Washington State Joint Transportation Committee Study

Broadband Access to State Highway Right of Way Study

Chapter 1: Evaluation of Current State Broadband Infrastructure Goals

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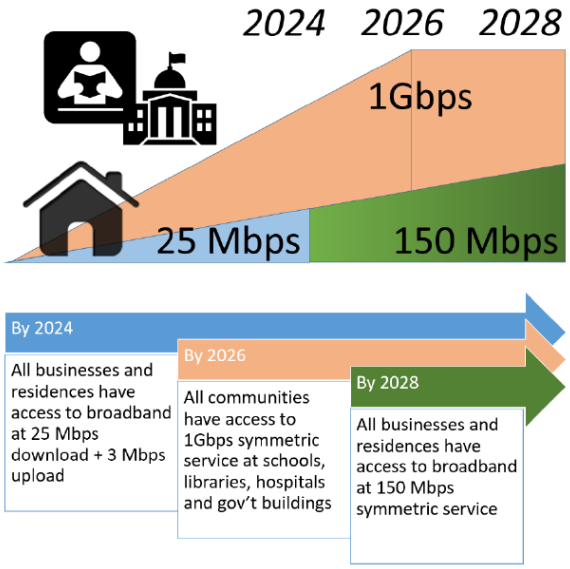
Chapter 1 – Introduction and Purpose

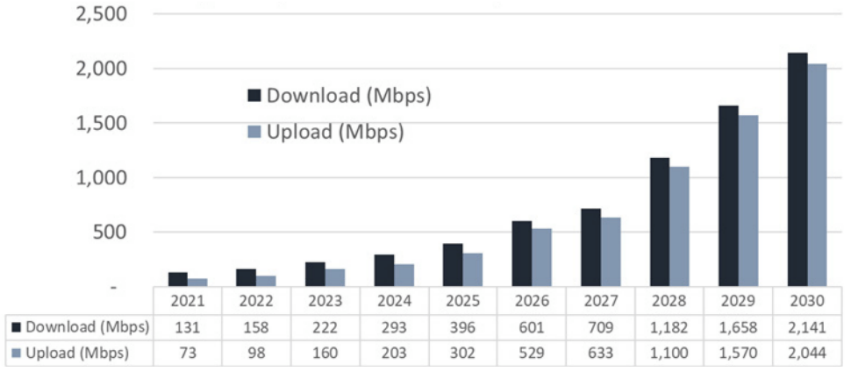
This study commissioned by ESHB 1457 in 2021 in order to facilitate the development of right of way ("ROW") related strategies towards universal broadband access. In 2019, the Washington State Legislature enacted Second Substitute Senate Bill 5511 creating the Statewide Broadband Office in the Department of Commerce and set the following goals for the Statewide Broadband Office.



Washington's Broadband Goals and Demand for Broadband Service

The broadband demand drivers for residential use include the number of devices per household, increased adoption of telecommuting and remote services including telemedicine and e-education, use cases that require voice and video transmission, adoption of smart home applications and gaming. Research commissioned by the Fiber Broadband Association (FBA) indicates that in the short term a household of four requires 131/73 Mbps of bandwidth and this bandwidth requirement will grow to 2,141/2,044 Mbps by 2030.

PROJECTED PEAK BANDWIDTH REQUIREMENTS - HOUSEHOLD OF 4



	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Download (Mbps)	131	158	222	293	396	601	709	1,182	1,658	2,141
Upload (Mbps)	73	98	160	203	302	529	633	1,100	1,570	2,044

- Does not include Robotics
- Early adopters, Radiologists, Power Users/Gamers, others may require much more

Source: Fiber Broadband Association Technology Committee

The current expectation is that the internet speed requirements of residential customers is likely to grow from 25/3 Mbps presently to 2 Gbps symmetrical service by 2030 and beyond as summarized in the table below. This expectation continues to evolve and will be influenced by technology disruptions, range of applications and growth in the number of a connected devices.

2021-2024	2025-2028	2029 and Beyond
25 / 3 Mbps to 100 / 25 Mbps	100 / 50 Mbps to 150 / 150 Mbps	1 Gbps / 500 Mbps to 2 / 2 Gbps

Furthermore, the broadband demand for institutional use is fundamentally driven by the population that these institutions serve. This demand is influenced further by increased use of remote services including distance education and telehealth services, use of private networks and deployment of real time analytics.

Overall, the State's Broadband goals for achieving a 1 Gbps symmetrical connection by 2028 for community anchor institutions and achieving a 150 Mpbs symmetric service for residential and business use are consistent with short/medium term use cases for broadband connectivity.

Current State of Broadband Technology

The broadband technology options to homes and businesses are wireline including fiber optic networks, fixed wireless, and satellite internet services as described below.

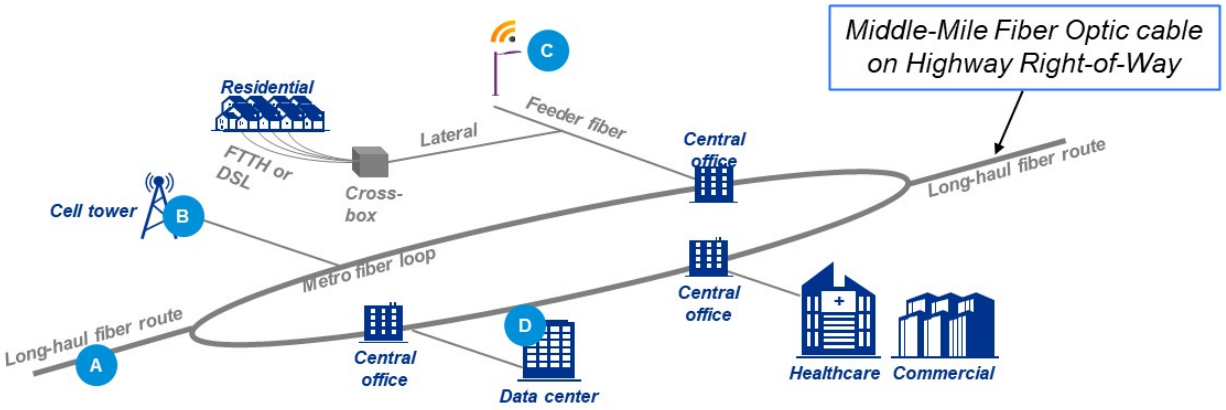
1. **Wireline**: Connect homes and businesses through a wired connection (i.e., coaxial cables, fiber optic network). These connections run from the central distribution point to a local access points, and then to the surrounding neighborhoods for last mile connections. Fiber optic technology is expected to be the only long-term wireline technology option.
2. **Fixed Wireless**: Connect homes and businesses through a fixed wireless system where the signal originating from a central distribution point are directed toward access points affixed to locations like cell towers and on top of a buildings antenna array that are between the distribution point and the customer utilizing radio links for connections.
3. **Satellite Based**: Connect homes and businesses through a satellite internet system where internet service is received through connecting to an orbiting satellite. The process involves transmitting signals from a dish to an orbiting satellite above the Earth's atmosphere. After the signal is received, it is beamed back to the Internet Service Provider's Network Operations Center (NOC) which is connected to the internet. Then the signal is transmitted to access points (i.e., receivers like a home satellite dish).

These technology options are outlined further below.

Wireline - Fiber Optic Network

Fiber technology uses fiber optic cable, which consists of very thin strands of glass that enable data to be transmitted as pulses of light, delivering high internet speeds. Furthermore, fiber optic network underpins the broadband ecosystem and enables other broadband technologies – i.e., connects to cell tower, fiber to the home (FTTH) or small cell infrastructure. The broadband ecosystem and the central role fiber

technology plays is outlined in the figure below. The middle-mile networks supported by fiber technology can help support fixed wireless system as well as create points of presence ("PoP"s) that can make "last-mile" connectivity financially and operationally viable in rural and remote areas.



	A Fiber Providers	B Towers	C Small Cells	D Data Centers
Participant Description	Own the fiber routes and offer both lit and dark fiber services to enterprise, wholesale, and consumer segments	Steel beam structure that houses electronic equipment from carriers to transmit radio frequencies (RF)	Consist of small radio equipment and antennas that can be placed on structures such as streetlights, building sites, or poles	Data center is a physical facility that organizations use to house their critical applications and data.

Fiber Centrality

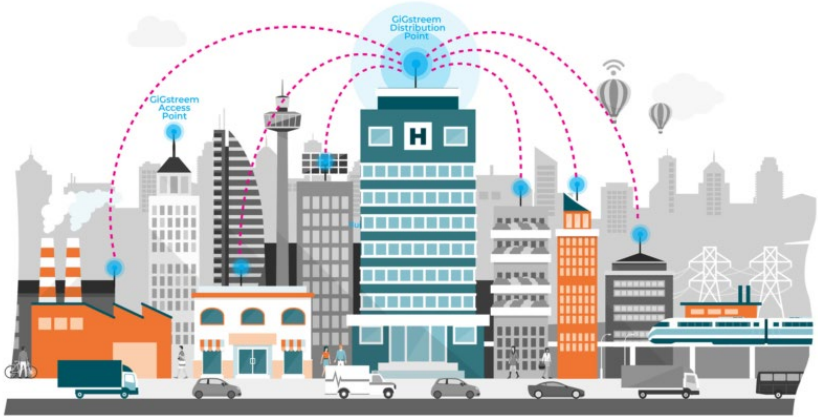
As compared to other telecommunication technology such as fixed wireless or satellite, a fiber optic network offers several advantages in terms of network speed, low latency, more reliable bandwidth, and higher performance. Fiber optic technology itself continues to develop alongside the increased demand for greater speed and efficiency. New devices called optical couplers and optical switches support a new communication trend called AON, or all-optical networks. This technology allows data to be transmitted without any electrical processing, which in turn can result in farther transmission distances.

Given the central role of fiber optic in the broadband ecosystem and use cases that fiber supports, telecom firms are transitioning their networks from copper coaxial cable to hybrid or fully fiber optic cable assemblies. The capacity of fiber optic cables in terms of data transmission continue to improve through sophisticated electronics. Additionally, fiber optic cables are typically designed for approximately a 40 year useful life, making them a suitable candidate to support the next generation of devices and related connectivity requirements.

Due to high cost of deployment (trenching and fiber deployment costs), the service providers are often not able to extend their FTTH services to remote areas and less populated communities. However, as the economics of these installations improve by private sector investment and public sector funding assistance, it is reasonable to expect increased FTTH services in the short and medium term.

Fixed Wireless:

Fixed wireless technology is one type of broadband connection that caters to consumers located in rural, and less populated areas, who are underserved by other types of technologies due to high cost of deployment.



Fixed wireless internet lets consumers in rural areas benefit from high-speed internet from local service providers. Fixed wireless speeds are usually slower as compared to fiber network speeds; however, they are comparable to other options such as cable and satellite. In some areas, fixed wireless service providers offer speeds of 100+ Mbps. Business-class fixed wireless plans are often much faster, with leading companies offering 500 Mbps symmetrical plans that rival dedicated fiber in terms of reliability, security, and speed of installation.

Fixed wireless systems consist of a radio transmitter that sends a signal on a combination of channels to numerous receivers, including homes and businesses. Each wireless technology operates on a different part of the radio spectrum. Digital versions of wireless cable promise to provide digital television, interactive services, high-speed internet access, and data-networking services. Breakthroughs in digital technology and digital compression now permit operators to increase dramatically the amount of data

that can be sent in a finite amount of spectrum. Fixed wireless access customers can be located between 2 and 20 miles from the wireless provider's network between the two locations. Fixed wireless provides internet-access at speeds ranging up to 150 Mbps. The fixed wireless radio access is dependent on the radio connection and the quality of the radio connection will determine the ultimate quality of service to the customer.

One of the benefits of fixed wireless broadband is its broad consumer availability. Service providers are not required to invest heavily in new cable and infrastructure, offering service to larger areas is often more cost effective. Wireless Internet Service Providers (WISP) are rapidly expanding the fixed wireless service in areas with a low concentration of wired options due to the flexible nature of fixed wireless deployment.

The fixed wireless system offers several advantages over satellite service in terms of weather conditions do not affect fixed wireless like they do satellite internet, there is virtually no lag time (i.e., low latency)

with fixed wireless as signal only travels between the receiver and the nearest tower; fixed wireless service providers often allow for very high caps (100GB or more) or no caps at all; and the consumers have access to reliable bandwidth.

The fixed wireless option comes with certain limitations in terms of requirement of a direct line of sight between location of the antenna at the consumer's premises and the ground station of the provider, network security concerns for a wireless service are somewhat different from a wired one, and severe storms can cause a slight reduction in download and upload speeds called "rain fade."

There are several types of new technologies under development that will make it easier for consumers to access the internet through fixed wireless services. Some providers have initiated wireless access that does not require line of sight radio connectivity. Since many customers may not have line of sight capabilities, this technology could create additional fixed wireless opportunities for consumers. Other providers are implementing systems that are easy for the customer to install and simply "plug and play." Going forward, emerging technologies such as 5G fixed wireless access (FWA) could replace Digital Subscriber Line (DSL) and Cable Modem – but fiber optic networks will still be critical in providing backhaul to such technologies.

Satellite:

Satellites are able to transmit data at very high speeds, but it was not until recently that consumer-friendly applications became popular. Data over satellite is not new; very small aperture terminal (VSAT) providers such as Gilat, PanAmSat, Comsat, and GE have been providing data connections to businesses for years. In many large business satellite-based offerings, the end user's terminal or satellite dish is capable of both sending and receiving data. Improvements to satellite technology may soon allow for much higher speeds, as well as drastically increased data limits, eliminating two of the main drawbacks of the service.

High-speed internet access via satellite provides consumers another wireless alternative and is well suited for businesses and consumers who cannot subscribe to traditional high speed internet access methods, such as people residing in rural, remote, or less populated areas. Over the past few years, a number of satellite companies have developed a line of service that fills the need for high speed internet connections in rural and remote locations. Using satellites that orbit far above the earth's atmosphere, companies are able to offer satellite internet access, including two-way internet service (the satellites both send and receive data) that is relatively affordable for residential customers and businesses.

The download and upload speed for satellite internet access depends on several factors including: the satellite internet provider, the consumer's line of sight to the orbiting satellite, and the weather condition. Typically, a consumer can expect to receive about 100 Mbps download speed and approximately 25 Mbps upload speed. Setting up satellite internet access can be more costly and more involved than obtaining high-speed internet access using DSL or Cable Modem. A user must have: a two or three foot dish (or base station as it is often called), a satellite internet modem, and a clear line of sight to the provider's satellite.

Satellite access to the internet is an alternative to DSL service and CM service, and in particular, its major advantage is its ability to reach areas that other alternatives cannot. There are several challenges with the satellite services including weather conditions affecting satellite internet more than fixed wireless. The line of sight is required for a satellite dish in order to see the satellite. In extreme weather conditions, the service may get impacted. The cost of satellite equipment and installation is higher as compared to other alternatives. Due to long haul satellite links, the transmission delay may be higher than other alternatives. The satellite internet services have a higher latency as compared to other options because the satellite is positioned much farther from the receiver.

Increased competition and new entrants like Starlink, OneWeb, Telesat and Amazon (Project Kuiper) internet service providers could be transformative for satellite internet going forward. With faster speeds, lower latency and unlimited data, Starlink and other service providers will assist residents of rural households who currently are unable to experience affordable, reliable and high-speed internet service.

Rural Connectivity Challenge: The speed, timeframe to deployment and overall cost dynamics for the various last mile broadband technology options are shown below.

Category	Fiber Optic	Fixed Wireless	Satellite
Potential Speed	Very High	High	Moderate to High
Cost per Access / 100 Mbps	Moderate to High	High	Very High (if available)
Deployment Speed	Low to Moderate	Moderate to High	High
Operating Expenses	Low	Moderate (High Electric Use)	Moderate to High

Achieving universal high-speed coverage could be challenging in the rural and remote areas. This is primarily due to high capital investment required, less than optimal return on investment potential, and operational challenges faced by the service providers.

This challenge can be addressed by advancing broadband infrastructure deployments leveraging incoming federal and state funding towards rural connectivity and by adopting middle mile strategies by leveraging WSDOT's ROW to enable last mile connectivity.

Role of Fiber Optic Networks in WSDOT's ROW

The following factors make fiber optic technology a potential option for deployment on WsDOT's ROW towards meeting the State's broadband goals.

Fiber Centrality: Fiber underpins the broadband ecosystem and supports other technology options including fixed wireless. Fiber is core to supporting the key elements including enabling long haul and middle mile connectivity as well as providing backhaul to cell towers and small cells to enable wireless technologies.

Supports Future Use Cases: Key characteristics such as high speeds, low latency, low attenuation, high reliability, and upstream/downstream symmetry make fiber technology apt for supporting the next generation of applications and connected devices.

Low Technology Obsolescence Risk: In addition to the centrality of fiber, continuous improvement to equipment and electronics as well as ability to strategically pull more fiber through existing infrastructure provide low cost scalability and low risk of obsolescence compared to alternatives.

Alignment with State DOT's ROW: The fiber technology plays a critical role in middle mile and long-haul connectivity in the broadband ecosystem. Given their continuous and strategic nature, WsDOT's highways are well suited to enable middle and long haul connectivity enabled by fiber technology.

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Disclaimer

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Washington State Joint Transportation Committee

Appendix A: Chapter 2 – Identify Expansion Opportunities

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Contents

Middle-Mile Assessment

Key Considerations for ROW Permit Application(s) Evaluation

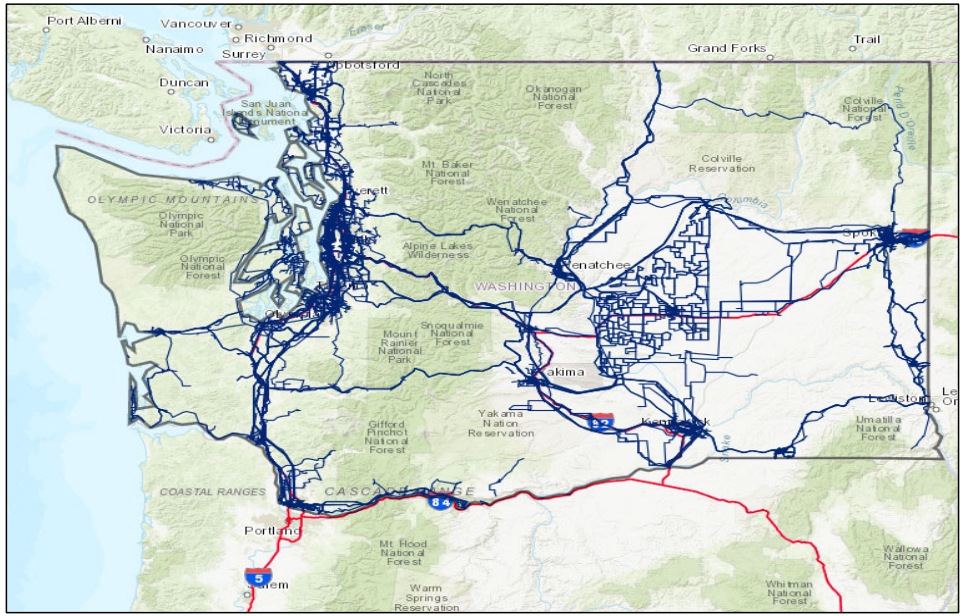
- Address long-term connectivity requirements of the public and private sector
  - ✓ Future proofing – i.e., ability to expand the network capacity in the future
  - ✓ Technical specifications
  - ✓ Performance requirements
- Open access network
  - ✓ Non-discriminatory access to all service providers and public agencies
- Compliance with state right-of-way access policies / procedures
  - ✓ Dig Once / Build Once
  - ✓ Fiber swap
  - ✓ Construction, operations and maintenance coordination with WSDOT
- Permit fees / compensation to the state

Determining Consumer Broadband Access

- Data Problem:
  - ✓ Presence of fiber does not necessarily mean open access
  - ✓ Telcos / carrier level data for existing fiber presence is proprietary
  - ✓ Multiple data sources (i.e., existing fiber presence, average internet speed, and number of service providers) are used for the analysis
- Can Estimate Coverage by looking at:
  - ✓ Where is Fiber located?
  - ✓ What are Broadband Speeds by location?
  - ✓ Where are open access providers?

Where is Fiber Located?

Current Fiber Optic Cable Coverage in Washington



Observations:

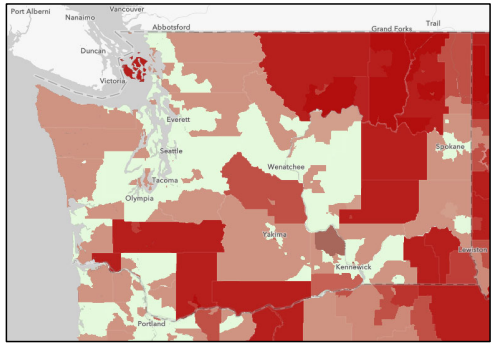
- Fiber presence shown represents proprietary private sector networks
- Not necessarily open access / non-discriminatory network(s) to serve public needs
- Analysis is leveraging multiple sources of data (fiber presence, internet speed and number of providers) to ascertain whether or not existing fiber optic networks can be leveraged for public use

Notes: Only includes fiber providers (and corresponding fiber mileage) within a 5-mile buffer range of interstate highways
Source: KPMG Analysis based on Publicly Available Information

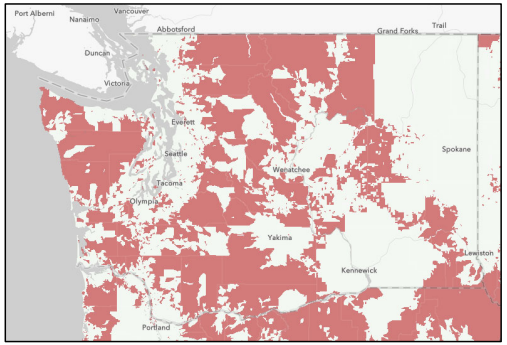
What are Broadband Speeds?

- FCC Form 407 Data
  - ✓ Widely recognized as unreliable – For example, FCC broadband score shows excellent coverage in Pend Oreille County
  - ✓ A composite score is calculated by aggregating the speeds of DSL, Cable, Broadband in the particular area adjusted by the mix of customers having these services
  - ✓ “Broadband Score” higher than 500 corresponds to >100/25 Mbps speed
- There are multiple metrics to measure average broadband speed
  - FCC broadband score
  - Ookla test
  - Microsoft device data
  - Washington Broadband Office survey

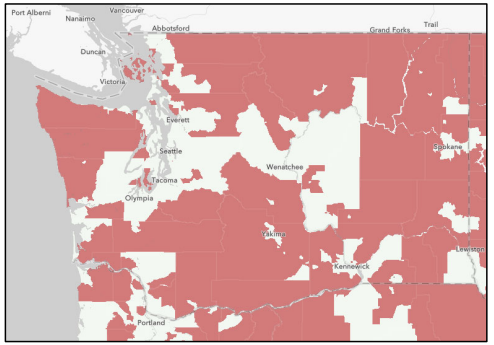
National Sources of Washington Broadband Speed Data



Source: National Telecommunications and Information Administration Data



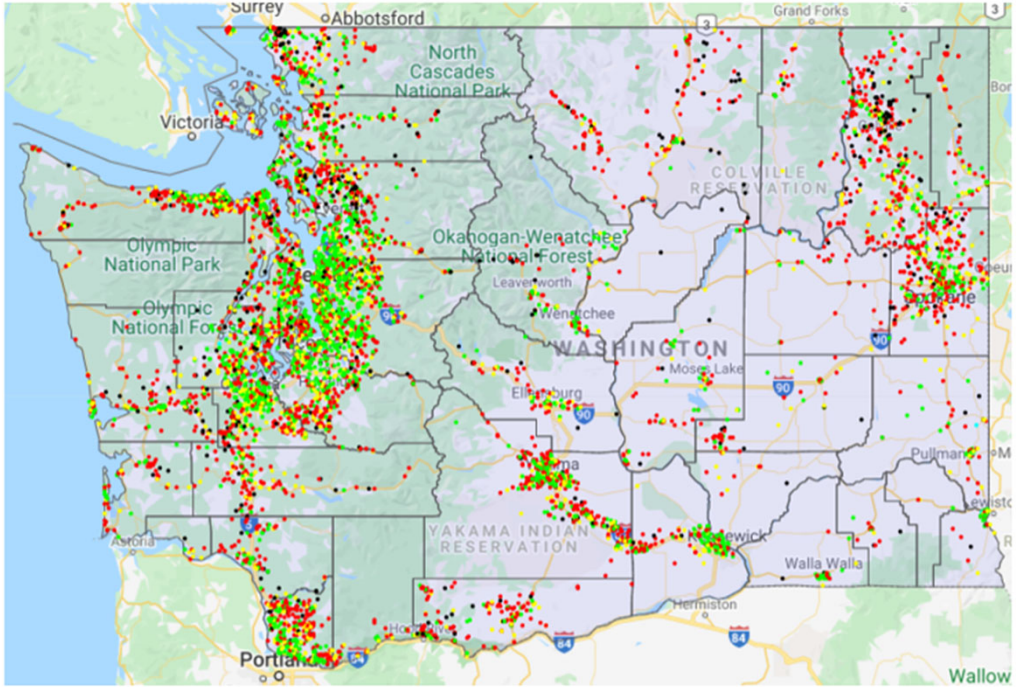
Source: FCC Form 477 Data - Fixed Broadband Services at 25/3 Mbps



Source: Ookla Median Speeds Fixed Broadband Below 25/3 Mbps (Census Tract)

- Each National Data Source has different strengths and weaknesses. Study looks to all sources to obtain aggregate estimate of coverage.

Office of Broadband Speed estimate



Broadband State and County Dashboards

Download

• No Service	5.9%
•0-10 Mbps	39.8%
•10-25 Mbps	18.6%
•25-150 Mbps	29.7%
•150+ Mbps	6.0%

Upload

No Service	5.9%
<3 Mbps	42.3%
3-10 Mbps	30.1%
10-25 Mbps	15.7%
25-150 Mbps	5.1%
> 150 Mbps	0.9%

Households	2,885,677
Population	6,724,540
Test locations	38,271
Total Tests	50,095

Reasons for No Service

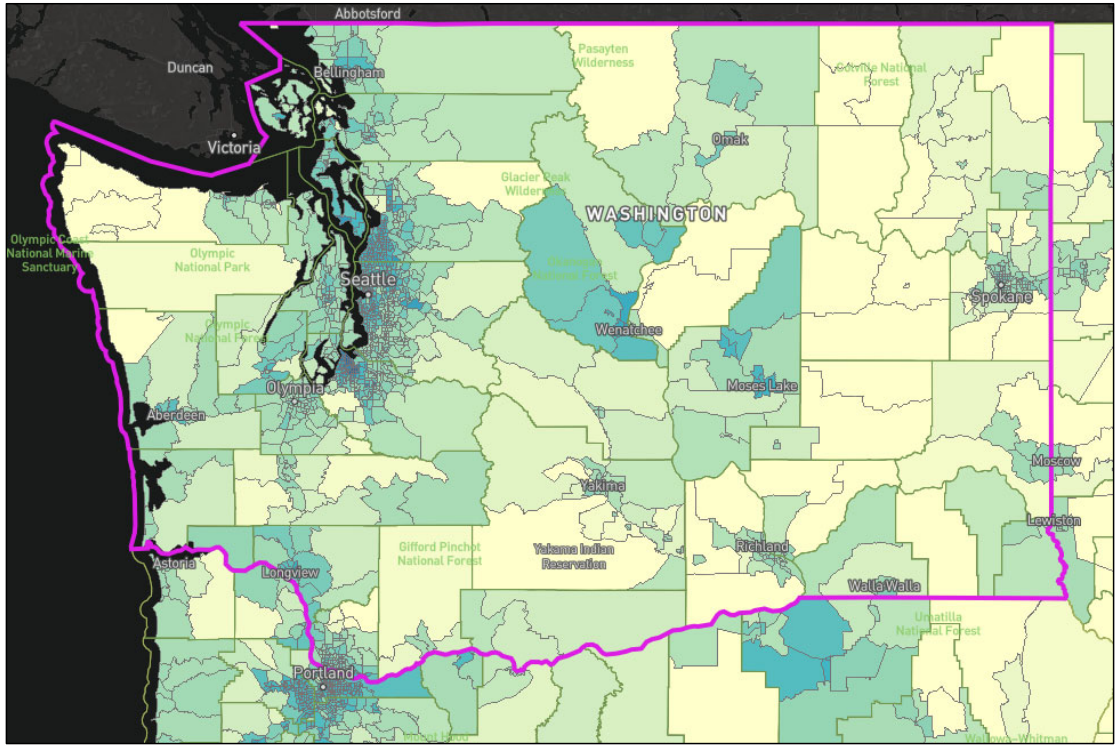
Respondents can select all that apply

Too Expensive	16.96%
Not Available	91.17%
Use Public	0.15%
No Computer	1.61%
Don't Know How Internet	1.53%
Don`t Know How Computer	0.46%
Don't Need	0.23%
Privacy	0.15%
Physical Issues	0.08%

Sources: Washington State Broadband Office

Identifying Service Needs: Where Are Service Providers?

Number of Providers



Number of Fixed Residential Broadband Providers

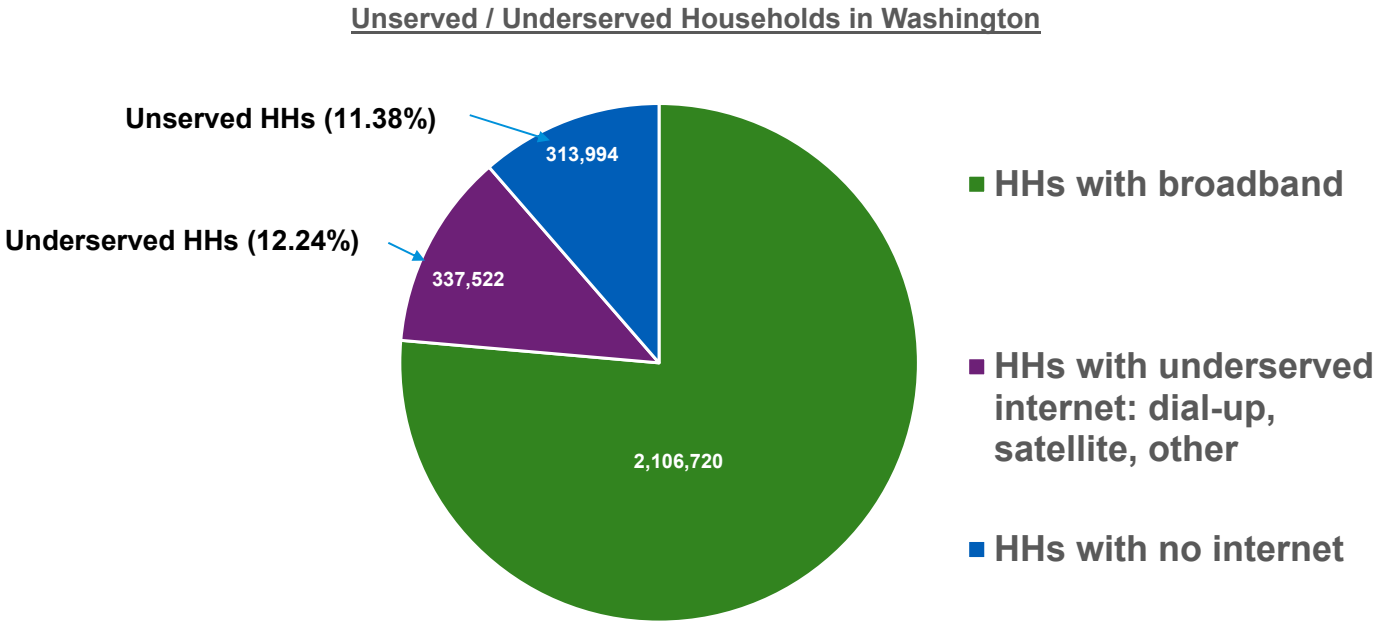
0 1 2 3 4 6 12 or more

Broadband

Technology	Cable, Fiber
Speed	≥ 100/10 Mbps
Date	June 2020 *(latest public release)*

- Number of providers of one or less defines lack of access and/or affordability
- Lower number (or lighter color) indicates that lack of fiber presence to connect to or inaccessibility

Aggregate Conclusion: Number of Unserved and Underserved Households in Washington



Notes: 1) The value for total households with no internet has been derived after reducing available input data for households with internet from the total number of households in Washington. Households with internet has further been broken up into 2 categories; (a) households with a broadband internet connection, and (b) households with underserved internet comprising of dial-up, satellite, non-subscription and any other forms of low-speed internet. Finally, households with no internet and households with underserved internet have been added to estimate total underserved households
Sources: ACS 2019 data

Framework for Highways and ROW Prioritization

Prioritizing Broadband access to state highway right-of-way

Nos.	Evaluation Criteria	Max. Score	Definition
1	Service need: Number of unserved/underserved households	40 points	• Unserved / underserved households indicates the level of connectivity of the area considered and severity as to lack of service • Measures effectiveness of public investment to address # of unserved / underserved households within a corridor
2	Current infrastructure: Where is open access fiber optic cable lacking?	30 points	• Measures lack of open access/availability to serve the underserved market • Measure lack of excess of capacity to serve the current market inferred by fiber presence, current speed score and number of providers in the served markets • Measures extent to which new highway broadband infrastructure could be effective to introducing new service and/or drive competition
3	Population Centers Covered / Points of Presence Addressed	30 points	• Measures number of population centers / points of presence that could be addressed by a corridor
	TOTAL	**100 points**	

Evaluation Criteria # 1 – Unserved / Underserved Households Addressed

Corridor	# of Unserved / Underserved HHs
90	107,421
5	302,835
82	48,964
405	74,183
182	39,457
205	22,189
705	36,448
Total Interstate Mileage / Underserved	**631,497**

Corridor	# of Unserved / Underserved HHs
20	27,848
101	36,689
2	67,601
97	25,609
395	43,913
14	63,693
18	34,200
6	6,286
702	3,827
Total Major State Route Mileage / Unserved and Underserved HHs	**309,666**

- # of Unserved / Underserved Households are based on a five (5) mile radius along the state routes
- Some degree of overlap exist between the interstate highways and state routes for unserved / underserved households

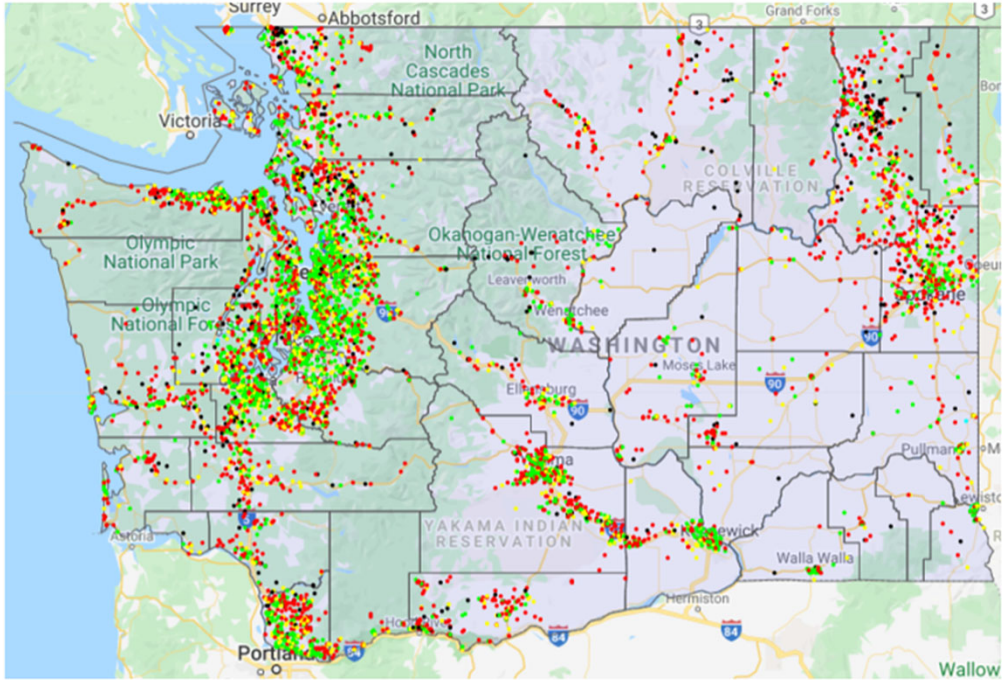
Sources: ACS 2019 and WSDOT

Evaluation Criteria # 2 – Where is Fiber Access Lacking?

Observations:

The purpose of this metric is to measure lack of excess broadband capacity to serve the current market inferred based on the following:

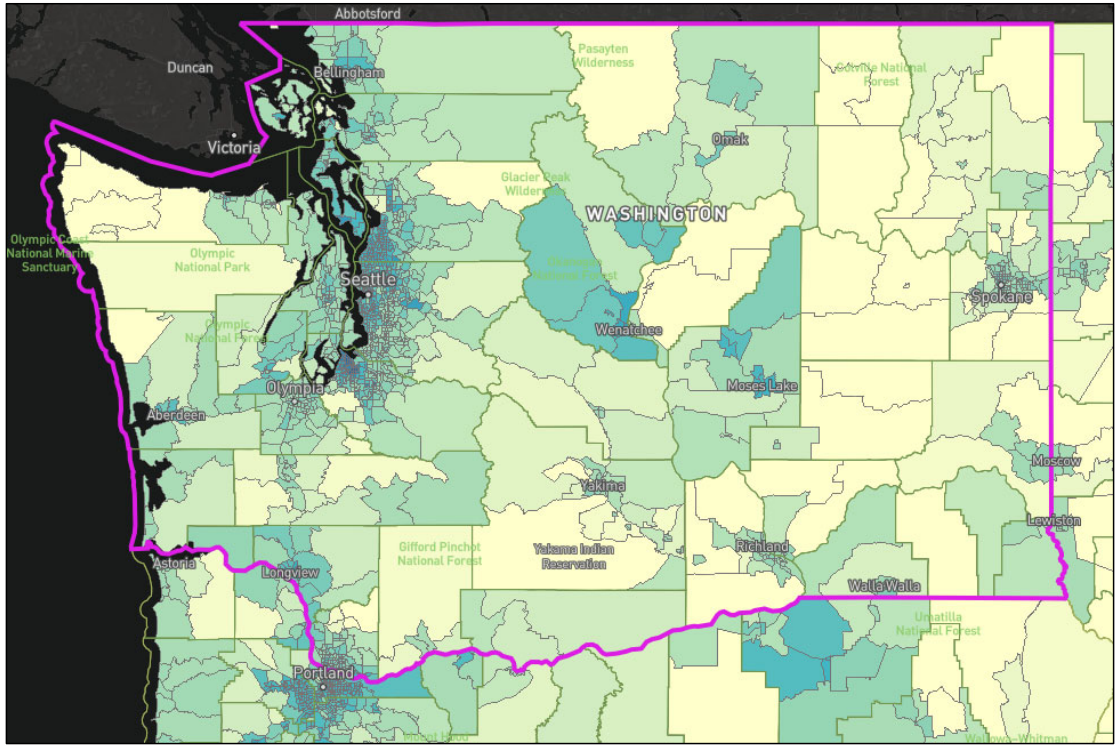
- Fiber presence on the long-haul routes on the interstate highways
- Overall broadband speed metric as measured by the broadband score across the corridor
- Number of service providers in the addressable market/counties served by the corridor



Sources: Washington State Broadband Office

Evaluation Criteria # 2 – Number of Broadband Service Providers (2/3)

Number of Providers



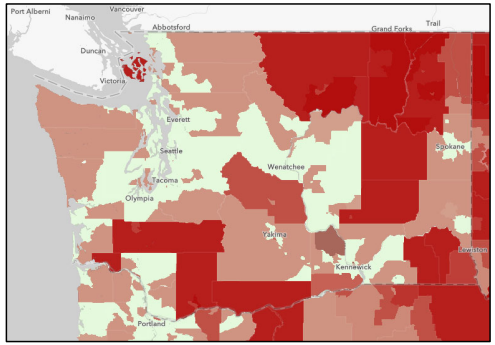
Number of Fixed Residential Broadband Providers

0 1 2 3 4 6 12 or more

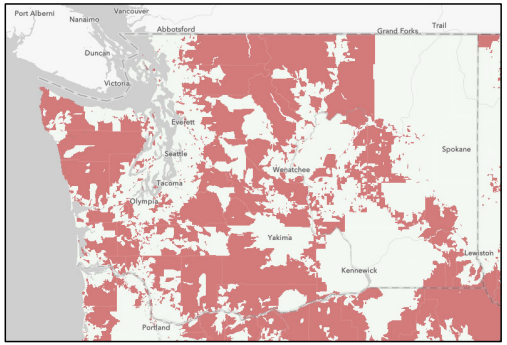
Broadband

Technology	Cable, Fiber
Speed	≥ 100/10 Mbps
Date	June 2020 *(latest public release)*

Evaluation Criteria # 2 – Average Broadband Speed (3/3)



Source: National Telecommunications and Information Administration Data



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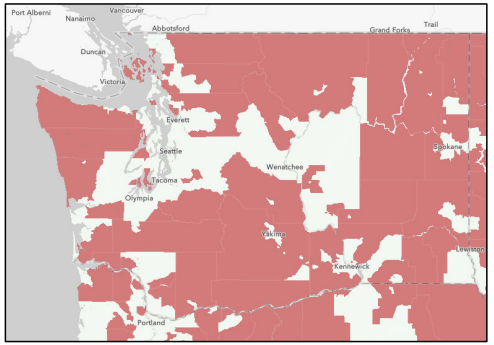


Source: Ookla Median Speeds Fixed Broadband Below 25/3 Mbps (Census Tract)

- Each National Data Source has different strengths and weaknesses. Study looks to all sources to obtain aggregate estimate of coverage.

Evaluation Criteria # 3 – Population Centers Covered / Points of Presence

WA State Internet Highways

Corridor	Counties Covered	# of Population Centers
90	King, Kittitas, Grant, Adams, Lincoln, Spokane	12
5	Clark, Cowlitz, Lewis, Thurston, Pierce, King, Snohomish, Skagit, Whatcom	33
82	Kittitas, Yakima, Benton	9
405	King, Snohomish	3
182	Benton, Franklin	2
205	Clark	1
705	Pierce	1

WA State Routes

Corridor	Counties Covered	# of Population Centers
20	Jefferson, Island, Skagit, Whatcom, Chelan, Okanogan, Ferry, Stevens, Pend Oreille	10
101	Pacific, Grays Harbor, Jefferson, Clallam, Mason, Thurston	10
2	Snohomish, King, Chelan, Douglas, Grant, Lincoln, Spokane, Pend Oreille	9
97	Klickitat, Yakima, Kittitas, Chelan, Douglas, Okanogan	7
395	Benton, Franklin, Adams, Lincoln, Spokane, Stevens, Ferry	7
14	Clark, Skamania, Klickitat, Benton	5
18	King	3
6	Pacific, Lewis	2
702	Pierce	N/A

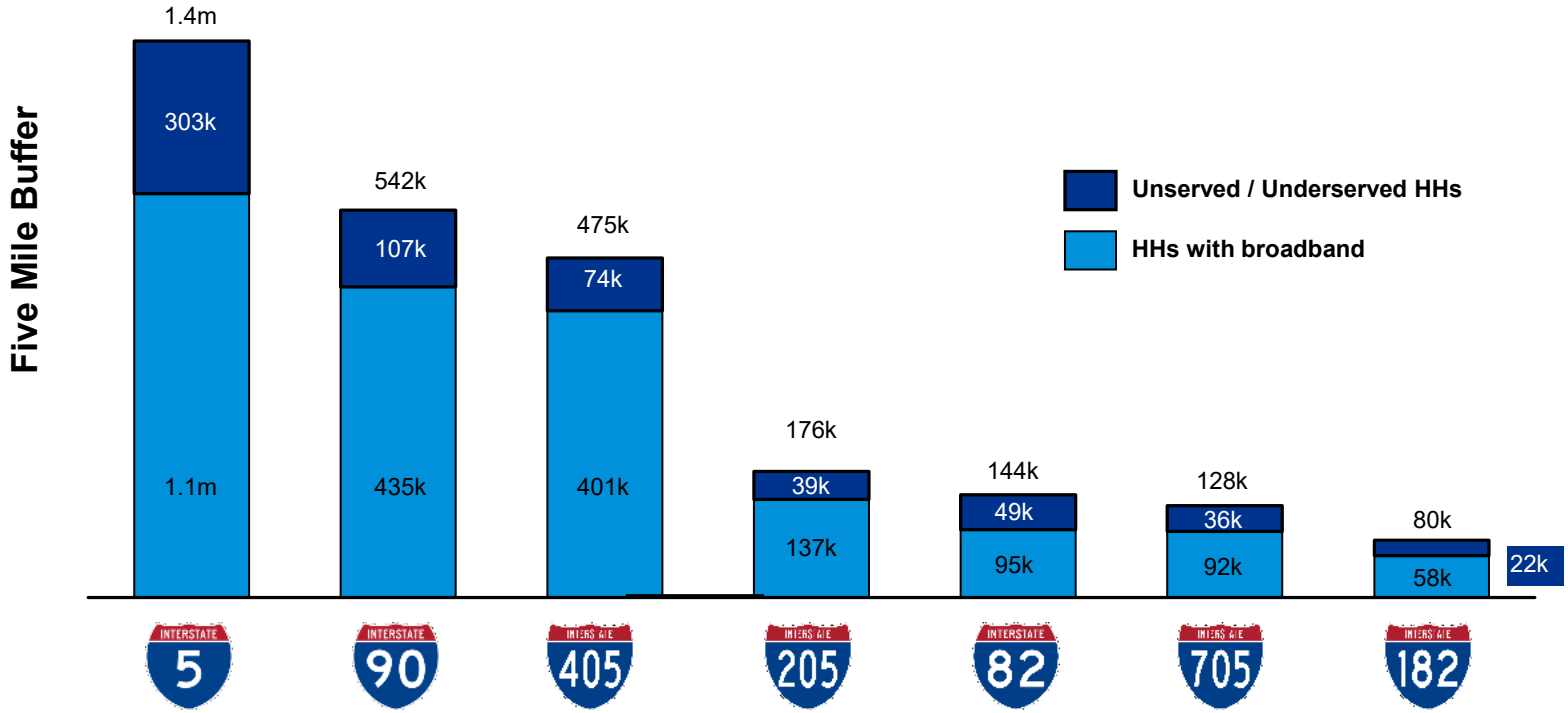
Interstate Network – Summary of Prioritization Scoring

Nos.	Evaluation Criteria	90	5	82	405	182	205	705
1	Unserved / Underserved Households Addressed	15.0	40.0	5.0	10.0	5.0	5.0	5.0
2	Lack of Existing Fiber Presence or Excess Capacity to Serve Unserved / Underserved Households	15.0	15.0	20.0	15.0	15.0	10.0	10.0
3	Population Centers Covered / Points of Presence Addressed	15.0	30.0	10.0	5.0	5.0	5.0	5.0
Total Score		**45.0 points**	**85.0 points**	**35.0 points**	**30.0 points**	**25.0 points**	**20.0 points**	**20.0 points**

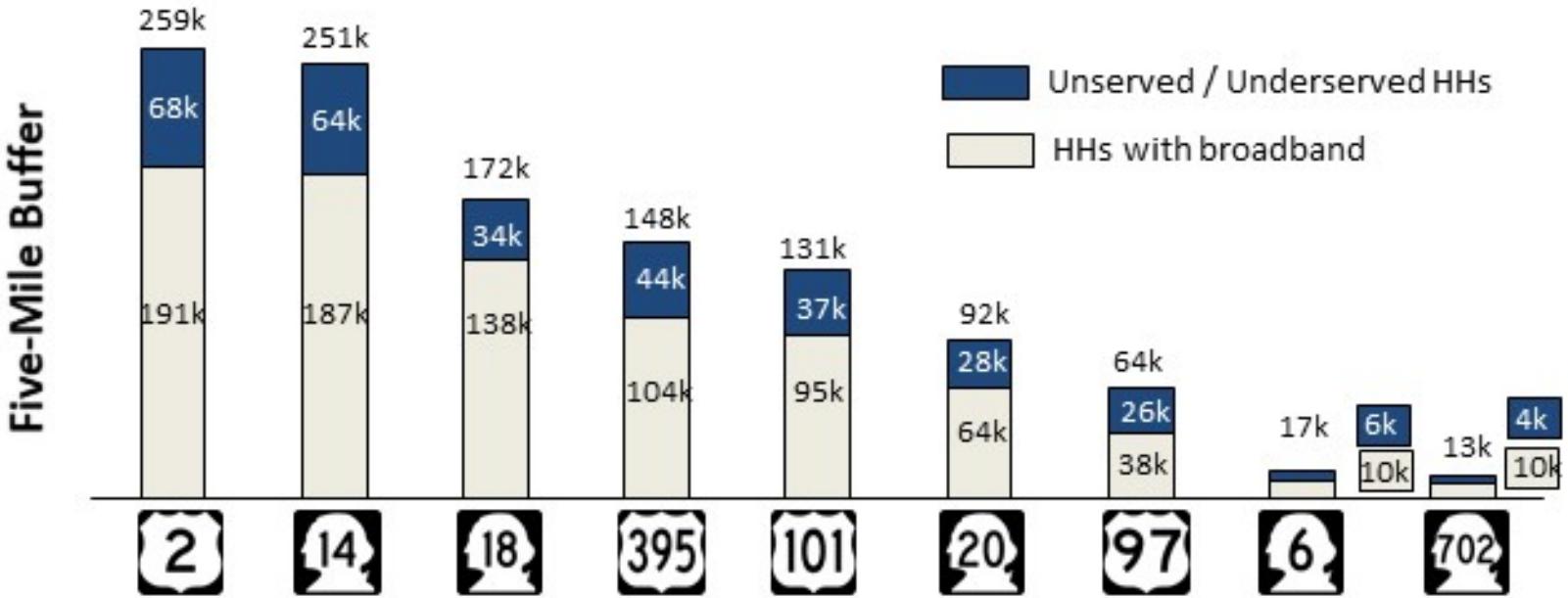
Select State Routes – Summary of Prioritization Scoring

Nos.	Evaluation Criteria	20	101	2	97	395	14	18
1	Unserved / Underserved Households Addressed	15.0	20.0	40.0	15.0	25.0	35.0	20.0
2	Lack of Existing Fiber Presence or Excess Capacity to Serve Unserved / Underserved Households	10.0	10.0	20.0	10.0	15.0	20.0	20.0
3	Population Centers Covered / Points of Presence Addressed	30.0	30.0	30.0	20.0	20.0	10.0	5.0
Total Score		**55.0 points**	**60.0 points**	**90.0 points**	**45.0 points**	**60.0 points**	**65.0 points**	**45.0 points**

Prioritization of Permitting Right-of-Way Access – Interstate Highways



Prioritization of Permitting Right-of-Way Access – Select State Routes



Interstate Highways Evaluation Data

I-90: Existing Fiber Presence / Providers

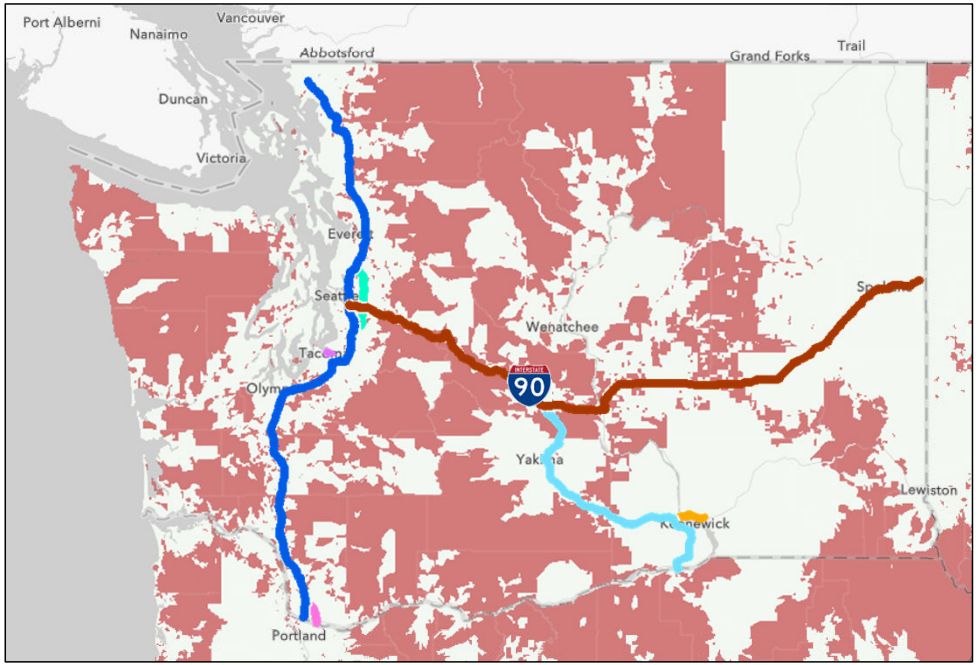
Fiber Providers along Washington I-90

Top Providers[1]

Company	Footprint	Fiber Mileage (within 5-mile buffer)
Legacy Noel Communications	Regional Fiber Company	1,467
Grant PUD High Speed Network	Regional Utility Company	756
LUMEN (Legacy Centurylink)	National Fiber Company	749
zayo	National Fiber Wholesaler	740
NOANET	Regional Wholesaler	331
AT&T	National Wireless Company	297
Orbitcom	Regional Fiber Company	292
allstream.	National Fiber Company	282
XO communications	National Fiber Company	256
Syringa Networks	National Fiber Company	155

Notes: 1) Only includes fiber providers (and corresponding fiber mileage) within a 5-mile buffer range of interstate highways
Source: KPMG Analysis based on Publicly Available Information

I-90: Broadband Speed (1/3)



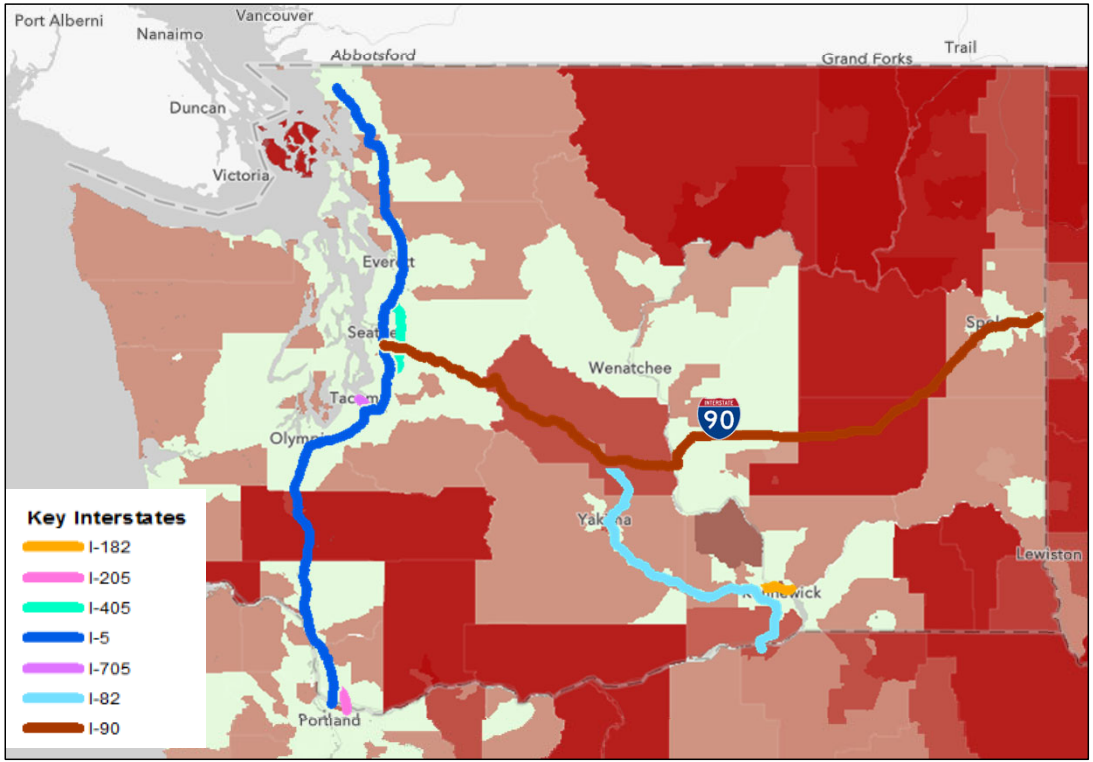
Key Interstates

- I-182
- I-205
- I-405
- I-5
- I-705
- I-82
- I-90

- *I-95 Corridor has low internet speeds for most part, except for around Seattle region which reflects speeds ranging 50 Mbps to 100 Mbps (upload) and 10 Mbps to 25 Mbps (download)*

Sources: FCC Form 477 Data - Fixed Broadband Services at 25/3 Mbps

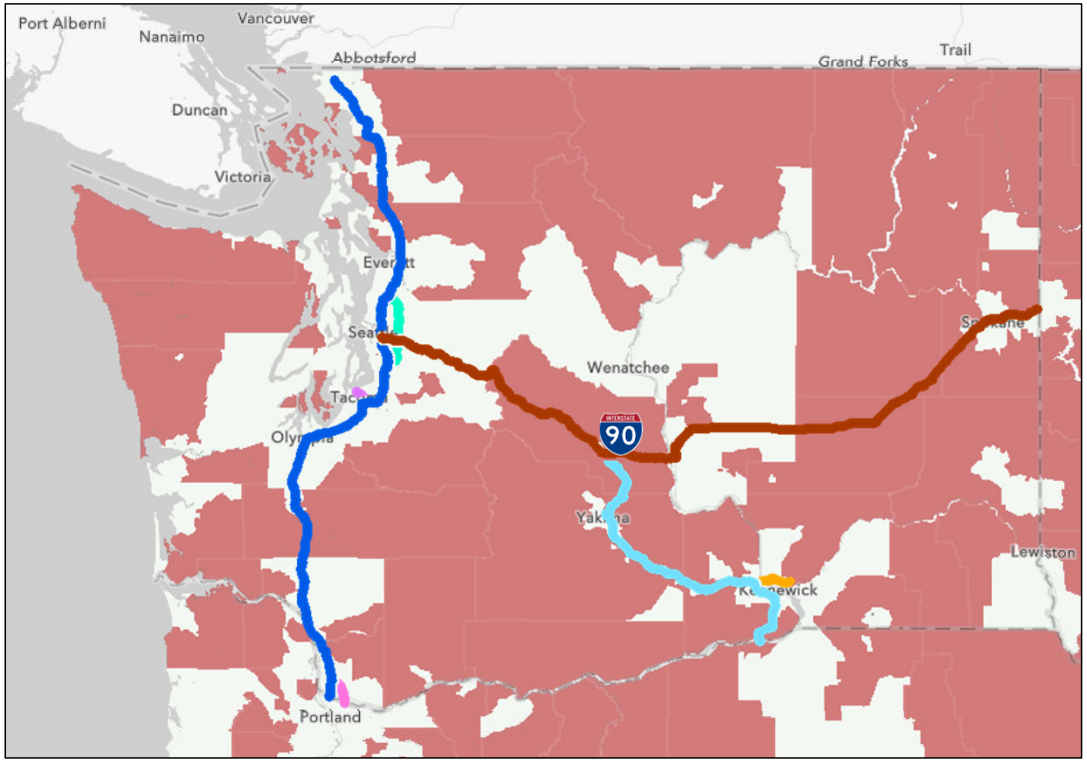
I-90: Broadband Speed (2/3)



Level	Indicator of Broadband Need	Yes	No	No Data
County	Speed Tests - M-Lab Median Speeds Fixed Broadband Below 25/3 Mbps			
	Usage - 75% or More of Devices Connect to Microsoft Updates/Services via Fixed Broadband Download Speeds below 25 Mbps			
Census Tract	Speed Tests - Ookla Median Speeds Fixed Broadband Below 25/3 Mbps			
	American Community Survey - 25% or More of Households Report No Internet Access			
	American Community Survey - 25% or More of Households Report No Computer, Smartphone or Tablet			
Census Block	FCC Form 477 – No Provider Reports Consumer Fixed Broadband Services at 25/3 Mbps			NA

Sources: National Telecommunications and Information Administration Data

I-90: Broadband Speed (3/3)

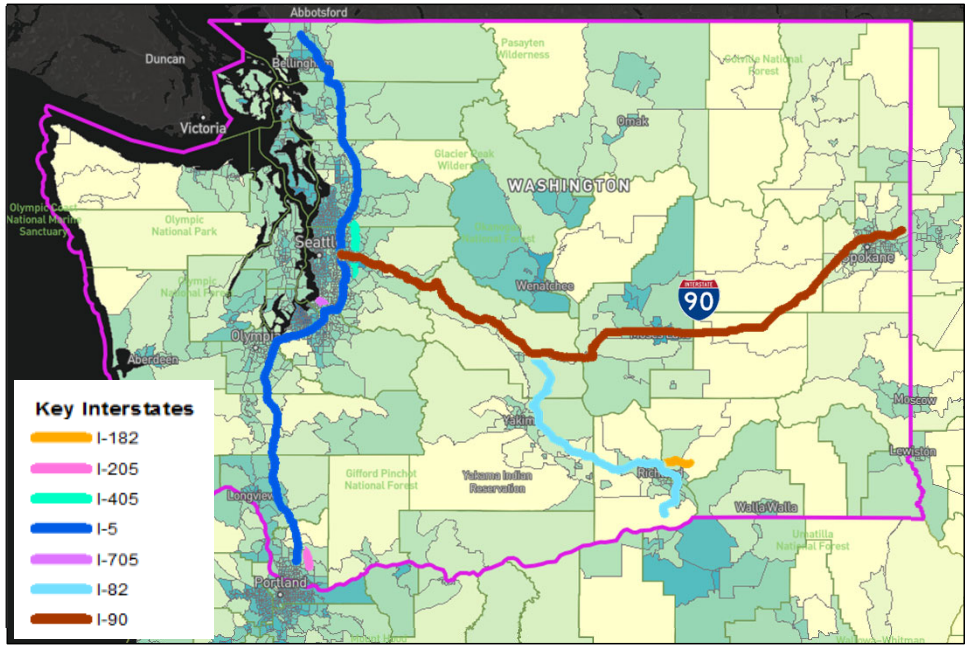


Key Interstates

- I-182
- I-205
- I-405
- I-5
- I-705
- I-82
- I-90

Sources: Ookla Median Speeds Fixed Broadband Below 25/3 Mbps (Census Tract)

I-90: # of Service Providers



Number of Fixed Residential Broadband Providers

0 1 2 3 4 6 12 or more

Broadband

Technology Cable, Fiber
Speed ≥ 100/10 Mbps
Date June 2020 *(latest public release)*

County	% of Population with No Providers	% of Population with One provider or less
King,	2.87 %	27.07 %
Kittitas	35.59 %	97.15 %
Grant	13.84 %	48.10 %
Adams	7.96 %	35.33 %
Lincoln	90.53 %	99.75 %
Spokane	10.91 %	56.45 %

Sources: ESRI, FCC, ACS 2019

- Kittitas and Lincoln Counties served by I-90 primarily have one provider or less
- This affects access to broadband as well as overall affordability in these regions
- Intermittent long-haul and middle-mile networks do not serve rural residential demand due to underlying economics

I-90: Corridor Evaluation Score

Nos.	Evaluation Criteria	Score	Remark(s)
1	Unserved/Underserved Households Addressed	15.0	▪ Second highest (107k) underserved / underserved households are covered within 5-mile radius of the corridor
2	Lack of Existing Fiber Presence or Excess Capacity to Serve Unserved / Underserved Households	15.0	▪ Noel Communications, Grant PUD, Lumen, and Zayo have existing presence; however, corridor has the second highest unserved / underserved households ▪ Existing fiber presence is concentrated around Seattle, Ellensburg, Sprague, and Spokane areas ▪ Except for the major metro areas, the corridor has an average internet speed of less than 50/10 Mbps
3	Population Centers Covered / Points of Presence Addressed	15.0	▪ Twelve population centers are covered by the interstate highway – approximately 53,000 households are residing within 5-mile radius
Total Score		**45.0 points**	

I-5: Existing Fiber Presence / Providers

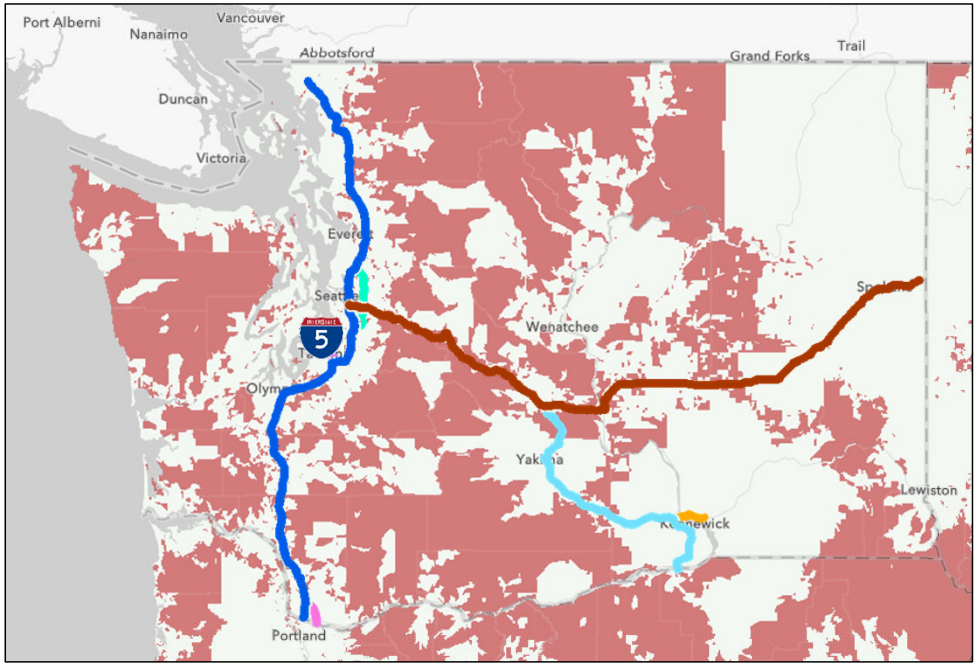
Fiber Providers along Washington I-5

Top Providers[1]

Company	Footprint	Fiber Mileage (within 5-mile buffer)
Legacy Noel Communications	Regional Fiber Company	1,732
wave	Regional Fiber Company	1,182
zayo	National Fiber Wholesaler	1,086
LUMEN (Legacy Centurylink)	National Fiber Company	786
allstream.	National Fiber Company	767
COMCAST	National Fiber Company	563
AT&T	National Wireless Company	492
Blackrock Cable	Regional Cable Company	489
NOANET	Regional Wholesaler	435
alaska COMMUNICATIONS	Regional Fiber Company	292

Notes: 1) Only includes fiber providers (and corresponding fiber mileage) within a 5-mile buffer range of interstate highways
Source: KPMG Analysis based on Publicly Available Information

I-5: Broadband Speed (1/3)



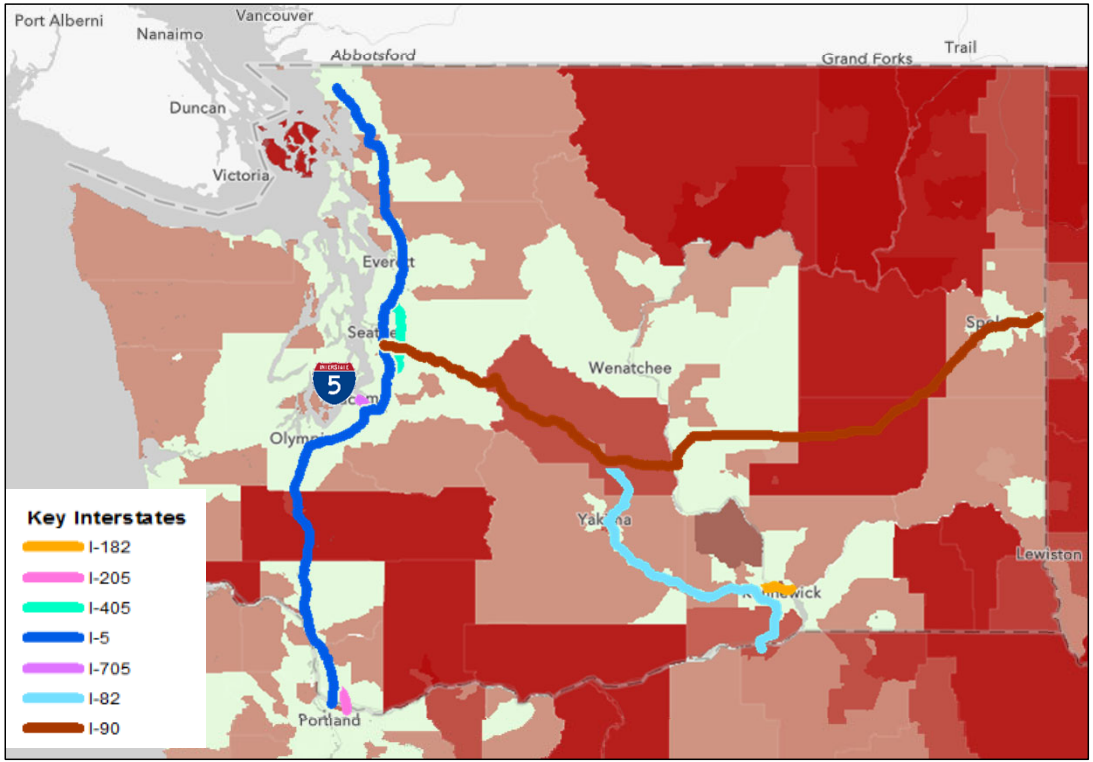
Key Interstates

- I-182
- I-205
- I-405
- I-5
- I-705
- I-82
- I-90

- *I-5 Corridor has low internet speeds for most part, except for around Seattle region and Adam County which reflects speeds ranging 50 Mbps to 100 Mbps (upload) and 10 Mbps to 25 Mbps (download)*

Sources: : FCC Form 477 Data - Fixed Broadband Services at 25/3 Mbps

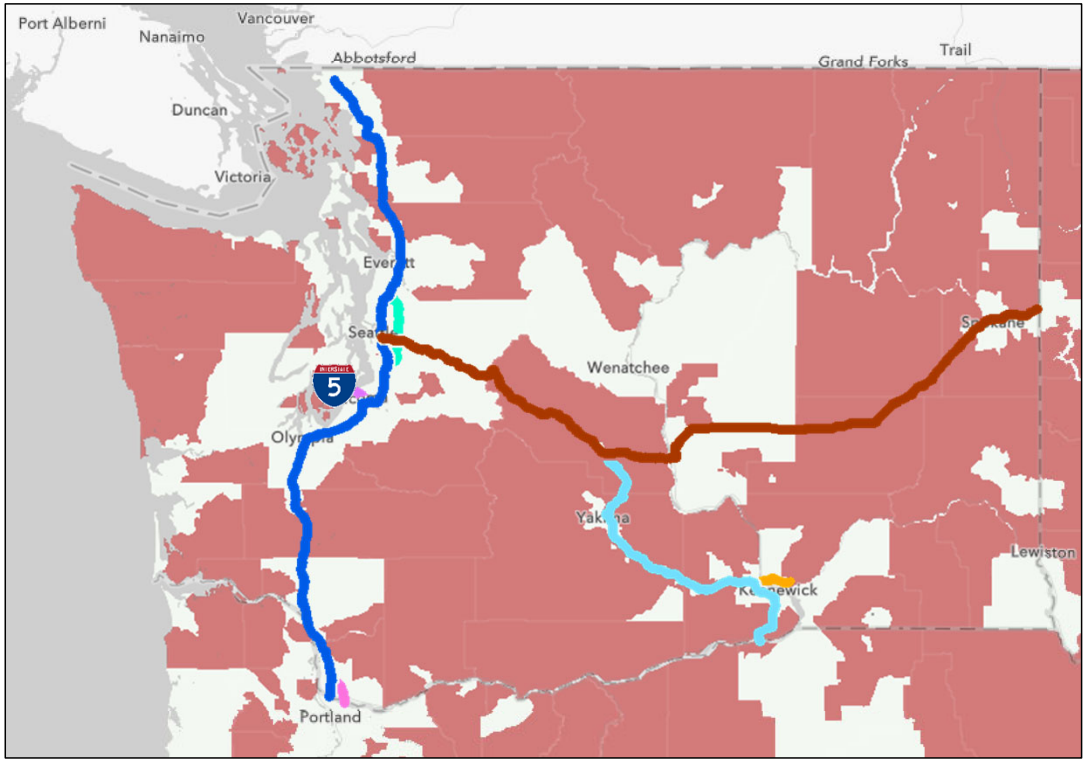
I-5: Broadband Speed (2/3)



Level	Indicator of Broadband Need	Yes	No	No Data
County	Speed Tests - M-Lab Median Speeds Fixed Broadband Below 25/3 Mbps			
	Usage - 75% or More of Devices Connect to Microsoft Updates/Services via Fixed Broadband Download Speeds below 25 Mbps			
Census Tract	Speed Tests - Ookla Median Speeds Fixed Broadband Below 25/3 Mbps			
	American Community Survey - 25% or More of Households Report No Internet Access			
	American Community Survey - 25% or More of Households Report No Computer, Smartphone or Tablet			
Census Block	FCC Form 477 – No Provider Reports Consumer Fixed Broadband Services at 25/3 Mbps			NA

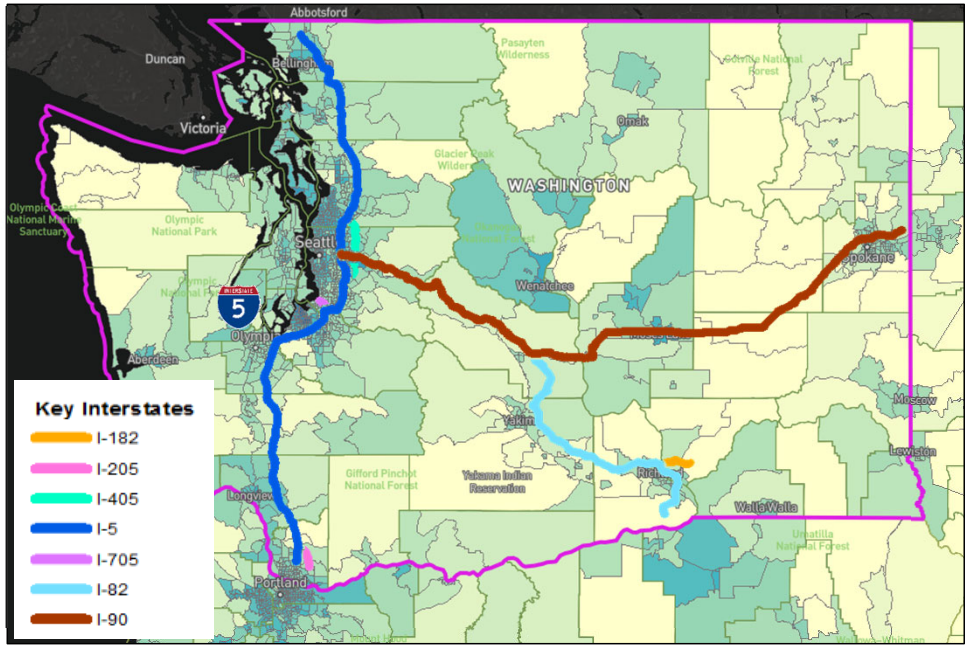
Sources: National Telecommunications and Information Administration Data

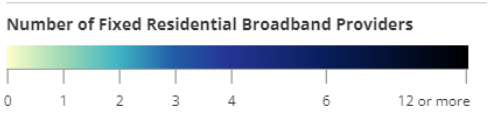
I-5: Broadband Speed (3/3)



Sources: Ookla Median Speeds Fixed Broadband Below 25/3 Mbps (Census Tract)

I-5: # of Service Providers





Broadband

Technology	Cable, Fiber
Speed	≥ 100/10 Mbps
Date	June 2020 *(latest public release)*

County	% of Population with No Providers	% of Population with One provider or less
Clark	4.68 %	15.24 %
Cowlitz	8.54 %	37.53 %
Lewis	29.01 %	95.22 %
Thurston	6.85 %	54.33 %
Pierce	3.77 %	33.32 %
King	2.87 %	27.07 %
Snohomish	3.65 %	30.52 %
Skagit	7.59 %	76.38 %
Whatcom	9.79 %	69.07 %

- Lewis, Skagit and Whatcom counites served by I-5 primarily have one provider or less
- Seattle, Olympia, and Portland regions have higher # of service providers

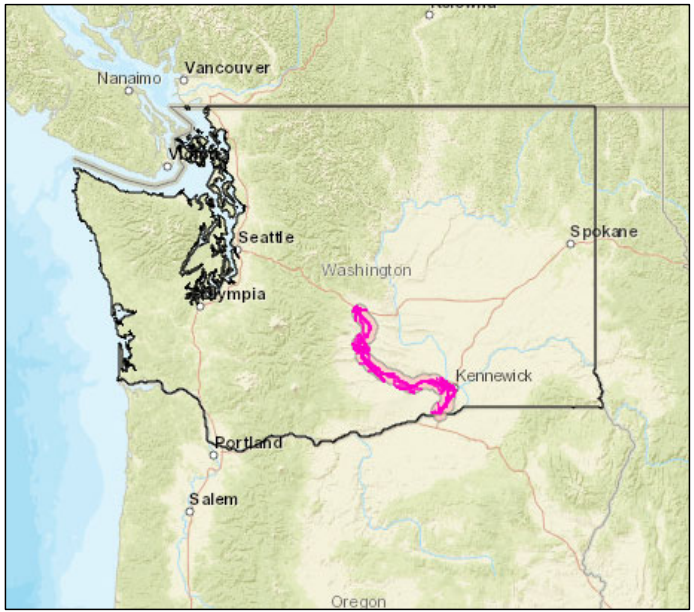
Sources: ESRI, FCC

I-5: Corridor Evaluation Score

Nos.	Evaluation Criteria	Score	Remark(s)
1	Unserved/Underserved Households Addressed	40.0	▪ Highest (302k) underserved / underserved households are covered within 5-mile radius of the corridor
2	Lack of Existing Fiber Presence or Excess Capacity to Serve Unserved / Underserved Households	15.0	▪ Noel Communications, Wave, Zayo and Lumen have existing presence; however, corridor has the highest unserved / underserved households ▪ Existing fiber presence is concentrated around Seattle, Olympia and Portland areas ▪ Except for the major metro areas, the corridor has an average internet speed of less than 50/10 Mbps
3	Population Centers Covered / Points of Presence Addressed	30.0	▪ Thirty three population centers are covered by the interstate highway – approximately 1.4 million households are residing within 5-mile radius
Total Score		**85.0 points**	

I-82: Existing Fiber Presence / Providers

Fiber Providers along Washington I-82

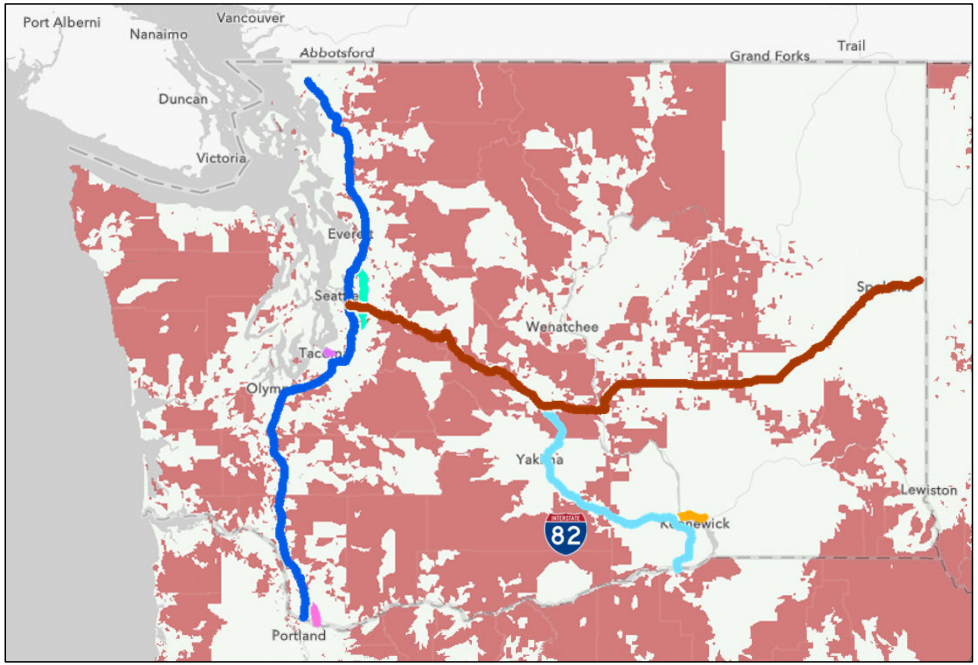


Top Providers[1]

Company	Footprint	Fiber Mileage (within 5-mile buffer)
Spectrum	National Cable Company	379
Legacy Noel Communications	Regional Fiber Company	361
NOANET	Regional Wholesaler	179
cogent	National Fiber Company	148
LUMEN (Legacy Centurylink)	National Fiber Company	128
zayo	National Fiber Wholesaler	112
Benton PUD	Regional Utility Company	108
Syringa Networks	National Fiber Company	99
allstream	National Fiber Company	82
Franklin PUD	Regional Utility Company	74

Notes: 1) Only includes fiber providers (and corresponding fiber mileage) within a 5-mile buffer range of interstate highways
Source: KPMG Analysis based on Publicly Available Information

I-82: Broadband Speed (1/3)



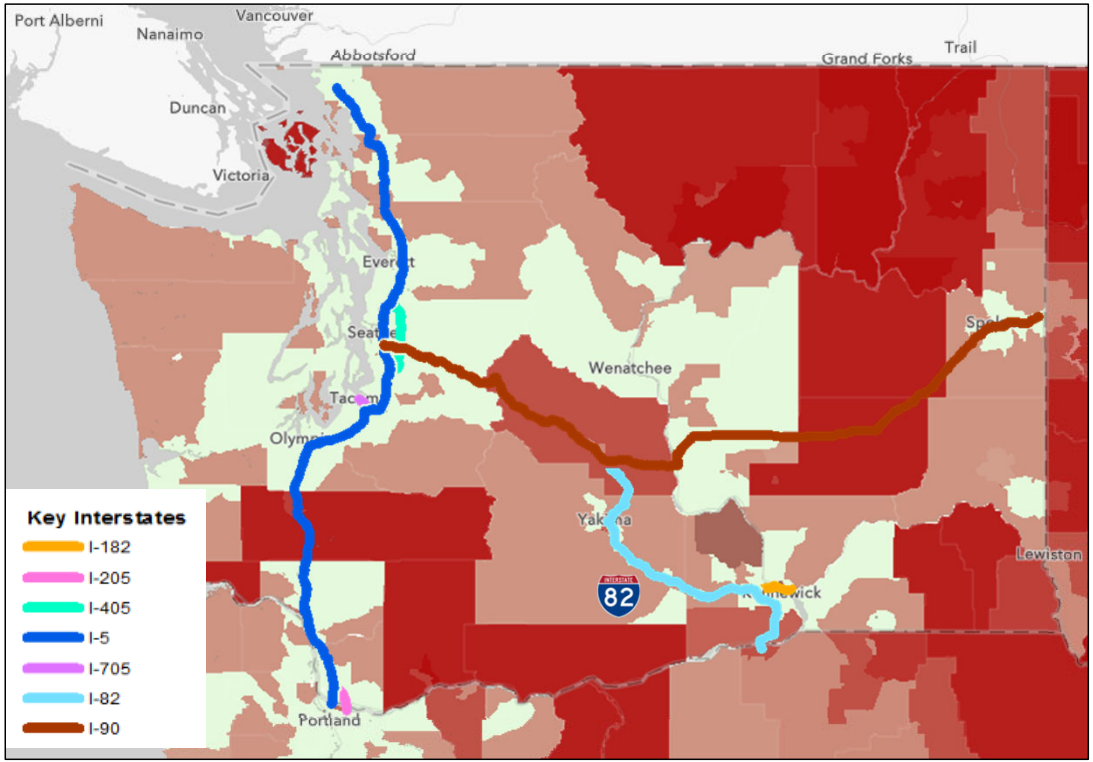
Key Interstates

- I-182
- I-205
- I-405
- I-5
- I-705
- I-82
- I-90

- *I-82 Corridor has low internet speeds for most part, except for around Kennewick area which reflects speeds ranging 50 Mbps to 100 Mbps (upload) and 10 Mbps to 25 Mbps (download)*

Sources: FCC Form 477 Data - Fixed Broadband Services at 25/3 Mbps

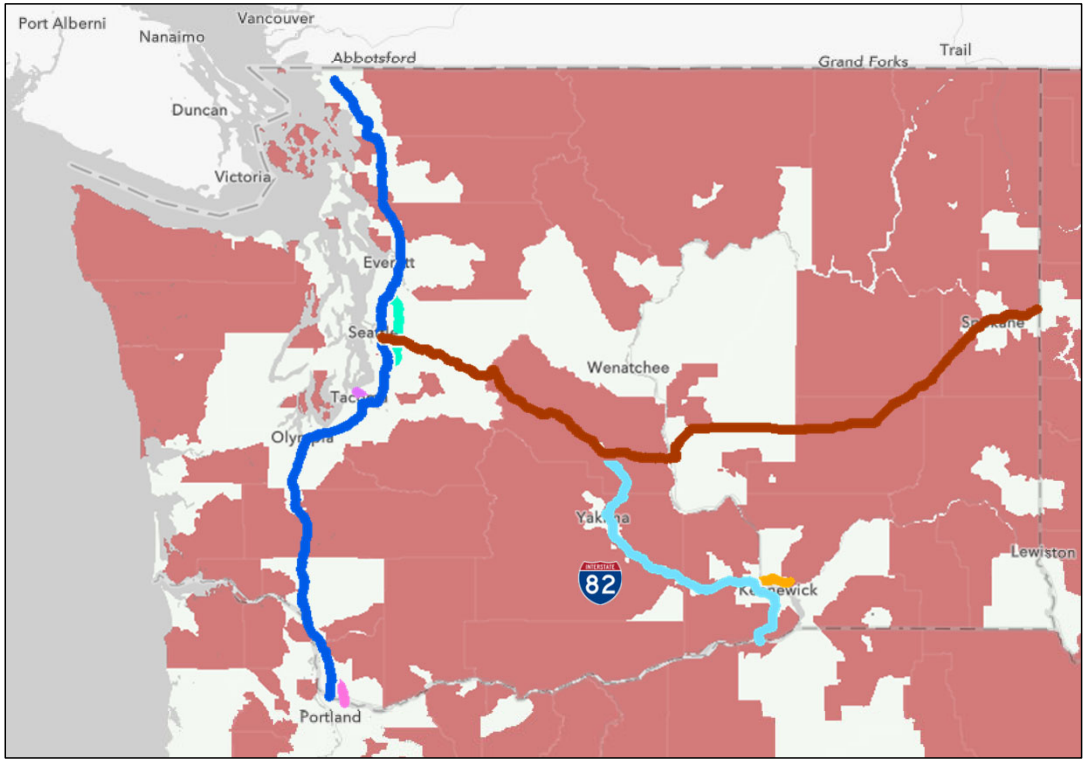
I-82: Broadband Speed (2/3)



Level	Indicator of Broadband Need	Yes	No	No Data
County	Speed Tests - M-Lab Median Speeds Fixed Broadband Below 25/3 Mbps			
	Usage - 75% or More of Devices Connect to Microsoft Updates/Services via Fixed Broadband Download Speeds below 25 Mbps			
Census Tract	Speed Tests - Ookla Median Speeds Fixed Broadband Below 25/3 Mbps			
	American Community Survey - 25% or More of Households Report No Internet Access			
	American Community Survey - 25% or More of Households Report No Computer, Smartphone or Tablet			
Census Block	FCC Form 477 – No Provider Reports Consumer Fixed Broadband Services at 25/3 Mbps			NA

Sources: National Telecommunications and Information Administration Data

I-82: Broadband Speed (3/3)

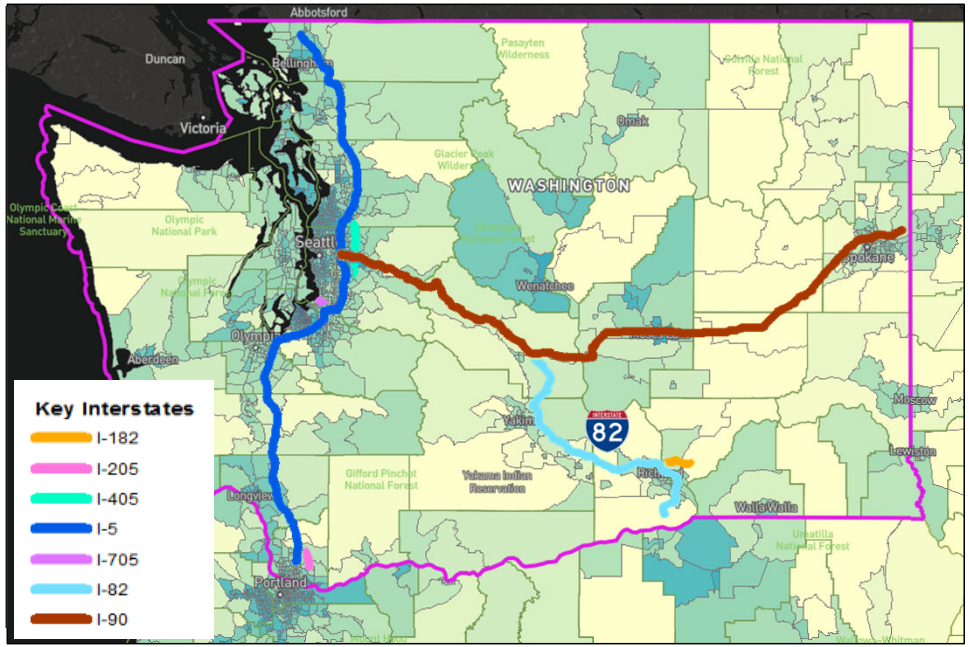


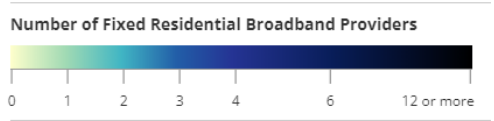
Key Interstates

- I-182
- I-205
- I-405
- I-5
- I-705
- I-82
- I-90

Sources: Ookla Median Speeds Fixed Broadband Below 25/3 Mbps (Census Tract)

I-82: # of Service Providers





Broadband

Technology	Cable, Fiber
Speed	≥ 100/10 Mbps
Date	June 2020 *(latest public release)*

County	% of Population with No Providers	% of Population with One provider or less
Kittitas	35.59 %	97.15 %
Yakima	7.69 %	37.75 %
Benton	2.81 %	13.6 %

Sources: ESRI, FCC, ACS 2019

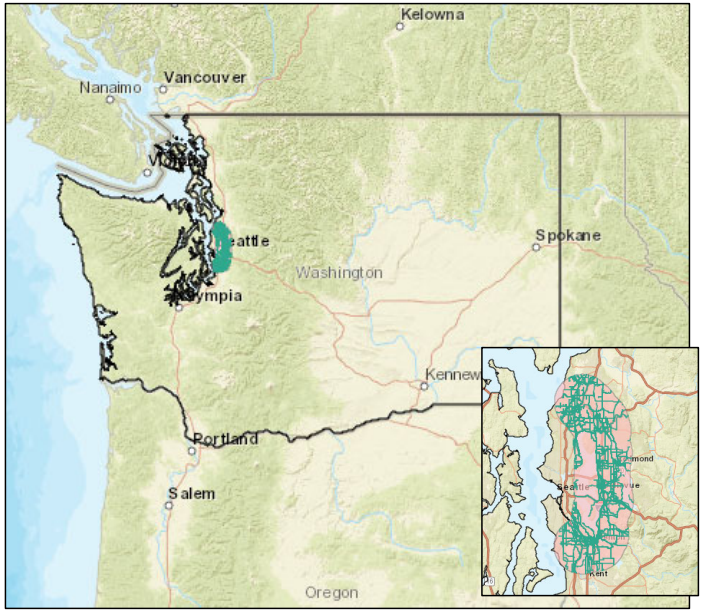
- Kittitas served by I-82 primarily have one provider or less
- Kennewick area have higher # of service providers

I-82: Corridor Evaluation Score

Nos.	Evaluation Criteria	Score	Remark(s)
1	Unserved/Underserved Households Addressed	5.0	▪ Approximately 49,000 underserved / underserved households are covered within 5-mile radius of the corridor
2	Lack of Existing Fiber Presence or Excess Capacity to Serve Unserved / Underserved Households	20.0	▪ Spectrum, Noel Communications, Noanet and Cogent have existing presence; however, corridor has approximately 49,000 unserved / underserved households ▪ Existing fiber presence is all along the corridor ▪ Except for the major metro areas, the corridor has an average internet speed of less than 50/10 Mbps
3	Population Centers Covered / Points of Presence Addressed	10.0	▪ Nine population centers are covered by the interstate highway – approximately 143,000 households are residing within 5-mile radius
Total Score		**35.0 points**	

I-405: Existing Fiber Presence / Providers

Fiber Providers along Washington I-405

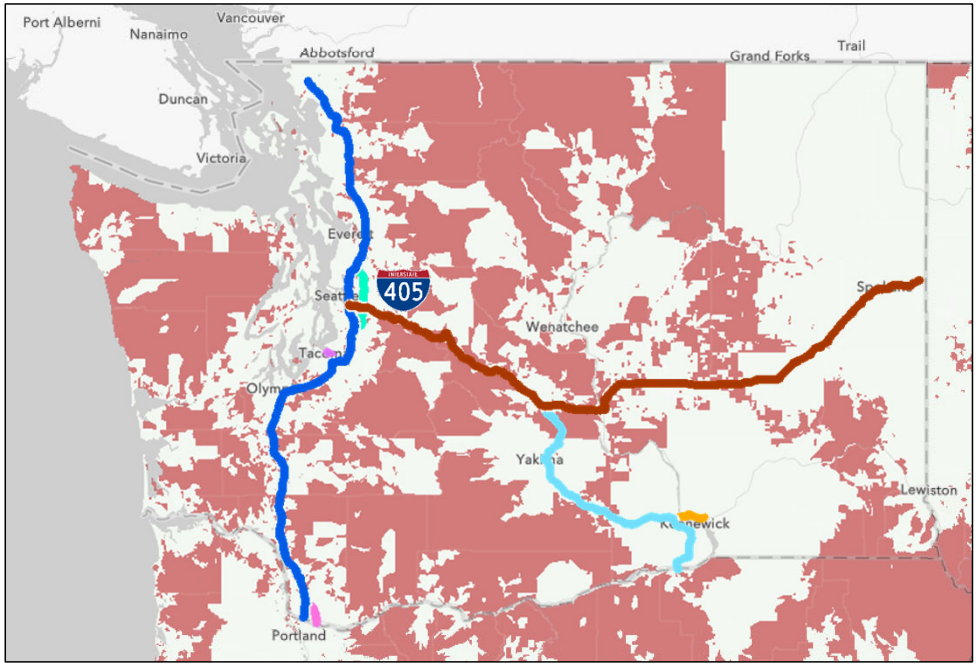


Top Providers[1]

Company	Footprint	Fiber Mileage (within 5-mile buffer)
LUMEN (Legacy Centurylink)	National Fiber Company	642
Legacy Noel Communications	Regional Fiber Company	603
zayo	National Fiber Wholesaler	349
allstream	National Fiber Company	335
verizon	National Wireless Company	325
COMCAST	National Fiber Company	244
wave	Regional Fiber Company	233
Blackrock Cable	Regional Cable Company	208
AT&T	National Wireless Company	206
XO communications	National Fiber Company	156

Notes: 1) Only includes fiber providers (and corresponding fiber mileage) within a 5-mile buffer range of interstate highways
Source: KPMG Analysis based on Publicly Available Information

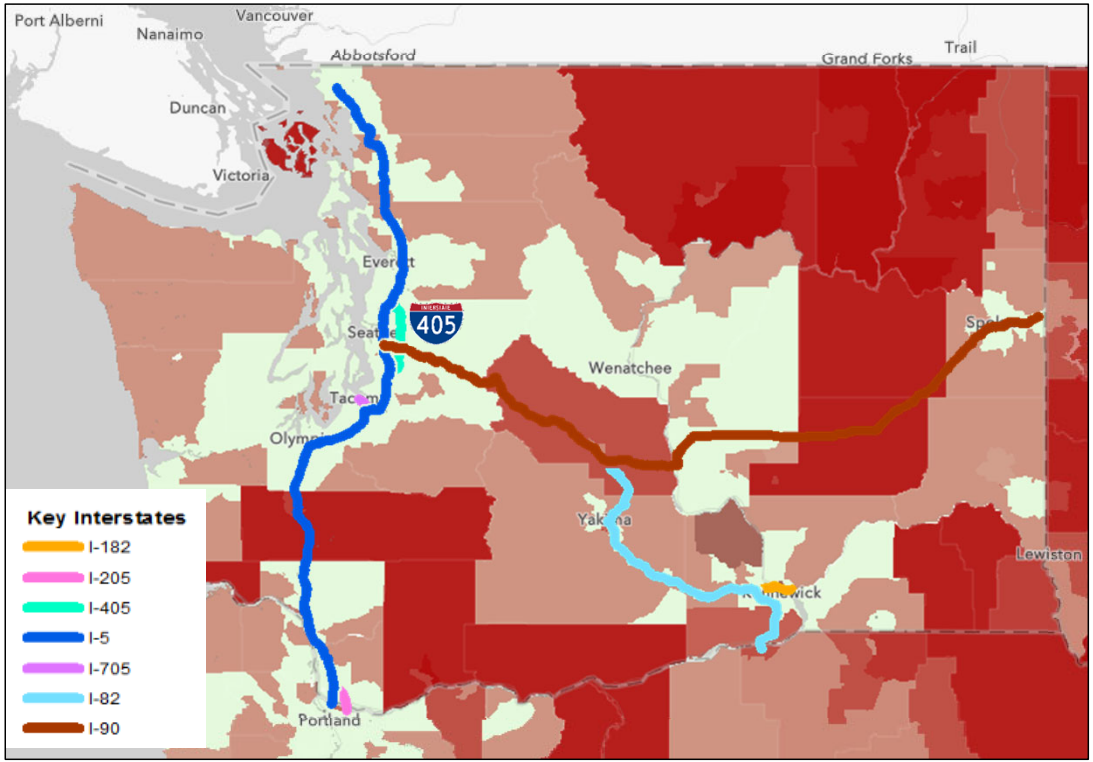
I-405: Broadband Speed (1/3)



- *I-405 Corridor has moderate internet speeds for most part, with Seattle region which reflects speeds ranging 50 Mbps to 100 Mbps (upload) and 10 Mbps to 25 Mbps (download)*

Sources: FCC Form 477 Data - Fixed Broadband Services at 25/3 Mbps

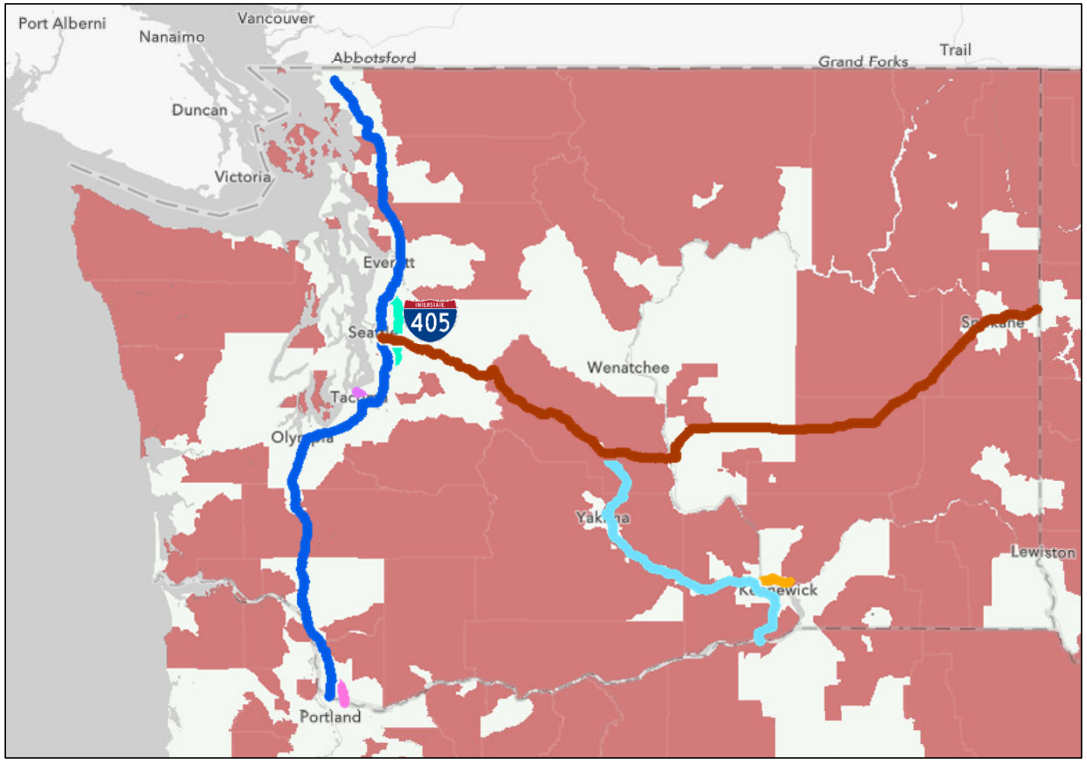
I-405: Broadband Speed (2/3)



Level	Indicator of Broadband Need	Yes	No	No Data
County	Speed Tests - M-Lab Median Speeds Fixed Broadband Below 25/3 Mbps			
	Usage - 75% or More of Devices Connect to Microsoft Updates/Services via Fixed Broadband Download Speeds below 25 Mbps			
Census Tract	Speed Tests - Ookla Median Speeds Fixed Broadband Below 25/3 Mbps			
	American Community Survey - 25% or More of Households Report No Internet Access			
	American Community Survey - 25% or More of Households Report No Computer, Smartphone or Tablet			
Census Block	FCC Form 477 – No Provider Reports Consumer Fixed Broadband Services at 25/3 Mbps			NA

Sources: National Telecommunications and Information Administration Data

I-405: Broadband Speed (3/3)

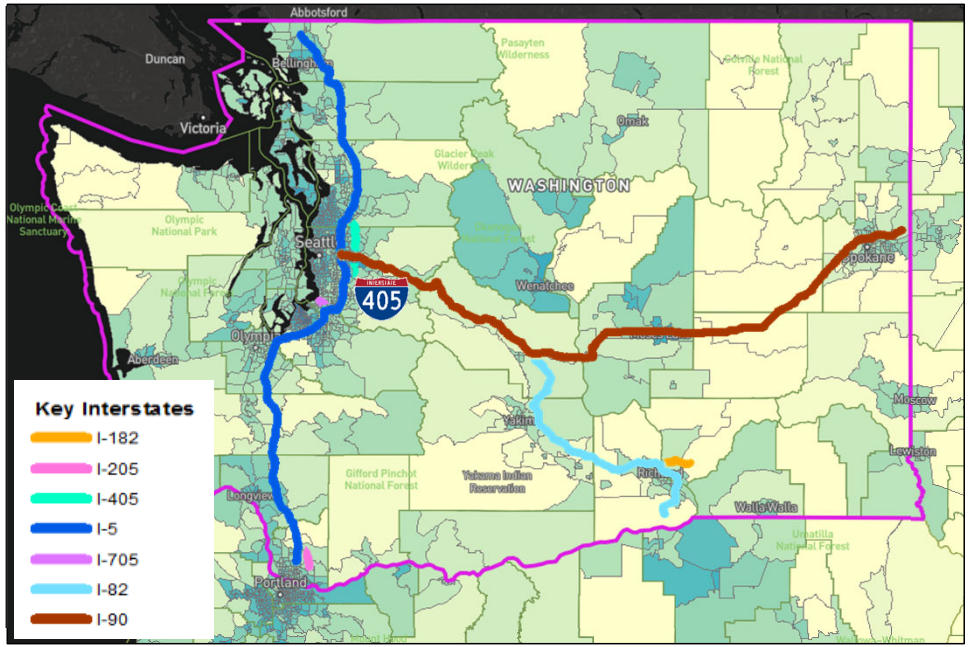


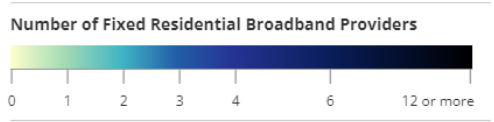
Key Interstates

- I-182
- I-205
- I-405
- I-5
- I-705
- I-82
- I-90

Sources: Ookla Median Speeds Fixed Broadband Below 25/3 Mbps (Census Tract)

I-405: # of Service Providers





County	% of Population with No Providers	% of Population with One provider or less
King	2.87 %	27.07 %
Snohomish	3.65 %	30.52 %

Sources: ESRI, FCC, ACS 2019

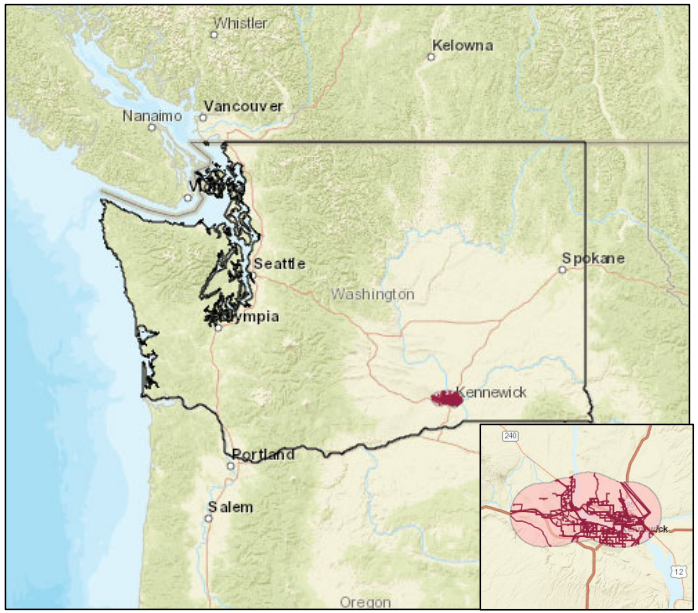
- Majority of households in King and Snohomish counties served by I-405 have more than one service providers

I-405: Corridor Evaluation Score

Nos.	Evaluation Criteria	Score	Remark(s)
1	Unserved/Underserved Households Addressed	10.0	▪ Approximately 74,000 underserved / underserved households are covered within 5-mile radius of the corridor
2	Lack of Existing Fiber Presence or Excess Capacity to Serve Unserved / Underserved Households	15.0	▪ Lumen, Noel Communications, Zayo and Allstream have existing presence; however, corridor has approximately 74,000 unserved / underserved households ▪ Existing fiber presence between Seattle and Olympia region ▪ Corridor has an average internet speed of less than 50/10 Mbps
3	Population Centers Covered / Points of Presence Addressed	5.0	▪ Three population centers are covered by the interstate highway – approximately 476,000 households are residing within 5-mile radius
Total Score		**30.0 points**	

I-182: Existing Fiber Presence / Providers

Fiber Providers along Washington I-182

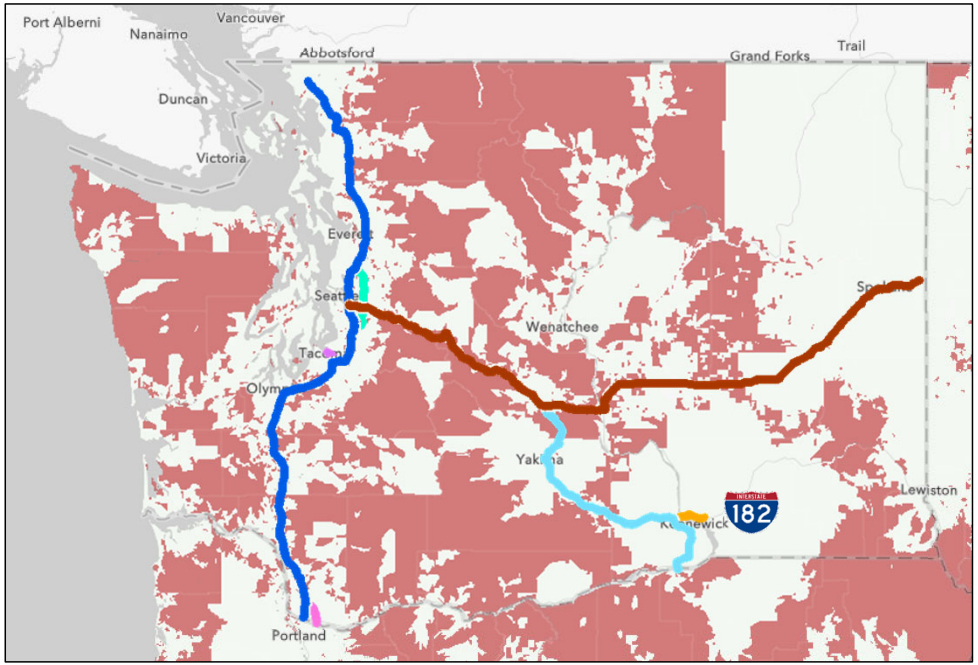


Top Providers[1]

Company	Footprint	Fiber Mileage (within 5-mile buffer)
Spectrum	National Cable Company	207
Franklin PUD	Regional Utility Company	206
Legacy Noel Communications	Regional Fiber Company	145
NOANET	Regional Wholesaler	120
Benton PUD	Regional Utility Company	99
Lumen (Legacy Centurylink)	National Fiber Company	68
allstream	National Fiber Company	56
zayo	National Fiber Wholesaler	54
fatbeam	National Fiber Company	52
Bonneville Power Administration	Regional Wholesaler	29

Notes: 1) Only includes fiber providers (and corresponding fiber mileage) within a 5-mile buffer range of interstate highways
Source: KPMG Analysis based on Publicly Available Information

I-182: Broadband Speed (1/3)



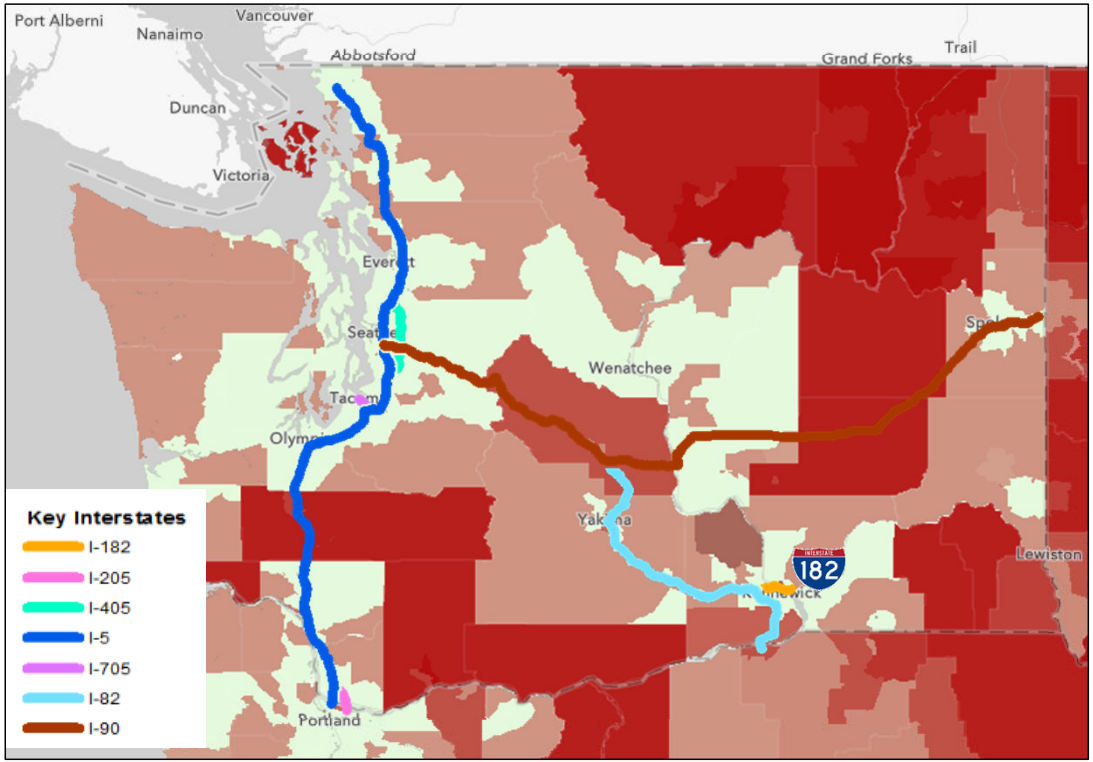
Key Interstates

- I-182
- I-205
- I-405
- I-5
- I-705
- I-82
- I-90

- *I-182 Corridor has low internet speeds with Kennewick area which reflects speeds ranging 50 Mbps to 100 Mbps (upload) and 10 Mbps to 25 Mbps (download)*

Sources: FCC Form 477 Data - Fixed Broadband Services at 25/3 Mbps

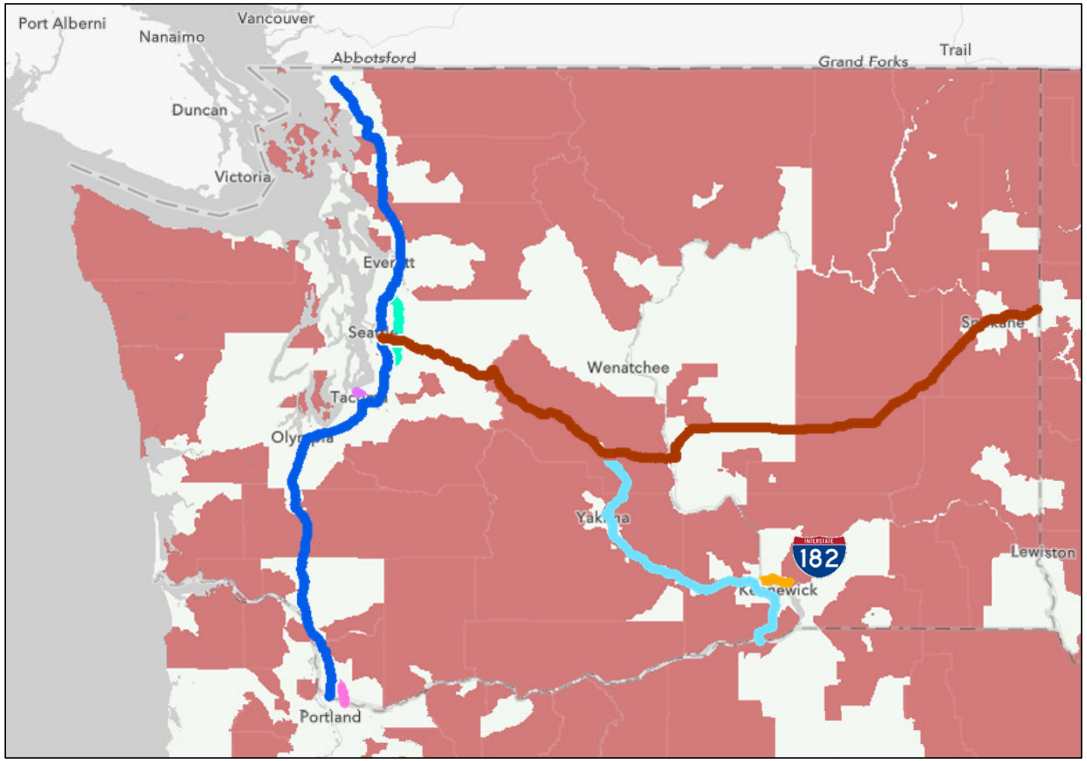
I-182: Broadband Speed (2/3)



Level	Indicator of Broadband Need	Yes	No	No Data
County	Speed Tests - M-Lab Median Speeds Fixed Broadband Below 25/3 Mbps			
	Usage - 75% or More of Devices Connect to Microsoft Updates/Services via Fixed Broadband Download Speeds below 25 Mbps			
Census Tract	Speed Tests - Ookla Median Speeds Fixed Broadband Below 25/3 Mbps			
	American Community Survey - 25% or More of Households Report No Internet Access			
	American Community Survey - 25% or More of Households Report No Computer, Smartphone or Tablet			
Census Block	FCC Form 477 – No Provider Reports Consumer Fixed Broadband Services at 25/3 Mbps			NA

Sources: National Telecommunications and Information Administration Data

I-182: Broadband Speed (3/3)

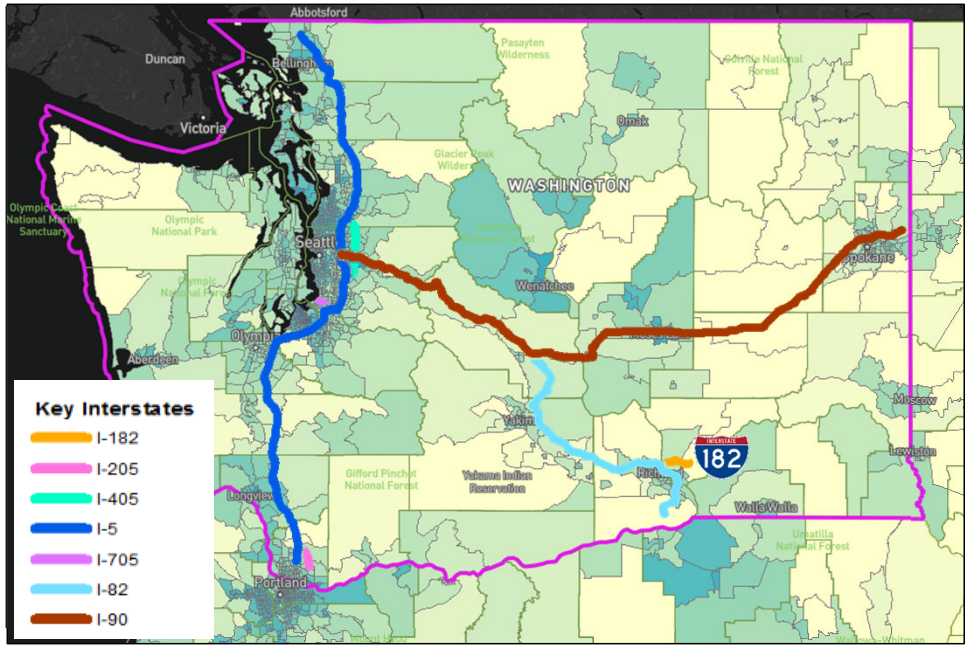


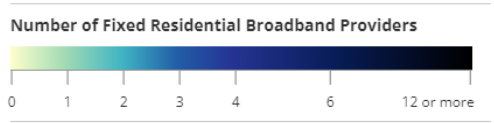
Key Interstates

- I-182
- I-205
- I-405
- I-5
- I-705
- I-82
- I-90

Sources: Ookla Median Speeds Fixed Broadband Below 25/3 Mbps (Census Tract)

I-182: # of Service Providers





County	% of Population with No Providers	% of Population with One provider or less
Benton	2.81 %	13.6 %
Franklin	0.11 %	22.91 %

Sources: ESRI, FCC, ACS 2019

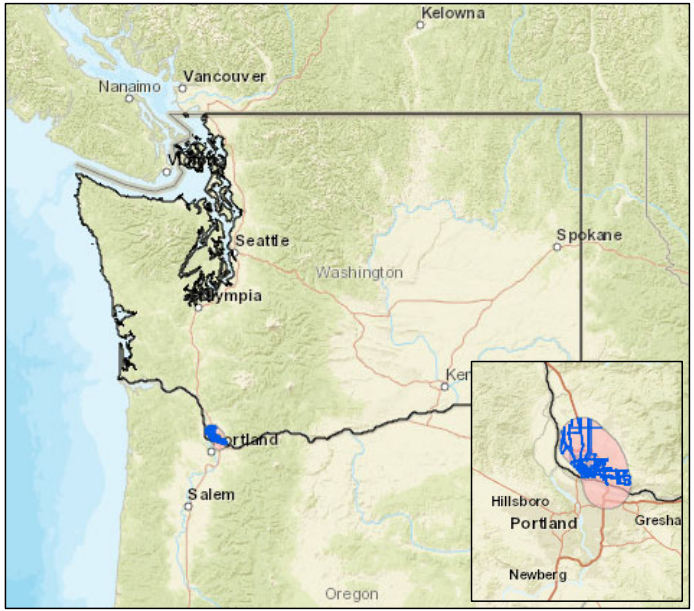
- Majority of households in Benton and Franklin counties served by I-182 have more than one service providers

I-182: Corridor Evaluation Score

Nos.	Evaluation Criteria	Score	Remark(s)
1	Unserved/Underserved Households Addressed	5.0	▪ Approximately 22,000 underserved / underserved households are covered within 5-mile radius of the corridor
2	Lack of Existing Fiber Presence or Excess Capacity to Serve Unserved / Underserved Households	15.0	▪ Spectrum, Franklin PUD, Noel Communication, and Neonet have existing presence; however, corridor has approximately 22,000 unserved / underserved households ▪ Existing fiber presence is around Kennewick area ▪ Corridor has an average internet speed of 50/10 Mbps in most areas
3	Population Centers Covered / Points of Presence Addressed	5.0	▪ Two population centers are covered by the interstate highway – approximately 80,000 households are residing within 5-mile radius
Total Score		**25.0 points**	

I-205: Existing Fiber Presence / Providers

Fiber Providers along Washington I-205

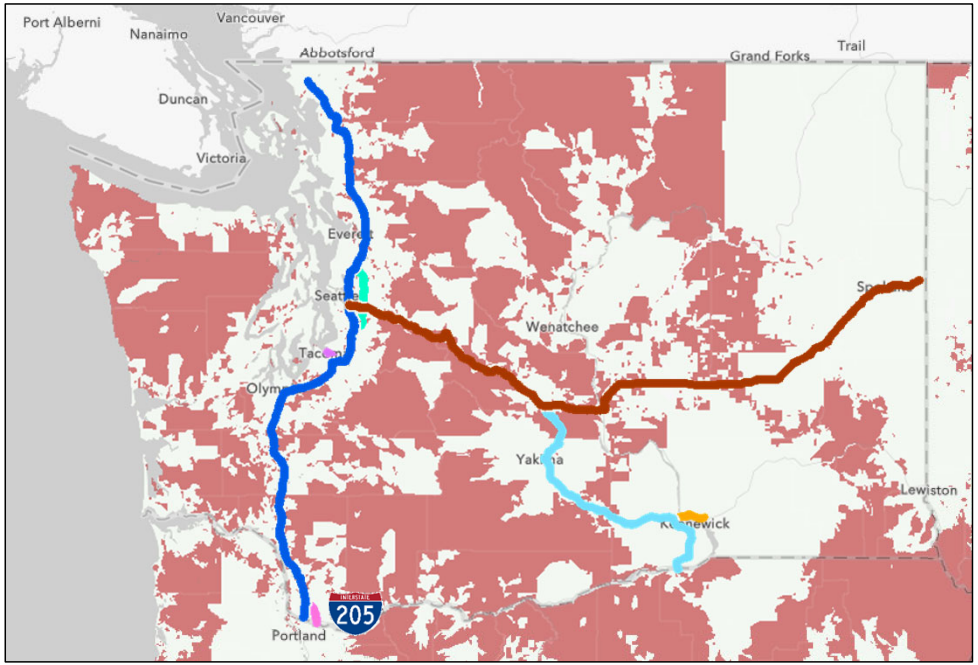


Top Providers[1]

Company	Footprint	Fiber Mileage (within 5-mile buffer)
NOANET	Regional Wholesaler	237
allstream.	National Fiber Company	197
Legacy Noel Communications	Regional Fiber Company	102
zayo	National Fiber Wholesaler	86
LUMEN (Legacy Centurylink)	National Fiber Company	64
wave	Regional Fiber Company	28
AT&T	National Wireless Company	27
Bonneville	Regional Utility Company	23
cogent	National Fiber Company	12
XO communications	National Fiber Company	9

Notes: 1) Only includes fiber providers (and corresponding fiber mileage) within a 5-mile buffer range of interstate highways
Source: KPMG Analysis based on Publicly Available Information

I-205: Broadband Speed (1/3)



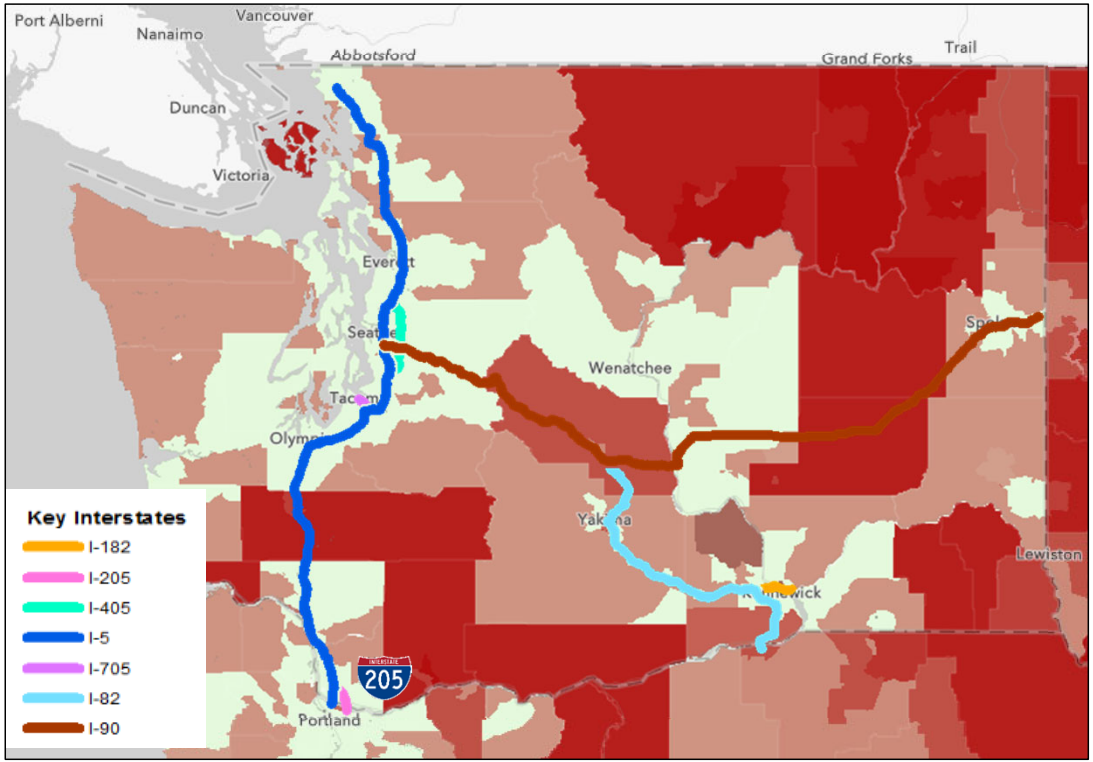
Key Interstates

- I-182
- I-205
- I-405
- I-5
- I-705
- I-82
- I-90

- *I-205 Corridor has moderate internet speeds with Portland region which reflects speeds ranging 50 Mbps to 100 Mbps (upload) and 10 Mbps to 25 Mbps (download)*

Sources: FCC Form 477 Data - Fixed Broadband Services at 25/3 Mbps

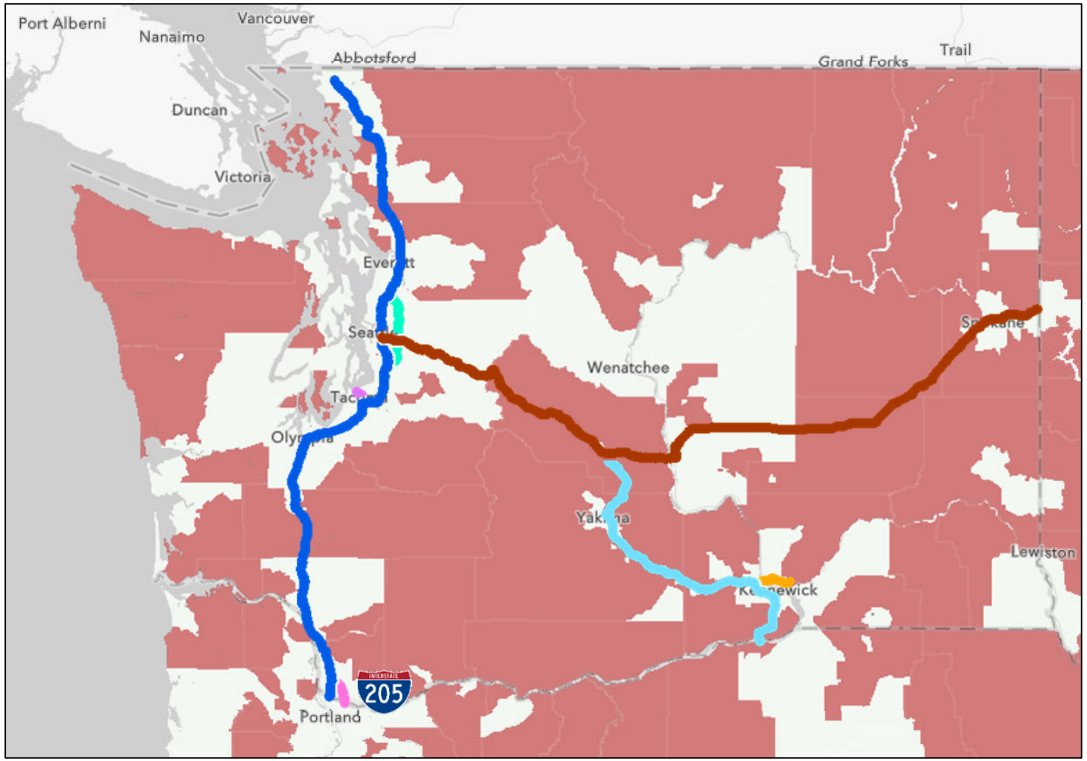
I-205: Broadband Speed (2/3)



Level	Indicator of Broadband Need	Yes	No	No Data
County	Speed Tests - M-Lab Median Speeds Fixed Broadband Below 25/3 Mbps			
	Usage - 75% or More of Devices Connect to Microsoft Updates/Services via Fixed Broadband Download Speeds below 25 Mbps			
Census Tract	Speed Tests - Ookla Median Speeds Fixed Broadband Below 25/3 Mbps			
	American Community Survey - 25% or More of Households Report No Internet Access			
	American Community Survey - 25% or More of Households Report No Computer, Smartphone or Tablet			
Census Block	FCC Form 477 – No Provider Reports Consumer Fixed Broadband Services at 25/3 Mbps			NA

Sources: National Telecommunications and Information Administration Data

I-205: Broadband Speed (3/3)

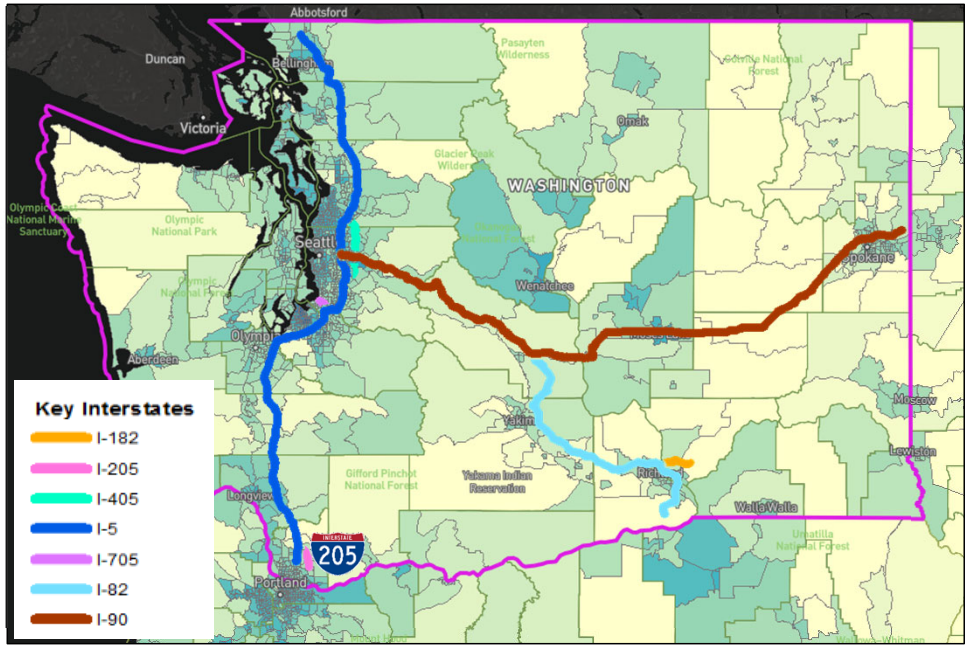


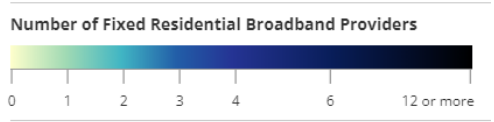
Key Interstates

- I-182
- I-205
- I-405
- I-5
- I-705
- I-82
- I-90

Sources: Ookla Median Speeds Fixed Broadband Below 25/3 Mbps (Census Tract)

I-205: # of Service Providers





County	% of Population with No Providers	% of Population with One provider or less
Clark	4.68 %	15.24 %

Sources: ESRI, FCC, ACS 2019

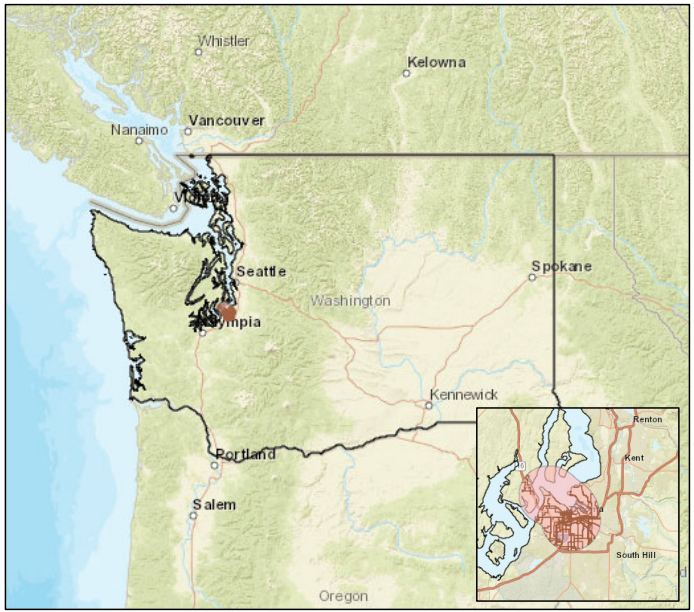
- Majority of households in Clark county served by I-205 have more than one service providers

I-205: Corridor Evaluation Score

Nos.	Evaluation Criteria	Score	Remark(s)
1	Unserved/Underserved Households Addressed	5.0	▪ Approximately 39,500 underserved / underserved households are covered within 5-mile radius of the corridor
2	Lack of Existing Fiber Presence or Excess Capacity to Serve Unserved / Underserved Households	10.0	▪ Neonet, Allstream, Noel Communication, and Zayo have existing presence; however, corridor has approximately 39,500 unserved / underserved households ▪ Existing fiber presence is around Portland metro area ▪ Corridor has an average internet speed of 50/10 Mbps in most areas
3	Population Centers Covered / Points of Presence Addressed	5.0	▪ One population center is covered by the interstate highway – approximately 177,000 households are residing within 5-mile radius
Total Score		**20.0 points**	

I-705: Existing Fiber Presence / Providers

Fiber Providers along Washington I-705

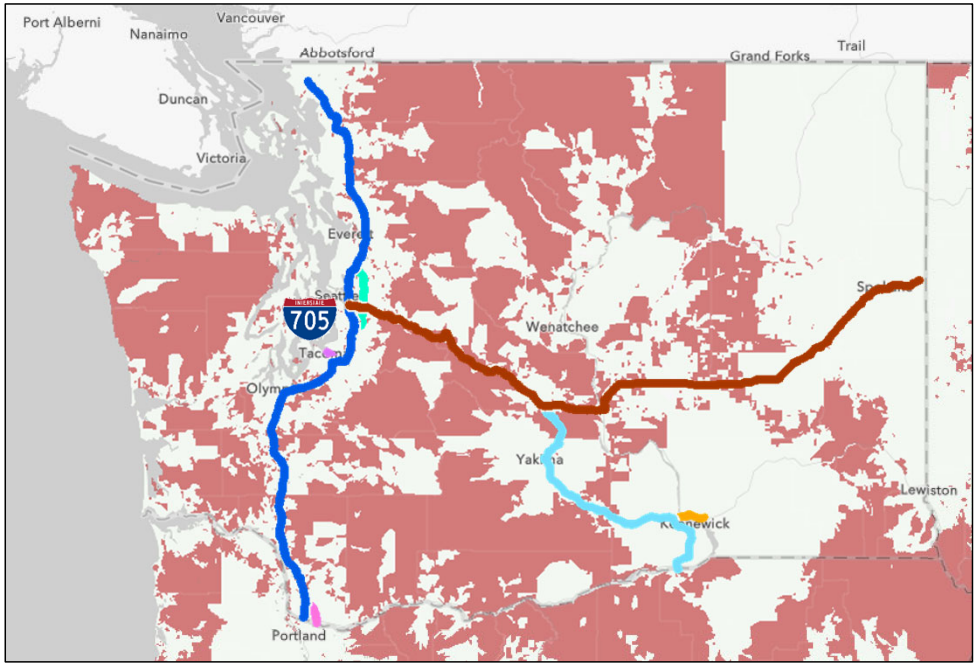


Top Providers[1]

Company	Footprint	Fiber Mileage (within 5-mile buffer)
zayo	National Fiber Wholesaler	109
CLICK! CABLE TV	Regional Public Utility	91
allstream.	National Fiber Company	91
Legacy Noel Communications	Regional Fiber Company	84
LUMEN (Legacy Centurylink)	National Fiber Company	83
COMCAST	National Fiber Company	54
wave	Regional Fiber Company	31
XO communications	National Fiber Company	23
alaska COMMUNICATIONS	Regional Fiber Company	19
fatbeam	Regional Fiber Company	11

Notes: 1) Only includes fiber providers (and corresponding fiber mileage) within a 5-mile buffer range of interstate highways
Source: KPMG Analysis based on Publicly Available Information

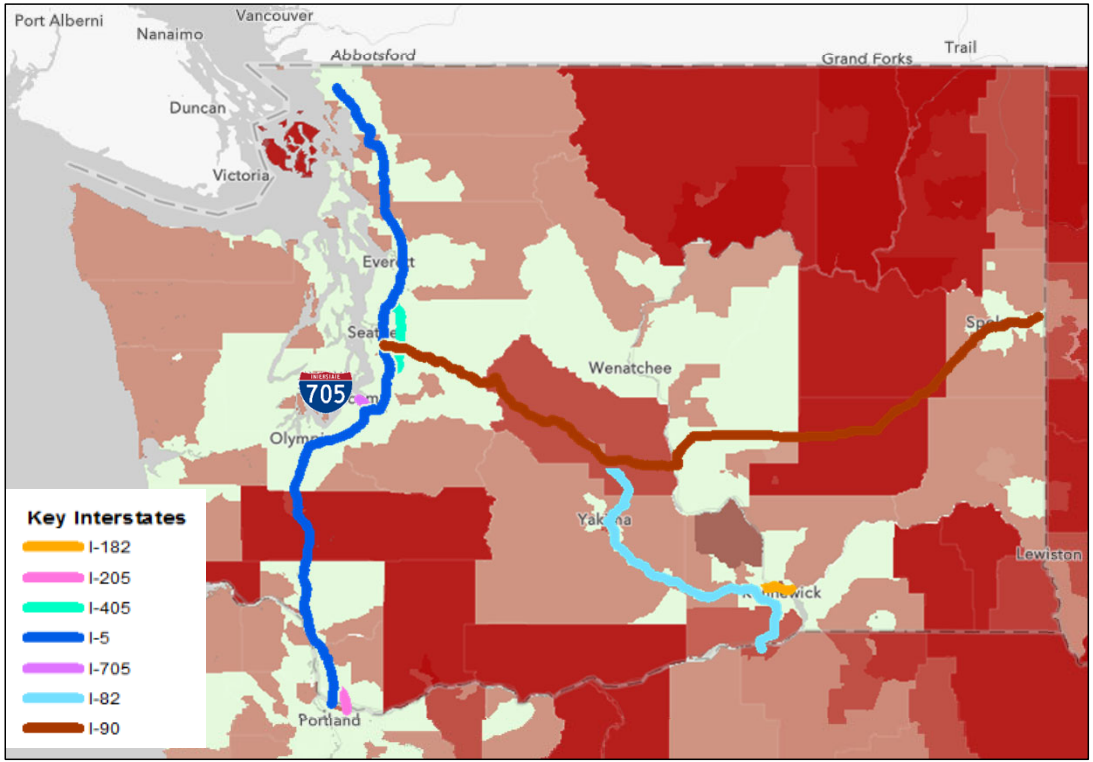
I-705: Broadband Speed (1/3)



- *I-705 Corridor has moderate internet speeds with Tacoma area which reflects speeds ranging 50 Mbps to 100 Mbps (upload) and 10 Mbps to 25 Mbps (download)*

Sources: FCC Form 477 Data - Fixed Broadband Services at 25/3 Mbps

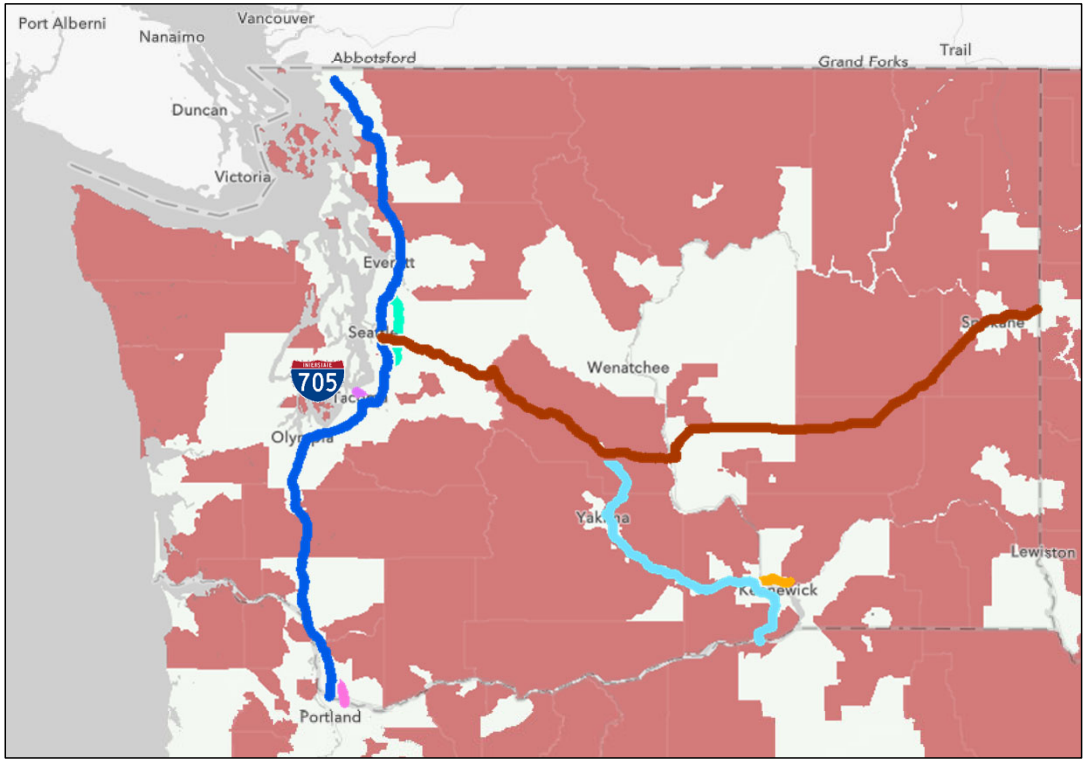
I-705: Broadband Speed (2/3)



Level	Indicator of Broadband Need	Yes	No	No Data
County	Speed Tests - M-Lab Median Speeds Fixed Broadband Below 25/3 Mbps			
	Usage - 75% or More of Devices Connect to Microsoft Updates/Services via Fixed Broadband Download Speeds below 25 Mbps			
Census Tract	Speed Tests - Ookla Median Speeds Fixed Broadband Below 25/3 Mbps			
	American Community Survey - 25% or More of Households Report No Internet Access			
	American Community Survey - 25% or More of Households Report No Computer, Smartphone or Tablet			
Census Block	FCC Form 477 – No Provider Reports Consumer Fixed Broadband Services at 25/3 Mbps			NA

Sources: National Telecommunications and Information Administration Data

I-705: Broadband Speed (3/3)

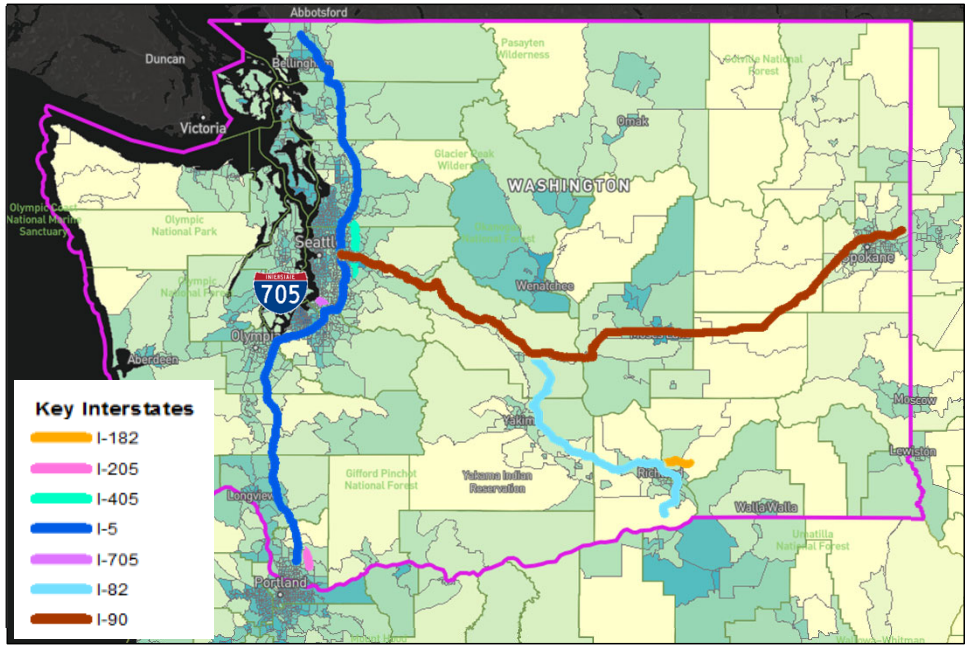


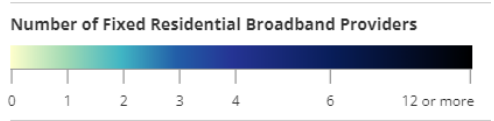
Key Interstates

- I-182
- I-205
- I-405
- I-5
- I-705
- I-82
- I-90

Sources: Ookla Median Speeds Fixed Broadband Below 25/3 Mbps (Census Tract)

I-705: # of Service Providers





County	% of Population with No Providers	% of Population with One provider or less
Pierce	3.77 %	33.32 %

Sources: ESRI, FCC, ACS 2019

- Majority of households in Pierce county served by I-705 have more than one service providers

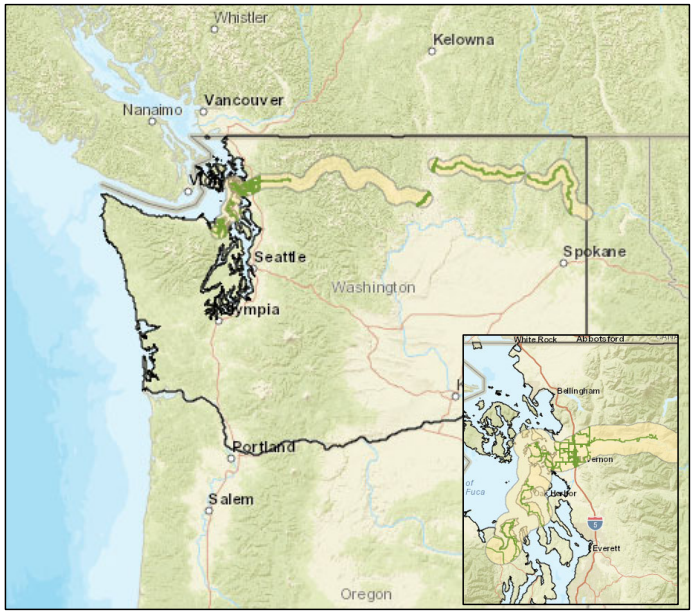
I-705: Corridor Evaluation Score

Nos.	Evaluation Criteria	Score	Remark(s)
1	Unserved/Underserved Households Addressed	5.0	▪ Approximately 36,500 underserved / underserved households are covered within 5-mile radius of the corridor
2	Lack of Existing Fiber Presence or Excess Capacity to Serve Unserved / Underserved Households	10.0	▪ Zayo, Click Cable, Allstream, and Noel Communication have existing presence; however, corridor has approximately 36,500 unserved / underserved households ▪ Existing fiber presence is around Tacoma metro area ▪ Corridor has an average internet speed of 50/10 Mbps in most areas
3	Population Centers Covered / Points of Presence Addressed	5.0	▪ One population center is covered by the interstate highway – approximately 128,500 households are residing within 5-mile radius
Total Score		**20.0 points**	

Select State Routes Evaluation Data

US-20: Existing Fiber Presence / Providers

Fiber Providers along Washington US-20

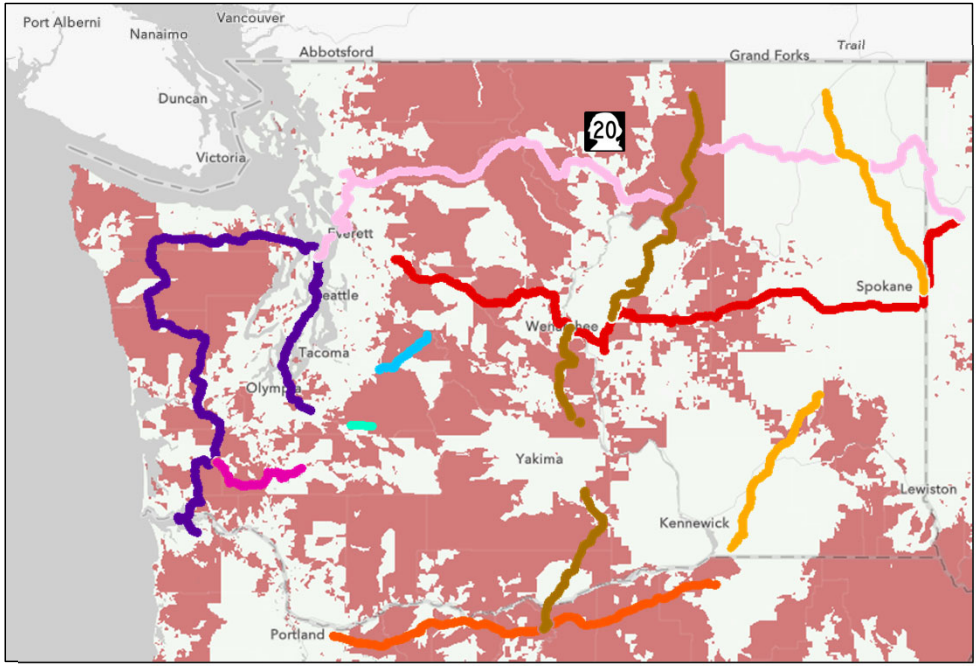


Top Providers[1]

Company	Footprint	Fiber Mileage (within 5-mile buffer)
wave	Regional Fiber	277
NOANET	Regional Wholesaler	276
Blackrock Cable	Regional Cable Company	245
Legacy Noel Communications	Regional Fiber Company	164
STARTOUCH	Regional Wholesaler	144
allstream	National Fiber Company	131
zayo	National Fiber Wholesaler	87
Skagit County	Municipality	48
COMCAST	National Fiber Company	29
Rail America Row	Regional Fiber Company	28

Notes: 1) Only includes fiber providers (and corresponding fiber mileage) within a 5-mile buffer range of interstate highways
Source: KPMG Analysis based on Publicly Available Information

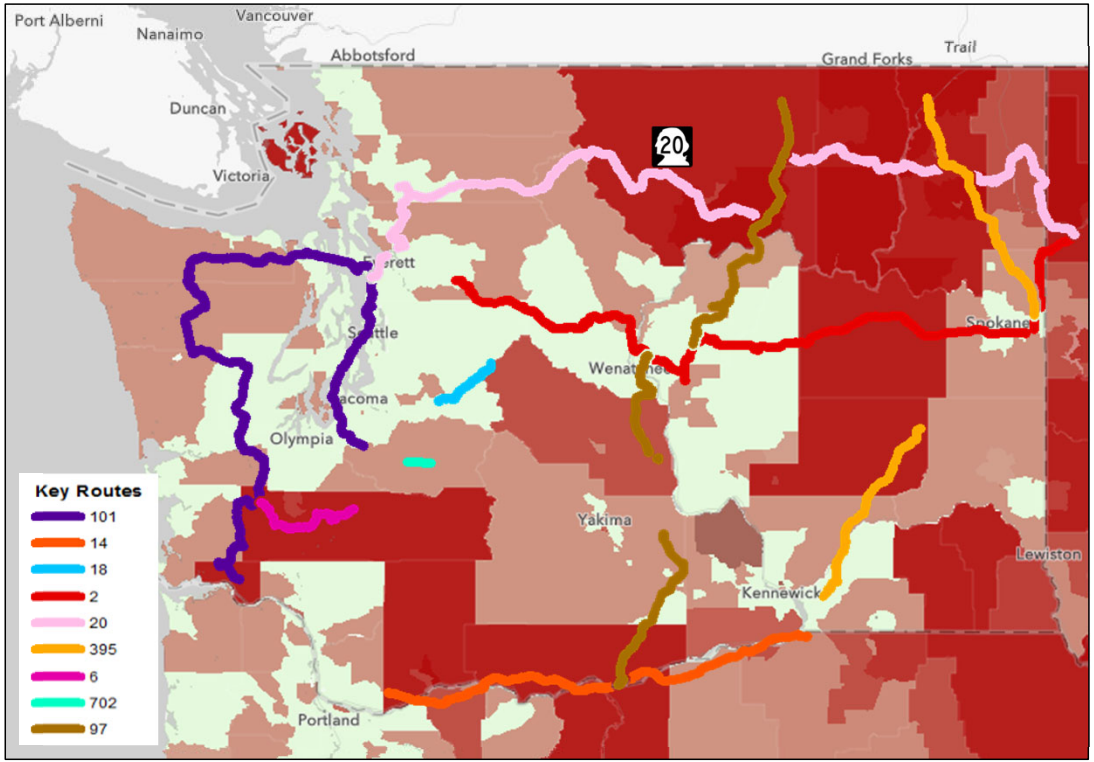
US-20: Broadband Speed (1/3)



- *US-20 Corridor has moderate internet speeds along Burlington, Sedro-Woolley, Rockport areas. The eastern portion of the corridor (Mazama area) reflects speeds ranging 50 Mbps to 100 Mbps (upload) and 10 Mbps to 25 Mbps (download)*

Sources: FCC Form 477 Data - Fixed Broadband Services at 25/3 Mbps

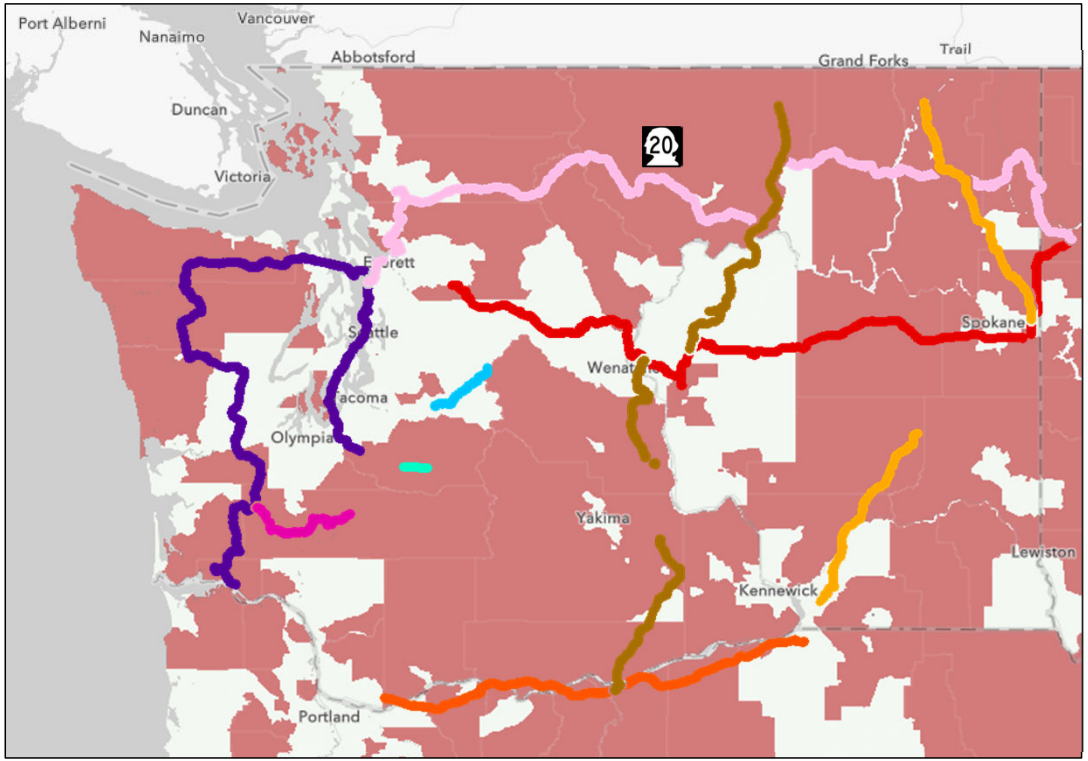
US-20: Broadband Speed (2/3)



Level	Indicator of Broadband Need	Yes	No	No Data
County	Speed Tests - M-Lab Median Speeds Fixed Broadband Below 25/3 Mbps			
	Usage - 75% or More of Devices Connect to Microsoft Updates/Services via Fixed Broadband Download Speeds below 25 Mbps			
Census Tract	Speed Tests - Ookla Median Speeds Fixed Broadband Below 25/3 Mbps			
	American Community Survey - 25% or More of Households Report No Internet Access			
	American Community Survey - 25% or More of Households Report No Computer, Smartphone or Tablet			
Census Block	FCC Form 477 – No Provider Reports Consumer Fixed Broadband Services at 25/3 Mbps			NA

Sources: National Telecommunications and Information Administration Data

US-20: Broadband Speed (3/3)

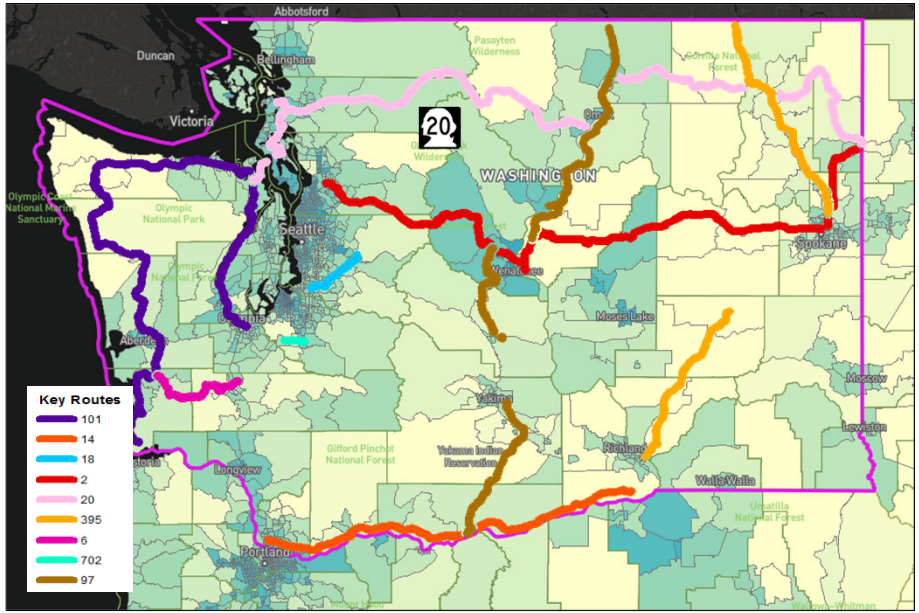


Key Routes

- 101
- 14
- 18
- 2
- 20
- 395
- 6
- 702
- 97

Sources: Ookla Median Speeds Fixed Broadband Below 25/3 Mbps (Census Tract)

US-20: # of Service Providers



Number of Fixed Residential Broadband Providers

0 1 2 3 4 6 12 or more

Broadband

Technology Cable, Fiber
Speed ≥ 100/10 Mbps
Date June 2020 *(latest public release)*

County	% of Population with No Providers	% of Population with One provider or less
Jefferson	17.04 %	97.65 %
Island	1.82 %	67.51 %
Skagit	7.59 %	76.38 %
Whatcom	9.79 %	69.07 %
Chelan	5.91 %	18.86 %
Okanogan	37.98 %	80.87 %
Ferry	0.39 %	99.42 %
Stevens	0 %	62.7 %
Pend Oreille	0.07 %	48.32 %

- *Majority of households in Jefferson, Island, Skagit, Whatcom, Okanogan, Ferry and Stevens counties have one or less service providers*

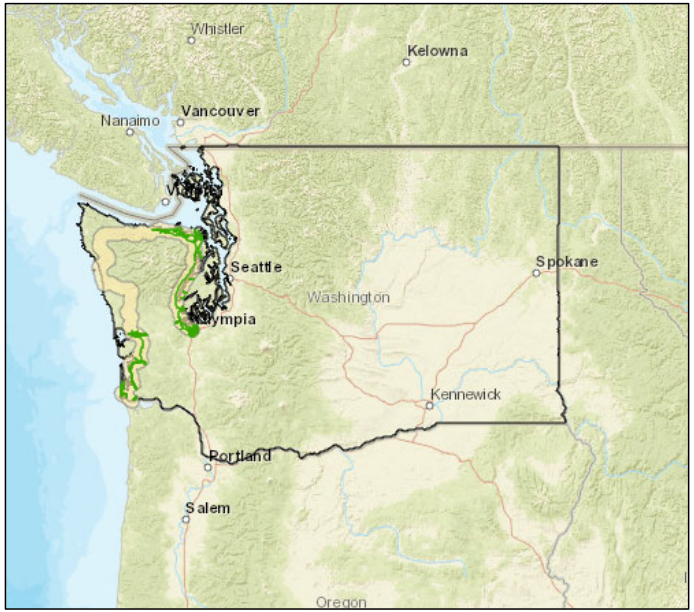
Sources: ESRI, FCC, ACS 2019

US-20: Corridor Evaluation Score

Nos.	Evaluation Criteria	Score	Remark(s)
1	Unserved/Underserved Households Addressed	15.0	▪ Approximately 27,800 underserved / underserved households are covered within 5-mile radius of the corridor
2	Lack of Existing Fiber Presence or Excess Capacity to Serve Unserved / Underserved Households	10.0	▪ Wave, Noanet, Blackrock Cable, and Noel Communication have existing presence; however, corridor has approximately 27,800 unserved / underserved households ▪ Population density is lower as compared to other corridors ▪ Existing fiber presence is located on the western and eastern parts of the corridor ▪ Corridor has an average internet speed of 50/10 Mbps in most areas
3	Population Centers Covered / Points of Presence Addressed	30.0	▪ Ten population center is covered by the state route – approximately 91,800 households are residing within 5-mile radius
Total Score		**55.0 points**	

US-101: Existing Fiber Presence / Providers

Fiber Providers along Washington US-101

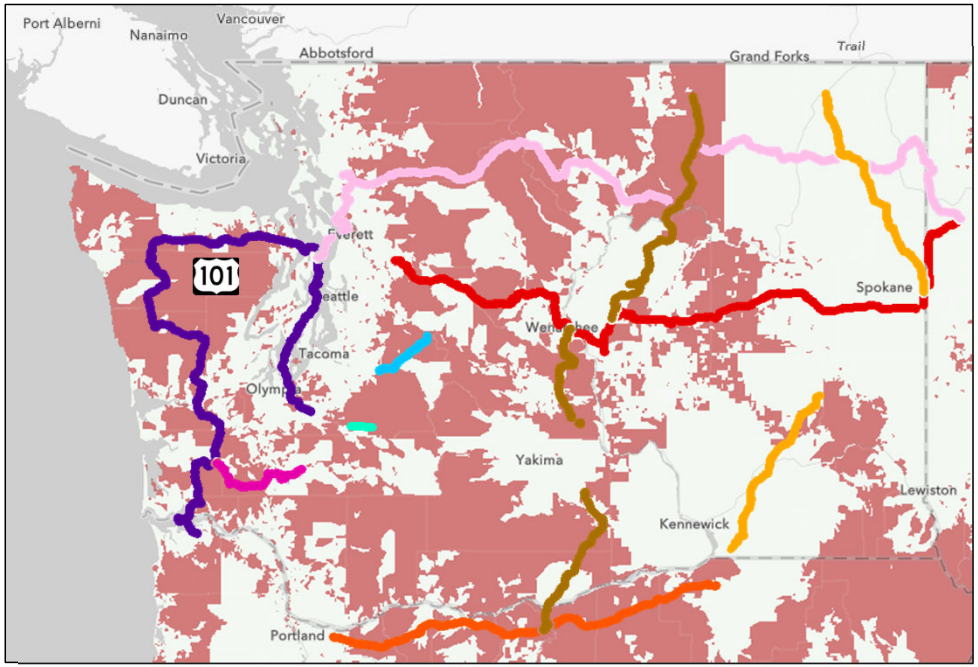


Top Providers[1]

Company	Footprint	Fiber Mileage (within 5-mile buffer)
NOANET	Regional Wholesaler	244
wave	Regional Fiber	216
Legacy Noel Communications	Regional Fiber Company	83
PUD	Regional Utility Company	78
Rail America Row	Regional Fiber Company	60
allstream	National Fiber Company	38
zayo	National Fiber Wholesaler	33
Spectrum	National Cable Company	24
Grays Harbor PUD	Regional Utility Company	19
COMCAST	National Fiber Company	19

Notes: 1) Only includes fiber providers (and corresponding fiber mileage) within a 5-mile buffer range of interstate highways
Source: KPMG Analysis based on Publicly Available Information

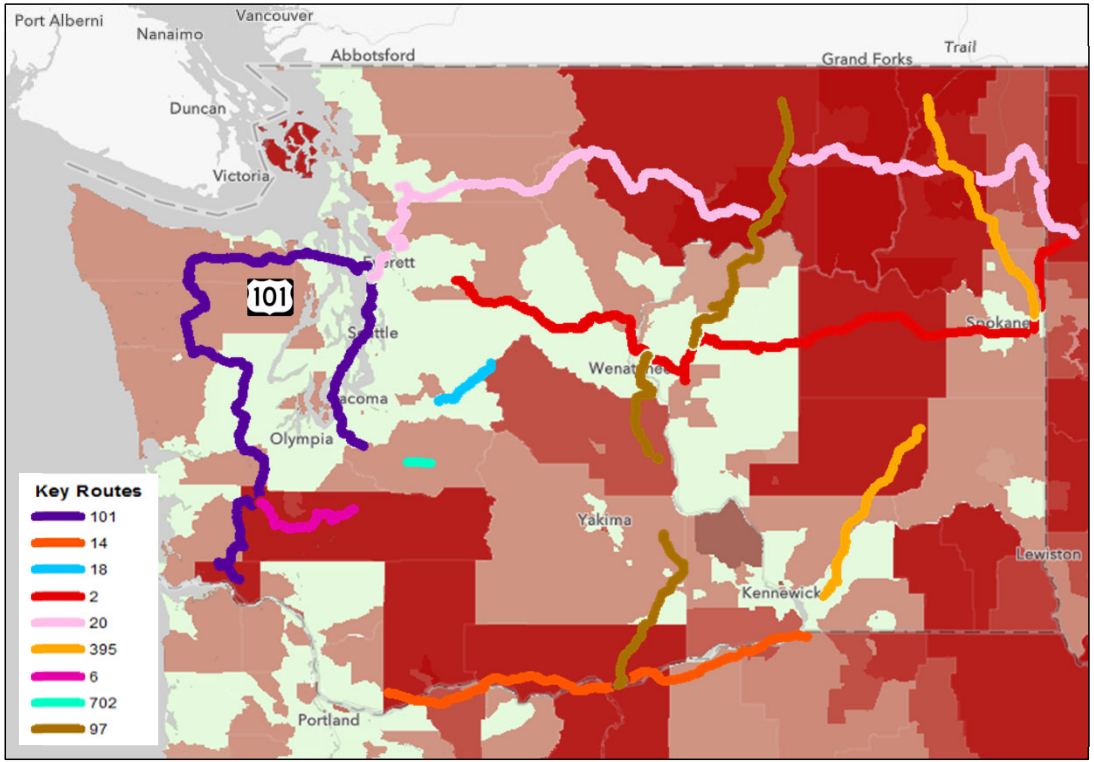
US-101: Broadband Speed (1/3)



- *US-101 Corridor has low to moderate internet speeds along the north-western and the western part of the corridor that have internet speeds ranging 25 Mbps to 50 Mbps (upload) and 3 Mbps to 10 Mbps (download)*

Sources: FCC Form 477 Data - Fixed Broadband Services at 25/3 Mbps

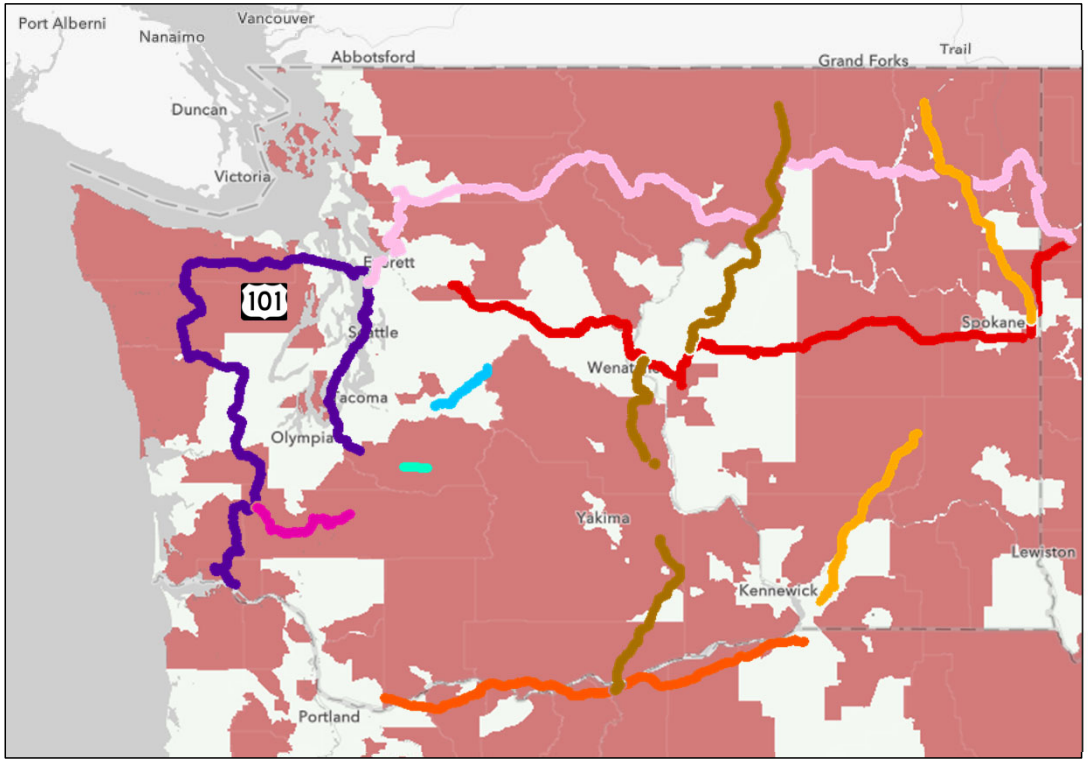
US-101: Broadband Speed (2/3)



Level	Indicator of Broadband Need	Yes	No	No Data
County	Speed Tests - M-Lab Median Speeds Fixed Broadband Below 25/3 Mbps			
	Usage - 75% or More of Devices Connect to Microsoft Updates/Services via Fixed Broadband Download Speeds below 25 Mbps			
Census Tract	Speed Tests - Ookla Median Speeds Fixed Broadband Below 25/3 Mbps			
	American Community Survey - 25% or More of Households Report No Internet Access			
	American Community Survey - 25% or More of Households Report No Computer, Smartphone or Tablet			
Census Block	FCC Form 477 – No Provider Reports Consumer Fixed Broadband Services at 25/3 Mbps			NA

Sources: National Telecommunications and Information Administration Data

US-101: Broadband Speed (3/3)

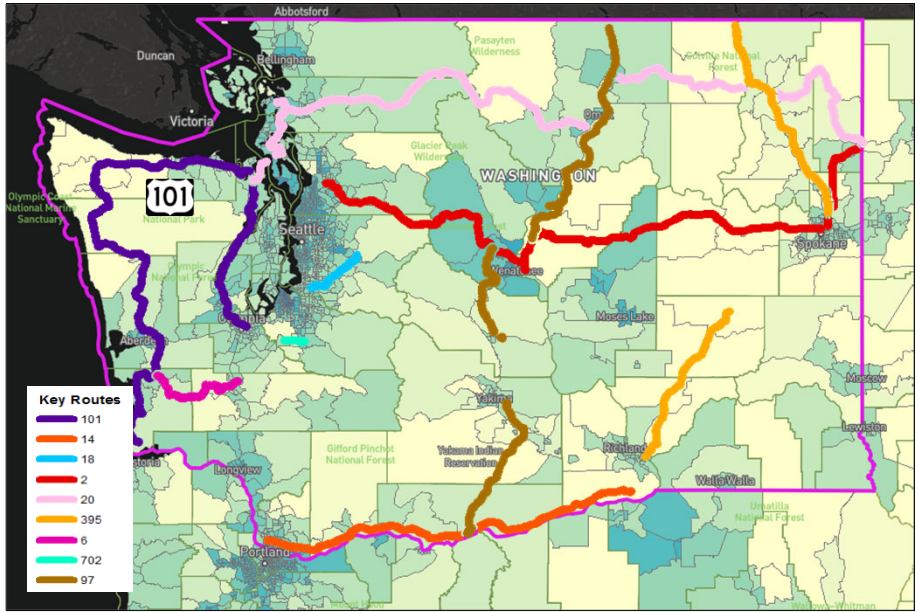


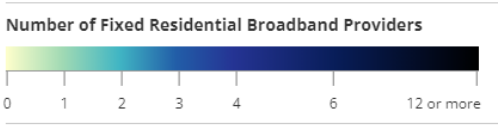
Key Routes

- 101
- 14
- 18
- 2
- 20
- 395
- 6
- 702
- 97

Sources: Ookla Median Speeds Fixed Broadband Below 25/3 Mbps (Census Tract)

US-101: # of Service Providers





Broadband

Technology Cable, Fiber
Speed ≥ 100/10 Mbps
Date June 2020 *(latest public release)*

County	% of Population with No Providers	% of Population with One provider or less
Pacific	14.56 %	100 %
Grays Harbor	11.58 %	71.71 %
Jefferson	17.04 %	97.65 %
Clallam	25.64 %	81.46 %
Mason	18.64 %	70.98 %
Thurston	6.85 %	54.33 %

- *Majority of households in Pacific, Grays Harbor, Jefferson, Clallam, Mason and Thurston counties have one or less service providers*

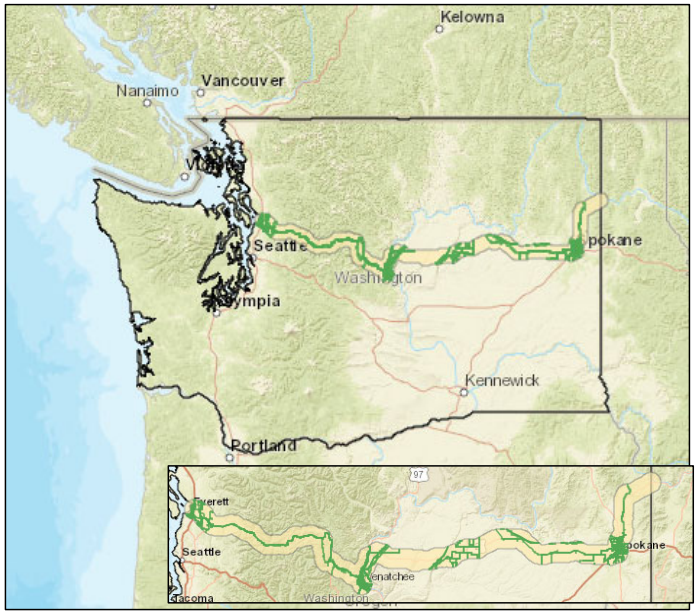
Sources: ESRI, FCC, ACS 2019

US-101: Corridor Evaluation Score

Nos.	Evaluation Criteria	Score	Remark(s)
1	Unserved/Underserved Households Addressed	20.0	▪ Approximately 36,600 underserved / underserved households are covered within 5-mile radius of the corridor
2	Lack of Existing Fiber Presence or Excess Capacity to Serve Unserved / Underserved Households	10.0	▪ Noanet, Wave, Noel Communication, and Pacific County PUD have existing presence; however, corridor has approximately 36,600 unserved / underserved households ▪ Population density is lower as compared to other corridors ▪ Corridor has an average internet speed up to 50/10 Mbps in most areas
3	Population Centers Covered / Points of Presence Addressed	30.0	▪ Ten population center is covered by the state route – approximately 131,400 households are residing within 5-mile radius
Total Score		**60.0 points**	

US-2: Existing Fiber Presence / Providers

Fiber Providers along Washington US-2

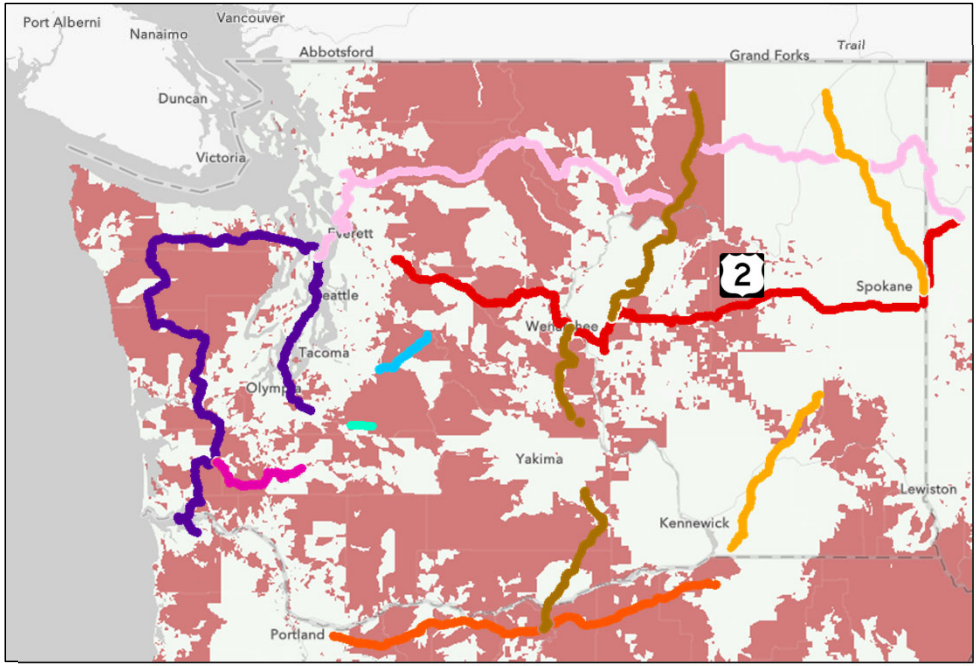


Top Providers[1]

Company	Footprint	Fiber Mileage (within 5-mile buffer)
Legacy Noel Communications	Regional Fiber Company	866
zayo	National Fiber Wholesaler	619
LUMEN (Legacy Centurylink)	National Fiber Company	376
NOANET	Regional Wholesaler	281
allstream.	National Fiber Company	250
Orbitcom	Regional Fiber Company	234
Grant PUD / High Speed Network	Regional Utility Company	211
Syringa Networks	National Fiber Company	208
Blackrock Cable	Regional Cable Company	173
XO communications	National Fiber Company	153

Notes: 1) Only includes fiber providers (and corresponding fiber mileage) within a 5-mile buffer range of interstate highways
Source: KPMG Analysis based on Publicly Available Information

US-2: Broadband Speed (1/3)



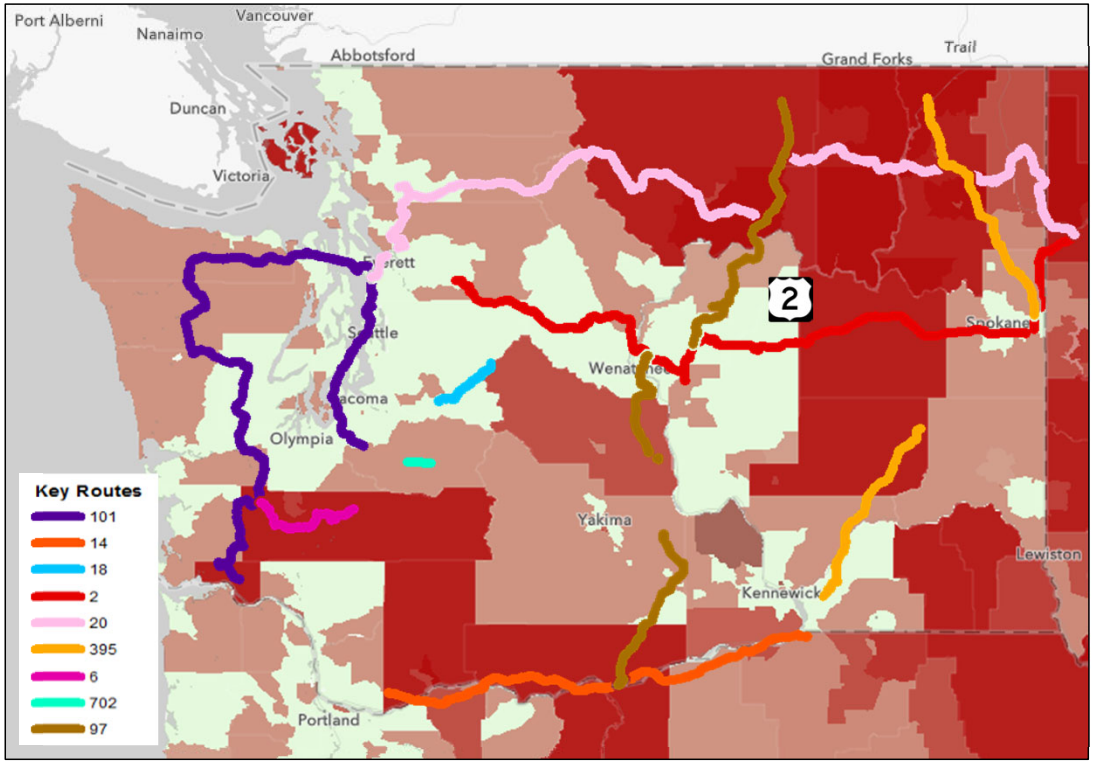
Key Routes

- 101
- 14
- 18
- 2
- 20
- 395
- 6
- 702
- 97

- *US-2 Corridor has moderate internet speeds along the western and eastern part of the corridor. Spokane area have internet speeds ranging 50 Mbps to 100 Mbps (upload) and 10 Mbps to 25 Mbps (download)*

Sources: FCC Form 477 Data - Fixed Broadband Services at 25/3 Mbps

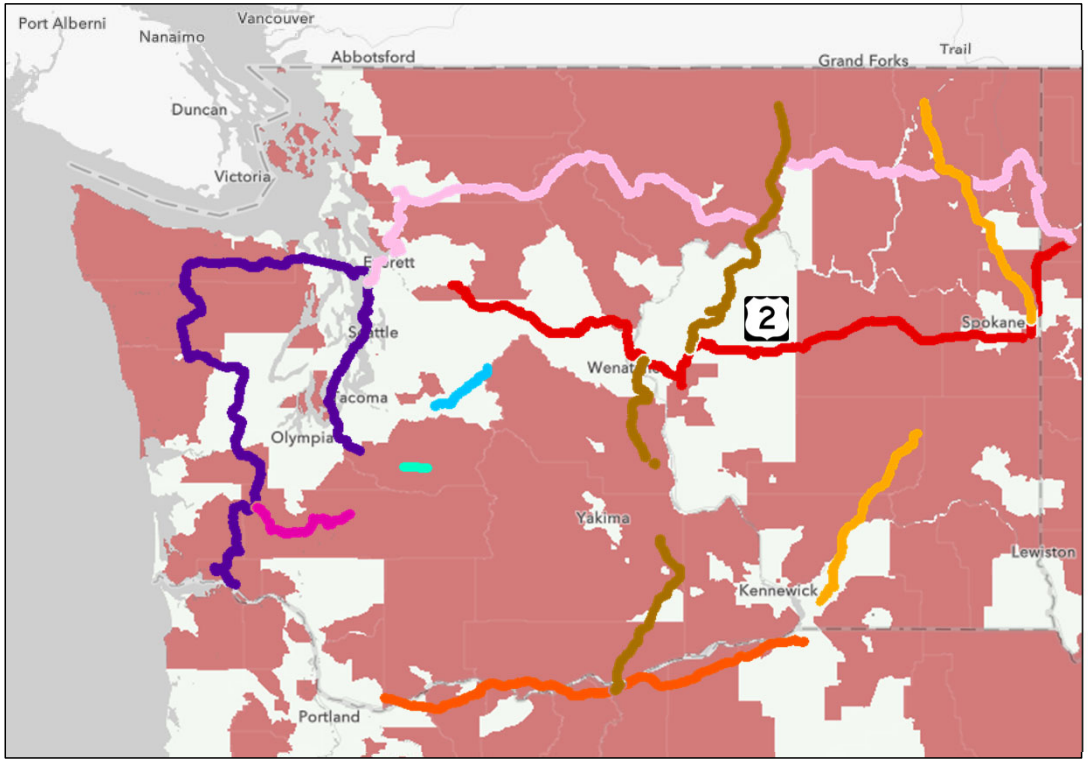
US-2: Broadband Speed (2/3)



Level	Indicator of Broadband Need	Yes	No	No Data
County	Speed Tests - M-Lab Median Speeds Fixed Broadband Below 25/3 Mbps			
	Usage - 75% or More of Devices Connect to Microsoft Updates/Services via Fixed Broadband Download Speeds below 25 Mbps			
Census Tract	Speed Tests - Ookla Median Speeds Fixed Broadband Below 25/3 Mbps			
	American Community Survey - 25% or More of Households Report No Internet Access			
	American Community Survey - 25% or More of Households Report No Computer, Smartphone or Tablet			
Census Block	FCC Form 477 – No Provider Reports Consumer Fixed Broadband Services at 25/3 Mbps			NA

Sources: National Telecommunications and Information Administration Data

US-2: Broadband Speed (3/3)

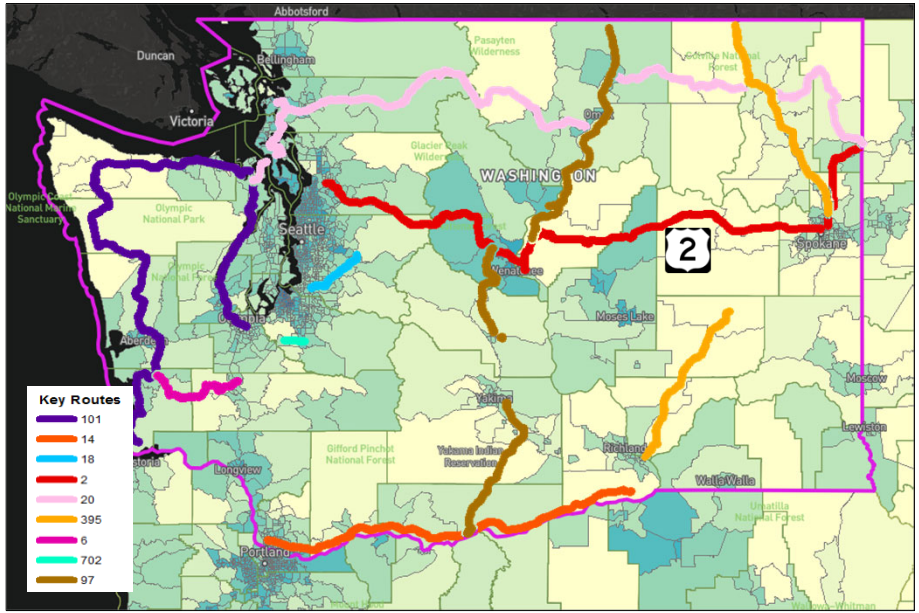


Key Routes

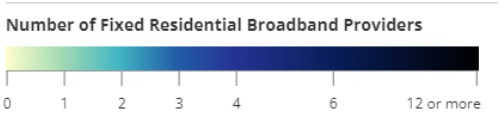
- 101
- 14
- 18
- 2
- 20
- 395
- 6
- 702
- 97

Sources: Ookla Median Speeds Fixed Broadband Below 25/3 Mbps (Census Tract)

US-2: # of Service Providers



- *Majority of households in Lincoln and Spokane counties have one or less service providers*



County	% of Population with No Providers	% of Population with One provider or less
Snohomish	3.65 %	30.52 %
King	2.87 %	27.07 %
Chelan	5.91 %	18.86 %
Douglas	9.11 %	31.43 %
Grant	13.84 %	48.1 %
Lincoln	90.53 %	99.75 %
Spokane	10.91 %	56.45 %
Pend Oreille	0.07 %	48.32 %

Sources: ESRI, FCC, ACS 2019

US-2: Corridor Evaluation Score

Nos.	Evaluation Criteria	Score	Remark(s)
1	Unserved/Underserved Households Addressed	40.0	▪ Approximately 67,600 underserved / underserved households are covered within 5-mile radius of the corridor
2	Lack of Existing Fiber Presence or Excess Capacity to Serve Unserved / Underserved Households	20.0	▪ Noel Communications, Zayo, Lumen and Noanet have existing presence; however, corridor has approximately 67,600 unserved / underserved households ▪ Existing fiber presence is concentrated around Seattle and Spokane area ▪ Corridor has an average internet speed up to 50/10 Mbps in most areas
3	Population Centers Covered / Points of Presence Addressed	30.0	▪ Nine population center is covered by the state route – approximately 258,800 households are residing within 5-mile radius
Total Score		**90.0 points**	

US-97: Existing Fiber Presence / Providers

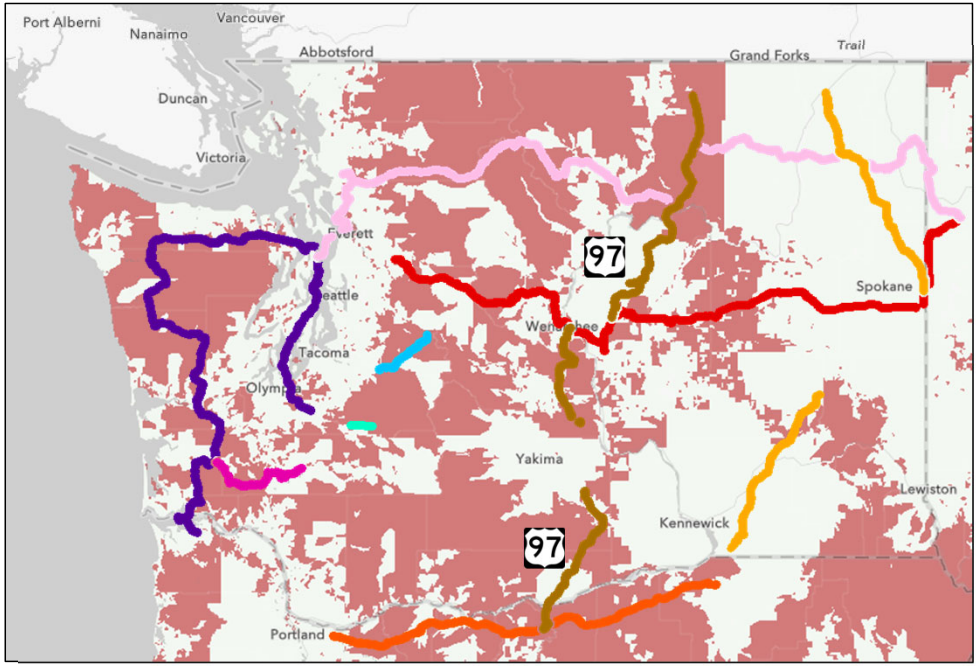
Fiber Providers along Washington US-95

Top Providers[1]

Company	Footprint	Fiber Mileage (within 5-mile buffer)
Legacy Noel Communications	Regional Fiber Company	420
Rail America Row	Regional Fiber Company	259
zayo	National Fiber Wholesaler	197
NOANET	Regional Wholesaler	194
Spectrum	National Cable Company	171
LUMEN (Legacy Centurylink)	National Fiber Company	98
allstream	National Fiber Company	87
Syringa Networks	National Fiber Company	78
wave	Regional Fiber	63
cogent	National Fiber Company	46

Notes: 1) Only includes fiber providers (and corresponding fiber mileage) within a 5-mile buffer range of interstate highways
Source: KPMG Analysis based on Publicly Available Information

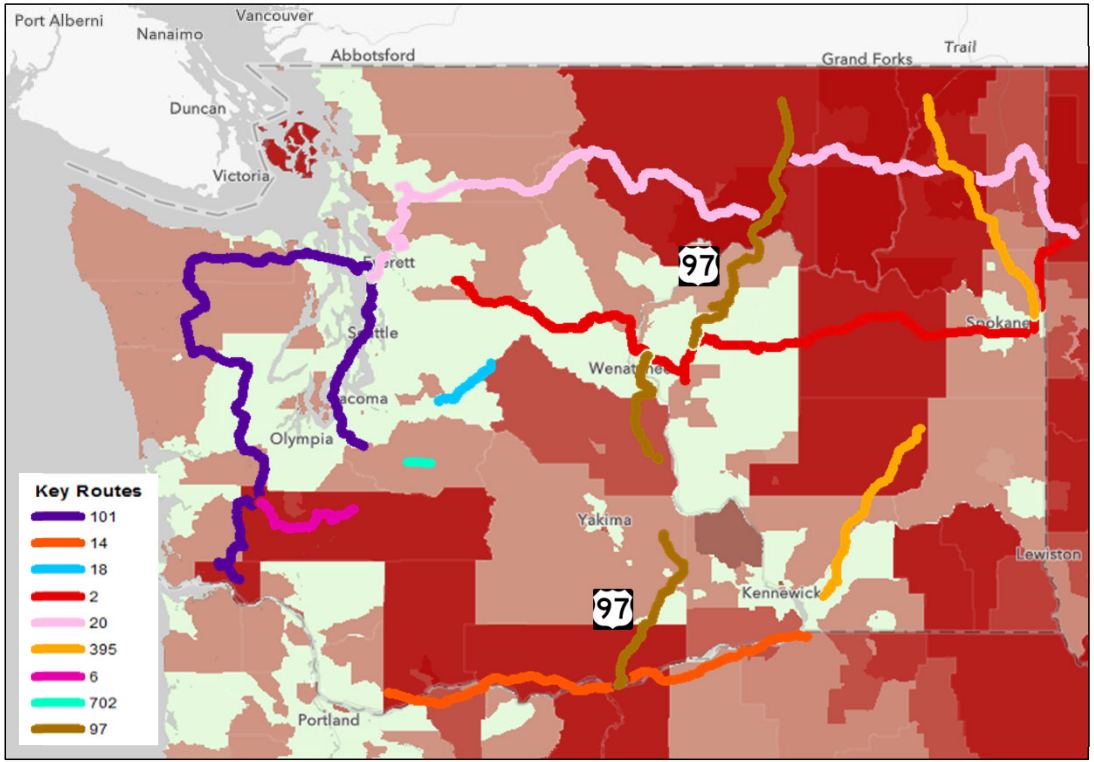
US-97: Broadband Speed (1/3)



- *US-97 Corridor has moderate internet speeds along the Wenatchee area have internet speeds ranging 50 Mbps to 100 Mbps (upload) and 10 Mbps to 25 Mbps (download)*

Sources: FCC Form 477 Data - Fixed Broadband Services at 25/3 Mbps

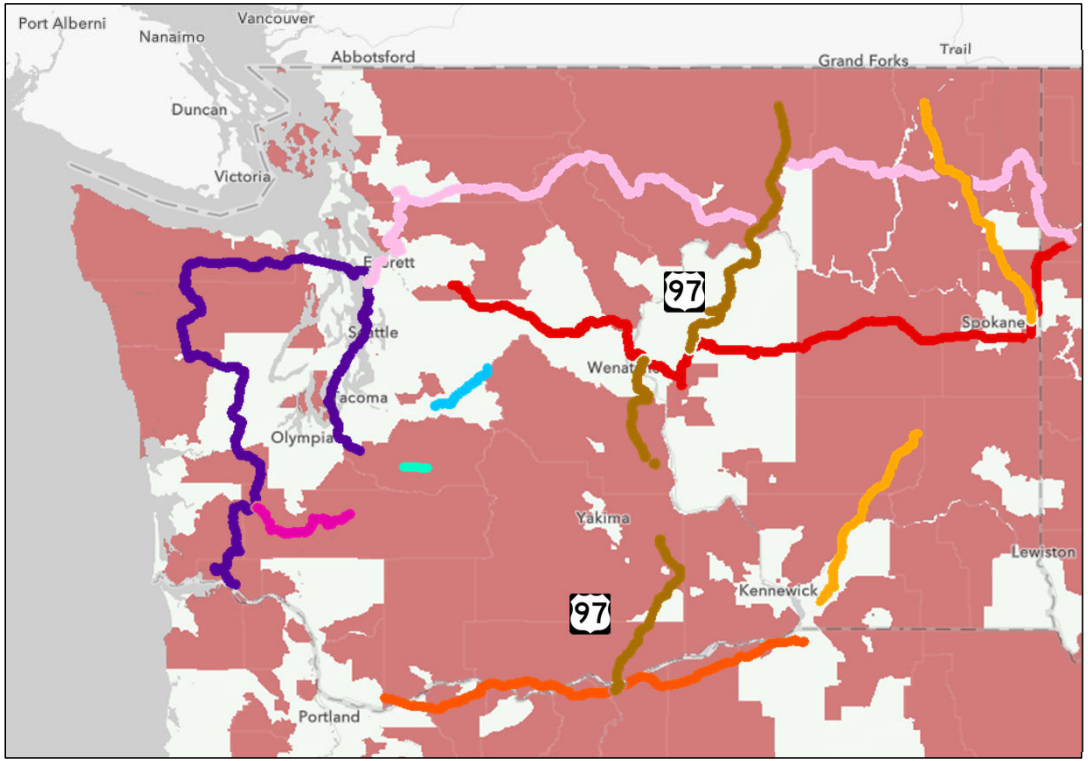
US-97: Broadband Speed (2/3)



Level	Indicator of Broadband Need	Yes	No	No Data
County	Speed Tests - M-Lab Median Speeds Fixed Broadband Below 25/3 Mbps			
	Usage - 75% or More of Devices Connect to Microsoft Updates/Services via Fixed Broadband Download Speeds below 25 Mbps			
Census Tract	Speed Tests - Ookla Median Speeds Fixed Broadband Below 25/3 Mbps			
	American Community Survey - 25% or More of Households Report No Internet Access			
	American Community Survey - 25% or More of Households Report No Computer, Smartphone or Tablet			
Census Block	FCC Form 477 – No Provider Reports Consumer Fixed Broadband Services at 25/3 Mbps			NA

Sources: National Telecommunications and Information Administration Data

US-97: Broadband Speed (3/3)

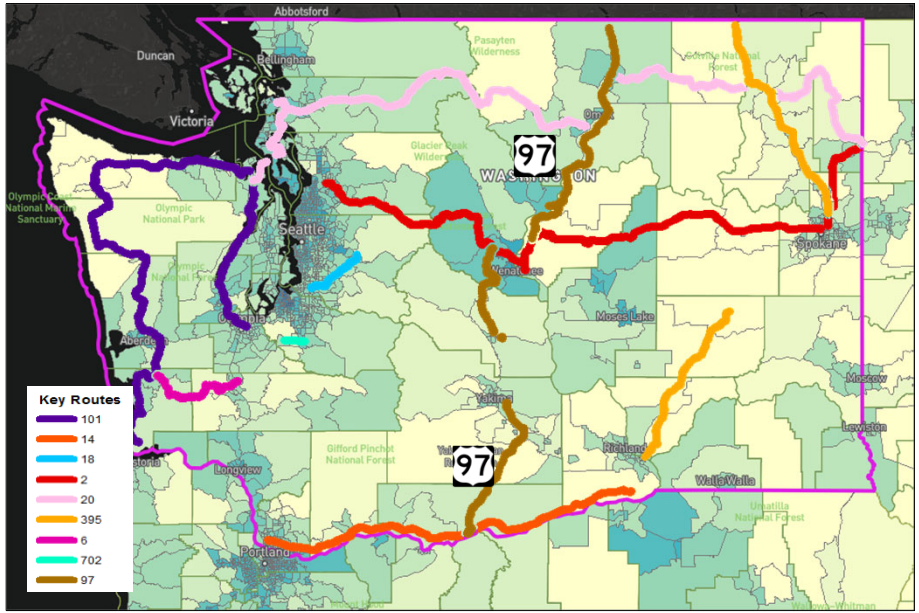


Key Routes

- 101
- 14
- 18
- 2
- 20
- 395
- 6
- 702
- 97

Sources: Ookla Median Speeds Fixed Broadband Below 25/3 Mbps (Census Tract)

US-97: # of Service Providers



Number of Fixed Residential Broadband Providers

0 1 2 3 4 6 12 or more

Broadband

Technology Cable, Fiber
Speed ≥ 100/10 Mbps
Date June 2020 *(latest public release)*

County	% of Population with No Providers	% of Population with One provider or less
Klickitat	45.81 %	95.34 %
Yakima	7.69 %	37.75 %
Kittitas	35.59 %	97.15 %
Chelan	5.91 %	18.86 %
Douglas	9.11 %	31.43 %
Okanogan	37.98 %	80.87 %

- *Majority of households in Klickitat, Kittitas, and Okanogan counties have one or less service providers*

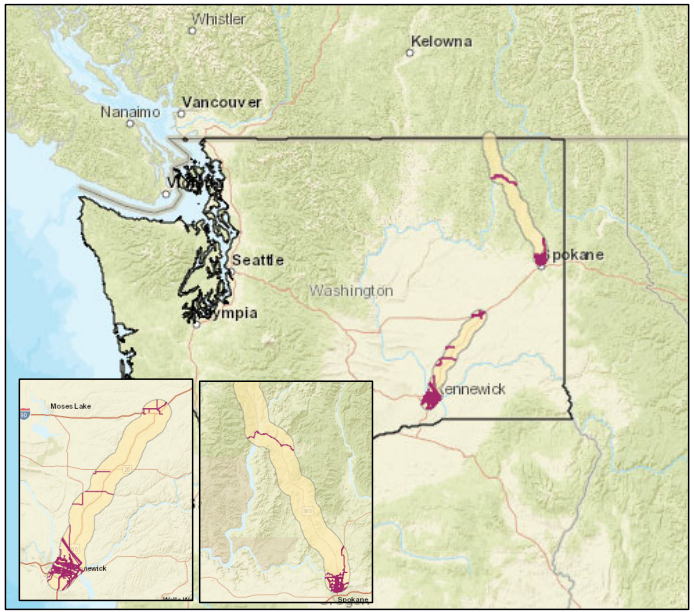
Sources: ESRI, FCC, ACS 2019

US-97: Corridor Evaluation Score

Nos.	Evaluation Criteria	Score	Remark(s)
1	Unserved/Underserved Households Addressed	15.0	▪ Approximately 25,600 underserved / underserved households are covered within 5-mile radius of the corridor
2	Lack of Existing Fiber Presence or Excess Capacity to Serve Unserved / Underserved Households	10.0	▪ Noel Communication, Rail America Now, Zayo and Noanet have existing presence; however, corridor has approximately 25,600 unserved / underserved households ▪ Population density is lower as compared to other corridors ▪ Existing fiber presence is concentrated around Tonasket, Omak, Okanogan area in north and Shaniko, Madras, Redmond areas in south ▪ Corridor has an average internet speed up to 50/10 Mbps in most areas
3	Population Centers Covered / Points of Presence Addressed	20.0	▪ Seven population center is covered by the state route – approximately 63,700 households are residing within 5-mile radius
Total Score		**45.0 points**	

US-395: Existing Fiber Presence / Providers

Fiber Providers along Washington US-395

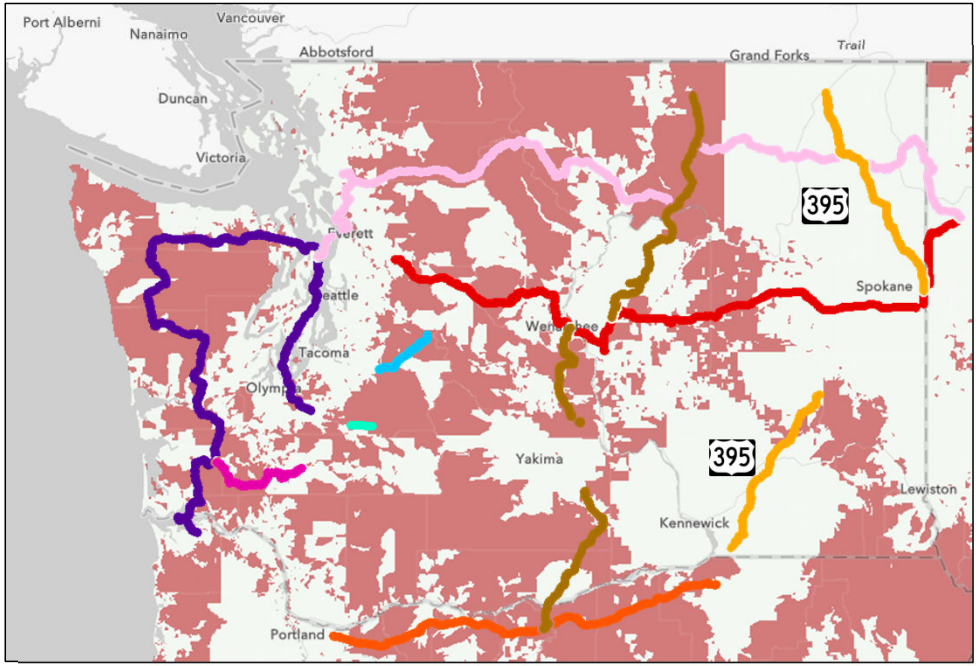


Top Providers[1]

Company	Footprint	Fiber Mileage (within 5-mile buffer)
Legacy Noel Communications	Regional Fiber Company	292
NOANET	Regional Wholesaler	211
Franklin PUD	Regional Utility Company	210
zayo	National Fiber Wholesaler	188
Spectrum	National Cable Company	148
LUMEN (Legacy Centurylink)	National Fiber Company	131
Orbitcom	Regional Fiber Company	120
Benton PUD	Regional Utility Company	83
allstream	National Fiber Company	81
Bonneville	Regional Fiber Company	54

Notes: 1) Only includes fiber providers (and corresponding fiber mileage) within a 5-mile buffer range of interstate highways
Source: KPMG Analysis based on Publicly Available Information

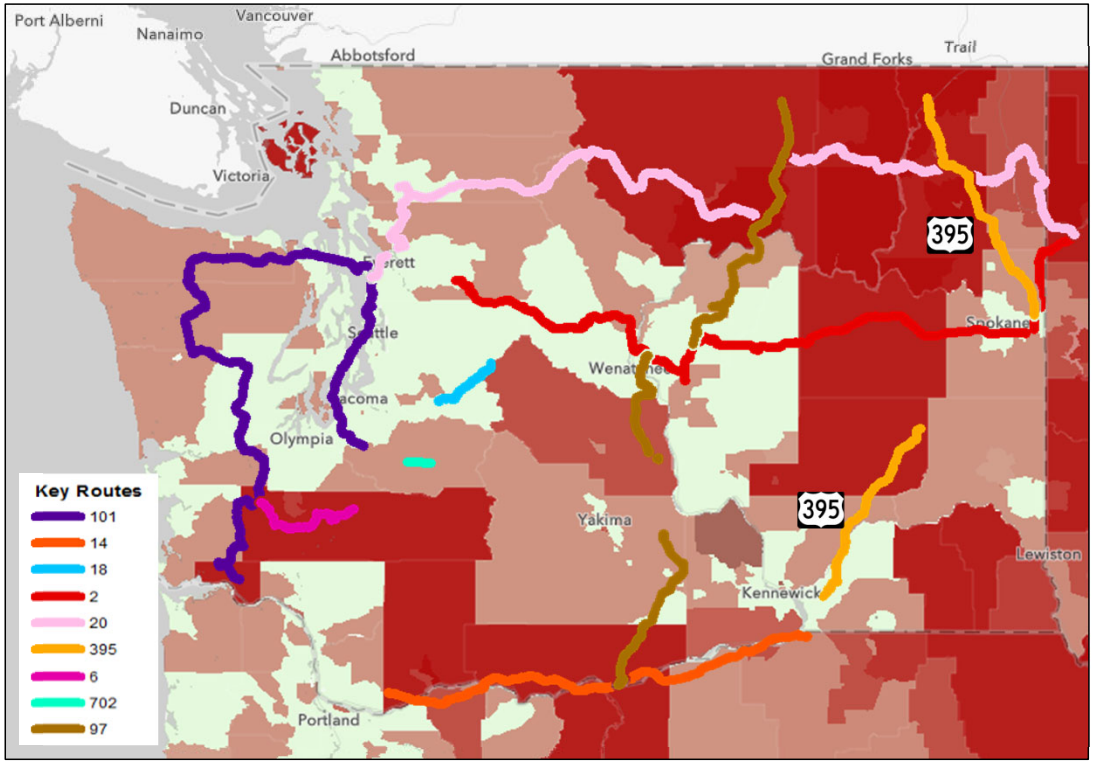
US-395: Broadband Speed (1/3)



- *US-395 Corridor has low to moderate internet speeds along the norther and southern part of the corridor. Spokane and Kennewick areas have internet speeds ranging 50 Mbps to 100 Mbps (upload) and 10 Mbps to 25 Mbps (download)*

Sources: FCC Form 477 Data - Fixed Broadband Services at 25/3 Mbps

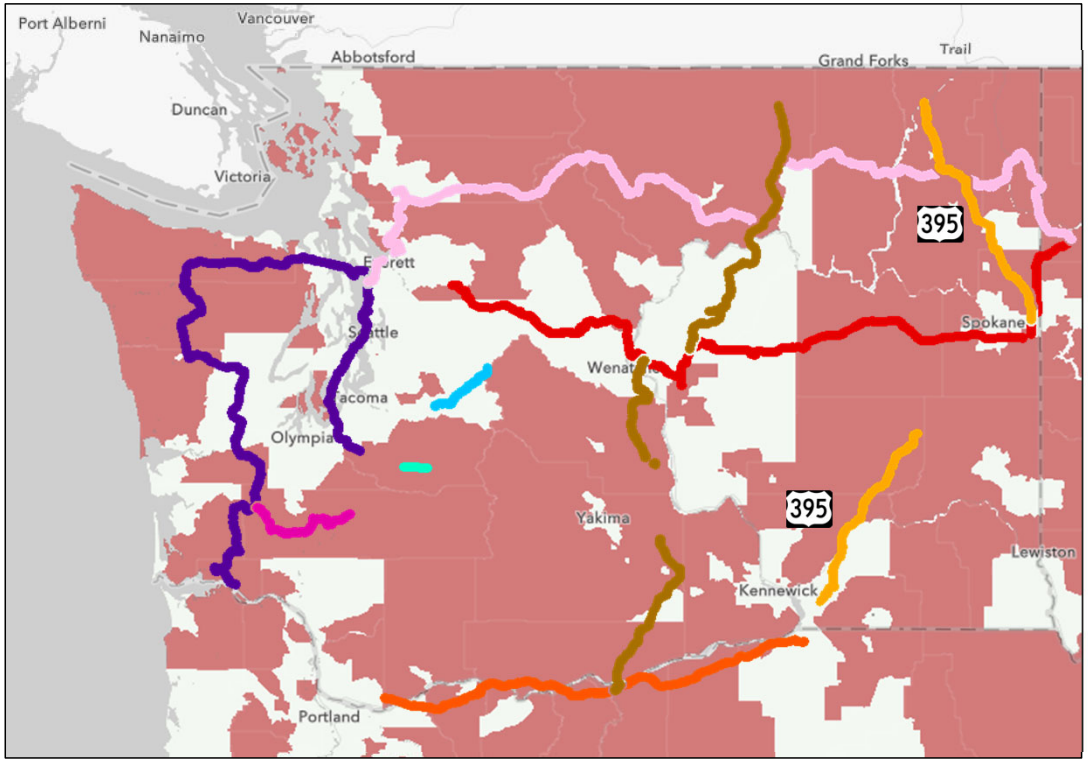
US-395: Broadband Speed (2/3)



Level	Indicator of Broadband Need	Yes	No	No Data
County	Speed Tests - M-Lab Median Speeds Fixed Broadband Below 25/3 Mbps			
	Usage - 75% or More of Devices Connect to Microsoft Updates/Services via Fixed Broadband Download Speeds below 25 Mbps			
Census Tract	Speed Tests - Ookla Median Speeds Fixed Broadband Below 25/3 Mbps			
	American Community Survey - 25% or More of Households Report No Internet Access			
	American Community Survey - 25% or More of Households Report No Computer, Smartphone or Tablet			
Census Block	FCC Form 477 – No Provider Reports Consumer Fixed Broadband Services at 25/3 Mbps			NA

Sources: National Telecommunications and Information Administration Data

US-395: Broadband Speed (3/3)

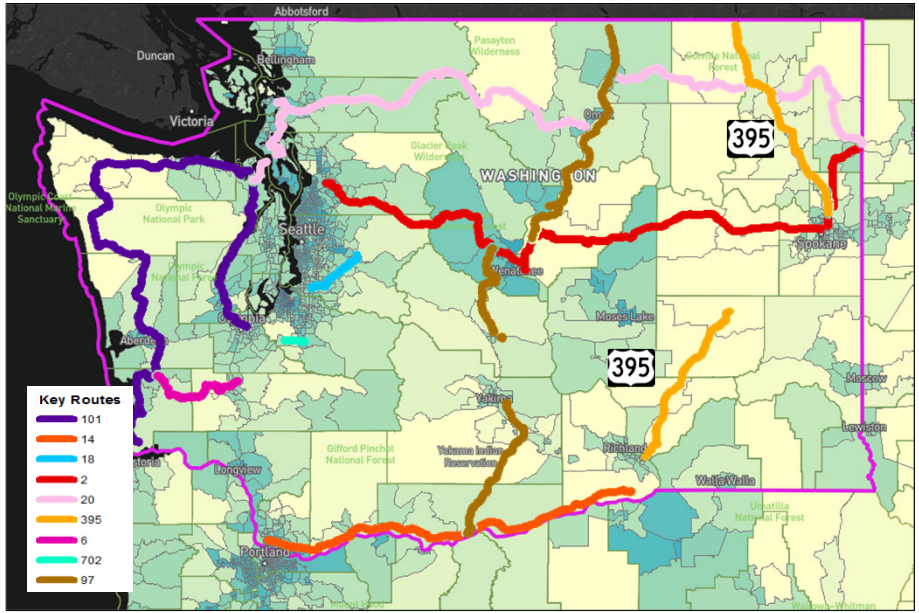


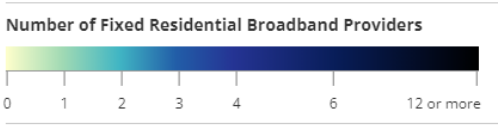
Key Routes

- 101
- 14
- 18
- 2
- 20
- 395
- 6
- 702
- 97

Sources: Ookla Median Speeds Fixed Broadband Below 25/3 Mbps (Census Tract)

US-395: # of Service Providers





County	% of Population with No Providers	% of Population with One provider or less
Benton	2.81 %	13.6 %
Franklin	0.11 %	22.91 %
Adams	7.96 %	35.33 %
Lincoln	90.53 %	99.75 %
Spokane	10.91 %	56.45 %
Stevens	0 %	62.7 %
Ferry	0.39 %	99.42 %

- *Majority of households in Lincoln, Spokane, Stevens, and Ferry counties have one or less service providers*

Source: KPMG Analysis based on Publicly Available Information

US-395: Corridor Evaluation Score

Nos.	Evaluation Criteria	Score	Remark(s)
1	Unserved/Underserved Households Addressed	25.0	▪ Approximately 43,900 underserved / underserved households are covered within 5-mile radius of the corridor
2	Lack of Existing Fiber Presence or Excess Capacity to Serve Unserved / Underserved Households	15.0	▪ Noel Communications, Noanet, Franklin PUD, and Zayo have existing presence; however, corridor has approximately 43,900 unserved / underserved households ▪ Existing fiber presence is concentrated around Spokane and Kennewick area ▪ Corridor has an average internet speed up to 50/10 Mbps in most areas
3	Population Centers Covered / Points of Presence Addressed	20.0	▪ Seven population center is covered by the state route – approximately 148,300 households are residing within 5-mile radius
Total Score		**60.0 points**	

US-14: Existing Fiber Presence / Providers

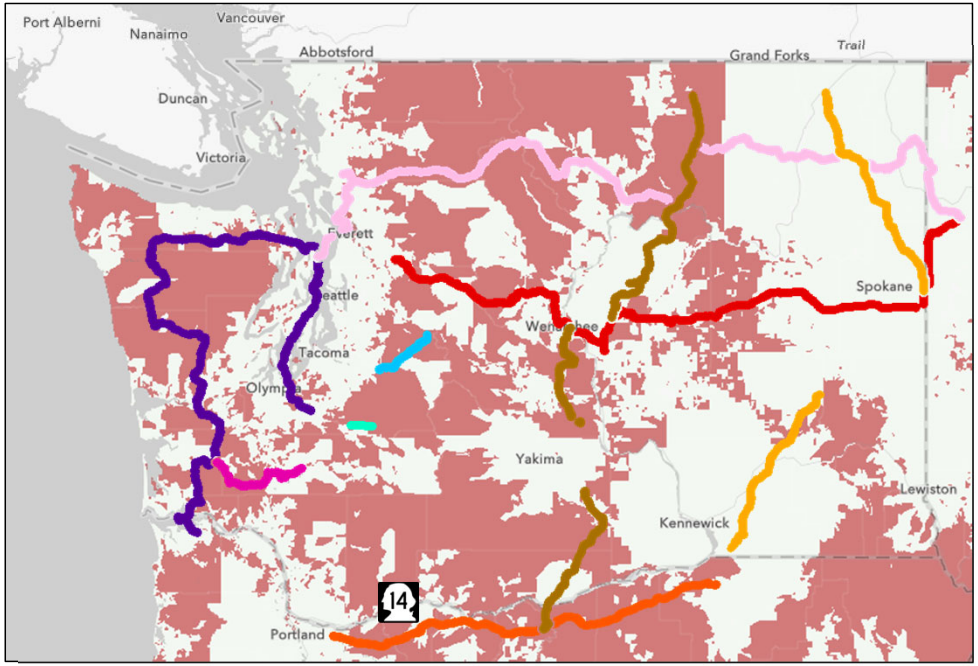
Fiber Providers along Washington US-14

Top Providers[1]

Company	Footprint	Fiber Mileage (within 5-mile buffer)
allstream	National Fiber Company	373
NOANET	Regional Wholesaler	269
Legacy Noel Communications	Regional Fiber Company	243
zayo	National Fiber Wholesaler	189
Bonneville	Regional Fiber Company	123
wave	Regional Fiber	104
LUMEN (Legacy Centurylink)	National Fiber Company	87
Spectrum	National Cable Company	44
XO communications	National Fiber Company	27
AT&T	National Wireless Company	23

Notes: 1) Only includes fiber providers (and corresponding fiber mileage) within a 5-mile buffer range of interstate highways
Source: KPMG Analysis based on Publicly Available Information

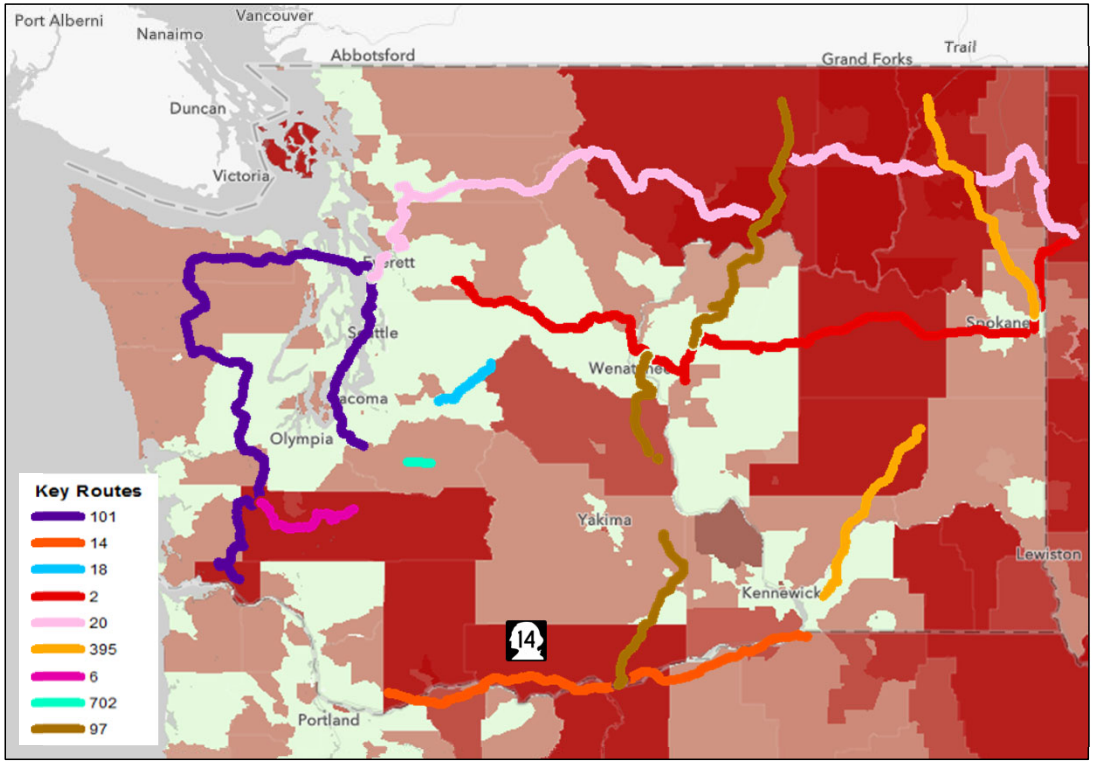
US-14: Broadband Speed (1/3)



- *US-14 Corridor has low to moderate internet speeds along the corridor. Gresham and Biggs Junction areas have internet speeds ranging 25 Mbps to 50 Mbps (upload) and 3 Mbps to 10 Mbps (download)*

Sources: FCC Form 477 Data - Fixed Broadband Services at 25/3 Mbps

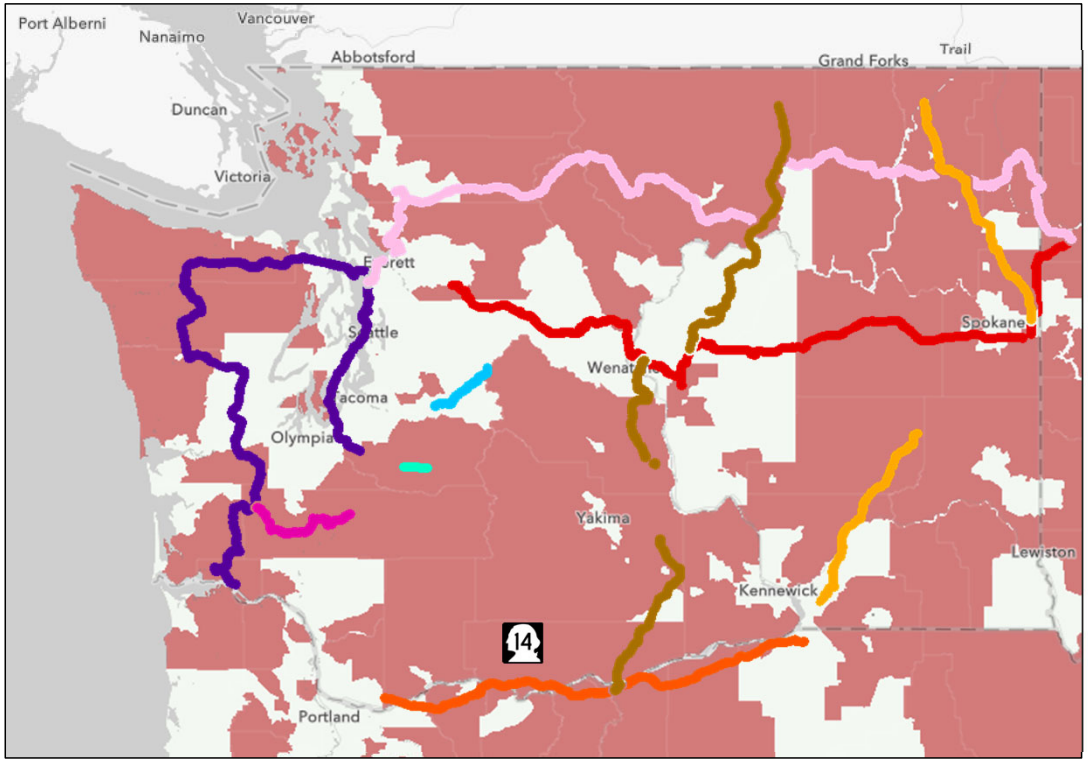
US-14: Broadband Speed (2/3)



Level	Indicator of Broadband Need	Yes	No	No Data
County	Speed Tests - M-Lab Median Speeds Fixed Broadband Below 25/3 Mbps			
	Usage - 75% or More of Devices Connect to Microsoft Updates/Services via Fixed Broadband Download Speeds below 25 Mbps			
Census Tract	Speed Tests - Ookla Median Speeds Fixed Broadband Below 25/3 Mbps			
	American Community Survey - 25% or More of Households Report No Internet Access			
	American Community Survey - 25% or More of Households Report No Computer, Smartphone or Tablet			
Census Block	FCC Form 477 – No Provider Reports Consumer Fixed Broadband Services at 25/3 Mbps			NA

Sources: National Telecommunications and Information Administration Data

US-14: Broadband Speed (3/3)

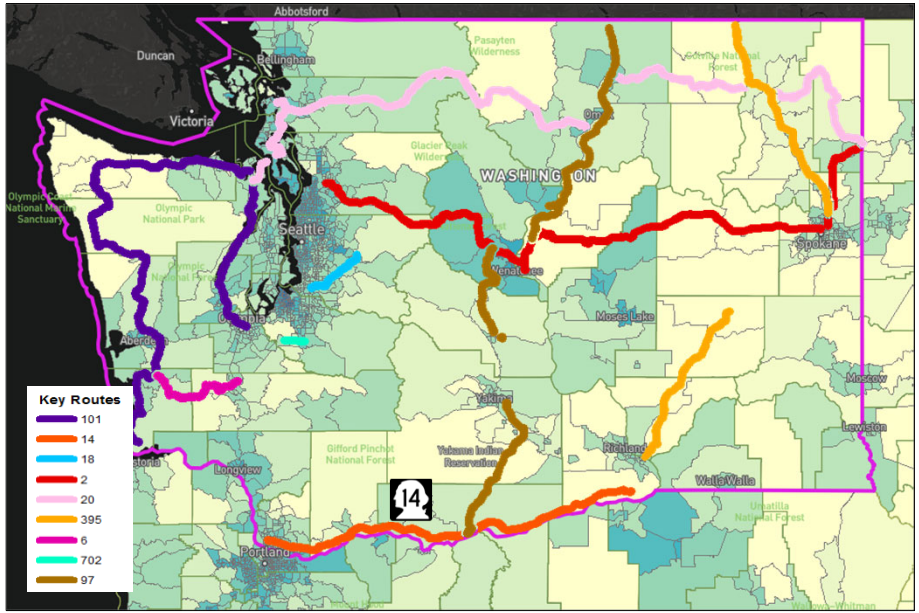


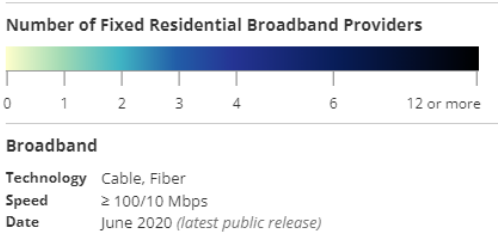
Key Routes

- 101
- 14
- 18
- 2
- 20
- 395
- 6
- 702
- 97

Sources: Ookla Median Speeds Fixed Broadband Below 25/3 Mbps (Census Tract)

US-14: # of Service Providers





County	% of Population with No Providers	% of Population with One provider or less
Clark	4.68 %	15.24 %
Skamania	34.46 %	98.32 %
Klickitat	45.81 %	95.34 %
Benton	2.81 %	13.6 %

- *Majority of households in Skamania and Klickitat counties have one or less service providers*

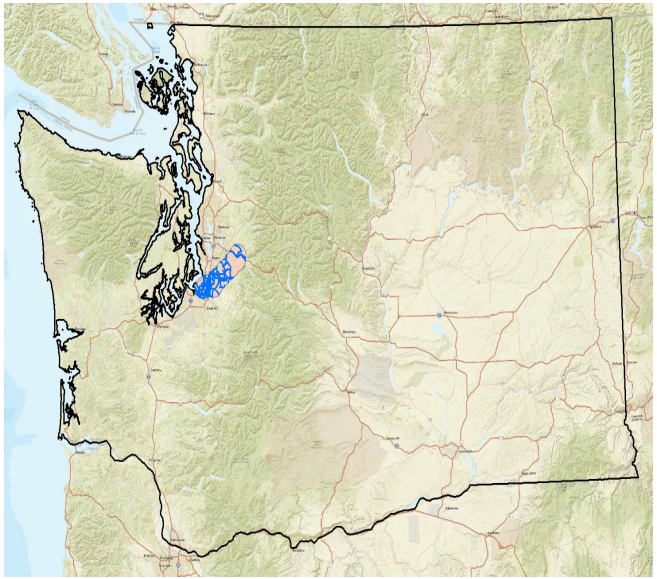
Sources: ESRI, FCC, ACS 2019

US-14: Corridor Evaluation Score

Nos.	Evaluation Criteria	Score	Remark(s)
1	Unserved/Underserved Households Addressed	35.0	▪ Approximately 63,600 underserved / underserved households are covered within 5-mile radius of the corridor
2	Lack of Existing Fiber Presence or Excess Capacity to Serve Unserved / Underserved Households	20.0	▪ Allstream, Noanet, Noel Communications, and Zayo have existing presence; however, corridor has approximately 63,600 unserved / underserved households ▪ Existing fiber presence is concentrated around Portland to Gresham area ▪ Corridor has an average internet speed up to 50/10 Mbps in most areas
3	Population Centers Covered / Points of Presence Addressed	10.0	▪ Five population center is covered by the state route – approximately 250,600 households are residing within 5-mile radius
Total Score		**65.0 points**	

US-18: Existing Fiber Presence / Providers

Fiber Providers along Washington US-18

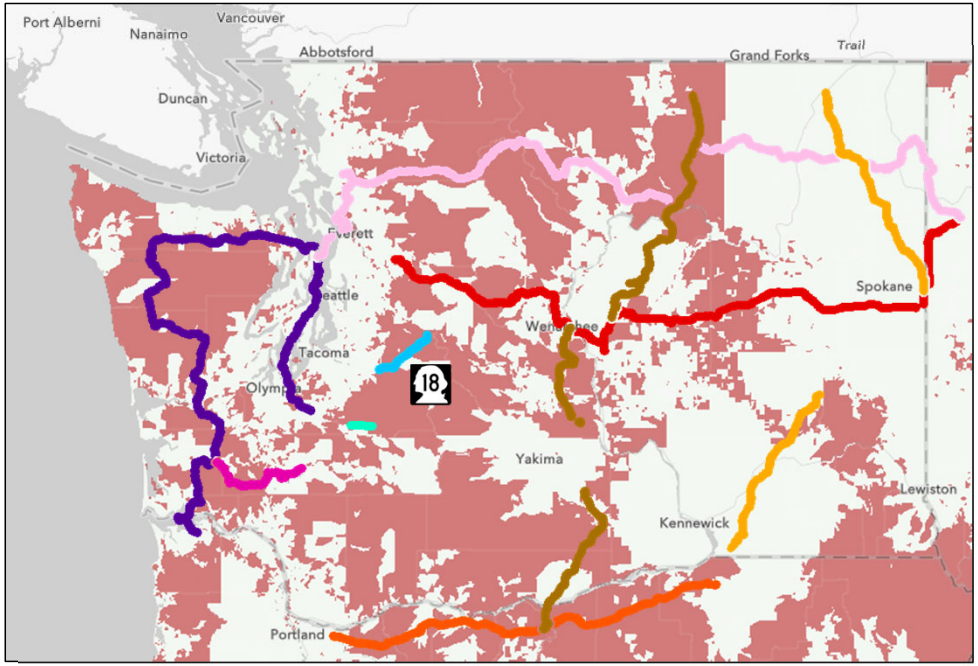


Top Providers[1]

Company	Footprint	Fiber Mileage (within 5-mile buffer)
NOANET	Regional Fiber Wholesaler	310
LUMEN (Legacy Centurylink)	National Fiber Company	179
zayo	National Fiber Wholesaler	161
Legacy Noel Communications	Regional Fiber Company	153
allstream	National Fiber Company	131
COMCAST	National Fiber Company	74
verizon	National Wireless Company	74
wave	Regional Fiber Company	68
XO communications	National Fiber Company	55
AT&T	National Wireless Company	54

Notes: 1) Only includes fiber providers (and corresponding fiber mileage) within a 5-mile buffer range of interstate highways
Source: KPMG Analysis based on Publicly Available Information

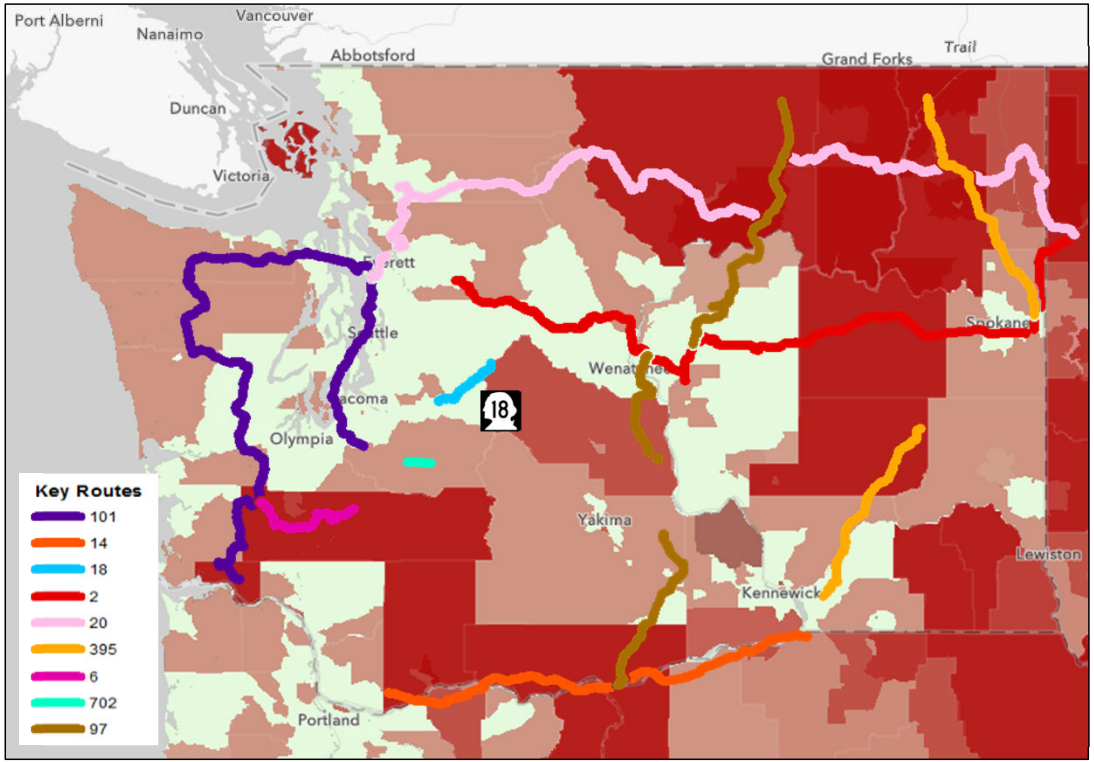
US-18: Broadband Speed (1/3)



- *US-18 Corridor has low to moderate internet speeds along the Auburn, Kent, Covington, and Maple Valley areas. Overall, the corridor has internet speeds ranging 50 Mbps to 100 Mbps (upload) and 10 Mbps to 25 Mbps (download)*

Sources: FCC Form 477 Data - Fixed Broadband Services at 25/3 Mbps

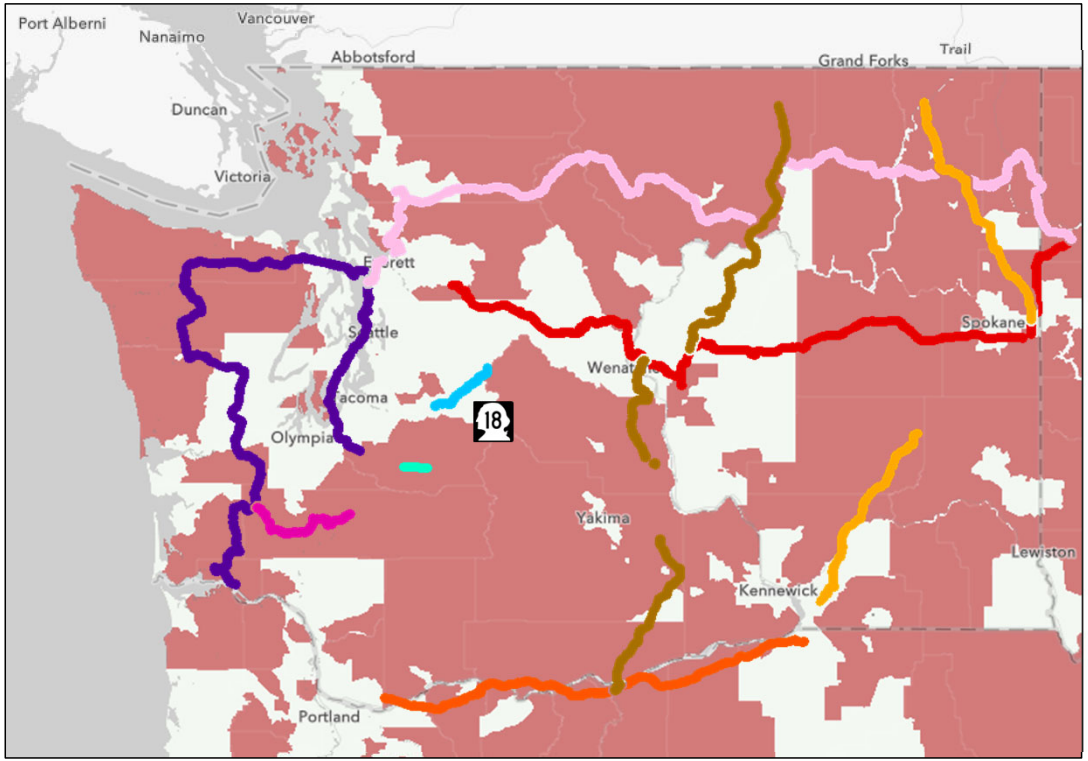
US-18: Broadband Speed (2/3)



Level	Indicator of Broadband Need	Yes	No	No Data
County	Speed Tests - M-Lab Median Speeds Fixed Broadband Below 25/3 Mbps			
	Usage - 75% or More of Devices Connect to Microsoft Updates/Services via Fixed Broadband Download Speeds below 25 Mbps			
Census Tract	Speed Tests - Ookla Median Speeds Fixed Broadband Below 25/3 Mbps			
	American Community Survey - 25% or More of Households Report No Internet Access			
	American Community Survey - 25% or More of Households Report No Computer, Smartphone or Tablet			
Census Block	FCC Form 477 – No Provider Reports Consumer Fixed Broadband Services at 25/3 Mbps			NA

Sources: National Telecommunications and Information Administration Data

US-18: Broadband Speed (3/3)

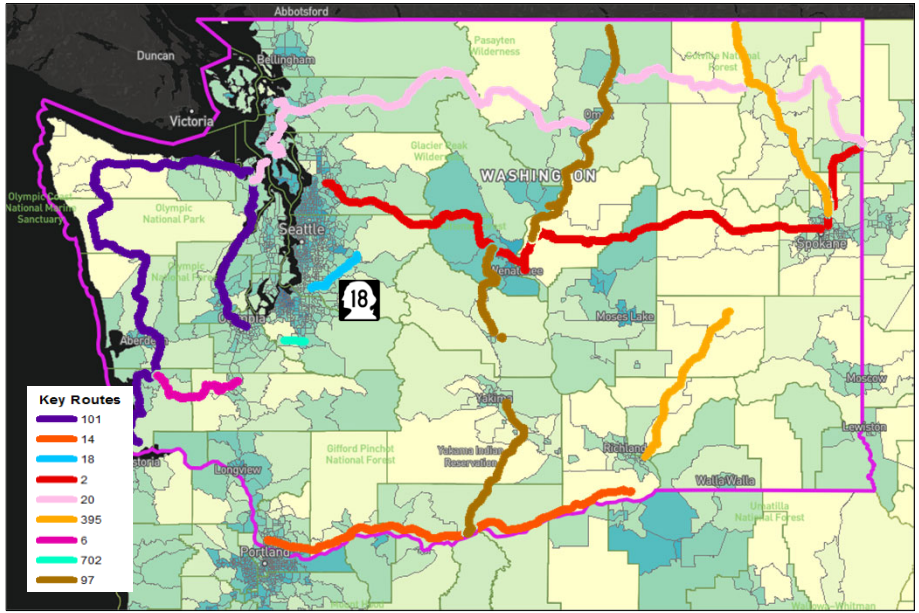


Key Routes

- 101
- 14
- 18
- 2
- 20
- 395
- 6
- 702
- 97

Sources: Ookla Median Speeds Fixed Broadband Below 25/3 Mbps (Census Tract)

US-18: # of Service Providers



Number of Fixed Residential Broadband Providers

0 1 2 3 4 6 12 or more

Broadband

Technology Cable, Fiber
Speed ≥ 100/10 Mbps
Date June 2020 *(latest public release)*

County	% of Population with No Providers	% of Population with One provider or less
King	2.87 %	27.07 %

- *Majority of households in King county have more than one service providers*

Sources: ESRI, FCC, ACS 2019

US-18: Corridor Evaluation Score

Nos.	Evaluation Criteria	Score	Remark(s)
1	Unserved/Underserved Households Addressed	20.0	▪ Approximately 34,200 underserved / underserved households are covered within 5-mile radius of the corridor
2	Lack of Existing Fiber Presence or Excess Capacity to Serve Unserved / Underserved Households	20.0	▪ Noanet, Lumen and Zayo have existing presence; however, corridor has approximately 34,200 unserved / underserved households ▪ Existing fiber presence is concentrated around Auburn, Kent, Covington, and Maple Valley area ▪ Corridor has an average internet speed up to 50/10 Mbps in most areas
3	Population Centers Covered / Points of Presence Addressed	5.0	▪ Three population center is covered by the state route – approximately 172,400 households are residing within 5-mile radius
Total Score		**45.0 points**	

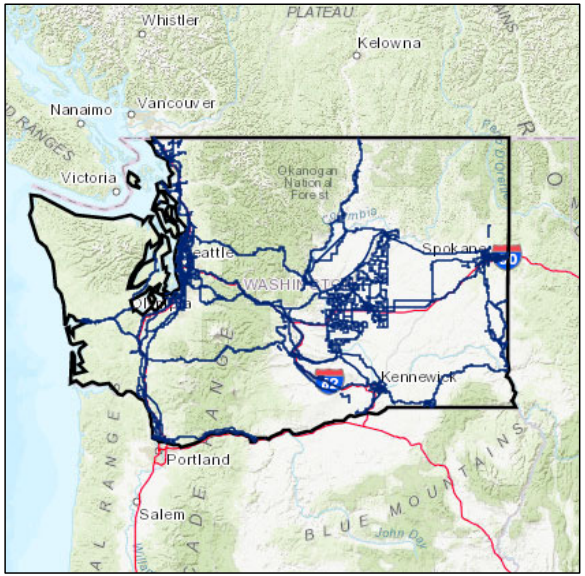
Mapping of Existing Fiber Networks in Washington State

Washington State Broadband Providers Footprint and Mileage (1/5)

Legacy Noel Communications

Noel Communications Fiber

states



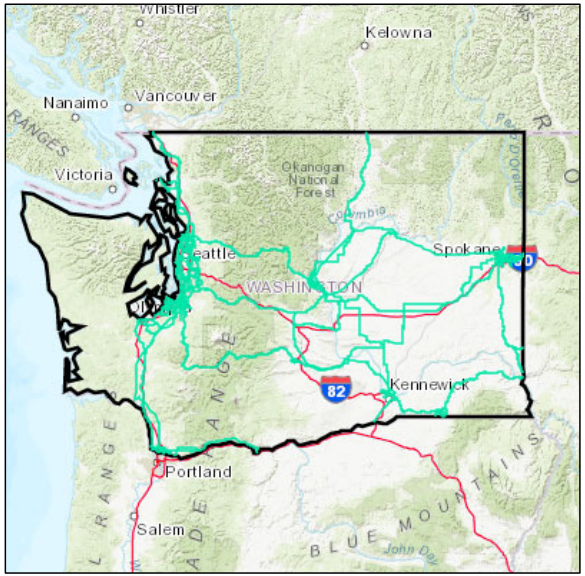
Fiber Network

4,494 miles

zayo

Zayo Fiber

states



Fiber Network

2,535 miles

Sources: KPMG Analysis based on Publicly Available Information

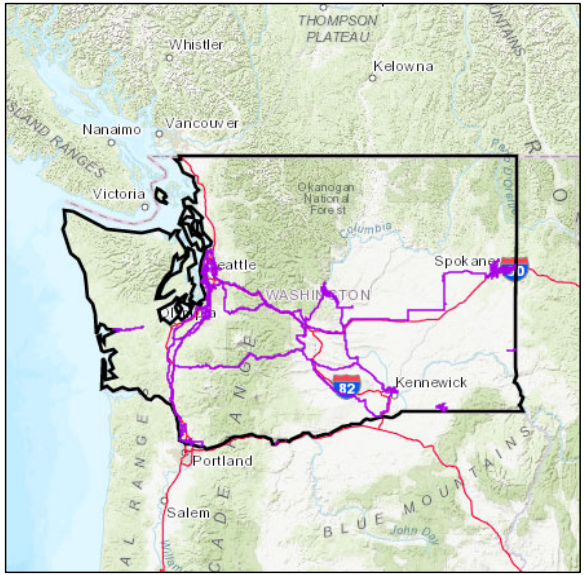
Washington State Broadband Providers Footprint and Mileage (2/5)

LUMEN

(Legacy Centurylink)

CenturyLink Fiber

states



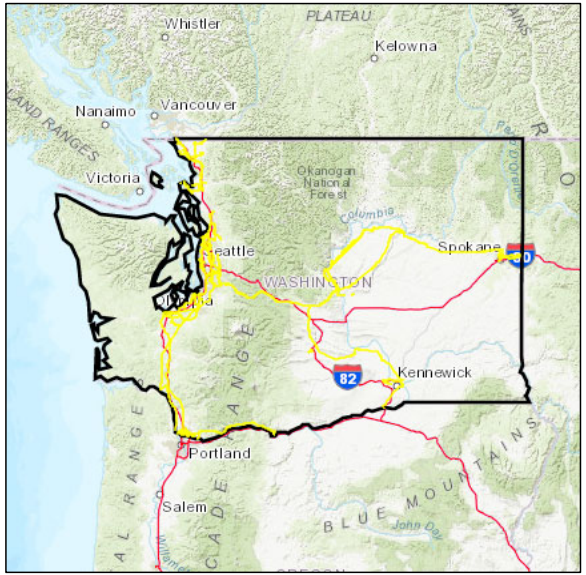
Fiber Network

2,521 miles

allstream

Allstream Fiber

states



Fiber Network

1,810 miles

Sources: KPMG Analysis based on Publicly Available Information

Washington State Broadband Providers Footprint and Mileage (3/5)

wave

Wave Fiber

states

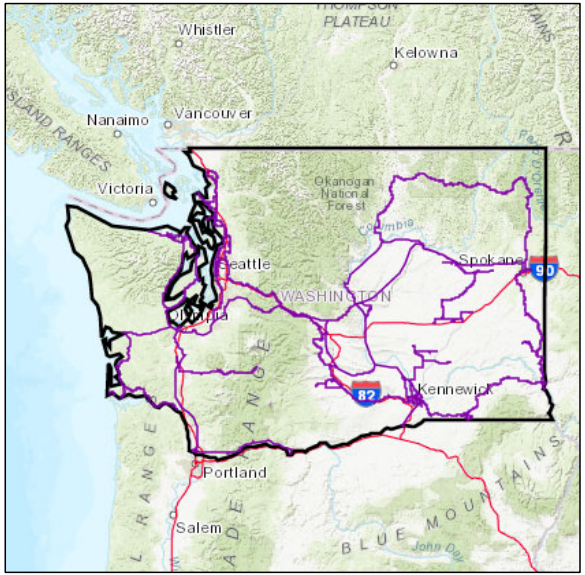
Fiber Network

1614 miles

NOANET

NOANET Fiber

states



Fiber Network

1400 miles

Sources: KPMG Analysis based on Publicly Available Information

Washington State Broadband Providers Footprint and Mileage (4/5)

AT&T

AT&T Fiber

states

Fiber Network

1,028 miles

COMCAST

Comcast Fiber

states

Fiber Network

1,002 miles

Sources: KPMG Analysis based on Publicly Available Information

Washington State Broadband Providers Footprint and Mileage (5/5)

Grant PUD High Speed Network

Grant PUD Fiber

states

Fiber Network

756 miles

XO communications

XO Communications Fiber

states

Fiber Network

722 miles

Sources: KPMG Analysis based on Publicly Available Information

Washington State Joint Transportation Committee

Broadband Access to State Highway Right of Way Study

Chapter 4: Effective WSDOT Strategies

December 2021

Table of Contents

Chapter 4 – ROW Strategies - Introduction and Purpose

Chapter 1 highlighted the role of fiber infrastructure in the Washington State Department of Transportation ("WSDOT") right-of-way ("ROW") as a long-term middle-mile technology alternative with low obsolescence risk. Chapter 2 focused on the prioritization framework for state highways to help the State address its connectivity needs to meet the State's broadband goals. In Chapter 3, the memorandum prepared by Nossaman LLP focused on documenting legal and regulatory requirements related to WSDOT ROW use.

Chapter 4 focuses on implementation strategies that WSDOT and the State of Washington could adopt to enable fiber deployment on WSDOT ROW including on priority corridors. In developing ROW strategies, the following background work was conducted:

1. Reviewed current WSDOT Right of Way Encroachment Policy
2. Received input from WSDOT on:
    - key opportunities and challenges regarding ROW encroachment, and
    - current systems related to fiber infrastructure
3. Benchmarked relevant right of way encroachment policies from other states and reviewed relevancy for WSDOT
4. Reviewed mutually beneficial partnership structures with DOT and financing models from precedent transactions and leading practices from other states
5. Reviewed analysis performed by Nossaman LLP on state and federal laws/regulations
6. Incorporated input from the Staff Workgroup

Chapter 4 provides ROW implementation strategies for WSDOT in the following categories. All recommendations should be developed through WSDOT and Department of Commerce existing public processes, subject to resource availability.

1. **Governance:**

    Recommended Roles and Responsibilities: The role that WSDOT and the Department of Commerce could play to effectively advance broadband deployment and enable a coordinated approach for installation of middle mile fiber/conduits and related infrastructure on WSDOT's ROW in anticipation of long-term broadband needs.

    Right of Way Implementation Strategy: The relevant strategies for WSDOT and the State of Washington to advance broadband infrastructure on WSDOT's ROW (to effectively authorize other entities to install broadband infrastructure).

2. **Recommended ROW Administration and Partnership Approaches:** Strategies for mutually beneficial WSDOT and service provider partnerships to provide broadband services for transportation purposes, as well as addressing connectivity gaps to meet the state broadband goals.

Governance

The purpose of a governance structure is to create a coordinated and streamlined effort in advancing broadband development both for transportation purposes and to achieve the State broadband goals. Such coordination can be achieved through effectively defining roles and responsibilities for the Department of Commerce (the Broadband Office) and WSDOT, and other key state departments/agencies including the Department of Education, and through supporting policies. Key considerations for each are summarized below:

Recommended Roles and Responsibilities

Focus Area	Department of Commerce (Broadband Office)	WSDOT
Overview of the Role	▪ Act as a single point of contact for statewide broadband program coordination with public agencies and private sector partners to promote coordinated broadband planning for the State ▪ Transparent sharing of information regarding existing broadband infrastructure inventory and mapping of broadband assets and policies	▪ Address the transportation connectivity needs for the State ▪ Owner and operator of transportation broadband network(s) located within WSDOT ROW
Consultation and coordination with stakeholders	▪ Coordinate with all public agencies and seeking to help address their connectivity requirements ▪ Collaborate with tribal nations for broadband infrastructure development ▪ Coordinate with public sector agencies and private sector service providers ▪ Be a resource to local communities and private sector service providers	▪ Coordinate with other governmental agencies, counties and cities, and private sector service providers on WSDOT ROW related broadband deployment ▪ Coordinate transportation related connectivity needs with stakeholders (including tribal nations) and the private sector partners
Financial Planning and Administration	▪ Pursue funding from state, local and federal governments towards broadband, administer grant programs and evaluate the economic return on investment for the planned public investment ▪ Establish a 5-year capital investment program ▪ Assess and prioritize public investments to meet the State's broadband goals	▪ Lead the financial planning and project prioritization for transportation related fiber deployment / infrastructure projects and to support Intelligent Transportation Systems ("ITS") and overall WSDOT operations ▪ Assess and implement mutually beneficial public private sector opportunities for broadband investment in WSDOT ROW to advance transportation needs and support the State's broadband goals
Policies and Implementation	▪ Develop and implement specific guidance, policies, strategies and plans to increase broadband affordability, adoption, reliability and accessibility throughout the State	▪ In coordination with the Broadband Office, provide input on transportation connectivity related broadband policies including on WSDOT ROW policy per ESHB 1457 ▪ Include stakeholders (including tribal nations) in development of guidance

Focus Area	Department of Commerce (Broadband Office)	WSDOT
		and policies consistent with existing WSDOT processes
Middle Mile Fiber Network Operations	▪ Responsible for coordinating operations and maintenance by leveraging a neutral private sector host on state-initiated corridors and interstate highways	▪ Accomplish transportation objectives as well assist on state broadband operational metrics ▪ Operate the network either directly or through a neutral host to meet operational performance metrics including transportation safety and congestion management

The above recommended roles and responsibilities can be expanded to include other key agencies including Department of Education. In addition, to facilitate coordination and decision making between these agencies, formation of an advisory committee comprising of representatives from such participating agencies and/or stakeholder groups (such as tribal nations) is recommended.

WSDOT ROW Access and Implementation Strategies

Developing and adopting "Collaboration", "Build Once", "Dig Once" or similar policies can result in efficient coordination of broadband infrastructure installation with highway construction and other utility infrastructure to reduce costs and help to facilitate accelerated broadband deployment more effectively by creating an environment of collaboration and information sharing among government agencies and broadband providers.

The policy recommendations from this study, if implemented, help mitigate the operational and safety impacts to WSDOT by reducing the scale and number of repeated excavations and the number of permit requests related to state highway projects for the installation and maintenance of broadband infrastructure in WSDOT ROW. This will further result in cost efficiencies, increased access to and reliability of broadband networks, public and economic benefits, and decreased time needed to deploy broadband infrastructure. It is also important to note that WSDOT would require adequate resources in performing its roles and responsibilities and in the overall administration related to ROW access.

Recommended WSDOT Implementation Strategies	
1. Standardize Specifications for Common Infrastructure	Establish standardized specifications for private sector and WSDOT initiated projects and to accommodate current and future needs without jeopardizing project affordability. In developing specifications, WSDOT should assess the following factors:
	A. ***Capacity***: Sufficient number of conduit(s) should be installed to accommodate current and anticipated future broadband needs. Consideration should be given to explore the feasibility of using multi-duct conduits to enable sharing of conduit and easier installation of fiber cable strands in the future
	B. ***Segmentation***: ensure that conduits have the necessary level of separation from each other for commercial, network security, operational and/or maintenance purposes
	C. ***Access***: For ease of maintenance and/or network security reasons, project sponsors may require vaults and hand-holes to be separate or dedicated for each entity

	D. ***Costs***: Consideration should be given to ensure affordability of the project as planning for the future may require trenches to be widened or deepened to accommodate multiple conduits
	E. ***Robustness***: Consideration should be given to develop standards for the materials, construction methods, and installation of fiber cable strands to minimize maintenance and repairs
2. Collaboration with Key Stakeholders	▪ Minimize costs and unnecessary digging by ensuring that stakeholders such as utility companies, WSDOT, and broadband providers work together to plan and execute the project phases. ▪ incorporate standard working practices with local governments and tribal nations to demonstrate leading practices on how to install fiber infrastructure by providing construction plans and standards.
3. Develop an Information Sharing, Tracking and Infrastructure Management System	▪ Make information on the location of existing fiber and conduit(s) more easily available to stakeholders and local governments. ▪ Develop a system to track its planned, ongoing, and completed construction (potentially using an asset management system) ▪ Prioritize and select projects for locality participation ▪ Establish a method to quickly notify potentially interested parties and to coordinate participation with project contractor(s)
4. Voluntary Joint Trenching	Create a platform for WSDOT and/or the private service provider(s) to voluntarily inform the utility industry and other service providers regarding opportunities for collocating and installing fiber infrastructure.
5. Resource Sharing Agreements	To promote mutual partnerships, create standardized agreements defining conduit and fiber strand requirements and related standardized specifications consistent with transportation use cases that telecom service providers can leverage for access to WSDOT ROW

Benchmarking - Governance Highlights from Other States

State	Policy Observations	Policy Description
Utah	*Distinct Broadband Partnership Office And executive support*	Utah utilizes distinct process and office for telecom providers interested in partnering with the DOT to install fiber conduit and coordinate the process. UDOT broadband success is driven by support from the highest levels of the DOT. Ensure buy-in with UDOT leadership up front.
Arizona	*Standardized conduit specification office with a rural focus*	Requires the DOT to coordinate the installation of multi-user conduit(s) in state highway ROW specifically targeting rural highways.
California	*Information sharing to telecom companies on state highway projects*	DOT notifies telecom providers and contractors working on broadband deployment of department-led highway construction projects and authorizes those companies to coordinate with the DOT on conduit installation.
Nevada	*Executive support and information Sharing*	DOT provides information, advice, strategic plans, priorities and recommendations in administering access to ROW to telecommunications providers for state-wide telecommunications purposes; the director to coordinate with telecom providers for the reasonable, efficient, and cost-effective installation, maintenance, operation, relocation and upgrade of telecom facilities within ROW for state highways.
Colorado	*Resource sharing & In-Kind Contribution*	Colorado enables private sector engagement and creative in-kind contributions, such as allowing developers to store equipment in ROW that encourages development

West Virginia	*Proactive Coordination with Telecom Carriers*	West Virginia encourages telecommunications carriers to coordinate the installation of broadband conduits to minimize costs for carriers and to minimize disruption and inconvenience to the traveling public.
Virginia	*Fiber Optic Resource Sharing*	Virginia works with telecommunication providers on resource sharing agreements for limited access ROW (fiber sharing, collocation spaces, fees) – mutually beneficial partnerships for transportation purpose as well as to advance private broadband deployment
Georgia	*Incentivize Collaboration*	Reduce annual rates when telecom companies install fiber simultaneously to help increase deployment of broadband in the state
Wisconsin	*Fee Reduction for unserved location and Agreement/Permit Term Length*	Though Wisconsin has the authority to charge fees for longitudinal occupation of C/A ROW, fees are waved for installation in underserved areas. Leverage longer-term ROW occupancy fees to encourage broadband adoption
New York	*Tiered Fiber Optic Installation Fees*	New York employs a tiered permitting structure based on population density of designated installation area and type of installation, thereby more closely aligning cost and return on investment.
Maryland	*Fiber Leasing*	Maryland leases fiber to scale broadband statewide, increase private investment, and streamline development

Select detailed case studies of Build Once/Dig Once Policy/Similar Policies are included in the Appendix.

Right of Way Administration and Partnership Models

Administration

ROW administration allows for and helps drive broadband development and installation of fiber. There are a range of administration mechanisms leveraged by state DOTs to manage broadband ROW requests. The administration and handling of incoming Right of Way or Encroachment permit requests varies in office accountability and responsibility, flowchart of approvals, and approach to fiber development and installation across the states (reference ***Appendix B: State Benchmarking of ROW Admin, Formula and Pricing Methods*** for DOT specific details on various administration and permitting processes across the US).

The administration of Fiber Right of Way Encroachment Requests tends to fall into two main categories: (1) As a traditional Easement / Encroachment ROW Request or (2) Distinct Fiber Trading / Mutual Broadband Partnership Office.

Traditional Easement / Encroachment ROW Request: States utilize a traditional "Utility Permit Application" that would be completed by a developer for the state or district engineer/designee, ROW technician, or permitting staff to review. This is the most common administrative process within the US and is utilized by states such as New Jersey, Maryland, and Tennessee, where fiber is treated as any other utility installation. The process includes a thorough check of safety issues and alignment to department of transportation future transportation needs, rather than a specific review into fiber commercial needs. Many DOTs utilized district offices to review ROW encroachment requests specific to a given geography. These permit offices reviewed the application and plans for technical and administrative completeness and subsequently determined whether the plans were acceptable for permit delivery.

Distinct Fiber Trading / Mutual Broadband Partnership Office: In other states, a distinct Fiber Trading / Mutual Partnership Office is utilized to proactively drive broadband development. Applied in Colorado and Utah, this structure necessitates premium broadband knowledge within the DOT to review the broadband needs of the state to inform the approval process. The developers are viewed as partners in

the development process and work collaboratively with the government to ensure sufficient fiber is installed in areas necessary. This structure utilizes Master Service Agreements and active databases of installed fiber, highlighting in-kind contributions as a means of meeting both the governments' and the private developers' needs.

Furthermore, some DOTs and transportation agencies, and states have taken a more active approach in procuring neutral private sector host entities to develop and operate the state's priority corridors including the interstates. These states include Pennsylvania, Georgia, North Carolina, and Kentucky.

States across the US utilize a range of structures for broadband deployment within state ROW; these structures have been synthesized across three main categories. WSDOT can evaluate and adopt a category based on whether the highway ROW under consideration is a priority and whether broadband deployment is WSDOT/State initiated or private sector initiated. The categories are described below.

1. **Transactions –** A transactional approach could be taken for priority corridors to the DOT as well for meeting state broadband goals. These are typically taken for interstates and/or for long/back haul routes.
2. **Flexible Partnerships –** Mutually beneficial partnership approach provides the flexibility for opportunity to drive both DOT and developer needs that allows for a range of solutions in driving installation of fiber broadband.
3. **Permits –** No Fee, Fixed Pricing or Tiered Pricing are market driven, reactive, and usually designed for shorter lengths of easement needed and predetermined locations for utility installation. These are typically used for corridors/routes that are not necessarily priorities for the DOT or the State

Based on the benchmarking of leading practices from other states and review of the current process for ROW access in WSDOT, the following administration/partnership models are recommended:

Recommended Administration/Partnership Models

Leading Entity and Corridor Priority	Recommended Partnership/ Administration Model	Structure	Explanation	Example States
State-led Approach **(State and DOT driven for Priority Corridors)**	**Transactions** *Targeted, mostly competitively procured solution where DOT makes a capital investment and/or service payment.*	Neutral Host Operating Agreement	DOT/State contracts with the neutral private sector host that meets DOT/State operational requirements and operate the network on nondiscriminatory basis to meet the State's goals	PA, NC, GA, KY

Private Sector Initiated Approach **(If the proposal is for a Priority Corridor)**	**Can be Transactional or Permits Based** *Program structures that do not clearly fit in 'Permits' or 'Transaction' categories*	Mutual Partnership	Non-exclusive relationship between government and private company to build out broadband, likely under an MSA, and in return for primarily in-kind contributions	CO, UT
Private-led Approach **(Market Driven)** **For Non-Priority Corridors**	**Permits** *Structure through which a developer applies for a permit, which, if approved, allows for installation. Often incorporates in-kind contribution.*	A. No Fee	Permit for fiber installation provided at no monetary cost	CO, OH, SC, TX, VA
		B. Fixed Pricing	Set fee (likely per mile or foot) for fiber regardless of location to cover DOT's costs	GA, PA, NJ
		C. Tiered Pricing	Varied fee (likely per mile or foot) based on population density	FL, MD, NY, TN, UT, WI

Leading practices and recommendations for partnership/administrative models are outlined below.

State /DOT Led Transactional Approach - Leading Practices and Recommendations

- Administer a non-discriminatory open access network to encourage private sector participation
- Establish points of presence along the state routes that incentivizes last-mile development
- DOT to lead procurement process and could own the network
- Department of Commerce to provide the role of aggregating governmental needs including education needs
- Network operations and maintenance by a neutral private sector host
- Integrate and diversify funding and financing sources for the planned corridors
- Private sector co-invests to cover portion of the capital costs to reduce the cost burden for DOT
- Explore opportunities for a private sector operator to co-invest in the network
- Ensure financial sustainability and recouping both capital costs invested and operating and maintenance costs

Private Sector Initiated Approach – Leading Practices and Recommendations

DOT will receive permit requests or solicited and unsolicited proposals from private sector entities for the corridors and routes that may be priority for DOT and/or the State.

- Establish clear pathway for unsolicited proposals from the private sector
- Accelerate the overall process for reviewing and approving permit requests on priority corridors
- Private sector owns, operates, and maintains the network and provide excess capacity for DOT's use
- DOT and Department of Commerce (Broadband office) to assess public side use cases including for transportation connectivity and rural broadband access and enable to the extent possible enable/negotiate an open access network.

Permits - Leading Practices and Recommendations

- Structure the pricing to cover costs of review of the application for installation of broadband infrastructure and oversight of such infrastructure

- Adopt a tiered pricing policy based on the importance of the corridor to cover unserved/underserved locations
- Set a review framework for ROW permit requests and specific processing time (e.g., 60 days from receipt of all required information for processing permits)

Ultimately, any ROW strategy that WSDOT adopts will need to be consistent with the analysis of federal and state laws and regulations presented as part of Chapter 3[1]. Specifically, any partnership approaches specified above should meet the neutral and non-discriminatory requirements as outlined in the analysis provided for Chapter 3. Also, limitations on compensation/fees to DOT are further delineated in the analysis provided for Chapter 3.

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[1] Chapter 3 – Memorandum prepared by Nossaman LLP on Documenting Legal and Regulatory Requirements

Appendices

Appendix A: Summary of Select State Build Once/Dig Once Policies

Benchmark Summary: State DOTs Policies	Maryland DOT	Minnesota DOT	Illinois DOT	Utah DOT
Policy Overview	Policy requires coordination and collaboration with internet service providers (ISPs) and utilities to install conduit for future use	Policy requires a competitive process which allows providers to install infrastructure when the ROW is open for utility work State promotes broadband conduit coordination between DOT and private entities	Policy requires coordination and collaboration between DOT and ISPs The DOT issues public bidding notices citing the need for conduit or cable	Policy requires DOT to play facilitator role for cooperative fiber and conduit trades with broadband service providers
Key Priorities of Policy	Interoperability and reduction of capital costs for telecom infrastructure	Accelerating broadband infrastructure throughout the state	Reducing cost	Broadband deployment and advancement of ITS initiatives in the State
Policy Scope	Sharing of highway ROW for monetary or in-kind compensation	Promote coordination between the DOT and private entities for the planning, relocation, installation, or improvement of broadband conduit with the ROW	Sharing of highway ROW to install fiber in new state- funded construction project that includes trenching. The State has successfully combined water and broadband projects to reduce costs	Facilitate cooperative fiber and conduit trades with broadband service providers
O&M of Broadband Network	Private entity installs and maintains the conduit(s)	State provides maintenance and operations (e.g., Dakota County)	DOT may permit a third party to manage the fiber and conduit leasing	Varies between DOT and telecoms
Resource Sharing Policy Exist?	Yes	Yes	n/a	Yes
Joint-trench Agreement Exist?	n/a (information not available)	Yes	Yes	n/a (information not available)
Policy Require the Use of Trenchless Technology?	Yes (horizontal directional drilling)	No	No	n/a (information not available)

Key Takeaways	Encourage the use of trenchless technologies If the conduit is installed and owned by a private entity, leasing rates remain competitive	Effectively communicate policies, including development and dissemination of best practices and model policies to state agencies and other stakeholders	Uniform ROW application processes can simplify filings and substantially reduce time and costs both for local governments and for communication carriers	ROW is open at all times, allowing for easy access to complete continuous build-outs, and ensuring that no single company has exclusive access
Summary	Maryland DOT coordinates with ISPs and local utilities to install conduit for future use and provides ROW access without charge to certain entities (until 2020). Through resource sharing, the State has been able to achieve interoperability and reduce capital costs for broadband infrastructure	The State promotes broadband conduit coordination between the DOT and private entities, connects broadband infrastructure to ITS and co-locates fiber / conduit in the same trench with other utilities. The policy includes a competitive process which allows service providers to install infrastructure when the ROW is open for utility work	The Illinois DOT currently employs a policy to collaborate with ISPs and to install fiber in new state-funded construction projects that includes trenching. This policy states that the Department of Central Management Services shall collaborate to install fiber-optic network conduit where it does not already exist in every new state-funded construction project that opens state-owned roadways	Utah DOT has facilitated cooperative fiber and conduit trades with broadband service providers to expand its communications network across the state without major capital investment. Utah DOT's approach to deploying broadband has also advanced ITS initiatives in the state, as well as promoted economic growth by enabling access to broadband in both urban and rural areas. Regional Broadband Planning councils were created to develop strategic plans to address local needs and provided recommendations
Approach to Policy and Practices	The Dig Once policy calls for the DOT to enter into an agreement with private service providers to install and maintain their conduits for future use. The policy requires sharing of the state ROW for monetary or in-kind compensation that may include communications or Information Technology (IT) equipment provided to Maryland State Highway Administration (MSHA) or exclusive allocation of fiber optic cables to MSHA	During the 2013 session, the legislature created the Office of Broadband Development (OBD) within the Minnesota Department of Employment and Economic Development (DEED). For the purposes of coordination of broadband infrastructure development, the OBD is required to collaborate with the DOT and private entities to encourage and coordinate broadband efforts for the planning, relocation, installation, or improvement of broadband conduit within the ROW in	The policy requires Illinois DOT and ISPs to collaborate to install fiber in new state-funded construction which includes trenching. The DOT issues public bidding notices explicitly citing the need for conduit or cable. The State has also successfully combined water and broadband projects to reduce costs of implementing broadband network	Utah DOT's approach to Dig Once policy is to install empty conduit(s) along major routes and provide access to the state ROW to service providers for broadband build-outs. The policy allows Utah DOT to enter into fiber trades with service providers. The Telecommunications Advisory Council reviews and approves trades and valuations, and coordinates potential issues relating to deployment of broadband networks. Additionally, the DOT has developed a single point of contact for all broadband projects and the DOT representative meets with service providers every 2 months about broadband projects. The DOT has developed a database of fiber and conduit locations, plans for economic

		conjunction with any current or planned construction, including, but not limited to, trunk highways and bridges projects. Additionally, the OBD is responsible for encouraging and assisting local units of government to adopt and implement similar policies		development, contact information and web links are available online to provide the service providers with information about the area they are servicing. Utah DOT installs conduit for its own network and allows private companies to use excess state-owned conduit in exchange for the use of company-owned conduit in areas where the state does not have broadband infrastructure. Utah DOT trades existing or planned fiber / conduit / circuit on a foot by foot basis for 30 years with automatic 5-year renewals. Ownership and maintenance of fiber varies between DOT and service providers. This approach has resulted in large cost savings since the DOT was able to expand its broadband network without major investment
Key Benefits of Policy	Through resource sharing, the DOT has been able to achieve interoperability and reduce capital costs for broadband infrastructure. Additionally, sharing of highway ROW for either monetary or in-kind compensation has allowed the DOT to improve its communication and/or transportation system.	The state's broadband infrastructure development and coordination efforts have resulted in effective implementation of broadband Dig Once policies, communications, and coordination for state highway projects. Based on information reviewed, these efforts appear to be successful and of continuing importance in implementing Minnesota's statutory goal of accelerating broadband infrastructure throughout the state. Additionally, the OBD believes that the policy has a potential to save millions of dollars for the state.	All levels of government work collaboratively with service providers for installation of fiber-optic network across the state. All parties benefit through efficiencies gained and reduction in project costs resulted from reduced time for installation of fiber, towers and related infrastructure.	Through frequent meetings with telecoms, creating open ROW, extensive information sharing and trading assets with telecoms, the state has doubled its broadband network, which now includes 900 miles of conduit owned by the DOT and about 1,000 miles obtained through trades.2 Utah DOT has indicated an estimated cost savings of 15.5% per mile when conduit and fiber are installed at the time a road is being constructed versus installing the conduit and fiber at a later time.

ROW Valuing Method	The method for determining fair market value or renting of the state ROW varies on a case-by-case basis; however, fiber exchanged for use of ROW typically has worked best for the DOT. Fees charged for the use of state ROW vary upon the specific proposal received and are negotiated with the service providers based on the location and the state's existing or future needs along the proposed route. Since 1994, Maryland has executed 23 agreements with private companies (Verizon, Nextel, AT&T) for sharing the state ROW for monetary or in-kind compensation (communications or IT equipment provided to MSHA).	Minnesota DOT accommodates private sector fiber on the interstate ROW through a barter arrangement by a Minnesota bandwidth expansion project, Connect Minnesota. The state does not have any direct fees; however, it uses offsetting reciprocal agreements to accommodate yearly maintenance costs. Barter values are based on initial capital costs which considers the conduit size, number of fibers, and distance.	Illinois charges fair market value of a lease for the use of interstate ROW for fiber optic cables. An annual fee is charged based on the current fair market value of a lease for the land, as such, fees are typically higher in urban areas and lower in rural areas. Presently, there are no charges for use of other state highway ROW.	Utah allows installation of fiber on interstates and service providers are required to pay fees for the use of intestate ROW. The fee amount varies (state law) as it is based on the value of the adjoining properties or area properties and the type of conduit. Utah has a preference to accept "in-kind" compensation.
Lessons Learned	— Encourage the use of trenchless technologies — Promote the installation of spare fiber and/or empty conduit where feasible — Ensure the resale of network capacity at reasonable and nondiscriminatory rates for broadband infrastructure projects in the state ROW — Identify environmentally-sensitive areas early in the process	— Promote and communicate Dig Once policies, including development and dissemination of best practices and model policies to state and local agencies and other stakeholders — Verify that agencies with construction oversight, construction funding, and land stewardship responsibilities lead by example in implementing “Dig Once” policies which encourage broadband competition and deployment, including planning, joint use, construction and notification	— Encourage Dig Once ordinances based on uniform standards and processes for fiber conduit installation — Uniform ROW application process can simplify filings and substantially reduce time and costs for developers — Work with local government agencies to develop and manage a training for efficient roll out of Dig Once policy	— Cooperative planning with service providers — ROW is open at all times, allowing for easy access to complete continuous build-outs, and ensuring that no single company has exclusive access — Extensive mapping of fiber locations — DOT can enter into fiber trades with service providers

Appendix B: State Benchmarking of ROW Admin, Formula and Pricing Methods

State	Administration	Formula	ROW Encroachment Pricing Methodologies

Wisconsin	-WisDOT's Division of Transportation System Development (DTSD) Region offices responds to questions on use of highway lands and projects dependent on location divided into five regions with 9 offices and 1 complex: North Central (2 offices), Northeast (1 office), Northwest (2 offices), Southeast (1 office), Southwest (3 offices, 1 complex). -Form DT1553 "Application/Permit to Construct and Operate Utility Facilities on Highway Right-of-Way" are processed in appropriate District office, this includes review of drawings, installation requirements, and ongoing maintenance	10k (≤ 100,000 AADT2) or $12k (> 100,000 AADT) x miles + 20% per duct per mile (each duct over two)	•One-time annual occupancy fee based on annual average daily traffic count, number of miles and 20% per duct per mile (each duct over two)
New York	-The New York City Charter assigns New York City Department of Information Technology and Telecommunications (DOITT) to be the authority in administering all franchises and revocable consents relating to telecommunications, which broadband initiatives fall under -DOITT authority includes oversight of private companies' use of public rights-of-way for broadband	-NYDOT charges permitting fees as well as annual fees based on encroachment type, strand count, and population density (3 tiers). The annual fees based on the criteria listed are as follows: -Tier 1: $3.98 (per ft and per cable) -Tier 2: $2.12 (per ft and per cable) -Tier 3: $.58 (per ft and per cable) -There is a multiplier that applies to each tier for each additional fiber cable exceeding 288 strands	•Annual usage fee based on population density (three tiers) •Additional multiplier for per-strand charge above 288
Utah	-UDOT reviews traditional encroachment applications for Statewide Utility License Agreement which allows developers to apply for encroachment permits for specific projects -Developers interested in partnering with UDOT meet directly with Lynne Yocom, UDOT Fiber Optics Manager, to discuss partnership potential and shepherd the process. -There are four region permit offices that report to individual permit engineers and staff level inspection professionals (3 per region), who are also responsible for other permitting requests	-Annual compensation rate per zone ($/mile) x # of miles accessed -Annual compensation rate per zone ($/mile) = zonal land value ($/mile) x rate of return on value of land (currently 10%)	•Interstates -Per mile pricing •State ROW -In-kind and/or monetary compensation
Maryland	Developers must first submit a utility permit application to construct transmission lines under or near a state highway. This application should include route maps, sharing agreements with MDOT, or monetary compensation agreements. The Developer's proposal is reviewed at the district office level with either a District Level Engineer or Designee, is added into the database of existing projects, and then begins an iterative process of commenting and resubmittal until a permit is eventually issued or denied.	Company Using State Property to Install its Own Fiber -Across the Fence: Land Value of ROW x length of area x width of area x rate of return x alienation factor x use factor -Tunnels and Bridges (Premium): Fiber = $3.75 x (# Strands/200) x Linear feet, Empty Conduit = # of conduits x Linear feet x $3.75	•Land value per square footage, required rate of return, alienation and use factors •Premium for bridges and tunnels •Separate structure for state-owned Dark Fiber
Tennessee	-TDOT begins their encroachment process by conducting a preliminary review of the project in conjunction with the developer -Following the submission of a complete application, the Regional Utilities Engineer, Regional Engineering Director, State Utilities Engineer, State Transportation Engineer assess the application materials and receive a surety bond -Upon approval, the developer is notified of acceptance and the District Maintenance Engineer inspects and monitors installation progress. Surety bond released upon determination of compliance.	-Annual per mile rate per 1 ¼ inch innerduct or equivalent ($1,500 for Urban, $1,000 for Suburban, or $500 for Rural) x # of miles accessed -Clear Zone Rate = $4,000 x # of miles of trench	•Per mile pricing •3 categories with varying rates based on population •Consent needed to transfer rights
Georgia	-GUPS permit application is submitted by the utility on the GUPS website -Permit is reviewed at the District Office level and State Utilities Office; if no changes, it goes to District Utilities Engineer (DUE) for final approval -GUPS will send automatic e-mail with instructions for contacting Area Permit Inspector (API) who will provide a questionnaire -Upon questionnaire completion, API release permit back to utility for End User License Agreement review -If utility agrees to all requirements and provisions the permit approval is complete	-GDOT charges annual permit fees as well as a $100 processing fee -Charges $0.50 per linear foot of communication cables for communications services	•Annual fees are assessed exclusively on longitudinal easements and is applied on both state and local roads •Additional permit processing fee applied
Pennsylvania	-Developer usually required to obtain State Highway Occupancy Permit before beginning work on state highway ROW -The District Permit Offices are responsible for review and approval of permit applications for non-limited access highways and coordinate with other District functions to avoid other highway improvement conflicts	-$55 per application for ROW access -$40 per opening in pavement (per 100 feet), $20 per opening in shoulder (per 100 feet), $10 per opening outside of pavement and shoulder (per 100 feet)	•Fixed application fees for proposal review by department •Digging fee for opening pavement per 100 feet (variable based on location of opening)
New Jersey	-Highway Occupancy Permits and Applications for Utility Openings are required for construction of transmission, fiber-optic, or electric conduit -Right of way plans and documentation are submitted to the Project Coordination Unit and subsequently transmitted to applicable District Offices -The NJDOT Permit offices reviews these plans for technical and administrative completeness and subsequently determines whether these plans are acceptable for permit delivery	-Permit application fee of $300-$600 is applied -Additional access fees are not charged	•Permit fee $300-$600 •No additional fee
Florida	-FDOT Office of ROW is subdivided into seven (7) geographical districts with responsibility for the transportation facilities within their designated counties -FDOT will issue permits for the construction, alteration, operation, relocation, removal, and maintenance of utilities upon the ROW in conformity with the FDOT Utility Accommodation Manual (UAM)3 -When a Utility Permit application complies with all requirements in the UAM and the utility work does not unreasonably interfere with the safety, operation, maintenance, future improvement, or expansion of the transportation facility, a Utility Permit must be approved by the Local Permit Office	-Based on FMV -Exact formula not specified	•Allows for "a just, reasonable, and nondiscriminatory fee for placement of the facilities… based on the FMV of space used by comparable communications facilities in the state."
Colorado	-CDOT ITS Department reviews unsolicited applications for broadband fiber ROW use	-Fees are not charged	•Limited ROW Fees

	-Fiber Management Team then reviews application if accepted by ITS and votes if they should approve the agreement as a P3 and sign an MSA -If approved and signed as an MSA, broader discussions surrounding in-kind contributions and future work are held		•In-Kind contributions in lieu of ROW fees
Virginia	-Regional Land Use Departments review permitting requests (150 Land Use Staff across staff divided into 5 regions, 9 districts) –no exclusive broadband staff -Request is then reviewed by Operations and Traffic Engineering, Residencies, Bridge Divisions, the P3 Office, and the ROW Division -Revenue Sharing Request is handled by Central Office -Governor's Broadband Advisor may be consulted if necessary	-No usage fees for non-limited access ROW, free permit -Land acquisition ROW value appraised via over-the-fence valuation, plus a convenience factor and permitting fee (~$10/100ft installation) -Distinct from phone and cable providers, who are required to pay fixed multiplier per access line	•C/A –across-the-fence appraisal plus in-kind contribution •Non-Limited Access –No fees assessed
Texas	There are 25 regional offices that handle ROW permitting in the state, with slightly different rules for each. Generally, a developer must submit a region-specific Utility Installation Review to begin the process. This submittal is then reviewed by area engineers, permit coordinators, and maintenance administrators. After review for safety and construction conflicts, the permit is provided and the developer may begin construction.	-No usage fees for broadband-only providers	•No ROW easement fees
Ohio	-Each district office is responsible for the review of E-Permit application, plan, and supplemental requirements -Managed differently in each district, involves Permit Technician, Area Engineer, ROW Engineer -There are 12 ROW Districts in Ohio with between one and three dedicated staff per district -Controlled Access ROW exception requests are managed by the Central office. No set process exists for review.	-Fees are not charged	•N/A –No permitting in C/A
South Carolina	-SCDOT uses an automated Encroachment Permit Processing System to accept, process, manage permit requests and issue the permits. -Utility permit is routed to the county level, where it is reviewed by permitting staff -If interstate request, county would forward the request to the central office and coordinate with FHWA	-Fees are not charged	•SC does not charge for ROW easements.

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