies to providers).

The FCC has also recognized the benefits of consortiums, and expressed their support of consortium purchasing, whether they are state consortiums like Utah, or regional consortiums, like New Jersey. The FCC in its Report and Order and Further Notice of Proposed Rulemaking, encouraged states to utilize a consortia as a way of increasing pricing transparency, simplifying the application process, and encouraging greater participation.

> "*168. Consortium purchasing can drive down the prices paid by schools and libraries for E-rate supported services. In this section, we reduce or eliminate some of the existing barriers to applicants' participation in consortia. As an initial matter, we direct Commission staff to work with USAC to prioritize review of consortia applications. We also adopt rules to make it easier for applicants to take advantage of consortium bidding and clarify some apparent misconceptions about consortia participation. . . . . we propose to amend the way consortia determine the amount of support to be received by their members to ensure that E-rate applicants that choose to join a consortium do not risk receiving less support, and seek comment on other ways to encourage consortium purchasing.*[60]

3. Challenges Creating a State Consortium

While the Utah model has definite benefits, certain characteristics simply cannot be adopted in Nevada. First, is the size of the UETN. The UETN is a formidable organization with over 115 employees. Second is the governance structure. The UETN, like NSHE, operates under the Utah System of Higher Education; however, the Utah System of Higher Education is governed by a board of regents who are appointed by the governor. By contrast, NSHE is a constitutionally separate entity from the executive branch, governed by an elected Board of Regents.[61] The UETN receives policy and direction from the Executive Branch, thus making it easier to create and implement state policies that can serve K-12 education, libraries and now, hospitals. While NSHE has provided much-needed support to a number of schools and health care institutions, there is no directive that it do so. A change in the Board of Regents or the chancellor could result in a different directive. Finally, the UETN was able to connect every school in the state because it had a vision to create a fiber network that would benefit all schools in the state. This vision was shared by the legislature, who then made it possible by supporting the UETN, and providing funding for the state match necessary for E-rate.

Other hurdles include whether school districts will be willing to join a consortium and turn over the responsibility for managing E-rate to another party. Currently, each school district

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[60] Federal Communication Commission, FCC 14-199, *Report and Order and Further Notice of Proposed Rulemaking*, Adopted July 11, 2014. This may be viewed at, https://transition.fcc.gov/Daily_Releases/Daily_Business/2014/db0723/FCC-14-99A1.pdf

[61] Nevada Constitution, Article 11, Sec. 4; https://www.leg.state.nv.us/const/nvconst.html#Art11

uses their own resources to pursue E-rate and pay for consultants. How these funds would be used, re-allocated or re-purposed would need to be examined in greater detail. In states with a robust E-rate program, funding has been appropriated for school connectivity. Finally, there is the issue of governance – who and how many will be needed to manage the consortium. Connected Nation is currently examining these very issues and will be presenting its finding in a subsequent report. Connected Nation will be examining possible governance structures, funding options, and how to ensure a consortium can secure state and federal funding necessary to expand broadband connectivity to our schools.

After reviewing other jurisdictions, one finding is undeniable. Based on our current way of doing things, the state is leaving E-rate dollars on the table and is not leveraging economies of scale when procuring broadband services, equipment and infrastructure to help bring improved connectivity to our schools.

B. Rural Health Care and Telemedicine

Prior to the passage of Assembly Bill 292,[62] also known as the Nevada Telemedicine Act, the main barriers to the successful implementation of telemedicine in Nevada was poor broadband connectivity to rural health care sites and the lack of regulatory clarity with respect to reimbursement rates. In 2009, the Nevada Hospital Association (NHA) applied for and received a $19 million federal grant to construct a fiber network that would connect certain rural hospitals and clinics in the state and create an important north-south fiber line, linking Reno with Las Vegas.[63] Assembly Bill 282 addressed reimbursement rates for telehealth under private insurance and Medicaid, as well as workers compensation (the first state to include this) to the same extent at the same price as provided in person.

Inadequate broadband connectivity, and the cost for those services, continues to be a barrier to the adoption of telemedicine in the state's rural hospitals and clinics. Other barriers include the high costs of telemedicine equipment, insufficient reimbursement rates for originating sites in rural communities,[64] ensuring proper training in the use of telemedicine equipment, and overcoming the preference for the in-person visit.

1. Broadband Capacity in Rural Hospitals

The following information provides a summary of the broadband speeds available in state's rural hospitals:

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[62] https://www.leg.state.nv.us/Session/78th2015/Bills/AB/AB292.pdf

[63] This project was originally managed by E-care. Eventually, Nevada Broadband Network (NBN) took over construction. NBN was unable to complete the fiber construction within the time frame set by the federal government. Switch/Supernap took over the responsibility for completing the line. Details of how that asset will be utilized and operated are still being worked out, but the fiber asset will still need to serve the entities identified in the grant.

[64] For the rural hospitals and clinics who act as the originating site (where patients go for their visit), their rates of reimbursement for providing this service do not cover their actual overhead/operational costs.

Pershing General Hospital	100 Mbps
Humboldt General Hospital	100 Mbps
Battle Mountain General Hospital	40 Mbps
Ely (William Bee Ririe Hospital)	100 Mbps
Fallon (Banner)	100 Mbps
Yerington	10 Mbps[65]
Hawthorne (Mt. Grant Hospital)	100 Mbps
Caliente (Grover C. Dils)	50 Mbps
Boulder City	100 Mbps
Desert View (Pahrump)	45 Mbps[66]
Incline Village	Fiber connected to Tahoe Forest
Tonopah	Planned future fiber via Highway 95 fiber
Mesa View	100 Mbps to corporate

Quality bandwidth is essential to make telemedicine work. This issue affects many states, not just Nevada. From Alaska to Maine, a number of states have difficulty expanding telemedicine services because they lack adequate broadband. Telemedicine services in particular involve data intensive applications that place large demands on bandwidth. For instance, a CAT scan file can require 50 Mb to 100 Mb. A mammogram, 25 Mb – 30Mb. Even the transfer of health records can be data intensive. When a network only has a 5 Mbps upload/1 Mbps download speeds, the ability to transfer files or operate video equipment can be severely hampered. In some settings, all other users must sign off the network in order to send/receive records.

Quality bandwidth is also essential to patient adoption.[67] The technology needed to replace that in-person visit needs to be high quality video and audio so the patients are comfortable talking to a 2-D face on a screen. If there is a lag in the video or garbled audio, the patient and provider will both be dissatisfied and the use of Telehealth will not improve. As the adoption of telemedicine is projected to only increase, now is the time to put the necessary infrastructure in place to meet the anticipated future demand.[68]

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[65] Plans are in the works to upgrade to 100 Mbps.
[66] Plans to upgrade to 100 Mbps by July 2016.
[67] http://www.amdtelemedicine.com/telemedicineresources/documents/QuestionSummary_TelemedicineProgramFunding.pdf
[68] Telemedicine must overcome technology barriers, institutional barriers and adoption issues. Millennials will ultimately change the paradigm in the future using smartphones versus the provider office. As they age, they will push providers to be available through smartphone or laptop applications for routine type visits. This still requires the proper infrastructure in place for the provider and this is why providing quality broadband to our HCP is essential for the development and adoption of telemedicine in the state.

2. Funding Opportunities for Telemedicine

Telemedicine is one area where there are still ample federal funding opportunities. The two main sources of federal funding that supports telemedicine are the Universal Services Administration Company (USAC) Telecommunications Program, Healthcare Connect Fund (HCF), and Pilot Program. Other opportunities exist through the United States Department of Agriculture, Rural Development Programs.

Created by the FCC in 2012, HCF provides support for broadband connectivity to eligible health care providers (HCPs) and encourages the formation of state and regional broadband networks. Individuals HCPs and consortium applicants can receive a 65 percent discount on all eligible broadband services and equipment. While the application process can be onerous and complex, Nevada Rural Hospital Partners (NRHP) manages the USAC filings for their membership with an annual savings of over $350,000, and will continue to pursue these funds each year to help pay for telecommunications and broadband technology for the rural hospitals.[69]

The USDA also provides an annual Distance Learning and Telemedicine **(**DLT**)** grants designed specifically to meet the educational and telemedicine and health care needs of rural America. Through loans, grants and loan/grant combinations, the USDA/DLT grants support advanced telecommunications technologies and health care opportunities that target rural and tribal communities. This is a highly competitive grant offers awards up to $500,000.[70] Virtually any entity, for profit, non-profit, governmental or tribal, can apply for this grant. However, it requires a minimum state match of 15 percent, with additional points based on the size of the match.

Finding the state matching funds to competitively pursue federal grants that can help pay for equipment and network connectivity necessary to effectively use telemedicine is another hurdle. As mentioned above, rural hospitals and clinics operate on narrow margins due to the costs of services, and limitations on their rates of reimbursement. In fact, the Nevada Rural Hospital Partners has been unable to pursue a number of grants simply because they could not find the match, leaving federal dollars on the table. Even if the state could appropriate $100,000 each year, it would still enable our non-profit rural health care providers to pursue more than $300,000 in federal funds each year to improve broadband connectivity, or purchase telemedicine equipment.

In addition to funding opportunities presented by the USDA, Rural Utility Services, other funding opportunities are available through the U.S. Department of Commerce and the U.S. Department of Housing and Urban Development. These agencies each have different

[69] As reported by Nevada Rural Hospital Partners.
[70] http://www.rd.usda.gov/programs-services/distance-learning-telemedicine-grants

programs that can fund project that support broadband infrastructure, adoption, access, planning or research.[71] Some of these programs include:

	Infrastructure Deployment	Adoption and Digital Literacy	Public Computer Access	Planning	Research	Other
Appalachian Regional Commission						
Telecommunications and Technology Program	X	X	X	X		
Federal Communications Commission						
Connect America Fund (High Cost Program)	X					
E-Rate (Schools and Libraries) Program	X					
Rural Health Care Program	X					
U.S. Department of Agriculture, Rural Utilities Service						
Telecommunications Infrastructure Loan Program	X					
Farm Bill Broadband Loan Program	X					
Substantially Underserved Trust Areas (SUTA) Provisions	X					
Community Connect Grant Program	X					
Distance Learning and Telemedicine Grant Program						X*
U.S. Department of Commerce, Economic Development Administration						
Public Works	X					
Economic Adjustment Assistance	X			X		
Partnership Planning				X		
Local Technical Assistance				X		
U.S. Department of Housing and Urban Development						
Community Development Block Grants (including Section 108 Loan Guarantee Program)	X	X	X	X**		
Public Housing Capital Fund			X			
Public Housing Operating Fund		X	X			
Multifamily Housing		X	X			
Indian Community Development Block Grants	X					
Indian Housing Block Grants	X					

[72]

This year, OSIT worked with a number of stakeholders to pursue a USDA-RUS grant for telemedicine equipment. After several meetings with stakeholders, Renown agreed to be the applicant and provide the matching funds. Renown developed an ambitious application,

[71] United States Department of Commerce, National Telecommunications & Information Association, BroadbandUSA: Guide to Federal Funding of Broadband Projects, September 2015, p. 2; *See* http://www2.ntia.doc.gov/files/broadband_fed_funding_guide.pdf

[72] United States Department of Commerce, National Telecommunications & Information Association, *BroadbandUSA: Guide to Federal Funding of Broadband Projects*, September 2015, p. 2; *See also* *http://www2.ntia.doc.gov/files/broadband_fed_funding_guide.pdf.* A thorough and complete guide to federal funding opportunities can also be gleaned from *A Guide to Broadband Funding Opportunities; How to Navigate the Funding Process*, by U.S. Senator Kirsten, E. Gillibrand, New York. See http://www.gillibrand.senate.gov/imo/media/doc/Gillibrand%20Broadband%20Funding%20Guidebook%202015.pdf

seeking the full grant sum of $500,000. The grant involved network upgrades, video equipment and telemedicine carts, which can cost from $20,000 to $50,000, for certain rural hospitals, clinics, and three of Nevada's correctional facilities. The USDA has not yet announced the 2016 grant recipients.

This experience demonstrated that planning, communication and collaboration are crucial to securing the resources needed to submit a quality grant. As with E-rate, federal funds cannot be pursued without a state match. Since Nevada's non-profit hospitals and clinics operate on tight margins, there is little opportunity for them to pursue federal funds without assistance from the state. In fact, several grants were sought by the state's non-profit hospitals and clinics, but were ultimately abandoned for lack of a state match. Through planning with its rural health care partners, tribal partners and correctional facilities, the state has the ability to maximize federal dollars to expand the reach of telemedicine services to a variety of users (tribes, correctional facilities, etc.), and incorporate a variety of telemedicine services (behavioral counseling, psychological services, distance learning/training for medical providers, etc.) thereby leveraging limited state funding.

The successful implementation of telemedicine in the future will hinge on the industry's ability to improve the individual patient experience, expanded training for health care providers in the use of telemedicine equipment, and the improved broadband connectivity that supports this technology and improves the quality and delivery of services.

C. Nevada's Rural Communities

The Governor's Office of Science, Innovation and Technology, in an effort to better understand the challenges facing Nevada's rural communities, scheduled a number of meeting with rural leaders throughout Nevada. Meetings were scheduled in the following towns:

- Gabbs
- Baker
- Austin
- Ely
- Elko
- Eureka
- Winnemucca
- Pahrump
- Pioche
- Tonopah
- Mt. Charleston
- Caliente

Meetings held in these rural communities highlighted several broadband and connectivity issues:

- Lack of Alternative Broadband Infrastructure. Certain areas are served by a single fixed wireless provider or microwave. Weather can affect cellular service, or disable towers or microwave equipment, resulting in a complete loss of services. Loss of service can range from hours to several days, halting financial transactions, and hampering public safety operations.

- Difficulties with 911 Operations: For those areas that lack back-up communications, key public safety services are placed at risk, including 911, police and fire. Certain counties have a 911 system that operates vis-à-vis cellular or microwave technology, such that they can take 911 calls from cellular phones and landlines. Other counties' 911 systems only operate on landlines. These smaller rural counties struggle to secure operational funds and technical personnel needed to manage and operate the system.

- Lack of Cellular Service throughout Central and Eastern Nevada. Cellular service is inconsistent in central and eastern Nevada in part due to geography and demand. There are large expanses with no cellular service, or service for one type of cellular service in one valley, and a different service in the next valley. This occurs because there are two main cellular technologies used in the industry, and not every valley is served by both. As a result, certain areas in central and eastern Nevada may only be served by one type of wireless technology, but not both technologies.

- Difficulties Obtaining Adequate Capacity from Local Providers. Ely has experienced on-going issues trying to obtaining the capacity they need from an ISP. In addition, other broadband service is provided using towers or microwave assets located on mountain tops. When these assets are compromised by weather or other events, the town may lose services. There are currently talks in progress with alternate providers to find a solution that will bring more robust broadband to the area.

- Esmeralda, Nye and Mineral County Lack Broadband: These three counties continue to face significant challenges with school connectivity, government services and emergency services. Tonopah, because of their geography has no direct fiber middle mile infrastructure coming into the town. They are reliant on antiquated technology and or microwave hops which have proven both insufficient and unreliable, as their 911 system has been compromised several times. At such time as the Highway 95 fiber network is lit and operation, some of these issues may be improved or resolved.

V. THE REGULATORY LANDSCAPE

A. Federal

The Telecommunications Act of 1996 was the first significant overhaul of United States telecommunications law in more than sixty years, amending the Communications Act of 1934. The Act, signed by President Bill Clinton, represented a major change in American telecommunication law, since it was the first time the Internet was included in broadcasting and spectrum allotment. One of the most controversial titles was Title 3 ("Cable Services"), which allowed for media cross-ownership. According to the FCC, the goal of the law was to "let anyone enter any communications business—to let any communications business compete in any market against any other." The legislation's primary goal was deregulation of the converging broadcasting and telecommunications markets. However, the law's regulatory policies have been questioned, including the effects of dualistic re-regulation of the communications market.[73]

While telephone services (telephony) and plain old telephone services (POTS) have been regulated by the federal government, the Internet has not. Internet access is categorized under U.S. law as an information service, and not a telecommunications service, and thus has not been subject to common carrier regulations.[74] There was agreement that government should not regulate information and this was the case when the Internet first gained popularity. It was believed that ISPs should likewise not be regulated, or considered a utility, for two primary reasons. First, there was a distinction made between telephony and Internet/data services, and second, there were so many ISPs, particularly in early 2000s, it was believed ISPs would not need regulation because competition would create a self-regulated market, such that if an ISP provided poor service, a consumer could find and other provider.

In the last 15 to 20 years, the Internet and cellular technology has changed dramatically. These cellular communication devices no longer simply transmit voice communications. Voice communications can now be sent through the Internet. The multiple applications offered on the new "smart phones" has turned this communication device into a camera, radio, recording device and miniature laptop computer. In fact, "smart phones" are increasingly being used instead of traditional phone service, particularly in the urban areas where there is quality service. As a result of technological changes (e.g. using the Internet for data and VoIP[75]) and other issues regarding

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[73] Wikipedia, https://en.wikipedia.org/wiki/Telecommunications_Act_of_1996

[74] Wikipedia, https://en.wikipedia.org/wiki/Internet_in_the_United_States

[75] VoIP stands for Voice over Internet Protocol. It is a technology that allows you to make voice calls using a broadband Internet connection instead of a regular (or analog) phone line. Some VoIP services may only allow you to call other people using the same service, but others may allow you to call anyone who has a telephone number - including local, long distance, mobile, and international numbers. Also, while some VoIP services only work over your computer or a special VoIP phone, other services allow you to use a traditional phone connected to a VoIP adapter (definition provided by FCC). https://www.fcc.gov/general/voice-over-internet-protocol-voip

certain activities of some ISPs, the FCC sought to make changes to address these issues. Under the Obama Administration, and the leadership of the FCC chairman, Tom Wheeler, the FCC has taken a more proactive stance in addressing ISPs activities, the Internet, and how this technology should and should not be used.

In early 2015, the FCC instituted a series of sweeping changes, and voted to institute certain Internet rules, thus imposing their authority over what was a previously unregulated environment. The landmark vote was the latest chapter in a decades-long debate over how or whether the federal government should regulate the Internet.[76] The primary focus of the FCC changes was to maintain "net neutrality," which is the idea that all traffic on the Internet should be treated equally. Even though most people agree with the basic premise of net neutrality, the FCC's rules were controversial, primarily because the FCC had now reclassified broadband as a so-called Title II telecommunications service under the 1934 Communications Act. That reclassification placed broadband providers under the same regulations that now govern telephone networks in some respects.

An explanation of these new rules helps shed light on some of these changes. The FCC's Net neutrality order boiled down to three key rules:

1. **No Blocking.** A broadband provider can no longer block lawful content, applications, services or non-harmful devices.

2. **No Throttling.** The FCC created a separate rule that prohibits broadband providers from slowing down specific applications or services, a practice known as throttling. More to the point, the FCC said providers can not single out Internet traffic based on who sends it (e.g. Netflix), where it's going, what the content happens to be or whether that content competes with the provider's business.

3. **No Paid Prioritization.** A broadband provider cannot accept fees for favored treatment. For example, a provider cannot slow down the speed/service of other users in order to accommodate someone who pays more for their services. In short, the rules prohibit Internet "fast lanes." The FCC is asking for providers to explain a rational basis for managing traffic, rather than business reasons. This means a broadband provider can block spam from your email inbox, block traffic from a denial of service attack and slow down or redirect traffic to ensure the network runs smoothly during times of congestion, so long as the provider isn't targeting any particular application or traffic source. It can't block or slow down access to video streaming services like Netflix or Hulu just because it thinks those services use too much bandwidth.[77]

[76] https://www.cnet.com/news/13-things-you-need-to-know-about-the-fccs-net-neutrality-regulation/
[77] *Id.*

These rules applied to wireless broadband as well as fixed services, meaning cell carriers like Verizon, Sprint and T-Mobile would also be bound by the same requirements. Until now, wireless broadband providers operated under less strict rules. These new changes even gave the FCC the authority to investigate certain disputes.[78] These new rules did not regulate any content or application on the Internet, or dictate how the Internet operates or where traffic is routed. As expected, these rules were immediately challenged in court.

On June 14, 2016, the United States Court of Appeals for the District of Columbia Circuit ruled in favor the FCC. In a 2-to-1 decision, the court upheld the doctrine of net neutrality and the FCC on the declaration of broadband as a utility, which was the most significant aspect of the rules. That has broad-reaching implications for web and telecommunications companies that have challenged the need for regulation to ensure web users get full and equal access to all content online. Two judges who ruled in favor of the FCC emphasized the changing landscape of communications, and the importance of the Internet as an essential communications and information platform for consumers.[79]

> "*Over the past two decades, this content has transformed nearly every aspect of our lives, from profound actions like choosing a leader, building a career, and falling in love to more quotidian ones like hailing a cab and watching a movie*,"[80]

Just how much regulation will occur in the future remains to be seen. Broadband providers say application of Title II will allow the FCC to impose higher rates and will discourage them from building or upgrading their networks. On the flip side, it is argued that Title II will help the FCC fight any legal challenges that broadband providers present and will help provide consumer protection in a previously unregulated landscape. This legal battle is not over, as this ruling will most likely be appealed the United States Supreme Court.[81]

In addition to the significant changes instituted by the FCC under Chairman Wheeler, other federal agencies have also engaged in discussion of improving the federal regulatory landscape to improve access to broadband. On August 20, 2015, the USDA issued its Broadband Opportunity Council

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[78] http://lifehacker.com/why-the-fccs-new-net-neutrality-rules-are-good-for-the-1683769527. The FCC may now investigate complaints involving the failure to deliver service that was advertised, certain billing issues, including unexpected, unfair or unapproved charges, and blocking or throttling of certain types of applications (e.g. streaming video). *See* *http://lifehacker.com/how-to-file-a-complaint-against-your-isp-and-finally-so-1714876357*

[79] Kang, C., New York Times, *Court Backs Rules Treating Internet as a Utility, Not Luxury*, June 14, 2016; This can be found at: http://www.nytimes.com/2016/06/15/technology/net-neutrality-fcc-appeals-court-ruling.html?_r=0

[80] *United States Telecom Association, et al., v. Federal Communications Commission and United States of America, et al.*, (D.C. Cir. 2016), p. 23, No. 15-1063; The court's decision may be found at: https://www.cadc.uscourts.gov/internet/opinions.nsf/3F95E49183E6F8AF85257FD200505A3A/%24file/15-1063-1619173.pdf. This ruling also provides a comprehensive history on the evolution of telecommunications in this country.

[81] *Id.*

Report and Recommendations which made a number of recommendations for federal action. These recommendations included:

1. Modernize federal programs valued at approximately $10 billion to include broadband as an eligible program expenditure, such as the Department of Agriculture's (USDA) Community Facilities (CF) program, which will help communities around the country bring broadband to health clinics and recreation centers;

2. Create an online inventory of data on federal assets, such as Department of the Interior (DOI) telecommunications towers, that can help support faster and more economical broadband deployments to remote areas of the country;

3. Streamline the applications for programs and broadband permitting processes to support broadband deployment and foster competition by creating a common permitting and application process; and

4. Create a portal for information on Federal broadband funding and loan programs to help communities easily identify resources as they seek to expand access to broadband. [82]

With respect to #4, permitting on federal lands and access to state highway rights-of-way over federal lands, remains an on-going issue, particularly in Western states.[83] Many states still continue to press the federal government for a more streamline process and standardized timelines for the review and processing of permitting applications, to make documentation easily accessible, to develop a comprehensive inventory of broadband assets, and to streamline environmental and cultural review processes, particularly in highway transportation projects.[84] By mid-2017, the Broadband Opportunity Council will also be issuing policy guidance defining broadband flexibilities within highway rights of way, including but not limited to: the use and valuation of excess fiber capacity within Intelligent Transportation Systems (ITS); shared use of fiber, conduit and other assets; and policies for over lashing and pole attachments.[85]

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[82] Pritzker, Vilsak, United States Department of Agriculture, *Broadband Opportunity Council Report and Recommendations Pursuant to the Presidential Memorandum on Expanding Broadband Deployment and Adoption by Addressing Regulatory Barriers and Encouraging Investment and Training*, August 20, 2015. This report can be viewed at: https://www.whitehouse.gov/sites/default/files/broadband_opportunity_council_report_final.pdf

[83] When a highway or interstate crosses over federal lands, the state is only granted an easement for that ROW. The state, or party who is working in that ROW, still requires separate permits from the federal agency controlling that land. In most cases, it is the Bureau of Land Management (BLM) or the Federal Highway Administration (FHWA). These two agencies have entirely different permitting processes, and there are often times significant differences in the amount of time it takes to process a permit in with each federal agency.

[84] Pritzker, Vilsak, United States Department of Agriculture, *Broadband Opportunity Council Report and Recommendations Pursuant to the Presidential Memorandum on Expanding Broadband Deployment and Adoption by Addressing Regulatory Barriers and Encouraging Investment and Training*, p. August 20, 2015. This report can be viewed at: https://www.whitehouse.gov/sites/default/files/broadband_opportunity_council_report_final.pdf

[85] *Id.*, at p. 23.

A. State

While telephony and plain old telephone service (POTS) continues to be a service regulated by the federal government and most state utility commissions, broadband is not regulated in Nevada. This is reflected in Nevada Revised Statute (NRS) 704.684, which provides, *"1. Except as otherwise provided in this section, the [Public Utility] Commission shall not regulate any broadband service, including imposing any requirements relating to the terms, conditions, rates or availability of broadband service. . . ."*

Like broadband, Voice over Internet Protocol (VoIP) is also not regulated in the state. Nevada Revised Statute 704.685 states,

> *"... 1. Except as otherwise provided in subsection 2, a state agency or political subdivision of the State may not, directly or indirectly, regulate the rates charged for, service or contract terms for, conditions for, or requirements for entry for Internet Protocol-enabled service or Voice over Internet Protocol service . . . ."*

The role of the Public Utility Commission of Nevada (PUC) is likewise limited with respect to telephone services. The PUC regulates providers of local telephone service, for example, CenturyLink and AT&T. The PUC does not regulate long distance telephone service, paging service, and other telecommunications competitive products and services. The PUC does issue licenses to wireless (cell) phone providers, also referred to as commercial mobile radio services, but does not regulate this service.[86] Additionally, with the passage of Assembly Bill 518 in 2007, the PUC no longer regulates the rates, pricing, terms and conditions of basic network service provided by competitive suppliers in Nevada, with the exception of competitive suppliers in rural areas.[87]

The PUC's telecommunication regulatory duties, generally, include:

- Ensuring telecommunication providers establish discount rates for low-income consumers, schools, libraries and rural health care providers.
- Encouraging competition and discouraging discrimination in the delivery of telecommunication services through standards and penalties.
- Ensuring telecommunication services are available to consumers in rural areas at rates comparable to rates in urban areas.
- Reviewing and approving annual performance measurements plans and performance incentives plans from competitive suppliers.

[86] http://puc.nv.gov/Utilities/Telecommunications/CMRS/
[87] http://puc.nv.gov/Utilities/Telecommunications/

In simple terms, telephony is still regulated, but not to the same extent it was 10 years ago. Certain rules and regulations that apply to cable providers or for phone services do not apply to cellular/wireless providers, broadband or Internet service providers. As more and more people shift to the relatively unregulated world of cellular service, more consumer issues may arise because resolution of customer complaints rests primarily with the provider. Further, where there is a lack of competition, there can also be a corresponding lack of customer service.

Also noted in Section II of this report, "Barriers to Broadband Adoption," *infra*, is the statutory restriction on the creation of municipal broadband networks. Municipal broadband refers to a broadband network that is owned, operate and maintained by a local government and the local entity or government becomes the ISP for the city, county or community. Nevada has not banned these networks, but has put restrictions in place that limit where and how they can be established. Elko has considered this as an option, but it is a long process to fund, construct and receive approval from the PUC.

V. NOTABLE POLICIES & PRACTICES IN OTHER JURISDICTIONS.

A. Federal Policies – "Dig Once" and Joint Trenching

Just as wireless networks use publicly owned spectrum, wireless and wired networks rely on cables and conduits attached to public roads, bridges, poles and tunnels. Securing rights to this infrastructure is often a difficult and time-consuming process that discourages private investment. Because of permitting and zoning rules, government often has a significant role in network construction. Government also regulates how broadband providers can use existing private infrastructure like utility poles and conduits. In the last several years, many state and local governments have taken steps to encourage and facilitate fiber conduit deployment as part of public works projects like road construction.

The 2010 National Broadband Plan recommended that government should take steps to improve utilization of existing infrastructure to ensure that network providers have easier access to poles, conduits, ducts and rights-of-way. It also recommended that federal government should foster further infrastructure deployment by facilitating the placement of communications infrastructure on federally managed property and enacting "Dig Once" legislation.[88]

"Dig Once," as defined by June 14, 2012 Executive Order signed by President Barak Obama, is a federal policy intended to facilitate the deployment of broadband on federal lands, buildings,

[88] Federal Communications Commission, National Broadband Plan, Chapter 6: Infrastructure, March 17, 2010; http://www.broadband.gov/plan/6-infrastructure/

rights-of-way, federally assisted highways and tribal lands.[89] The Executive Order refers to "requirements designed to reduce the number and scale of repeated excavations for the installation and maintenance of broadband facilities in ROW." Coordinating highway construction projects with the installation of broadband infrastructure can reduce costs, especially in areas where the entire right-of-way (ROW) is paved or developed and the only option for installing cable is below ground. Coordination also helps to reduce deployment time by avoiding the need for duplicative Federal reviews and permits for work done at the same location. Coordinating the timing of construction projects with utility installations can be challenging because it requires a concerted effort to share information on policies and processes among all parties involved.

Planning, communication and coordination are at the heart of any "Dig Once" policy. This policy also establishes requirements designed to reduce the number and scale of repeated excavations for the installation and maintenance of broadband utilities in highway ROW. At the federal level, several bills have been put forth to implement a federal "Dig Once" policy.[90] Proposed legislation went further than the Executive Order, in that it specifically required states to evaluate the need for broadband conduit or excess conduit to be installed at the same time as a federally funded highway construction project. Another proposal required streamlining the permitting process of federal land agencies so it would be easier for broadband providers to build infrastructure on public lands,[91] as well as address mandatory historical preservation and environmental protections and permitting required on BLM land.[92]

In an effort to improve coordination and planning efforts, some local planning or transportation agencies in some states have engaged in joint-trench agreements (a.k.a. "joint use" or "joint build") with telecommunication providers when plans are made for opening the ground. Joint use means requiring that all providers of broadband services (in some cases, all utilities) to install their infrastructure at the same time, in the same trench, or in the same conduit and, in most cases, share the cost of installing the infrastructure. It can also involve having the first utility in place extra conduits. Subsequent utilities must then negotiate with the first utility to occupy one or more of the empty conduits.[93]

B. State Implementation of "Dig Once" Policies

Many state and local stakeholders have recognized the value of "Dig Once" policies for expediting the deployment of fiber along main highway routes. Of the states who have adopted a "Dig Once" policy, one of the most successful implementations of that policy has been the state of Utah,

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[89] http://www.fhwa.dot.gov/policy/otps/successprac.cfm
[90] *See* http://www.govtech.com/network/Bipartisan-Dig-Once-Legislation-Provides-Hope-for-Broadband-Expansion.html
[91] http://www.govtech.com/network/Bipartisan-Dig-Once-Legislation-Provides-Hope-for-Broadband-Expansion.html
[92] CenturyLink often faces wait-times of 6 to 12 months for permits from federal land agencies, while permits for state and private lands usually take just a few weeks. UDOT and other transportation agencies have complained that environmental clearances through the BLM can take 2 years or more.
[93] *Id.*

through the Utah Department of Transportation (UDOT). For that reason, the Task Force reached out to UDOT and requested a presentation b and information on their model to better understand whether their practices could be adopted in Nevada.

1. Utah

Like other states, costs remain the greatest challenge to expanding broadband infrastructure. Utah, like Nevada, has vast open space that must be traversed when installing fiber, and also like Nevada, has many small communities, some quite isolated, that make it difficult for an ISP to realize a return on their investment.

More than 20 years ago, in response to the impending 2002 Winter Olympic Games, Utah's legislature recognized the need to expand their fiber infrastructure and enacted legislation to allow its Department of Transportation (UDOT) to leverage its highway rights-of way to support broadband deployment, and engage in fiber and conduit trades with private companies. Using their ROWs, UDOT leveraged private companies' assets to decrease the cost of expanding their own state-owned fiber optic networks used in their Intelligent Traffic System (ITS) through a fiber optic resource sharing program and conduit trade system. UDOT found that if the state installed small sections of conduit, telecoms would then help extend the infrastructure and provide services to rural communities. By implementing a practice of laying empty conduit during road construction projects, multiple providers could install infrastructure at much lower cost. By implementing this practice of laying empty conduit during road construction projects, multiple providers are able to install infrastructure at a much lower costs.[94]

At the heart of the UDOT model are four principles:

1. Provide for the installation of empty conduit by the state along major routes;
2. Engage in cooperative planning with telecoms and allow telecoms access highway ROW to allow for build-outs;
3. Allow for the use of the highway ROW at low or no-cost to non-profit entities;[95] and,
4. Allow UDOT to enter into fiber trades with telecoms.

Another UDOT policy is the manner in which UDOT works with the private telecom industry. UDOT maintains open and regular communication with the state's telecoms. Every two months, UDOT meets with the telecoms to discuss broadband projects, provide assistance on

[94] Because one of the largest cost element for deploying broadband is burying infrastructure underground, one of most effective ways for a telecom to reduce their construction cost is to run fiber through existing conduit in the ground. Studies have indicated that as much as ninety percent of the cost of deploying broadband infrastructure is spent during construction, particularly while excavating roadways, according to the FHWA. *See also* Meinrath, S. and Lennett, B., Open Technology Institute, *Building a 21st Century Broadband Superhighway*, January 19, 2009; *https://www.newamerica.org/oti/policy-papers/building-a-21st-century-broadband-superhighway/*

[95] https://www.fhwa.dot.gov/policy/otps/successprac.cfm

ROW acquisitions, the permitting process and share information. Some of this information includes mapping data. This data sharing has enabled UDOT to develop extensive mapping of fiber locations with the help of UDOT's dedicated Geographic Information System (GIS) mapping team. UDOT has also created an electronic list of broadband providers and provides them notice of future construction projects, where broadband infrastructure can be installed, and coordinates planning and construction efforts to help minimize fiber construction costs. Finally, UDOT solicits an annual "wish list" from telecom providers, which is overlaid with road projects thereby enabling the telecoms and UDOT to align excavation/implementation activities. These practices highlight the importance of coordination, communication and planning with telecom partners to let everyone know what is there, what is available, and where fiber needs to be installed, thereby allowing all stakeholders to see the "big picture" and how pieces will fit together.

All of UDOT's fiber projects and trades are overseen by the Telecommunications Advisory Council (TAC), which is comprised of six members appointed by the Governor. In addition to reviewing and approving any trades and the valuations, the Council also advises UDOT on telecommunications issues and works in collaboration with a separate broadband council to develop state policies and provide guidance to the governor and legislators. Having a body to provide oversight of fiber trades and the values assigned thereto is a key to ensuring the integrity of values derived by UDOT.

Other states have adopted various versions of this fiber expansion model. For example, Maryland has a well-developed resource sharing program, which is separately funded through an account within the state's Transportation Trust Fund to advance IT-related projects. Maryland also established a Rural Broadband Assistance Fund and a Rural Broadband Coordination Board to facilitate deployment in rural areas, and passed laws making the use of highway ROW for telecommunication services available to non-profit entities without charge until 2020. Arizona has also adopted a similar policy.[96] In several of these states (including Utah), some sort of enabling legislation was required to specifically allow telecoms into the ROW, or to allow the DOT to install excess conduit or fiber, or allow the DOTs to enter into public private partnership and conduct trades for value, and/or create a mechanism for approving the valuations placed on the conduit/fiber by the DOTs.

As a result of this policy as well as the best management practices developed throughout the years, UDOT has successfully facilitated cooperative fiber and conduit trades with broadband providers, thereby enabling the expansion of its own communications network across the state, and into rural communities, without major capital investment.[97] In the last 20 years, UDOT

[96] http://www.azleg.gov/DocumentsForBill.asp?Bill_Number=SB1402&Session_ID=107
[97] https://www.fhwa.dot.gov/policy/otps/successprac.cfm#ftn2

has doubled its network footprint, with 900 miles of fiber owned by the agency, and acquired the use of nearly 1,000 miles obtained in trade.[98]

In May, 2013, the United States Department of Transportation, Federal Highway Administration (USDOT-FHWA) developed a summary on Federal-aid highway program regulations and policies pertaining to broadband deployment in highway ROW[99] and provided a summary on successful practices. UDOT's program was recognized as being one of the most successful models for accelerating broadband deployment. [100] This policy has also been cited by the FCC and NTIA and numerous other broadband commissions, as an important example of how states can promote broadband development and deployment that supports overall economic growth.

Other states who have adopted a "Dig Once" or joint trenching policies include:

2. Iowa

Iowa, recently enacted legislation creates a fiber-optic network conduit installation program, the purpose of which is the centralize efforts to provide for fiber-optic conduit installation where it does not currently exist (not within a linear range of 500 feet or less in any one direction from existing conduit).[101]

3. Arizona

In 2012, Arizona passed legislation to promote high-speed Internet access to citizens statewide. Arizona Digital Highway Bill (SB1402)[102] makes provisions for the state to install empty conduit in connection with rural highway construction. The installation of the conduit would be funded by a state program (which receives federal funding) managed by the Arizona Strategic Enterprise Technology (ASET)'s Digital Arizona Project. The state then leases the conduit to all telecoms. It is expected that this approach will significantly lower costs to providers of service in rural communities; however, it has yet to be implemented. In the City of Flagstaff, empty conduit is installed whenever there is new street construction.[103]

4. Vermont

Vermont DOT allows for the installation of fiber on the Interstate. Using funds from NTIA grants, the State recently installed 14 miles of conduit along the Interstate, which has been

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[98] *See* UDOT Presentation at: https://www.google.com/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF-8#q=UDOT+presentation+to+FHWA

[99] *See* Title 23 of the U.S. Code section 514 b (4), ""*to promote the innovative use of private resources in support of intelligent transportation system development*."

[100] United States Department of Transportation, Federal Highway Administration, Office of Policy and Governmental Affairs, *Successful Practices of Broadband Deployment in Highway Rights-of-Way: Summary Paper*, May 2013, p. 3; *See* http://www.fhwa.dot.gov/policy/otps/successprac.cfm

[101] https://www.legis.iowa.gov/docs/Published/LGE/86/HF655.pdf.

[102] http://www.azleg.gov/legtext/50leg/2r/bills/sb1402p.pdf

[103] http://www.fhwa.dot.gov/policy/otps/successprac.cfm

leased to a telecom for a 20-year period at $5000 per year, and lateral connections for $1000 per year. The DOT also has a barter agreement in place with the telecom for the use of one conduit. A public-private agreement is in negotiation to add conduit along the entire Interstate. One hundred and forty-four strands would be installed and used for ITS purposes and excess capacity for the State.

5. Maryland

Maryland DOT has a well-developed resource sharing program, including a separate account created within the state's Transportation Trust Fund to specifically advance IT-related projects. Since 1994, the state has executed 23 agreements with private companies such as Verizon Wireless, Nextel, Cingular, AT&T, Level-3 and Fibergate. Agreements are based on sharing highway rights of way for monetary or in-kind compensation. In-kind compensation may include communications or IT equipment provided to the Maryland State Highway Administration (MSHA), or exclusive allocation of fiber optic cables to MSHA. In most cases, the private entity installs and maintains the conduit. Through resource sharing, the state has been able to achieve interoperability and reduce capital costs for communications infrastructure. In an effort to facilitate economic development in rural areas, Maryland established a rural broadband assistance fund and a rural broadband coordination board. In addition, laws concerning highways under construction and maintenance make the use of highway right of way for telecommunication services available to non-profit entities without charge (until 2020). [104]

C. Implementation of "Dig Once" Policies at the Local Level

Many state DOT's see adoption and implementation of a "Dig Once/Joint Trenching" policy as a local issue, and indeed, it has seen more success at the local level. example, it has been implemented by San Francisco, Santa Cruz County and a number of other cities and counties throughout the United States.[105] In most case, it requires that local cities and counties adopt ordinances that require the city or county engaged in any excavation projects where it is both financially feasible and consistent with the entity's long term communication goals, to require municipal utilities to take communications infrastructure into account in their planning process, to provide advanced notice to telecoms and the department of public works of the trenching/excavation opportunity, and require the establishment of a process for the IT or technology department to participate in the utility excavation.

Another variation of these policies, called "Trench One," is currently being used in San Francisco. This approach allows for a roadside trench to be left open after construction ends. This trench is later used to bury conduit and is shared among broadband providers, if possible, to avoid the costs associated with additional excavation in areas where the entire right of way is paved. According

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[104] *Id*.

[105] http://sfgov.org/dt/sites/default/files/FileCenter/Documents/6885-San%20Francisco%20Dig-Once%20Specification%20-%20CTC%20-%20042415.pdf

to the San Francisco's Dig Once Specification,[106] this policy reduces the cost of conduit installed from $128,000 per street mile for the first installation (including excavation of the trench) to $71,000 for the second. This decrease is largely attributable to a reduction in excavation costs.[107]

Other jurisdictions that have various "Dig Once" policies at the local level include:

- **Boston, MA.** Boston's Joint Build approach for deploying broadband, has worked very well in Boston to minimize street excavation. It has also sped up the deployment process because all companies are required to work together to install their infrastructure at the same time. In addition, construction costs, including digging the trench, installing the conduit and repaving, are shared by all companies participating in the build-out.

- **Santa Cruz, CA.** Santa Cruz County approved a telecommunications infrastructure improvement ordinance which required any time work is done on public roads or otherwise in county ROWs, they must include broadband facilities, including fiber optic cable, conduit and other related equipment wherever practical and feasible. In addition, the City created a "Broadband Master Plan," a comprehensive, city-wide policy for the development of broadband infrastructure.[108]

- **Sandy, OR.** In June 2011, the Santy City Council approved and ordinance requiring all new development, including housing developments, to install underground fiber along with other utilities, such as sewer and water. The ordinance further stated that developers were required to put conduit all the way into a home and to deed that conduit to the city. Thereafter Sandy entered into a public-private partnership for building fiber to the premise (FTTP). The only regret expressed by a community leader was they wished they had the forethought to pass it 10 years ago.[109]

  In addition, Sandy, a town of about 10,000 residents, began construction on a municipal network. The town elected to pursue creation of its own municipal network because city hall couldn't get a DSL line. Ten Oregon invested in fiber upgrades to the city. The upgrade was paid for with a $7.5 million revenue bond, which will be repaid by system revenues. The cost for service is approximately $40/month for 100 Mbps. Sandy Oregon has leveraged this into an advertising campaign to bring business into town, with "Sandy, Oregon. Home of the $60 Gig."[110]

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[106] http://sfgov3.org/modules/showdocument.aspx?documentid=6885
[107] http://www.csg.org/pubs/capitolideas/enews/cs41_1.aspx
[108] *See* http://www.santacruztechbeat.com/2015/04/02/community-owned-fiber-networks/ and the City Council staff report at: http://www.tellusventure.com/downloads/ccbc/santa_cruz_city_council_broadband_plan_agenda_report_5mar2015.pdf
[109] A Brief Assessment: The Current State of Dig-Once Policy in the U.S., p. 6, July, 2013; See at http://centralsierraconnect.org/uploads/summit-flash/6%20-%20Draft%20Dig%20Once%20Assessment%20July%202013.pdf
[110] This city presents an interesting story and more can be read at http://arstechnica.com/business/2015/08/how-a-small-city-offers-60-gigabit-fiber-with-no-taxpayer-subsidies/. *See also,* http://www.ci.sandy.or.us/SandyNet/

- **Trenton, NJ.** The City Council passed an ordinance to govern fiber optic cable installation as a result of numerous request for approval to use the City rights-of-say, streets and other municipally owned property. The City imposed a "reasonable fee" for approvals, licenses, permit or sub-easements and charges a flat rate of $10/linear foot aboveground installation, and $25/linear foot underground installation. Further, "the City may accept in-kind services or products in lieu of the above fees if the City determines that the value of such products or services meets or exceeds the total fee imposed . . . . adjusted by any time/value of money calculation appropriate and necessary to the nature and timing of the in-kind contribution . . . . "[111]

D. Encouraging Developers to Provide Broadband Infrastructure

Local policies should ensure that developers consider and ensure that adequate broadband infrastructure capacity will be in place in new developments. Such policies can include placement of adequately sized broadband conduit and ducts alongside roads and inside buildings, in order to "future proof" that development. Community and provider collaboration to problem-solve around local pole attachment and other right-of-way issues is one of the most effective opportunities to encourage faster, new deployment of infrastructure. In addition, as discussed above, mapping and knowledge of local infrastructure can facilitate and attract broadband investment and upgrades.[112]

Most large developers of single-family homes and many developers of multiple-dwelling units (MDU) see the benefit of adding fiber-to-the-home (FTTH) to new properties; however, in Nevada there is no process for encouraging developers to provide FTTH for new developments or retrofit older properties. Since the mid-2000s, the market research firm RVA, LLC has surveyed home buyers and developers. Through boom, recession and recovery, surveys have noted that FTTH adds more than $5,000 to the price of a single-family home. RVA's 2014 survey of MDU residents found that condo buyers were willing to pay a 3 percent premium for an FTTH connection, and renters would pay an 8 to 15 percent premium for FTTH.[113]

As noted earlier, since broadband is not considered a utility, or even necessary infrastructure, there are few ordinances that establish a manner or process for accommodating it in either new master planned communities, multi-unit developments (MUD) or commercial construction. This can be seen in Nevada Administrative Code (NAC) 704A.490, which requires a developer to install trenches used "*jointly with the facilities of other public utilities. 2. The developer shall provide a separate trench for any telephone facilities which are inside the development or not more than 100 fee from it if joint trenching is not technically possible or economically feasible.*" Since fiber and broadband are not considered a public utility, or telephone facilities, there is no requirement that conduit – for fiber or any other similar service, be included.

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[111] http://ecode360.com/9130896
[112] Connected Nation, *Nevada Broadband Plan*, p. 31.
[113] *What Fiber Broadband can do for your Community; Fiber Optics Primer*, 10th Ed. Nov. 2014. Fiber to the Home Council Americas

With respect to installing conduit, NAC 704A provides that the telephone company may place conduits in trenches inside or not more than 100 feet from a development to serve customers who reside more than 100 feet from the development if the conduits are installed at the same time as the underground facilities which will serve the residents in the development and the placement does not require the developer to perform additional excavation or supply additional material for backfill. The telephone company is not required to pay the developer for such an additional use of these trenches. So for certain situations, a developer is responsible for installing conduit, but only in certain situations and only for "telephone facilities" (*see also* NAC 704A.500[114]).

In some instances, it may be easier to change the language in the NRS to accommodate broadband facilities in MDUs, master planned communities or commercial projects. If such facilities were accommodated by a developer, he could certify the development as a "broadband certified" or "fiber certified" development.[115]

On March 24, 2016, the Wisconsin Legislature passed a "Broadband Forward! Community Model Ordinance" (Assembly Bill 820 / Senate Bill 699)[116] The act created a Broadband Forward certification for municipalities that plan to seek broadband installation and grant funding in the future. It is a package of model ordinances that a community may adopt to prepare for working with telecommunications companies to expand broadband. The bill also directs the Public Service Commission to focus broadband expansion on priority needs and projects with economic development and community advancement elements. Enacting the Model Ordinance and obtaining certification ensures a local unit of government has streamlined its administrative procedures by appointing a single point of contact for all matters relating to a broadband network project, adhering to a timely approval process, charging only reasonable fees for reviewing applications and issuing permits imposing only reasonable conditions on a permit and not discriminating between telecommunication service providers.[117]

E. Broadband Funding

One proactive method for states to increase broadband access and affordability is to directly fund deployment in areas that lack broadband access or affordable broadband choices. Nevada has no such mechanism, fee or tax to fund broadband development or deployment. There are many reasons to prioritize funding for broadband development, but the most universally compelling of

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[114] NAC 704A.400 and 500 - http://www.leg.state.nv.us/nac/NAC-704A.html#NAC704ASec440

[115] Douglas County planners were of the opinion that it would be better to have such a requirement in statute, rather than go through the long process of placing it in an ordinance. If written broadly, the ordinances could narrow the scope, but it would still be less objectionable if it was required in statute.

[116] https://legis.wisconsin.gov/senate/17/marklein/media/press-releases/governor-signs-broadband-forward-legislation/

[117] *See also*, Wisconsin State Legislature 2015 Assembly Bill 820. https://docs.legis.wisconsin.gov/2015/related/proposals/ab820

these is economic development. According to Matt Schmit, Minnesota State Senator, "Broadband is a priority for the state's business community, which sees high-speed Internet as key to economic competitiveness." In one funding approach, a handful of states have set aside funding specifically for library broadband infrastructure and/or service.[118]

[119] Table 1. States that Have Funded Broadband Deployment

California	Legislated: funding via Universal Service Fund
Illinois	Legislated in Illinois Jobs Now
Maine	Legislated: from assessments on in-state communication services
Minnesota	Legislated: funding via the General Fund
North Carolina	North Carolina's share of the national tobacco settlement
Vermont	Legislated: from the capital budget

For example, the Minnesota governor's Task Force on Broadband[120] recommended allocating $100 million for broadband deployment in unserved and underserved areas. Through bipartisan discussions, outreach to constituents via listening tours, and meetings with local newspaper editorial boards, the Border-to-Border Broadband Fund passed in May 2014, with a one-time allocation of $20 million.[121]

As noted in The Washington Post,

> *It's become an article of faith among politicians, investors and entrepreneurs that the Internet—and access to it—is an economic engine. It helps connect Americans to education and government services. It serves as a platform for new ideas and companies that wind up changing the world. And it reduces costs for consumers and businesses everywhere. … According to a report by the Boston-based Analysis Group, cities that offer broadband at [significantly higher speeds] report higher per-capita GDP compared to cities that lack those Internet speeds.*[122]

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[118] For a full description of those states' efforts (plus more) is available in Chief Officers of State Library Agencies, COSLA Planning Guide for Library Broadband Connectivity, 2014; *see at* http://www.cosla.org/documents/Broadband_Guide_2014.pdf , April 25, 2015

[119] Siefer, A., *State-Level Broadband Policy, A Compendium of Resources and Approaches*, Pell Center for International Relations and Public Policy, pp. 11-12, September 2015. See http://pellcenter.org/wp-content/uploads/2015/09/State-Level-Broadband-Policy-FINAL.pdf

[120] State of Minnesota Executive Department, "Executive Order 11-27: Providing for the Establishment of the Governor's Task Force on Broadband." Accessed online at http://mn.gov/governor/multimedia/pdf/EO-11-27.pdf April 25, 2015.

[121] For more detail, *see* 2014 Minnesota Session Laws, Chapter 312 – HF 3172, Article 2, Section 2 and Article 3, Section 3. The Office of the Reviser of Statutes, "2014 Minnesota Session Laws," 2014. Accessed online at: http://pellcenter.org/wp-content/uploads/2015/09/State-Level-Broadband-Policy-FINAL.pdf

[122] Brian Fung, "Study: Cities with Super-Fast Internet Speeds are More Productive," Washington Post, September 18, 2014. See http://www.washingtonpost.com/blogs/the-switch/wp/2014/09/18/study-cities-with-super-fastinternet-speeds-are-more-productive/, April 25, 2015, as reported in http://pellcenter.org/wp-content/uploads/2015/09/State-Level-Broadband-Policy-FINAL.pdf

This highlights the need for Nevada to develop a strategic plan that examines all possible funding opportunities and sources, and decide whether broadband is an essential service worthy of further investment. In a recent report[123], key sources for broadband funding included:

- State agency budgets (Department of Information, IT, or some similar agency)
- E-rate
- Multi-year capital budget allocation from the state
- Public purpose programs, such as the California Advanced Services Fund, which provide grants for construction of infrastructure in underserved and unserved areas.
- Federal grants
- Universal Service Fund (3 states)
- State general fund/state budget (8 states)

Secondary sources for funding include:

- Educational funds
- Homeland security grants
- Liquor sales tax revenue
- Public/private partnerships with telecommunication/ISP providers[124]

Other states have considered re-examining how the state Universal Service Funds are used, while others already collect fee from other sources (e.g. mobile broadband/cell phones) to pay for broadband funding and initiatives. Idaho recent completed a report entitled, "The Future of Idaho's Universal Service and its Relationship to Broadband Development." The report noted that, ". . . the PUC proposes that in the future, it would be prudent to modernize and reform the contribution mechanism to promote and equitable and sustainable framework in an evolving communications environment."[125]

In order for Nevada to strengthen its broadband infrastructure and stand prepared to meet the broadband demands anticipated in the next 5 to 10 years, it will need to consider whether or not broadband represents an essential infrastructure worth investing in, and initiate exploring all possible funding sources.

F. Update on Federal Broadband Grants & Projects in Nevada, 2008 – 2014

From 2008 to 2014, the State of Nevada received a number of federal grants for broadband initiatives that included mapping, data collection, policy development, and some broadband construction projects. Several inquiries had been made with respect to the status of these projects,

[123] Adams, D., and Curri, M., *Fifty States of Broadband*, May/June 2016. www.broadbandcommunities.com
[124] http://www.bbcmag.com/2016mags/May_June/BBC_May16_FiftyStates.pdf
[125] http://www.puc.idaho.gov/telecom/Broadband%20and%20USF%20Report.pdf, at p. 2

and how the monies were used. The following provides a summary and update on these broadband initiatives and federal grants.

Many of the earlier large broadband grants were funded through the American Recovery and Reinvestment Act (ARRA), which provided a total of $7.2 billion to the National Telecommunications and Information Administration (NTIA) and the Department of Agriculture's Rural Utilities Service (RUS) to fund projects to expand access and adoption of broadband services across the United States. NTIA utilized $4.7 billion of that funding for grants to deploy broadband infrastructure in the U.S., expand public computer center capacity, and encourage sustainable adoption of broadband service. The State of Nevada was awarded five (5) Broadband Technology and Opportunity (BTOP) state awards, one (1) BTOP award that impacted both California and Nevada, and three (3) BTOP awards which impacted various states at the national level (including One Economy Corporation, University Corporation for Advanced Internet Development, and the Communication Service for the Deaf).

California Broadband Cooperative, Inc.[126]
Infrastructure $81,148,788
Project served: California, Nevada

Much of the Eastern Sierra region between Carson City, Nevada and Barstow, California was dependent on decades-old telephone infrastructure and had limited, insufficient broadband middle mile capabilities, leaving wide swaths of the Central Valley and eastern California unserved. The California Broadband Cooperative's Digital 395 Middle Mile project built a new 553-mile, 10 Gbps middle-mile fiber network that follows U.S. Route 395 between southern and northern California. In addition to 36 municipalities, the project's proposed service area encompasses six Indian reservations and two military bases.

Connected Nation (Nevada)[127]
Broadband Data & Development $3,993,441
Project served: Nevada

State Broadband Capacity Building**:** Staff time for this project supported the Nevada Broadband Task Force and State Librarian, coordinated statewide broadband activities and provided outreach to local community technology planning teams. This effort included the development of a state-wide broadband action plan for future initiatives of the state. Also included were technical assistance and mapping. Connect Nevada initiative gathered and presented research to local communities, government and non-profit offices and agencies. In combination with survey work funded in the original proposal, Connect Nevada provided the Task Force with an analysis of how well the state has met the goals it presented in its original broadband strategic plan. This project was originally funded for broadband planning activities and two years of data collection. In September of 2010, this project was amended to extend data collection activities for an additional three years and to identify and implement best

[126] http://www2.ntia.doc.gov/grantee/california-broadband-cooperative-inc
[127] http://www2.ntia.doc.gov/grantee/connected-nation-nevada

practices. This project also established regional planning teams in the 14 counties with the lowest rates of broadband availability and adoption. The local planning process worked in parallel with and complimented the work of the BTOP-funded "One Click Away" project, which will provide technical training to local residents.

Las Vegas-Clark County Urban League[128]
Public Computer Centers $4,680,963
Project served: Nevada
The Access to Computer Technology and Instruction in Online Networking (ACTION) project expanded the capacity of 14 public computer centers and create 15 new computer centers in public housing developments and community and senior centers throughout the most economically disadvantaged communities in Clark County, Nevada. The 29 centers offered computer classes, job training and certification programs, and community health programs through local partner organizations.

Lyon County School District[129]
Public Computer Centers $745,005
Project serves: Nevada
The Lyon County School District improved economic opportunities for residents of Lyon and neighboring Mineral County through its Computer Centers for Rural Nevada project. In addition to creating public computer centers, the project provided instructors and volunteer trainers for basic computer literacy, graduate education preparation, and English as a Second Language (ESL) training, some schools offered college credit and advanced placement classes to high school students and community members. Several local small businesses also used the centers to train local residents in specialized skills pertinent to their industries. The Walker River Paiute Tribe and Yerington Paiute Tribe utilized the public computer centers to view or participate in national tribal events.

Nevada Department of Cultural Affairs[130]
Public Computer Centers $806,045
Project served: Nevada
The Nevada Department of Cultural Affairs expanded the training and educational capacity at libraries and other hubs for free computer access in each of 15 counties throughout the state. The Nevada One Click Away project upgraded 34 public computer centers and created one new center. The project enhanced existing computer training programs, including computer skills training provided by librarians and volunteers, and adding accessible technology and computer classes in Spanish in the larger participating library branches. Additionally, some libraries partnered with the local Chambers of Commerce to host small business workshops focused on best practices, customer creation and retention, and marketing practices.

[128] http://www2.ntia.doc.gov/grantees/LasVegas_ClarkCo
[129] http://www2.ntia.doc.gov/grantee/lyon-county-school-district
[130] http://www2.ntia.doc.gov/grantee/nevada-department-of-cultural-affairs

Nevada Hospital Association[131]
Infrastructure $19,643,717
Project served: Nevada

The Nevada Hospital Association was tasked to build and operate a statewide telemedicine network to be made available to 37 medical providers throughout the state, with additional capacity for use by public safety agencies, educational institutions, tribal governments, and last-mile Internet service providers. This project was not completed and was taken over by Switch/Supernap in early 2016. It is set to be completed by the end of 2016.

Pyramid Lake Paiute Tribe[132]
Infrastructure $7,070,006
Project serves: Nevada

To address low Internet speeds and a general lack of access to online tools like distance learning, telemedicine, and enhanced public safety services on its reservation, the Pyramid Lake Paiute Tribe proposed a public-private partnership project to deploy a fiber-optic middle mile network across 742 square mile reservation. The project built 44 new miles of fiber in partnership with Praxis Associates that provided direct connections to local community anchor institutions at a minimum speed of 10 Mbps.

The USDA Broadband Initiatives Program (BIP)

Rural Telephone Company
Broadband Service Implementation Last Mile
$728,700 Loan
$1,700,300 Grant

Rural Telephone Company extended ADSL2+ high-speed broadband service to existing and new customers in the Jarbidge, North Fork and Tuscarora service areas. The network made services available to 272 households, 104 businesses, and 10 anchor institutions.

Arizona Nevada Tower Corporation
Middle Mile
$2,276,650 Loan
$5,312,182 Grant

Arizona Nevada Tower Corporation provided middle-mile broadband to enhance existing but limited fiber-optic cable and provide transport where fiber-optic cable is unavailable by using LTE/WiMAX ready technology. This project will provide microwave radio backbone and a middle-mile system to provide significant bandwidth in 15 areas of Nevada and California. The network made services available to 12,933 households, 3,422 businesses, and 186 anchor institutions.

[131] http://www2.ntia.doc.gov/grantee/nevada-hospital-association
[132] http://www2.ntia.doc.gov/grantee/pyramid-lake-paiute-tribe

Reno-Sparks Indian Colony, Inc.
Hungry Valley Broadband Initiative Last Mile
$400,000 Grant

Reno-Sparks Indian Colony, Inc., offered wireless broadband service speeds at a minimum of 5 Mbps to communities in a rural reservation in Hungry Valley. The network made services available to 162 households, 1 business, and 4 anchor institutions.

While federal monies still exist for certain broadband-related programs, they are nowhere need the scope and size of the previous broadband grants, and the state will need to focus its efforts in order to secure its share of the currently available federal monies.

VI. RECOMMENDATIONS

It is the intention of this Task Force that these recommendations will allow state leaders and policy makers to make changes that will bring improvement to the state's broadband issues and support efforts to help facilitate the construction, adoption and access to broadband.

In considering potential policy changes, the Broadband Task Force sought out best practices from other jurisdictions, considered the attributes, challenges and limitations that exist in our state, including state laws, governance, geography and funding. These recommendations have also taken into account best practices and policies in other jurisdictions, and their adaptability to our state.

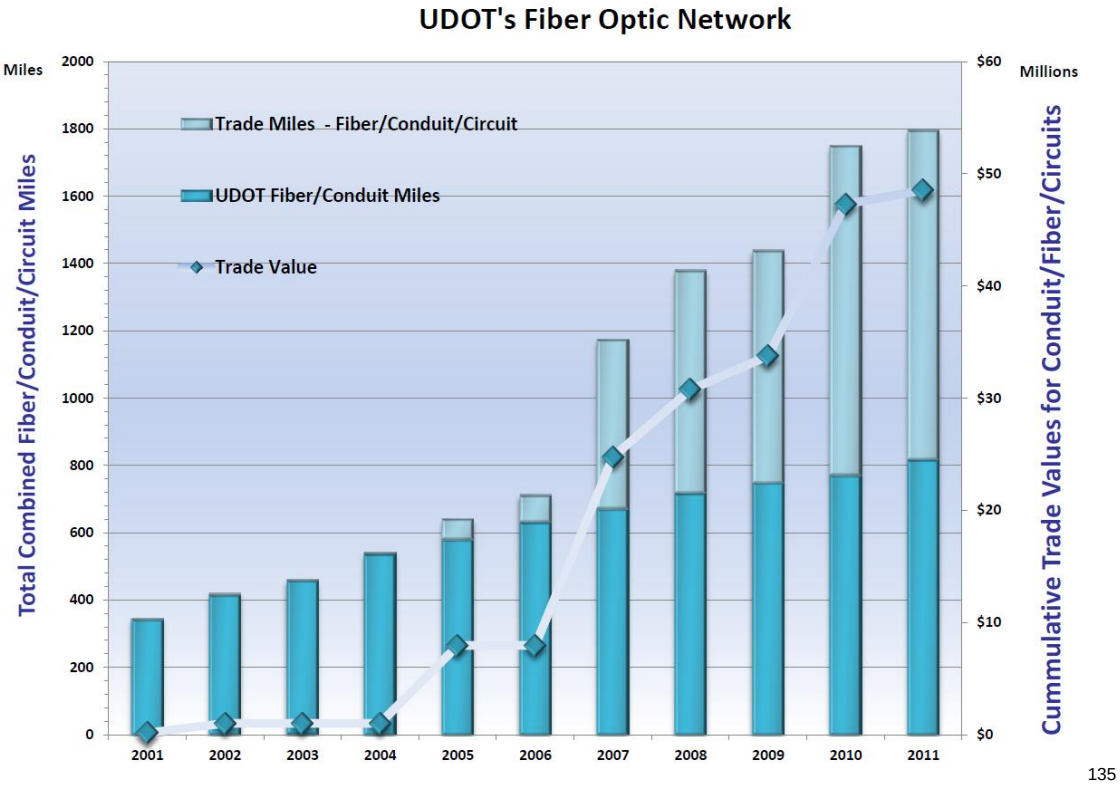
RECOMMENDATION #1

Facilitate broadband expansion by allowing the Nevada Department of Transportation (NDOT) to install conduit and fiber systems in the rights-of-way that support telecommunication facilities, and allow NDOT to enter into public-private partnerships for cooperative fiber and conduit trades.

This recommendation encourages adoption of the Utah Department of Transportation policy and practices that will allow NDOT to engage in fiber and conduit trades with private companies, and leverage the highway rights-of-way to support broadband deployment. By implementing the practice of laying excess conduit during road construction projects, multiple telecommunication providers can install infrastructure at a much lower cost, thereby reducing one of the greatest barriers to broadband deployment.[133] Over the last 15 years, more and more states have recognized

[133] One of the largest cost element for deploying broadband is burying infrastructure underground. Therefore, one of most effective ways for a telecom to reduce their construction cost is to run fiber through existing conduit in the

the value of leveraging their ROWs to help facilitate the expansion of broadband telecommunication services. As a result, the FHWA has been actively supporting this policy.[134] UDOT's policy has demonstrated that by installing small sections of conduit, telecommunications providers will cooperate in helping to extend the infrastructure and provide services to rural communities. Utah has following this policy for almost 20 years, and in speaking with telecoms who have worked with UDOT, all expressed support of the program, and satisfaction with UDOT's methods and practices.



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Based on the directive from the FHWA, and successes seen in other states, the Task Force recommends that the Nevada Department of Transportation adopt this policy and be granted authority to install conduit and fiber systems in the rights-of-way that support telecommunication facilities. In addition, that NDOT be granted authority to enter into public-private partnerships with telecommunications providers for cooperative fiber and conduit trades.

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ground. According to the FHWA, studies have indicated that as much as 90 percent of the cost of deploying broadband infrastructure is spent during construction, particularly while excavating roadways,. *See also* Meinrath, S. and Lennett, B., Open Technology Institute, *Building a 21st Century Broadband Superhighway*, January 19, 2009; *https://www.newamerica.org/oti/policy-papers/building-a-21st-century-broadband-superhighway/*

[134] Last month, the FHWA gave a presentation to NDOT addressing the use of longitudinal access of highway rights-of-way to for accommodation of fiber and excess conduit.

[135] Utah Department of Transportation, FHWA Broadband Workshop, February 14, 2013, p. 22, Powerpoint presentation.

RECOMMENDATION #2

Promote "Dig Once/Joint Trenching" policies at the local levels through the creation of local model policy guidelines.

More and more local governments are taking the initiative to address access to the local rights-of-way, and how to better promote, plan and integrate broadband projects into local public works projects. Of key importance is creating policies and a process that requires a coordinated planning effort between transportation, public works, telecoms and utility providers.

The net effect of promoting local "Dig Once" policies is that it can be tailored to accommodate local ordinances and practices, and can play a key role in reducing the cost and time involved to deploy broadband facilities.

RECOMMENDATION #3

Establish a state broadband-in- education consortium and recurring funding to provide a state match to school district funds to more effectively leverage federal E-rate money, thereby creating an organized process for improving broadband connectivity to, and within E-rate eligible entities.

Utilizing a centralized mechanism for pursuing E-rate funding, and establishing a strategic plan to leverage E-rate funding to pay for broadband connectivity to, and within, their K-12 schools has helped expand the reach of broadband services to public schools in a number of states. By using a state consortium for pursuing E-rate funds, Utah, a state with geographic challenges similar to Nevada, has managed to connect every high school, middle school and elementary school to 1 Gig service, of which 98 percent is provided through fiber.

In examining other states, several key points can be made:

- Consortia buying leverages economies of scale, and help level costs for broadband services and equipment.
- A consortium would relieve districts from the responsibility of providing dedicated staff to manage E-rate applications, reporting and oversight.
- Using E-rate funds to help pay for broadband construction projects can help bring ISPs into a community, thereby serving the entire community.
- A consortium will require staff who possess the necessary experience and skills to process E-rate applications, negotiate service agreements and be able to assess the technical/broadband needs of a school. This will relieve smaller districts with limited resources of this responsibility.
- Members of the consortia can include both public and private schools, and any other E-rate eligible entity, such as libraries.

RECOMMENDATION #4

Adopt specific broadband goals for the state and create a state strategic five-year broadband development plan for Nevada.

In every other state that has made notable improvements expanding broadband infrastructure, almost all of them recognized the importance of establishing specific goals, and creating a strategic plan for achieving those goals. Some states have adopted statutes that set forth specific broadband objectives or goals, while other states commissioned creation of strategic broadband plans.[136] Strategic plans provide a framework that establishes priorities, a clearly defined direction for implementing policy, and how successes will be measured. These plans can be created for the entire state, or tailored for regions.

In this regard, Nevada will need to address some very fundamental issues. For instance, where should fiber "information highways" be constructed? Should there be a centralized system to provide broadband support our K-12 schools? What are the benefits of having NSHE continue its operation and management of the existing network? Should the state increase acquisition of dark fiber to expand its state network, or lease service? Should the transport of data be considered a type of essential infrastructure, in the same way that our roads and highways are? All of these questions highlight one important and timely fact: The state must have a vision, clear goals and objectives, and a plan of action to strengthen Nevada's "information highways."

RECOMMENDATION #5

Continue the Broadband Task Force through executive order beyond June 2017, or otherwise establish an ongoing broadband body, to coordinate and collaborate on broadband adoption and deployment efforts, review and develop broadband policies, and assist in efforts to implement strategic planning goals.

Many states continue to retain broadband task forces or broadband councils as a way of maintaining ongoing discussion of broadband-related policy issues, remain current on particular state issue or changes in the private sector, examine emerging technology, continue engagement with stakeholders, and provide on-going guidance to lawmakers. The knowledge and experience possessed by members in such a body provides state leaders with an important resource to draw from and serves to regularly engage interested parties and stakeholders in on-going collaboration and planning efforts.

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[136] These states include New York, California, Minnesota, Wisconsin, and Utah. New Mexico recently completed a comprehensive a state strategic plan which can be seen at *http://www.doit.state.nm.us/broadband/reports/nmbbp_strategic_plan.pdf*

While the current Task Force was convened by an executive order of the Governor, the order will expire in June, 2017. Because there is still considerable work that remains to be done, establishing an ongoing broadband council or committee will be essential to helping develop and carry out broadband policies, or any other recommendations set forth in a strategic plan. In addition, such a body can also help support data collection efforts and provide support and guidance to the Department of Transportation, Department of Education as well as the Governor's Office of Science Innovation and Technology.

RECOMMENDATION #6

Develop model policies and incentives for deployment of broadband in certain commercial and residential developments (e.g. create "certified" broadband or "fiber-ready" residential and commercial sites).

Unlike several counties in California, no county in Nevada has adopted any local building ordinances or codes that require a developer to install conduit, when and where it makes sense. It should also be noted there is nothing in state statute that requires developers to accommodate fiber[137] because it is not considered a utility and the NAC does not address installation of conduit for this type of service. Therefore, it is left to county ordinances to determine what service, or infrastructure, a developer must provide.

Indeed, one of the smartest things a community can do to improve connectivity is prepare an environment that encourages high-speed connectivity infrastructure investment. As developers erect new buildings, some cities require developers to work with them to develop internal wiring standards and conduit installation standards for high-quality Internet access within and to their buildings.[138]

Developers in other jurisdictions, recognizing the increase in value of properties wired for FTTH, have embraced the practice given the strong evidence that it increases the value of a home or commercial building.[139] In addition, conduit and fiber installed by a developer could also later be used by the local government or leased to other providers. Over a period of ten years or more, this policy could result in fiber throughout the majority of a community and developers would recoup their costs.[140] By creating incentives or model ordinances that establish "certified" broadband or

[137] What this pertains to is not fiber optic cable itself, but the conduit.
[138] http://lomalinda-ca.gov/asp/Site/LLCCP/AboutLLCCP/Introduction/index.asp
[139] In speaking with one Douglas County planner, there was tremendous enthusiasm for this policy, because the process for changing an ordinance or building can be long and arduous, and local elected officials may not have the political will to require their contributors to make such changes. Douglas County is one community where planners have asked developers to voluntarily consider installing conduit in certain projects. These requests were ignored, as developers did not want to undertake any additional work or expense. It was their recommendation that the state initiate legislation that would grant local planners the ability to request inclusion of conduit as part of the utility design in certain projects, as defined by the local government.
[140] *Connecting 21st Century Communities, A policy Agenda for Broadband Stakeholders*, July 2015.

"fiber ready" residential and commercial sites, the path to increased access will lie with the developer, and the ISP, both of whom will receive a return on the investment.

RECOMMENDATION #7

Assign one agency to house all Indefeasible Right of Use (IRUs) and/or Trade Agreements executed by state agencies and higher education regarding the state's broadband and fiber assets, and initiate legal review of state IRUs and/or trade agreements by counsel at least three years prior to the expiration of same.

Currently, the state's fiber assets are controlled by Irrevocable Right to Use (IRU) agreements. Contained in the IRUs are the rights, duties, limitations and restrictions of the user (i.e. the state agencies that are the party to the IRU). Most IRUs are for 20 to 25 years and create a vested property right for the duration of the IRU. In addition, NSHE has entered into a number of other IRUs and trade agreements in the south to provide connectivity to schools and higher education institutions and strengthen the state network. Currently, no one agency houses these IRUs, making it more difficult to understand the broadband landscape, scope and limitations of the state's fiber assets. Further, one agency may not know what assets another possesses, or what restrictions are placed on these assets. By housing all IRUs with one agency, it makes the task of understanding the nature and extent of the state's assets easier, and will reduce the information silos that currently exist.

This recommendation also allows the state adequate time to initiate a review of these contracts prior to their expiration. Some IRUs will automatically renew and this may or may not be in the state's best interest. Based on discussions with the Attorney General's office, the consensus is that state IRUs and trade agreements concerning fiber assets should be brought before legal counsel for review at least three years prior to their expiration to evaluate whether they should be automatically renewed, modified or terminated.

RECOMMENDATION #8

Include certain broadband fiber assets on the list of infrastructure documents that could potentially be deemed confidential at the Governor's discretion pursuant to NRS 239C.210. .[141]

[141] NRS 239C.210 Confidentiality of certain documents, records or other items of information upon declaration of Governor; penalties; decennial review.

1. A document, record or other item of information described in subsection 2 that is prepared and maintained for the purpose of preventing or responding to an act of terrorism is confidential, not subject to subpoena or discovery, not subject to inspection by the general public and may only be inspected by or released to:

(a) Public safety and public health personnel; and

(b) Except as otherwise provided in this subsection, the Legislative Auditor conducting a post audit pursuant to NRS 218G.010 to 218G.555, inclusive, if the Governor determines, by executive order, that the disclosure or release of the document,

Currently, there is no statutory definition for "critical infrastructure." The only place the definition can be found is on the Nevada Department of Emergency Management Website, which defines critical infrastructure as, "*systems, assets, and services that are necessary to ensure security, safety, and health. Critical infrastructure supports the region's economy and maintains public confidence. Destruction or compromise of any of these systems or services would have a debilitating impact on the area either directly, through interdependencies or from cascading effects*."

Assembly Bill 239, passed in the 2015 Legislative Session, did establish a new definition for "critical facility," as a "*petroleum refinery, a petroleum or chemical production, transportation, storage or processing facility, a chemical manufacturing facility, a pipeline and any appurtenance thereto, a wastewater treatment facility, a water treatment facility, a mine as that term is defined in NRS 512.006, a power generating station, plant or substation and any appurtenances thereto, any transmission line that is owned in whole or in part by an electric utility as that term is defined in subsection 5 of NRS 704.187, a county, city or town jail or detention facility and any prison, facility or institution under the control of the Department of Corrections. The term does not include any facility or infrastructure of a utility that is located underground."*

At issue is whether the state should consider long-haul fiber, or certain other fiber assets that support the long haul fiber, as critical or sensitive infrastructure so as to limit what type of information can be disseminated by state agencies. Currently, any maps, plans, or schematics of fiber components now in the possession of a state agency can be disseminated to the public via public records requests.

This information should be deemed sensitive infrastructure because of its role in supporting communications and information. Data-reliant applications have redefined broadband into a key service necessary to conduct aspects of everyday life, and for public safety these applications stretch even further. Fiber back haul has offered the capability to transmit sensitive data in a timely manner to ensure first responders, critical utilities and other governmental agencies have access to

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record or other item of information would thereby create a substantial likelihood of compromising, jeopardizing or otherwise threatening the public health, safety or welfare. Any information that is inspected by or released to the Legislative Auditor pursuant to this subsection is not subject to the exception from confidentiality set forth in NRS 218G.130. The Legislative Auditor may confirm that vulnerability assessments have been submitted to or are in the possession of a state agency that is the subject of a postaudit, but the assessments must not be inspected by or released to the Legislative Auditor. An employee of the Audit Division of the Legislative Counsel Bureau who is conducting a postaudit that includes access to documents or information subject to the provisions of this section must be properly cleared through federal criteria or state or local background investigation and instructed, trained or certified, as applicable, regarding the security sensitivity of the documents or information.

2. The types of documents, records or other items of information subject to executive order pursuant to subsection 1 are as follows:

(a) Assessments, plans or records that evaluate or reveal the susceptibility of fire stations, police stations and other law enforcement stations to acts of terrorism or other related emergencies.

(b) Drawings, maps, plans or records that reveal the critical infrastructure of primary buildings, facilities and other structures used for storing, transporting or transmitting water or electricity, natural gas or other forms of energy.

(c) ….. (g)

critical information in real time. When fiber lines are compromised or damaged, (particularly those fiber lines that lack redundancy and cannot re-route traffic) basic communications essential to government operations and public safety can cease.

Currently, NRS 239C.210 only provides that drawings, maps, plans or records that reveal the critical infrastructure of primary buildings, facilities and other structures used for storing, transporting or transmitting water or electricity, natural gas or other form of energy, may be deemed confidential. The Task Force recommends that this statute be expanded to include certain fiber assets, or other broadband infrastructure, thereby allowing such information to be deemed confidential at the Governor's discretion and withheld from public disclosure by a state agency.

RECOMMENDATION #9

Establish a state funding source to provide matching funds required to enable Nevada's non-profit rural health clinics and hospitals to competitively pursue annual federal grants to help expand the use and delivery of telemedicine and distance learning.

Each year the United States Department of Agriculture, Rural Utilities Services, offers a Distance Learning and Telemedicine Grant that awards from $50,000 to $500,000 to support telemedicine and distance learning and training. In addition, there are many more federal grants that support broadband deployment, access and utilization. In order to be competitive for these grants, our rural non-profit hospitals and clinics must find 30 percent of the matching funds

For reasons set forth in this report, these grants have not been pursued with any regularity because non-profit health care providers operate on thin margins and struggle to find extra funds for the state match. Under this recommendation, if a 30 percent match is required, the applicant should be required to come up with one-half (15 percent) and the state provide the other half of the match (remaining 15 percent). Providing matching funds will enable our non-profit rural hospitals and health care clinics to competitively pursue these annual grants specifically designed to promote, pay for and develop telemedicine in rural and frontier communities. If the state could appropriate $100,000 each year, it would enable our rural health care providers to pursue more than $300,000 in federal funds to pay for telemedicine equipment and the technology required to operate it.

APPENDIX A
TERMS, DEFINITIONS & ACRONYMS

3G Wireless - Third Generation - Refers to the third generation of wireless cellular technology. It has been succeeded by 4G wireless. Typical speeds reach about 3 Mbps.

4G Wireless - Fourth Generation - Refers to the fourth generation of wireless cellular technology. It is the successor to 2G and 3G. Typical implantations include LTE, WiMax, and others. Maximum speeds may reach 100 Mbps, with typical speeds over 10 Mbps.

5G Wireless – Fifth Generation – Refers to fifth generation of wireless cellular technology.

A

ARRA – American Recovery and Reinvestment Act.

ADSL – Asymmetric Digital Subscriber Line - DSL service with a larger portion of the capacity devoted to downstream communications, less to upstream. Typically thought of as a residential service.

ATM – Asynchronous Transfer Mode - A data service offering by ASI that can be used for interconnection of customers' LAN. ATM provides service from 1 Mbps to 145 Mbps utilizing Cell Relay Packets.

B

Bandwidth – The amount of data transmitted in a given amount of time; usually measured in bits per second, kilobits per second, and megabits per second.

BIP – Broadband Infrastructure Program - Part of the American Recovery and Reinvestment Act (ARRA), BIP is the program created by the U.S. Department of Agriculture focused on expanding last mile broadband access.

Bit – A single unit of data, either a one or a zero. In the world of broadband, bits are used to refer to the amount of transmitted data. A kilobit (Kb) is approximately 1,000 bits. A megabit (Mb) is approximately 1,000,000 bits.

BPL – Broadband Over Powerline - An evolving theoretical technology that provides broadband service over existing electrical power lines.

BPON – Broadband Passive Optical Network - A point-to-multipoint fiber-lean architecture network system which uses passive splitters to deliver signals to multiple users. Instead of running

a separate strand of fiber from the CO to every customer, BPON uses a single strand of fiber to serve up to 32 subscribers.

Broadband – A descriptive term for evolving digital technologies that provide consumers with integrated access to voice, high-speed data service, video-demand services, and interactive delivery services (e.g. DSL, cable Internet).

BTOP – Broadband Technology Opportunities Program - Part of the American Recovery and Reinvestment Act (ARRA), BTOP is the program created by the U.S. Department of Commerce focused on expanding broadband access, expanding access to public computer centers, and improving broadband adoption.

C

Cable Modem – A modem that allows a user to connect a computer to the local cable system to transmit data rather than video. It allows broadband services at speeds of five Mbps or higher.

CAP – Competitive Access Provider - (or "Bypass Carrier") A company that provides network links between the customer and the Inter-Exchange Carrier or even directly to the Internet Service Provider. CAPs operate private networks independent of Local Exchange Carriers.

Cellular – A mobile communications system that uses a combination of radio transmission and conventional telephone switching to permit telephone communications to and from mobile users within a specified area.

CLEC – Competitive Local Exchange Carrier - Wireline service provider that is authorized under state and federal rules to compete with ILECs to provide local telephone and Internet service. CLECs provide telephone services in one of three ways or a combination thereof: a) by building or rebuilding telecommunications facilities of their own, b) by leasing capacity from another local telephone company (typically an ILEC) and reselling it, or c) by leasing discreet parts of the ILEC network referred to as UNEs.

CMTS – Cable Modem Termination System - A component (usually located at the local office or head end of a cable system) that exchanges digital signals with cable modems on a cable network, allowing for broadband use of the cable system.

CO – Central Office - A circuit switch where the phone and DSL lines in a geographical area come together, usually housed in a small building.

Coaxial Cable – A type of cable that can carry large amounts of bandwidth over long distances. Cable TV and cable modem broadband service both utilize this technology.

Community Anchor Institutions (CAI) – Institutions that are based in a community and larger user of broadband. Examples include schools, libraries, healthcare facilities, and government institutions.

CWDM – Coarse Wavelength Division Multiplexing - Multiplexing (more commonly referred to as WDM) with less than 8 active wavelengths per fiber.

D

Dial-Up – A technology that provides customers with access to the Internet over an existing telephone line. Dial-up is much slower than broadband.

DLEC - Data Local Exchange Carrier - DLECs deliver high-speed access to the Internet, not voice. DLECs include Covad, Northpoint, and Rhythms.

Downstream – Data flowing from the Internet to a computer (surfing the net, getting e-mail, downloading a file).

DSL – Digital Subscriber Line - The use of a copper telephone line to deliver "always on" broadband Internet service.

DSLAM – Digital Subscriber Line Access Multiplier - A piece of technology installed at a telephone company's CO that connects the carrier to the subscriber loop (and ultimately the customer's PC).

DWDM – Dense Wavelength Division Multiplexing - A SONET term which is the means of increasing the capacity of SONET fiber-optic transmission systems, to allow multiple users on a single optical fiber.

E

E-rate – A federal program that provides subsidy for voice and data lines to qualified schools, hospitals, Community-Based Organization (CBOs), and other qualified institutions. The subsidy is based on a percentage designated by the FCC.

Ethernet – A local area network (LAN) standard developed for the exchange data with a single network. It allows for speeds from 10 Mbps to 10 Gbps. Technology changes are allowing for faster speeds.

EON – Ethernet Optical Network - The use of Ethernet LAN packets running over a fiber network.

EvDO – Evolution Data Only - A new wireless technology that provides data connections that are 10 times faster than a regular modem.

F

FCC – Federal Communications Commission - A federal regulatory agency that is responsible for, among other things, providing oversight and limited regulation over broadband and VoIP.

Fixed Wireless Broadband – The operation of wireless devices or systems for broadband use at fixed locations such as homes or offices.

Franchise Agreement - An agreement between a cable provider and a government entity that grants the provider the right to serve cable and broadband services to a particular area - typically a city, county, or state.

FTTH – Fiber-To-The-Home - Another name for Fiber-To-The-Premises, where fiber optic cable is pulled directly to an individual's residence or building allowing for extremely high broadband speeds.

FTTN – Fiber-To-The-Neighborhood - A hybrid network architecture involving optical fiber from the carrier network, terminating in a neighborhood cabinet that converts the signal from optical to electrical.

FTTP – Fiber-To-The-Premise (Or FTTB – Fiber-To-The-Building) - A fiber optic system that connects directly from the carrier network to the user premises.

G

Gbps – Gigabits per second - 1,000,000,000 bits per second or 1,000 Mbps. A measure of how fast data can be transmitted.

GPON – Gigabyte-Capable Passive Optical Network - Uses a different, faster approach (up to 2.5 Gbps in current products) than BPON.

GPS – Global Positioning System - A system using satellite technology that allows an equipped user to know exactly where he is anywhere on earth.

GSM – Global System for Mobile Communications - This is the current radio/telephone standard in Europe and many other countries except Japan and the United States.

H

HFC – Hybrid Fiber Coaxial Network - An outside plant distribution cabling concept employing both fiber optic and coaxial cable.

Hotspot – See Wireless Hotspot.

I

IEEE – Institute of Electrical and Electronics Engineers (pronounced "Eye-triple-E.").

ILEC – Incumbent Local Exchange Carrier - The traditional wireline telephone service providers within defined geographic areas. They typically provide broadband Internet service via DSL

technology in their area. Prior to 1996, ILECs operated as monopolies having the exclusive right and responsibility for providing local and local toll telephone service within LATAs.

IoT – Internet of Things – Refers to a network of physical objects—devices, vehicles, buildings and other items—embedded with electronics, software, sensors, and network connectivity that enables these objects to collect and exchange data and "communicate" with each other. The IoT allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit when IoT is augmented with sensors and actuators. It also encompasses "machine-to-machine" communications, such as smart phones communicating with homes, refrigerators, cars, autonomous transportation and "smart cities." By 2020, experts estimate that the IoT will consist of almost 50 billion objects.

IP-VPN – Internet Protocol - Virtual Private Network - A software-defined network having the appearance, functionality, and usefulness of a dedicated private network.

ISDN – Integrated Services Digital Network - An alternative method to simultaneously carry voice, data, and other tracks, using the switched telephone network.

ISP – Internet Service Provider - A company providing Internet access to consumers and businesses, acting as a bridge between customer (end-user) and infrastructure owners for dial-up, cable modem, and DSL services.

K

Kbps – Kilobits per second - 1,000 bits per second. A measure of how fast data can be transmitted.

L

LAN – Local Area Network - A geographically localized network consisting of both hardware and software. The network can link workstations within a building or multiple computers with a single wireless Internet connection.

LATA – Local Access and Transport Areas - A geographic area within a divested Regional Bell Operating Company is permitted to offer exchange telecommunications and exchange access service. Calls between LATAs are often thought of as long-distance service. Calls within a LATA (IntraLATA) typically include local and local toll telephone services.

Local Loop – A generic term for the connection between the customer's premises (home, office, etc.) and the provider's serving central office. Historically, this has been a wire connection; however, wireless options are increasingly available for local loop capacity.

Low Income – Low income is defined by using the poverty level as defined by the U.S. Census Bureau. A community's low-income percentage can be found at www.census.gov.

M

MAN – Metropolitan Area Network - A high-speed date intra-city network that links multiple locations with a campus, city, or LATA. A MAN typically extends as far as 50 kilometers (or 31 miles).

Mbps – Megabits per second - 1,000,000 bits per second. A measure of how fast data can be transmitted.

Metro Ethernet – An Ethernet technology-based network in a metropolitan area that is used for connectivity to the Internet.

Multiplexing – Sending multiple signals (or streams) of information on a carrier (wireless frequency, twisted pair copper lines, fiber optic cables, coaxial, etc.) at the same time. Multiplexing, in technical terms, means transmitting in the form of a single, complex signal and then recovering the separate (individual) signals at the receiving end.

N

NDOT – Nevada Department of Transportation

NSHE – Nevada System of Higher Education

NTIA - National Telecommunications and Information Administration, which is housed within the United States Department of Commerce.

NIST - National Institute of Standards and Technology.

O

Overbuilders – Building excess capacity. In this context, it involves investment in additional infrastructure projects to provide competition.

OVS – Open Video Systems - A new option for those looking to offer cable television service outside the current framework of traditional regulation. It would allow more flexibility in providing service by reducing the build-out requirements of new carriers.

P

PON – Passive Optical Network - A Passive Optical Network consists of an optical line terminator located at the Central Office and a set of associated optical network terminals located at the customer's premises. Between them lies the optical distribution network comprised of fibers and passive splitters or couplers.

R

ROW - Right-of-Way – A legal right of passage over land owned by another. Carriers and service providers must obtain right-of-way to dig trenches or plant poles for cable and telephone systems and to place wireless antennae.

RPR – Resilient Packet Ring - Uses Ethernet switching and a dual counter-rotating ring topology to provide SONET-like network resiliency and optimized bandwidth usage, while delivering multi-point Ethernet/IP services. RUS - Rural Utility Service - A division of the United States Department of Agriculture that promotes universal service in unserved and underserved areas of the country through grants, loans, and financing.

S

Satellite – Satellite brings broadband Internet connections to areas that would not otherwise have access, even the most rural of areas. Historically, higher costs and lower reliability have prevented the widespread implementation of satellite service, but providers have begun to overcome these obstacles, and satellite broadband deployment is increasing. A satellite works by receiving radio signals sent from the Earth (at an uplink location also called an Earth Station) and resending the radio signals back down to the Earth (the downlink). In a simple system, a signal is reflected, or "bounced," o the satellite. A communications satellite also typically converts the radio transmissions from one frequency to another so that the signal getting sent down is not confused with the signal being sent up. The area that can be served by a satellite is determined by the "footprint" of the antennas on the satellite. The "footprint" of a satellite is the area of the Earth that is covered by a satellite's signal. Some satellites are able to shape their footprints so that only certain areas are served. One way to do this is by the use of small beams called "spot beams." Spot beams allow satellites to target service to a specific area, or to provide different service to different areas.

SBI – State Broadband Initiatives, formerly known as the State Broadband Data & Development (SBDD) Program.

SONET – Synchronous Optical Network - A family of fiber-optic transmission rates.

Streaming – A Netscape innovation that downloads low-bit text data first, then the higher bit graphics. This allows users to read the text of an Internet document first, rather than waiting for the entire file to load. Commonly used in conjunction with “video streaming.”

Subscribership – Subscribership is the number of customers that have subscribed for a particular telecommunications service.

Switched Network – A domestic telecommunications network usually accessed by telephones, key telephone systems, private branch exchange trunks, and data arrangements.

T

T-1 - Trunk Level 1 – A digital transmission link with a total signaling speed of 1.544 Mbps. It is a standard for digital transmission in North America.

T-3 - Trunk Level 3 – 28 T1 lines or 44.736 Mbps.

U

UDOT – Utah Department of Transportation

UEN – Utah Education Network

UETN – Utah Education and Telehealth Network – Created by legislative action in 2014, after merging the Utah Education Network with the Utah Telehealth Network. This network serves as the education consortium for pursuing E-rate funding and other federal funding for telehealth/telemedicine opportunities in Utah.

UNE – Unbundled Network Elements - Leased portions of a carrier's (typically an ILEC's) network used by another carrier to provide service to customers.

Universal Service – The idea of providing every home in the United States with basic telephone service.

Universal Service Fund – A system of telecommunications subsidies and fees managed by the United States Federal Communications Commission to promote universal access to telecommunications services in the United States. The FCC established the fund in 1997 in compliance with the Telecommunications Act of 1996. The fund is supported by charging telecommunications companies a fee which is set quarterly. As of the first quarter of 2016, the rate is 18.2 percent of telecom company's interstate and international end-user revenues. These funds serve four constituent programs: The Connect America Fund, Low Income (Lifeline), Rural Health Care Program, and Schools & Libraries Program (E-Rate).

Upstream – Data flowing from your computer to the Internet (sending e-mail, uploading a file).

V

VDSL (or VHDSL) – Very High Data Rate Digital Subscriber Line - A developing technology that employs an asymmetric form of ADSL with projected speeds of up to 155 Mbps. Video On Demand - A service that allows users to remotely choose a movie from a digital library and be able to pause, fast-forward, or even rewind their selection. VLAN - Virtual Local Area Network - A network of computers that behave as if they were connected to the same wire even though they may be physically located on different segments of a LAN.

VoIP – Voice over Internet Protocol - A new technology that employs a data network (such as a broadband connection) to transmit voice conversations.

VPN – Virtual Private Network - A network that is constructed by using public wires to connect nodes. For example, there are a number of systems that enable one to create networks using the Internet as the medium for transporting data. These systems use encryption and other security mechanisms to ensure that only authorized users can access the network and that the data cannot be intercepted.

Vulnerable Groups – Vulnerable groups will vary by community, but typically include low-income, minority, senior, children, etc.

W

WAN – Wide Area Network - A communications system that utilizes cable systems, telephone lines, wireless, and other means to connect multiple locations together for the exchange of data, voice, and video.

Wi-Fi – Wireless Fidelity - A term for certain types of wireless local networks (WLANs) that uses specifications in the IEEE 802.11 family.

WiMax – A wireless technology that provides high-throughput broadband connections over long distances. WiMax can be used for a number of applications, including last mile broadband connections, hotspots, and cellular backhaul and high-speed enterprise connectivity for businesses.

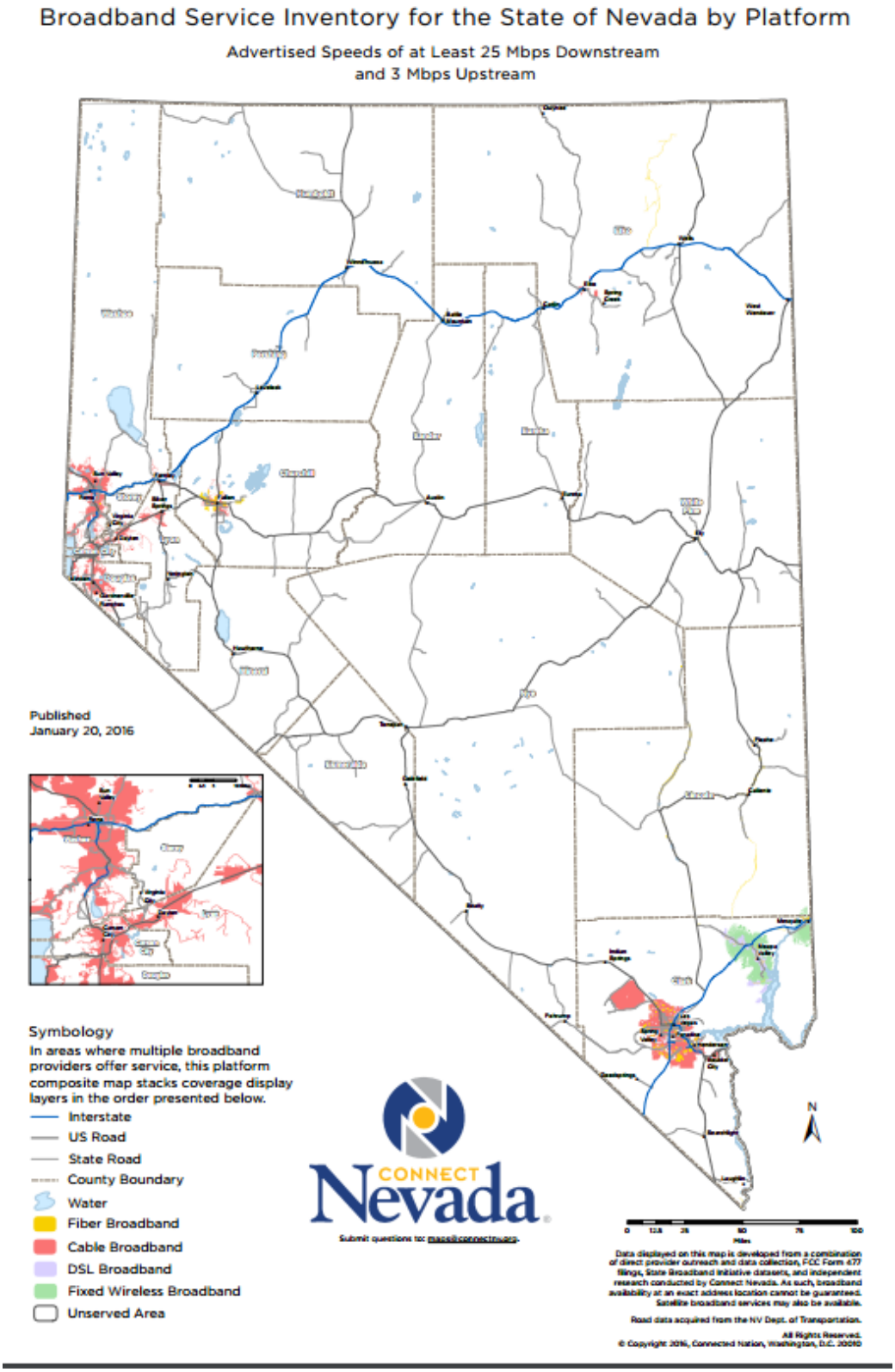
Wireless Hotspot – A public location where Wi-Fi Internet access is available for free or for a small fee. These could include airports, restaurants, hotels, coffee shops, parks, and more.

Wireless Internet – 1) Internet applications and access using mobile devices such as cell phones and palm devices. 2) Broadband Internet service provided via wireless connection, such as satellite or tower transmitters.

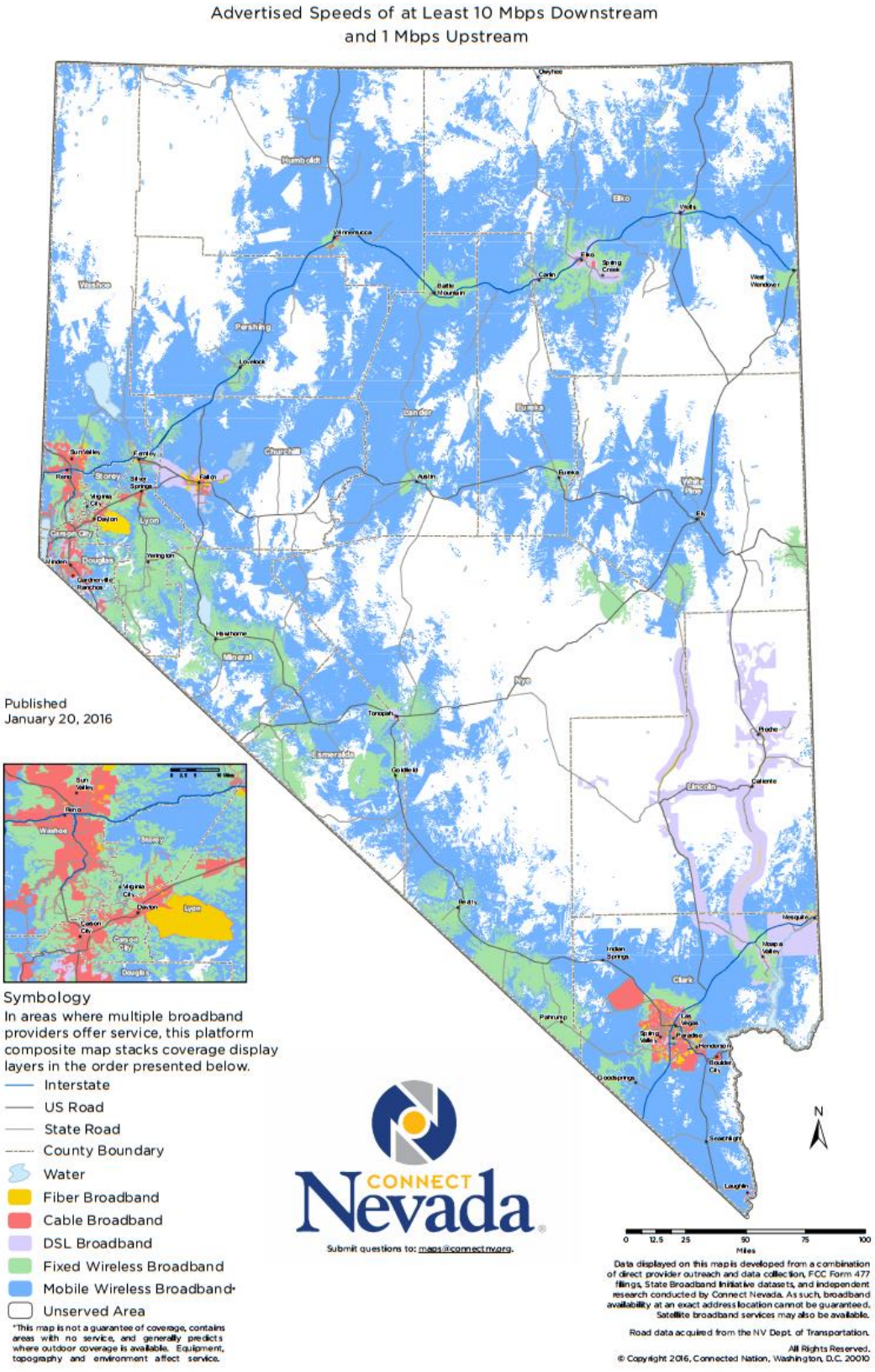
Wireline – Service based on infrastructure on or near the ground, such as copper telephone wires or coaxial cable underground, or on telephone poles.

WISP – Wireless Internet Service Provider

APPENDIX B:
2016 ADVERTISED SPEEDS IN NEVADA 25 MBPS / 3 MBPS



APPENDIX C:
BROADBAND SERVICE INVENTORY FOR THE STATE OF NEVADA BY PLATFORM

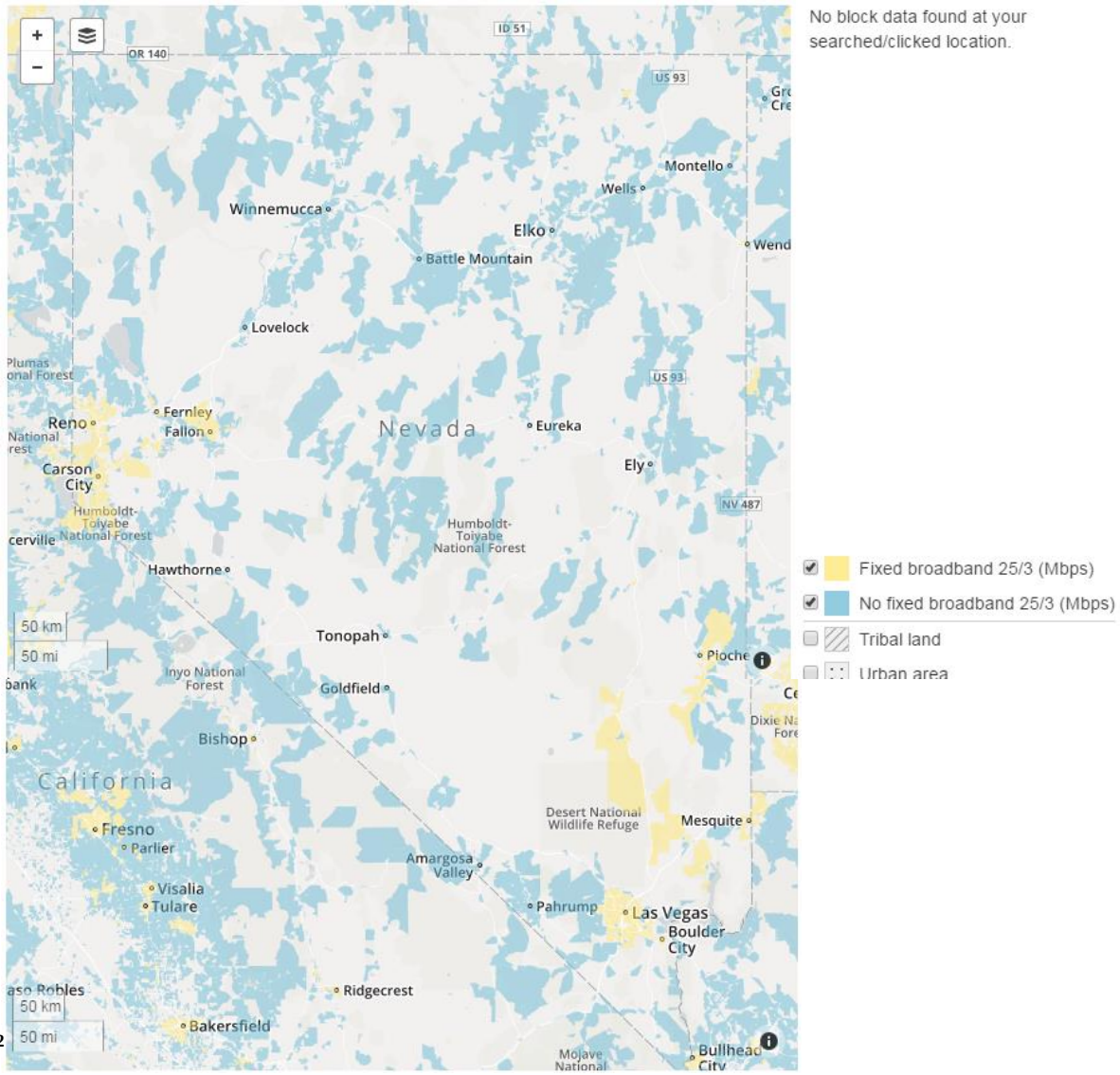


APPENDIX D:
RESIDENTIAL FIXED 25 MBPS/3 MBPS BROADBAND DEPLOYMENT

Residential Fixed 25 Mbps/3 Mbps Broadband Deployment (2016 Broadband Progress Report)

This map shows where fixed residential broadband services of at least 25 Mbps download and 3 Mbps upload is deployed and where it is not deployed. Enter an address to see the list of providers that offer residential services in the census block area, each provider's maximum advertised residential speed, and demographic data for the county associated with the Census block. Tribal lands and urban areas can be displayed by clicking the appropriate box in the legend. Click on the symbol in the upper left hand corner next to + and – to change the view from a street view to a satellite or a terrain view. Areas without population are shown without color.

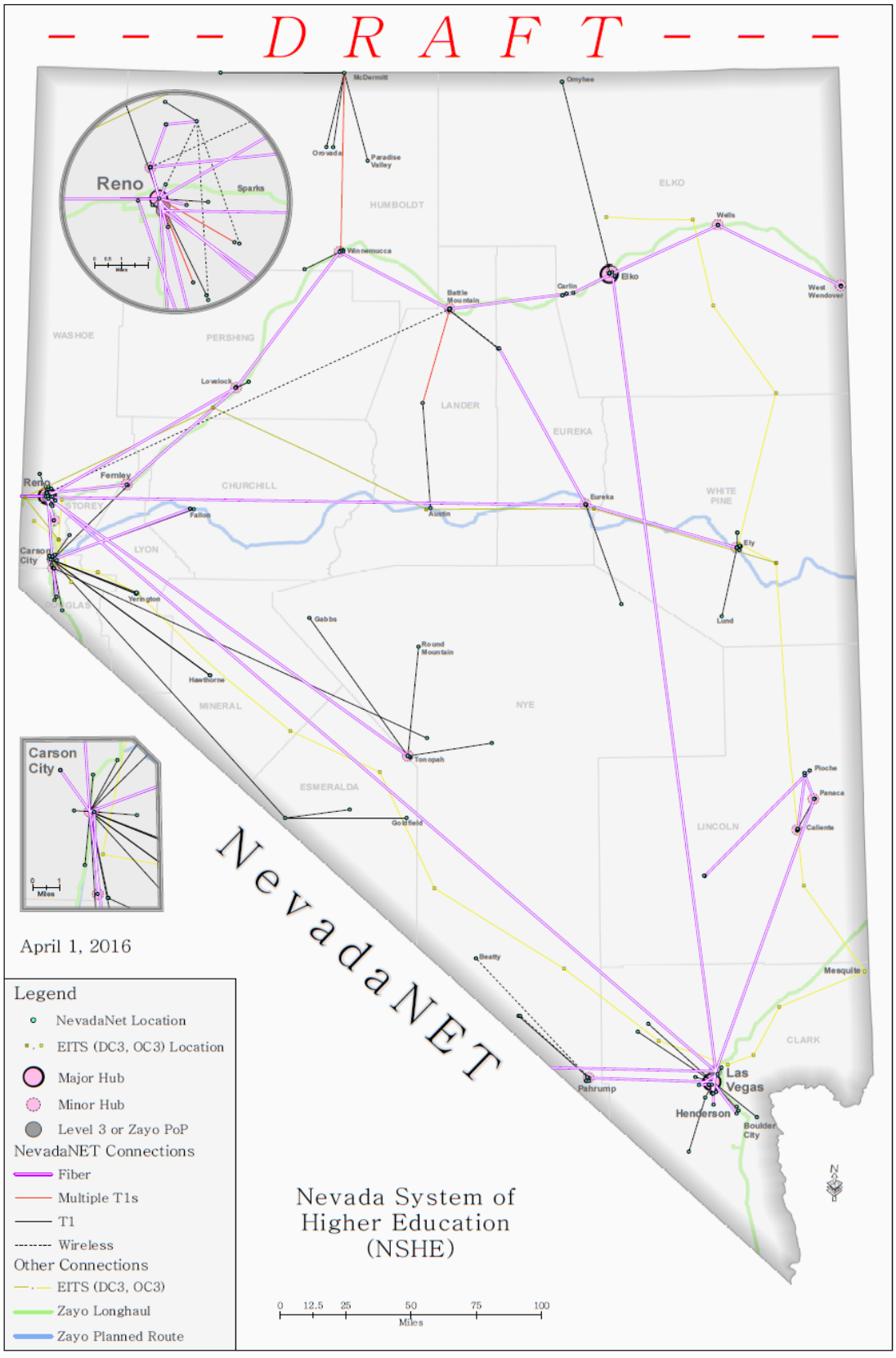
For more information, visit https://www.fcc.gov/reports-research/reports/broadband-progress-reports/2016-broadband-progress-report.



142

142 https://www.fcc.gov/reports-research/maps/bpr-2016-fixed-25mbps-3mbps-deployment

APPENDIX E:
PRELIMINARY MAP OF NEVADANET



APPENDIX F:
NSHE / NEVADANET – GROWTH

This graph depicts NSHE commodity Internet usage. Note that traffic loading doubles every two years.