

June 11, 2019

Hollie R. Casey
Dinwiddie County
14010 Boydton Plank Road
P O Drawer 70
Dinwiddie VA 23841

Dear Ms. Casey,

Please accept our submission for your Request for Proposal: Counties of Amelia and Dinwiddie Joint PPEA Request for Proposals, RFP-19-050719, BROADBAND PROJECT.

Due to the quick turnaround for the response, we have taken the stance of giving you examples of what the final product would be. Our experience in doing projects like this, has demonstrated to us that we can predict coverage to the best of our ability, then still find nuances in the field where we have to make adjustments.

You will find our response is a hybrid solution, where we use fiber as much as we can, then spread out throughout the counties with wireless, with speeds over 1000 MBPS.

One particularly difficult situation is the foliage. We run into the in North Carolina as well, but have found solutions to get around that issue. We use LTE 3.5 GHz, and would like to discuss the use of 2.5 GHz LTE as well. The changes to CBRS will be how it is licensed and for the ability for a "SAS" to change channels of a radio, allow more radios to be utilized from different vendors. For the licensing part, we will be in the auction for your counties, and will be awarded licenses based on the fact we are already licensed for LTE and that give us precedence.

The LTE and CBRS bands are going through a lot of changes, and all of our LTE equipment is ready for those changes with a simple firmware update. There are few ISPs that understand or have even deployed LTE. We would invite the counties to come and visit some of our LTE deployments.

Thank you for your attention. We are excited about helping Dinwiddie and Alemia Counties with their broadband needs!

Sincerely,

Kent A Winrich
Managing Member/Chief Technology Officer
Open Broadband LLC
kent@openbb.net
919 924 3389 cell/text

**RFP Response for
Counties of Amelia and
Dinwiddie

Broadband Project**

Joint PPEA Request for Proposals, RFP-19-050719

June 11, 2019

Response is respectfully submitted by:

Open Broadband, LLC

PO Box 723
Waxhaw, NC 28173
<http://openbb.net>

Contact persons:

Alan Fitzpatrick – CEO
704-237-0102
alan@OpenBB.net

Kent Winrich - CTO
919-924-3389
kent@openbb.net

Legal form:

Open Broadband, LLC is a North Carolina Limited Liability Corporation

FEIN:

81-4019167

Tax Year: Calendar

FCC Registration Number (FRN): 0026202879.

North Carolina Secretary of State: C2016 270 00880

/s/ Alan Fitzpatrick
Alan Fitzpatrick – CEO

/s/ Kent Winrich
Kent Winrich - CTO

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Qualification and Experience

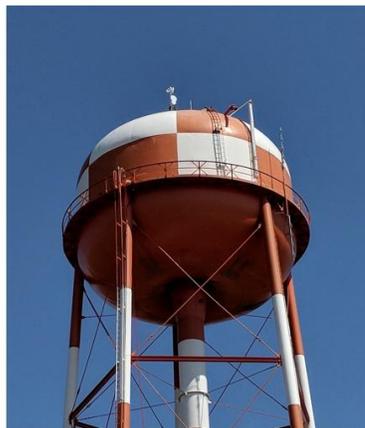
Open Broadband, LLC (<http://openbb.net>) is a privately held Wireless ISP headquartered in Waxhaw, NC. We offer fixed-wireless broadband service to government, education, business, and residential users, with a specific focus on unserved and underserved counties. The primary point of contact for this proposal is:

Alan Fitzpatrick
CEO – Open Broadband, LLC
201 N. High St. Waxhaw, NC 28173
704-237-0102
alan@openbb.net

This proposal is made by Open Broadband, LLC.

We have considerable experience in implementing WISP service for counties. Recently we were selected for North Carolina broadband grants for Caswell County and Vance County NC, and an ARC broadband grant for Alexander County NC. Public-Private-Partnerships were made in Orange County, Wayne County, and Gaston County NC, and we've implemented broadband partnerships directly with towns throughout North Carolina. We recently received our first Purchase Order from a Virginia County (Charles City County) and are planning continued expansion in southern Virginia.

We typically deploy fixed-wireless antennas on communication towers and water towers as shown in the pictures below from Orange County and Wayne County NC:



Our service includes residential and business internet from 25Mbps to 1000Mbps, and public Wi-Fi Zones for towns, universities, and parks. We provide service to various municipal entities including town halls, police stations, parks and recreation, public works, fire stations, and an airport. Our gigabit (1000 Mbps) service is provided to entrepreneurship centers in Gaston and Mecklenburg Counties, and to business clients like Hannon Orthodontics in Belmont NC. University clients include Guilford Technical Community College, University of Mount Olive, and Pfeiffer University.

Open Broadband is engaged in economic development in the communities in which we work. Our CEO founded CharlotteHeartsGigabit.com, one of the leading advocacy groups in the country on promoting gigabit broadband, and [NC Hearts Gigabit](#), the equivalent statewide effort which holds an annual interactive [conference at the NC Rural center](#). Our founders spoke at **Gigabit City Summit** and **Gigabit Cities Live** events, Broadband Communities conferences, the Connect(x) Wireless Conference, and brought Mozilla to Charlotte to host a Gigabit 101 Workshop. We co-hosted a 5 city **Gigabit Hackathon (GIGHacks)** in Charlotte, and emceed an ethical hacking competition in Wilson NC.

Our CEO is on the City of Charlotte's **Digital Inclusion Steering Committee**, focusing on closing the digital divide. A member of our team is an experienced trainer of **Digital Literacy and Digital Inclusion** programs. We can offer a series of classes to help residents leverage internet access for job search, medical information, education, and other applications critical to being successful in society today. We believe broadband infrastructure is an essential need, similar to electricity, and everyone needs home access.

Open Broadband was founded by 2 veterans of the telecom industry each with 25+ years of operations providing broadband service. In 2016 we saw the great need for broadband connectivity in underserved areas and decided to depart our employers to form a company, Open Broadband LLC, to address it.

Our company enjoys a close working relationship with Segra (a merger of Lumos Networks and Spirit Communications), who has a legacy of 100+ years delivering telecom and data services in the Mid-Atlantic region. Segra has a super-regional fiber bandwidth network of over 21,000 miles of fiber in the Mid-Atlantic and Southeast United States. Nearly 10,000 enterprises, over 400 government agencies, and 300 school districts rely on Segra for their communications needs. This RFP response is solely on behalf of Open Broadband LLC, however for fiber, data center, and bandwidth services we partner with Segra. For this project we will explore a working relationship with MBC for service to supplement Segra.

References:

- Bonnie Hammersley, County Manager for Orange County NC. bhammersley@orangecountync.gov
- Chip Crumpler, Asst. County Manager for Wayne County NC. chip.crumpler@waynegov.com
- Charles Brown, Mount Olive NC City Manager. manager@townofmountolivenc.com
- Dr. Ken Russell, former CIO for Pfeiffer University. ken.russell@pfeiffer.edu
- Adrian Miller, Belmont NC City Manager. AMiller@cityofbelmont.org
- Catharine Rice, Community Broadband Consultant to Local Governments, Manager – Broadband Matters catharine.rice@gmail.com

Key Management and Staff

Alan Fitzpatrick, CEO, LinkedIn: <https://www.linkedin.com/in/alanfitzpatrick/>

Kent Winrich, CTO, LinkedIn: <https://www.linkedin.com/in/kentwinrich/>

Mario Aldayuz, Director of Network Engineering

Rob Cranwell, Director of Network Deployment

See the [About Us](#) tab on our website for additional background information on the staff.

We have Area Managers, local to our markets, who manage the business and communicate on a regular basis with our county partners. We plan to appoint a new Area Manager with general authority to manage our service territory in Southern Virginia.

Backgrounds of the Open Broadband, LLC Founders:

Alan Fitzpatrick, CEO, has over 25-years' experience (LinkedIn Profile:

<https://www.linkedin.com/in/alanfitzpatrick/>):

- COO of DC74 Data Centers in Charlotte, NC, providing internet service from 50Mb to 10Gb to business customers in the greater Charlotte region. While at DC74 Alan spearheaded the build of the region's first internet peering exchange.
- Global VP of Network Services at ACN in Concord NC. Led the engineering and operations functions for the company serving residential users in the U.S., Canada, Puerto Rico, and 14 countries in Europe.
- Senior Vice President of US LEC Corp., a competitive telecom provider based in Charlotte NC, serving internet to business customers in 27 cities, from Miami to New York to New Orleans. Alan led the Engineering, NOC, and Vendor Management functions for the publicly traded company.
- Prior to US LEC Alan was VP of Engineering for NET-tel Communications in Washington DC, Director of Engineering for CTC Communications in Concord, NC, and a variety of functions in engineering and operations for AT&T in Georgia and Florida servicing both residential and business internet customers.

Kent Winrich, CTO, has over 25-years' experience (LinkedIn profile:

<https://www.linkedin.com/in/kentwinrich/>):

- Director of Broadband and Infrastructure at Fibrant (City of Salisbury municipal network), providing internet service from 10Mb to 10Gb to residential, educational and business customers in Salisbury NC.
- Senior Engineer at Hibernia Media. Responsible for the complete European Fiber Optic Network for Hibernia, from Dublin to Moscow, working with large data users, and provided service from 50Meg to 100Gigs. Kent led the worldwide engineering team as well as planning for bandwidth needs throughout Europe.
- Head of Broadcast Services at Vidyo. The VidyoCast division of Vidyo offered broadcast quality video encoding over the open internet. He was responsible for all

connectivity and engineering worldwide, and performed in countries such as India, New Zealand, Peru, Singapore, South Africa, and throughout Europe and the US.

- Director of Engineering at Clear Channel. Kent was in charge of all transmission facilities from high power AM stations, to FM to Microwave, as well as all real estate assets and all things technical. He was also responsible for interacting with the FCC to ensure all FCC rules were followed and was responsible for every FCC license.
- Kent also has experience at BAE Systems, where he was stationed at Ft Bragg, performing propagation predictions, antenna design, as well as training soldiers on RF and electrical theory.

As evidenced by the background specifics identified above, the Open Broadband founders have a great deal of experience building and operating some of the highest quality broadband networks in the world. We've served institutions and organizations with the highest uptime requirements, and built Network Operations Centers to support these high demands. We understand how to alarm for network conditions, and to build processes for technical support and troubleshooting.

Open Broadband has built a team of highly experienced telecom veterans with expertise in wireless and fiber. We are uniquely equipped to bring the latest in high-speed broadband to underserved markets, while instilling the same level of customer and technical support required by the largest companies in the world. We have spent a lifetime in the craft.

Background of the company

Open Broadband, LLC is a privately owned ISP, organized in the state of North Carolina in 2016, and financed through private investors. (North Carolina Secretary of State: C2016 270 00880). Our fiber and data center partner is Segra Data Centers, part of Segra Networks, a 100+ year old fiber-based company headquartered in Virginia. We design and build a hybrid fiber and fixed-wireless network that brings broadband to rural areas. Our network design utilizes fiber from our data center to towers hosting our fixed-wireless antennas. We also deploy fiber to select neighborhoods and areas that justify the cost. We believe in getting fiber as deep into the community as possible, and serve the last mile in a hybrid of point-to-multipoint wireless and fiber-to-the home.

As experienced telecom industry veterans, we've built personal connections with most of the major carriers in the U.S. Our data center relationship with Segra Data Centers gives us access to multiple carriers for internet upstream connectivity and for leasing point-to-point fiber circuits. We have carrier contracts with Spectrum, Level 3, and AT&T, and have access to several others including Windstream, and CenturyLink. For Customer Call Center operations, we are partnering with the City of Wilson NC to use the same call center used for the Greenlight municipal broadband network.

Alan Fitzpatrick and Kent Winrich are the two founders of Open Broadband, LLC, and the company has additional private investors. Open Broadband is happy to provide copies of our North Carolina organization documents and financial documents upon award of the RFP.

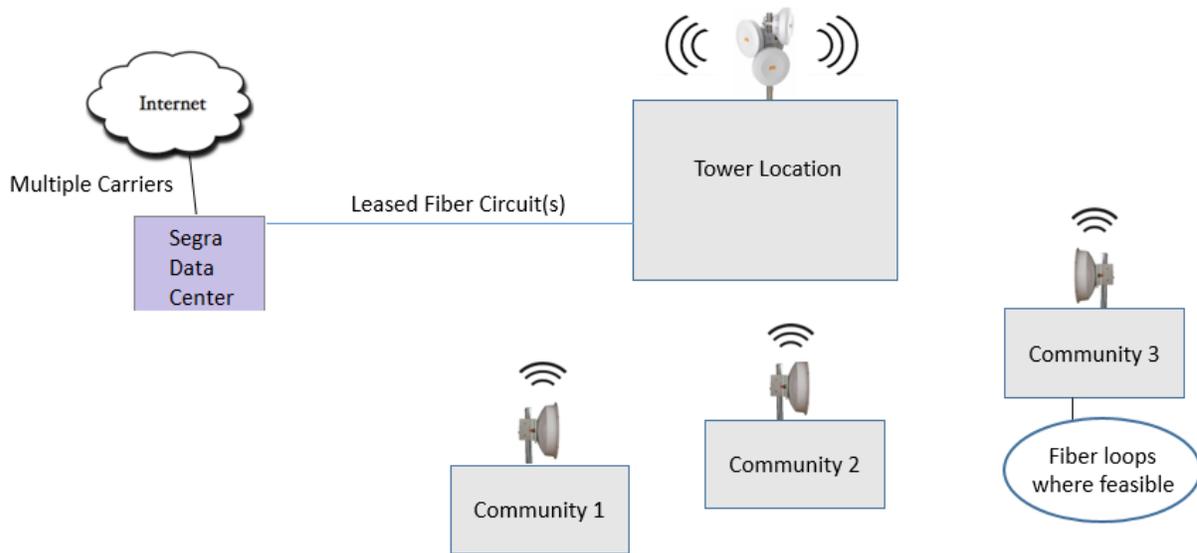
Certifications: Open Broadband, LLC has not declared bankruptcy within the past 10 years. We have no persons who would be obligated to disqualify themselves from participation in any transaction arising from or in connection to the project pursuant to Virginia State and Local Government Conflict of Interest Act (Va. Code §§ 2.2-3100 et seq.). The firm is not currently debarred or suspended by any federal, state or local government entity, nor have its principals operated as another entity that is so debarred or suspended. Upon selection as the provider of choice for this RFP, Open Broadband will sign the sworn certifications.

As a private company Open Broadband, LLC does not provide financial information that could be made public. Upon selection as the provider of choice for this RFP, Open Broadband will privately provide a current financial statement and other documentation to assure the counties of our financial stability.

Conceptual Network Design Proposal

Open Broadband uses a hybrid technology of fiber and fixed-wireless. It consists of the following components:

- Data Center with multi-carrier BGP routed internet upstream connections.
- Leased point-to-point fiber circuit(s) from the data center to tower sites in Dinwiddie and Amelia Counties. Fiber circuit will be ordered from one of the available carriers: Segra, MBC, etc. The fiber circuit can transmit 10 Gbps today, but the ordered capacity will be based on the initial 3-year demand, and grown as traffic grows. The fiber backhaul to the data center future-proofs the network for growth.
- Fixed Wireless antennas operating in various frequencies, including 24 GHz and 11GHz for backhaul and 5 GHz and below for customer connections. **This includes the licensed 3.5-3.7GHz spectrum used by LTE and the upcoming release of the CBRS spectrum, and selected use of 2.4Ghz where applicable. It is this service that allows for Non-Line-of-Site (NLoS) service through trees. Very few companies offer or are even familiar with LTE, and for a project like this, it will be totally necessary!** Symmetric speeds can be provided on 5 GHz and above radios, and Open Broadband has the majority of clients using service at 25 Mbps, 50 Mbps, and 100 Mbps speeds. To a lesser degree we have customers using us for symmetrical 200 Mbps, 300 Mbps, and 1000 Mbps. In non-line-of-sight applications we use 3.65 Ghz and/or 2.4 GHz spectrum, which operates most efficiently today at 25 Mbps x 3 Mbps. We purchase these radios “off-the-shelf” from the manufacturers. As radio technology continues to improve we will upgrade our fixed-wireless radios to faster speeds. We are hopeful that the radio manufacturers will develop symmetric 100 Mbps service in the 3.65 GHz (CBRS) spectrum in the future.
- Select use of fiber loops where clusters of homes/businesses make it economically viable



We primarily use a fixed-wireless last-mile, and fiber to the tower network design as we've found it to be the most cost effective, fastest to install technology that results in the fastest broadband speeds and lowest cost to consumers. Fiber alone often does not make economic sense in rural areas due to the high cost of installation and having to pass every property on the route. Wireless alone can have limitations on bandwidth and network expansion. A hybrid approach takes the best of each technology, using fiber for high bandwidth to the data, while using last mile fixed-wireless to quickly turn up just those users who subscribe to the service. This is a scalable solution that is easily grown to meet demand 20 years in the future.

Open Broadband Service Availability

Our network is designed with the following specifications:

- Data Center: SSAE 16 compliant, PCI DSS compliant, and HIPAA compliant. The data center is staffed 24x7x365 and has a 99.999% network uptime guarantee.
- Fiber circuits are on carrier backbones with a 99.999% network uptime guarantee.
- Fixed-wireless antennas are rated for 99.99% uptime.
- Fixed-wireless circuits are designed to withstand typical weather patterns including heavy rain, winds, and snow.
- 11GHz fixed-wireless backhaul circuits are licensed links to avoid interference.
- Consumer connections in the 3.5 – 3.7 GHz and 2.4GHz spectrum are designed to work through, or around obstructions such as heavy foliage.

Open Broadband Service Level Agreement

For our business, education and government customers we offer a money back SLA as follows:

Network Uptime – Wireless circuit	
Length of 100% packet loss	Credit Against Monthly Services
0 - 120 minutes	0%
120-240 minutes	10%
240-360 minutes	25%
360 minutes and above	50%

The details of our business class SLA can be [found here](#), which is a link at the bottom of our website: <https://openbb.net>. We are willing to negotiate specific SLA requirements for clients.

It should be noted that our dedicated fixed-wireless connections are 128-bit encrypted. Free public Wi-Fi zones are not.

Open Broadband Service Offerings in Amelia and Dinwiddie Counties:

A key differentiator in our service is we do not force the customer to bundle services in order to get a low rate. Our rate is a stand-alone price for the service. Unlike the large carriers we do not use ‘teaser rates’ which go up after 12 months. Our price is the price, and for residential users there is typically no contract. Also there are no data caps, no overage charges, and no throttling. We offer flat rate billing with no surprises.

Our intentions are to provide the rural areas with broadband speeds and prices as close as possible to the metro areas (see Exhibit 2, provided in a sealed envelope, for user pricing). It should be noted that some users may be located in areas where there are technical challenges. Our intention is to offer service to everyone, but there are likely to be some users that require additional build costs. We prefer not to charge this upfront to the user, but we may require a term commitment from the user in order to recoup the additional costs to serve.

Open Broadband offers internet service speeds starting at 25 Mbps and going up to 1000 Mbps. Since most users will be non-line-of-sight, our 25 Mbps x 3 Mbps service will be the service offering available to most residents. With clear line-of-sight we can deliver symmetrical speeds up to 300 Mbps within 5 miles of an antenna and symmetrical gigabit (1000 Mbps) service for clear line-of-sight customers within 2500 ft. of an antenna. Where possible we offer service in symmetrical model. This applies to all fiber customers and line-of-sight fixed-wireless customers. Service is available to anyone; resident, business, school, or government agency.

Open Broadband is agreeable to develop unique pricing and/or packages for key community stakeholders and populations (e.g., government, community colleges, universities and K-12 facilities). Several of these stakeholders in other counties have signed with Open Broadband as a result of our superior value proposition.

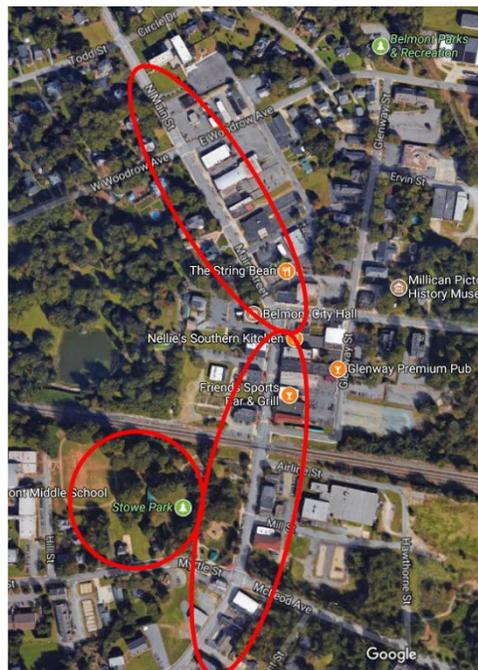
Public Wi-Fi Zones: Open Broadband provides public Wi-Fi Zones in parks, communities, and business areas. We believe public access in common areas is one of the most cost effective ways to bridge the Digital Divide; getting broadband service in the hands of more people, faster. Wi-Fi Zones can be added in just about any area selected by the county. A user does not need to be a customer of Open Broadband to utilize free public Wi-Fi Zones. These Wi-Fi Zones are free to the public, but are paid for by a combination of County/Town funding and advertisements.

We discourage businesses from using free public Wi-Fi zones by establishing sign-in credentials and auto time-out after an hour. For business use we offer dedicated, 128-bit encrypted service.

Wi-Fi Zones can also include IP cameras for surveillance capability for law enforcement, and we can implement a complete IP surveillance system as needed.

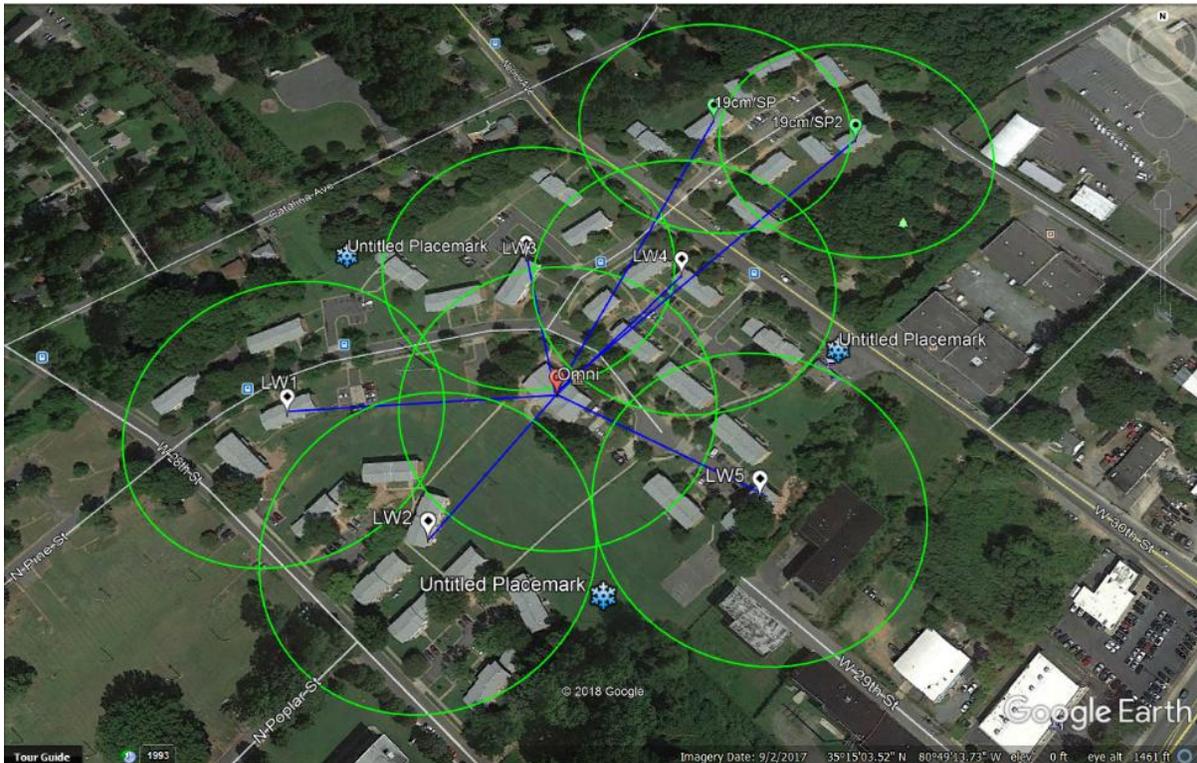
We also offer a Data Analytics service for Wi-Fi zones (described in Exhibit 3) so the county/town can measure the results of the service and can control access pages, advertisements, and announcements.

A map of the downtown Belmont NC Wi-Fi zone we deployed, covering north and south Main St and Stowe Park is shown here:



Open Broadband manages free public Wi-Fi zones in Belmont, NC, Mount Olive, NC, the sports complex in Berkeley Park in Goldsboro, NC, Romare Bearden Park in Charlotte, and free Wi-Fi coverage of the sports complex at Pfeiffer University's campus. We are currently deploying downtown Wi-Fi Zones in the towns of Angier and Sanford NC.

We also serve Public Housing communities. Open Broadband contracted with the City of Charlotte to provide free public Wi-Fi service to 136 family units in the Dillehay Courts community. Residents can access the network from any phone/tablet/laptop simply by selecting the Wi-Fi SSID and logging in. Similar service can be provided to Public Housing communities in Amelia and Dinwiddie Counties. A diagram of the Dillehay Courts coverage is shown here:



Access to County Controlled Assets

As described in the RFP, Open Broadband requests access to vertical assets that are owned by the county or allow county providers to access them. We request that counties leverage existing business relationships with some or all of its partner organizations, e.g., municipalities, schools, colleges and universities, to facilitate access agreements.

Co-working spaces

Open Broadband loves to serve the entrepreneurial community, We provide gigabit service to [Packard Place](#) in Charlotte, gigabit and Wi-Fi service to [TechWorks](#) in Belmont NC, and gigabit and high-speed Wi-Fi to [Tabbris Co-working](#) in Charlotte. We frequently speak at startup events and would be happy to support the Amelia and Dinwiddie County ecosystems in a similar fashion.

Business districts, business parks, and residential communities

The vast majority of our targeted unserved and underserved areas are rural, however there are pockets where neighborhoods and businesses are clustered. For each of these areas we evaluate the need of the users and will deploy either a fixed-wireless solution or a GPON fiber-to-the-premise solution. The latter will require a high adoption rate as cost is based on buildings passed, not just those that sign up for service. For this reason, we are likely to initially provide service in these areas with fixed-wireless until high adoption rates make it more attractive for fiber.

If/when fiber is an attractive investment in these areas, our plans are to install one or more outdoor enclosures with GPON fiber splitters designed for 16:1 up to 32:1. From the enclosures we build a network of fiber optic cables in conduit (if buried) or on poles if aerial. An optical network terminal is placed on the side of each business or home. Our use of GPON technology is similar to how Google Fiber and Ting Internet deploy their fiber-to-the-premise network.

Roles and Responsibilities

- Network design – Open Broadband
- Network construction – Open Broadband, our partner Segra, and selected vendors for tower climbing and fiber builds as needed
- Network operations and management – Open Broadband and Segra
- Customer support – Open Broadband
- Publicly available information – Open Broadband
- Marketing and outreach – Open Broadband

Technology

We believe in solving the customer need regardless of technology, and will deliver service over fixed-wireless, fiber, or a hybrid depending on the situation.

Our fixed-wireless service leverages a variety of spectrums, depending on the area being covered. These options include licensed LTE/CBRS 3.5 GHz, non-licensed bands of 2.4GHz, potential the use of licensed 2.5 GHz LTE, 5GHz, 24GHz, and 60-70 GHz, and licensed bands at 11GHz, and 80 GHz. The wireless design consists of placing antennas on tall structures/towers and beaming signals to another antenna at a customer location. For close-in line-of-sight customers we can deliver 1000 Mbps speed using 60-80 GHz. For line-of-sight customers farther from the tower, we are delivering symmetrical speeds up to 100 Mbps using the 5GHz frequency.

Fixed-wireless technology is impacted by vegetation and line-of-sight factors. In areas with heavy vegetation we have to use the lower frequencies (2.4 GHz, or LTE/CBRS at 3.5 GHz or 2.5 GHz), and as a result, target 25 Mbps down by 3 Mbps up in those areas. Much of the unserved and underserved areas in Amelia and Dinwiddie Counties fall into this category.

Fixed wireless radios and antennas are readily available from distributors in the US. Vendors include Ubiquiti, IgniteNet, Baicells, RF Elements, Mimoso, Cambium, and Carlson. The technology we are deploying is state of the art with an expected minimum life span of 5 years.

Open Broadband will install maintain, and upgrade its network equipment as needed to maintain high service levels. Open Broadband owns all network equipment and does not expect the counties to hold a lease on any equipment.

Video and phone service

Video services are not provided by Open Broadband, but we will support the wide variety of commercially available over-the-top service options such as Sony VUE, Sling.tv, YouTube.tv, Netflix and others. Our high-speed service easily accommodates multiple video streams, allowing households to have multiple video streams happening simultaneously.

For phone service we recommend several VoIP options that include an ATA (analog telephone adapter) that connects to our internet service. Service is less than \$20/month/line. Other solutions such as magicJack offer a full year of VoIP service for \$35.

Rather than provide our own video and VoIP services we simply point customers to these commercially available offerings which work well with our broadband service.

Customer Support

Through our relationship with the City of Wilson NC, the 24x7x365 US based Call Center supports 80% calls answered within 30 seconds. Users may also submit support requests 24x7x365 via the website. Some service requests can be resolved in a self-service manner by the FAQs, others within minutes over the phone with the call center agent. Other service requests may require on-site support (e.g. storm damage) and thus longer repair times including next business day.

We strive to provide superior customer service, and are offering SLAs to businesses and anchor institutions as described in the next section. Storm damage, downed trees, lightning damage, etc. will result in longer times to repair. Our overall approach to meet or beat the SLAs offered by the major ISPs in the metro areas (Comcast, Windstream, etc.).

Business and anchor institutions (government, schools, etc.) will receive priority restoration service. These customers have active monitoring and proactive identifications of outages, enabling Open Broadband to addresses issues even prior to the customer becoming aware they have an issue. We offer these groups an SLA of 99.95% service availability, with the ability to receive service credits if we are unable to perform (excepting Acts of God events). These groups will also receive out-of-business-hours on-site support per our agreements with our local maintenance crews.

Residential customers have the 24x7 support previously described, and we will make best efforts to resolve troubles as fast as possible. While individual homes are not proactively monitored or include SLAs, the network as a whole is proactively monitored by Open Broadband technical support. We will take action on service issues as identified through our network alarming, prior to any user trouble submission.

The Call Center is staffed 24x7x365, and all customers (SLA and non) call into this center. All calls are immediately handled according to the nature of the trouble and the call center agent's ability to resolve it over the phone. All calls not resolved by the agent are dispatched to either Open Broadband's technical team, or our on-site maintenance crews. Normal hours of operation of these groups is Monday through Friday from 8 am – 5 pm, with the exception of Tier 1 and Tier 2 clients identified below.

Priority is first given to Tier 1 organizations, such as hospitals, government, schools, airports, and other important anchor institutions. Tier 2 priority are business clients, with the priority being their hours of operation. Service restoration efforts may require the business to have a person on-site, and will therefore need to be scheduled. We support on-site, off-hours/nights/weekends for Tier 1 and Tier 2 clients.

Tier 3 priority is standard residential service, and could possibly require a site visit and need to be scheduled. This tier includes the 24x7x365 phone support previously mentioned, as well as the ability to email tickets and use of the FAQ section on the website. However, in order to provide low rates to our customers, this tier level does not include night/weekend on-site support. If/when needed, on-site support for residential issues will be the next business day.

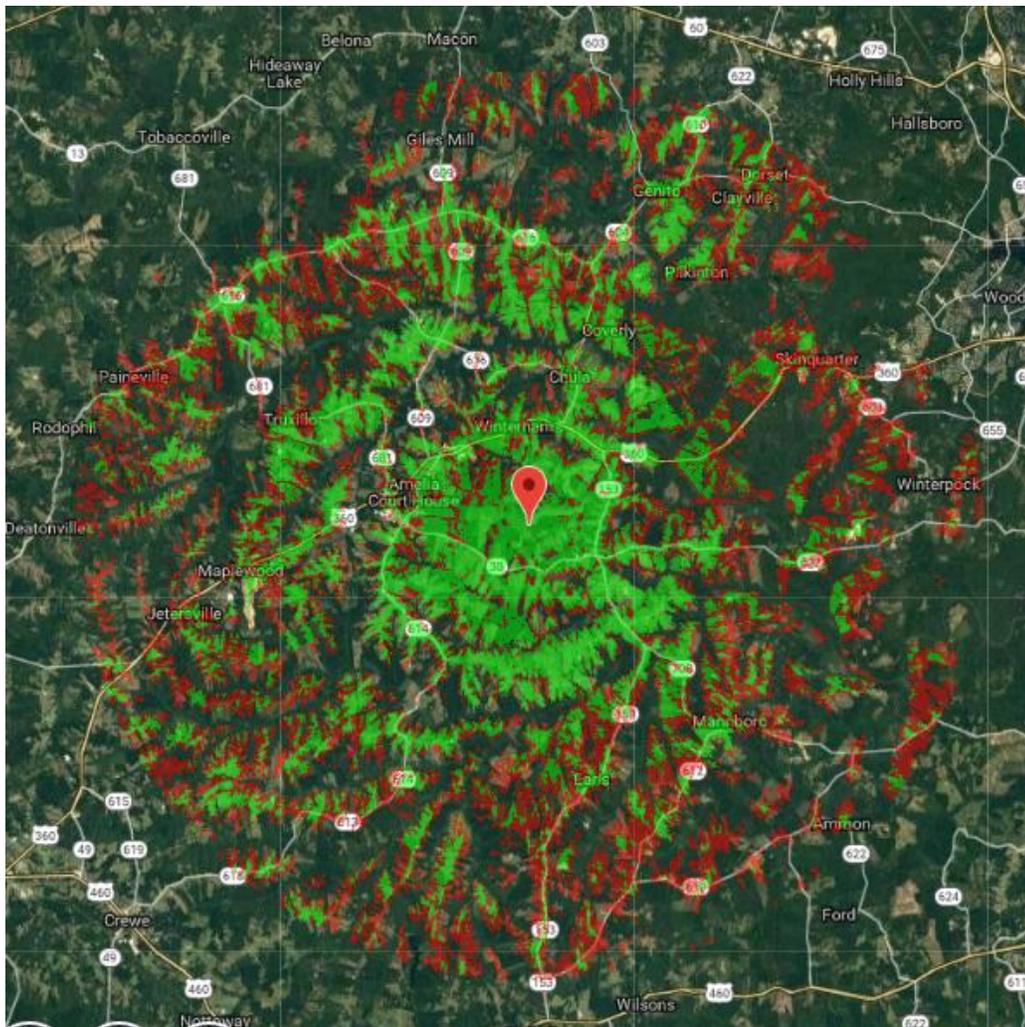
Open Broadband's Proposed Service Areas

The following are examples of maps that would be generated for this project. Each tower would have a RF Prediction map generated to understand expected coverage off of a tower. We would first do a “non-line-of-site” LTE 3.5 GHZ map, then a Line-of-Site 5 GHz map for each tower, and then a final combined map for the whole area. In addition, we would also generate point-to-point maps.

Amelia County

1. RF Propagation Map of coverage

Example of NLoS 3.5 GHz LTE coverage off of the Public Service tower in Amelia County.

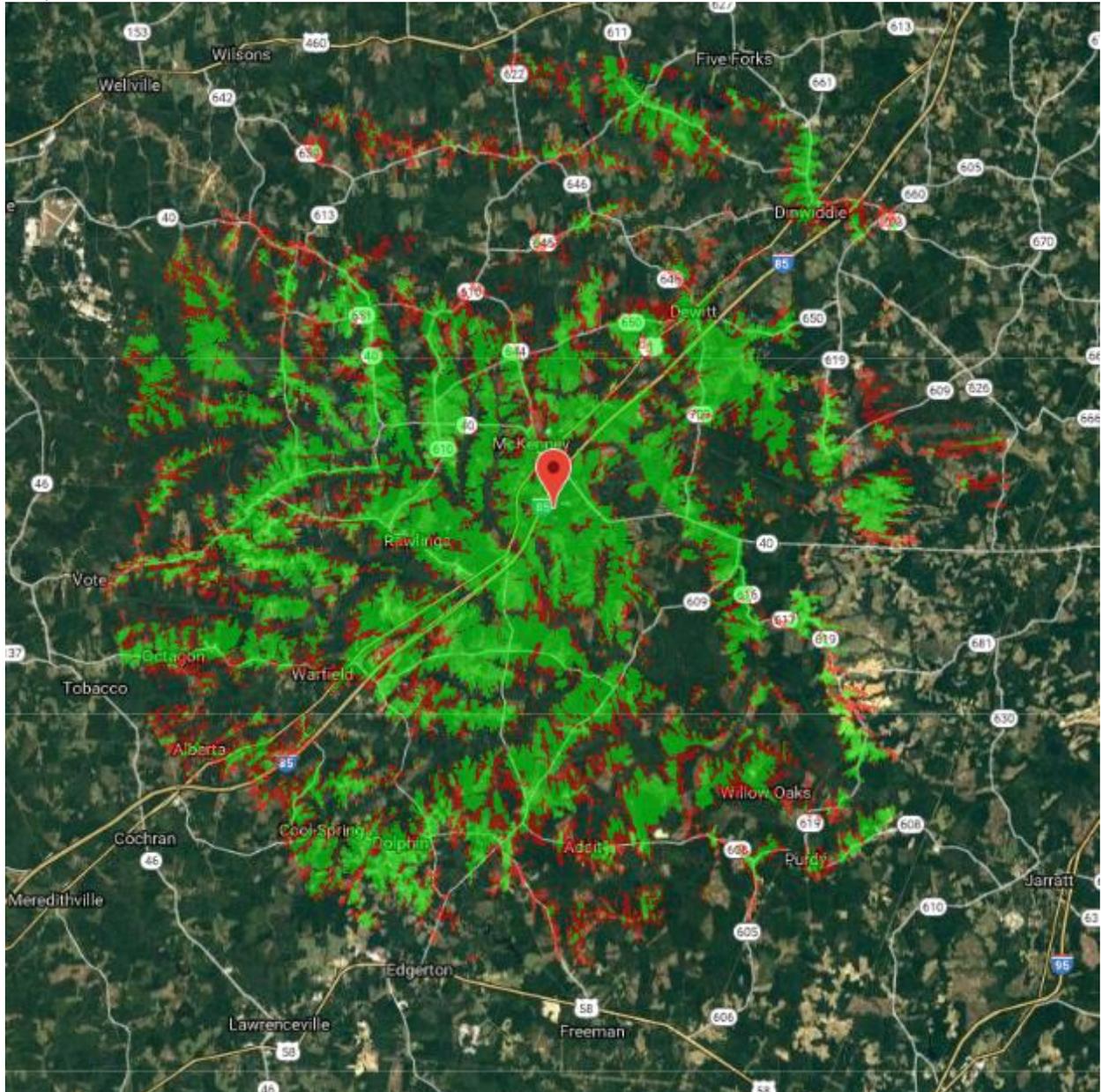


- 12 towers are planned, and to be supplemented with micro-POPs, the number of which will be determined by geography and take rate of the service.

Dinwiddie County

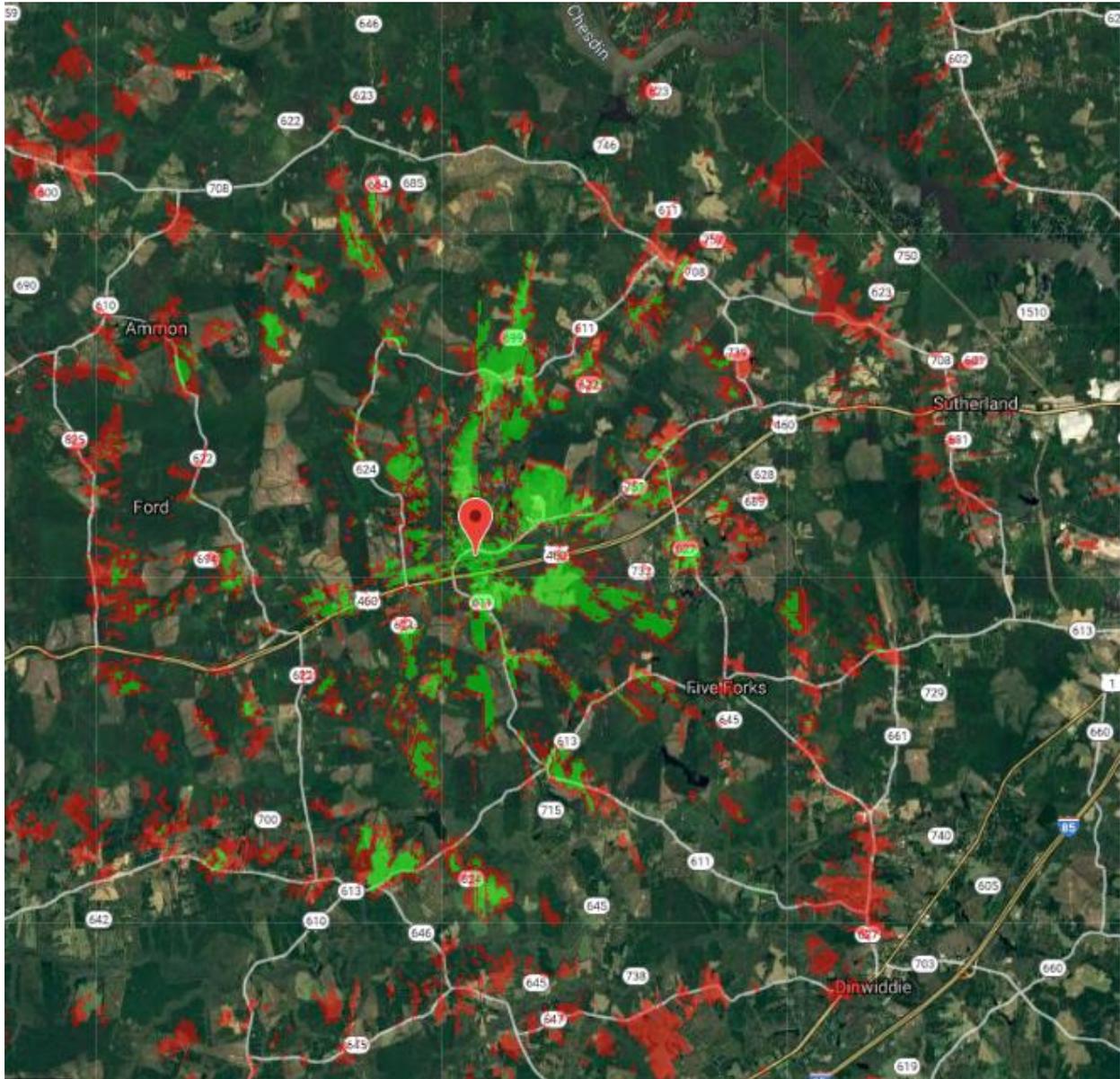
2. RF Propagation Map of planned coverage

An example off of a tower near McKenney, VA, using 3.5 GHz LTE NLoS (Non-Line-of-Site) service.

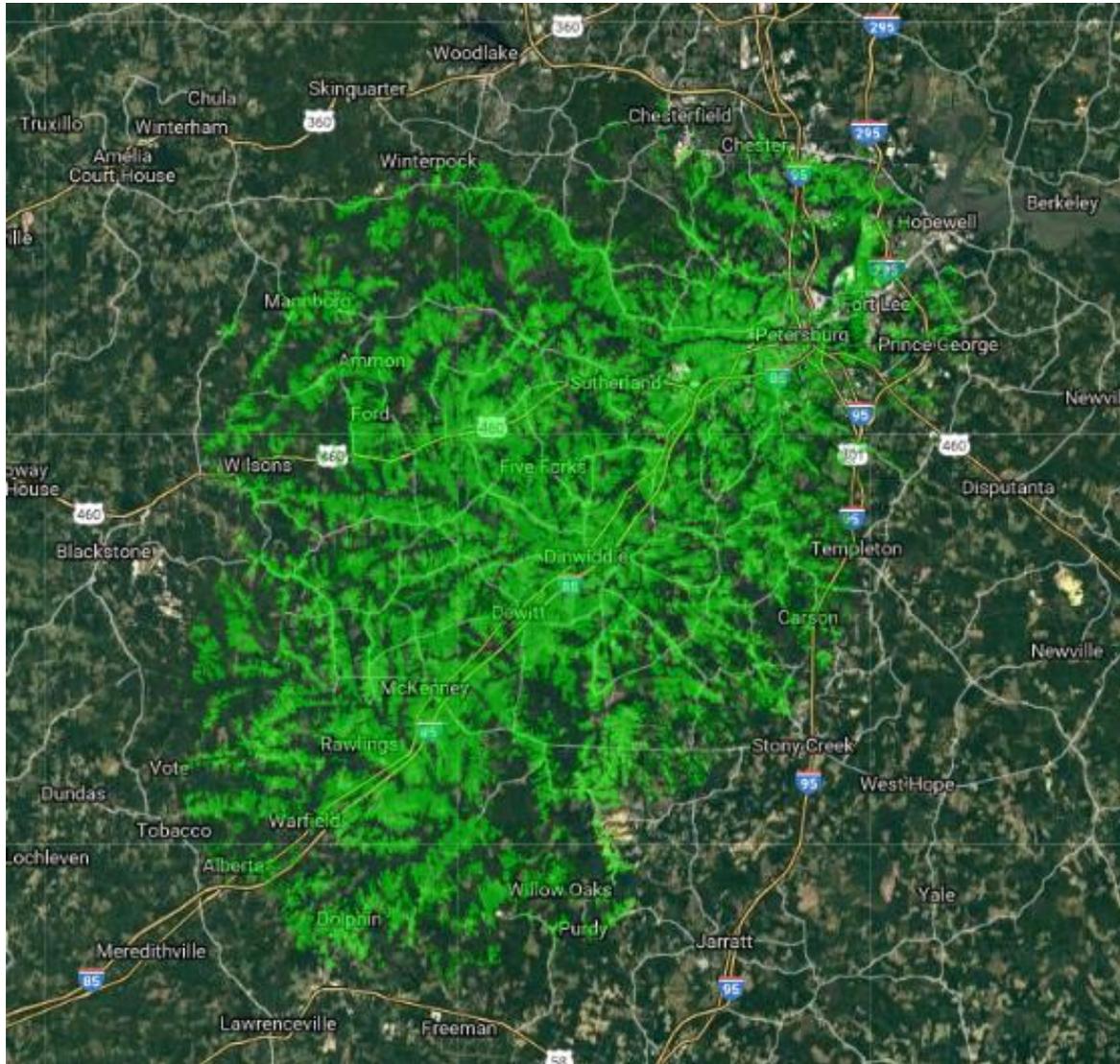


- 12 towers are planned, and to be supplemented with micro-POPs, the number of which will be determined by geography and take rate of the service.

An example of 5 GHz Line-of-Site (LoS) coverage on a tower near Poole Siding, VA. This type of map can help us find locations for Micro PoPs as well as providing direct LoS coverage to customers. Remember that LoS coverage will provide for faster internet connection.

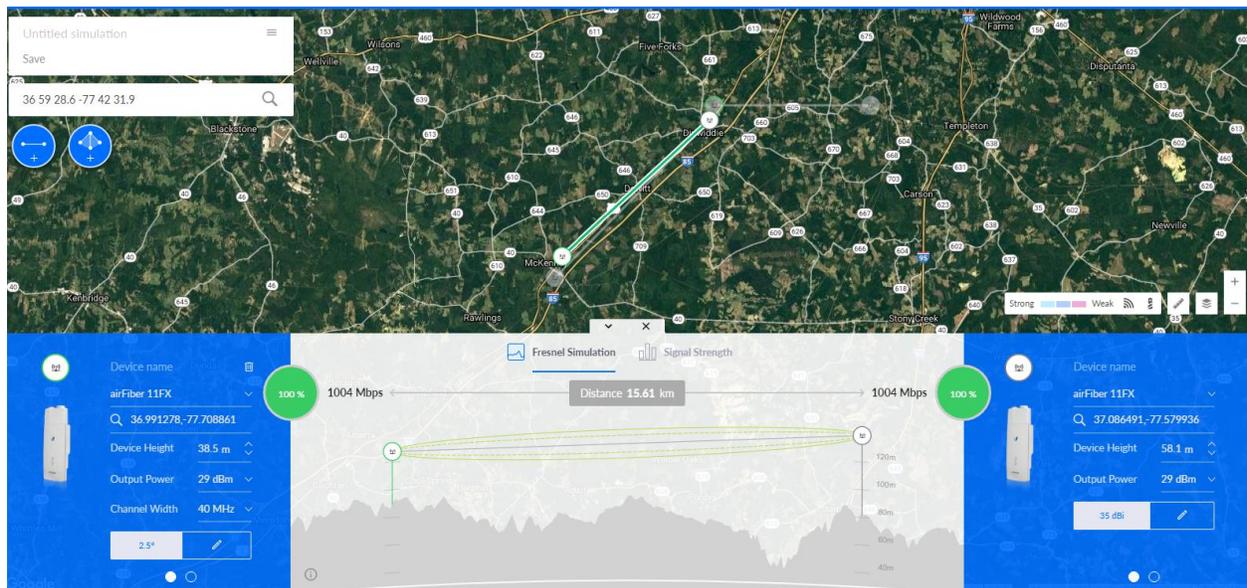


This is a combined map of several maps in the Dinwiddie area. I have used 4 towers in this example to get an estimate on what the total coverage would be using these four towers. With gaps in the coverage, smaller Micro PoPs will still be needed to fill in some areas. This is very normal. Micro PoPs (Point-of-Presence) are smaller towers that cover a neighborhood or group of businesses; mainly to fill in gaps in coverage. These maps give us an idea where the Micro PoPs need to be. This map is for 3.5 GHz LTE NLoS.



This is an example of a Point-to-Point (PtP) link map, using licensed 11GHz radios, over a path of nearly 10 miles, offering a Gigabit symmetrical of throughput. This map helps us specify what equipment and dish we will need for a certain path. It also shows us how high we need to be on a tower so we don't end up with problems of terrain or Fresnel zones, which could greatly limit the throughput. Every single Point-to-Point link would be mapped like this. You can see the terrain that this link passes over, and we can adjust the height of each end of the link.

It is important to have our links clearly laid out as this is the core of the network. All Access Points will be provided bandwidth off of these links. We do attempt to create a link ring for redundancy, where possible.



Individual Tower Equipment – Dinwiddie and Amelia Counties

Conceptual and to be refined

Radio/Antenna Type 1:		
	Radio	
	Manufacturer	Ubiquiti AF-11X
	Frequency	11 GHz
	Link To Product Spec Sheet:	https://dl.ubnt.com/datasheets/airfiber/airFiber_AF-11FX_DS.pdf
	Quantity	3
	Weight Per Unit	5 lbs
	Physical Dimensions/Unit (WxLxH)	12.87 x 4.41 x 3.39"
	Input Power Consumption	36W max
	Mounting Location (Tower or Ground)	Tower
Antenna		
	Height Requested	8' mast between 170-180
	Acceptable Height Range	150 - 200
	Manufacturer	Ubiquiti
	Link To Product Spec Sheet:	https://dl.ubnt.com/datasheets/airfiber/airFiber_AF-11G35_DS.pdf
	Quantity	3
	Weight Per Unit	26.12 lb (including mount)
	Physical Dimensions	31.9 x 18.1"
	Direction facing (N, E, S, W)	Northeast, northwest, and southwest
	Antenna Attachment Method	A clamped standoff to an 8 ft mast
	Attachment Method Total Weight	15 lbs – will support all antennas/radios at this height
	Attachment Method Dimensions	8' mast, 2" diameter
	Ethernet Cable Quantity	3
	Weight Per Foot Per Ethernet Cable	0.046 lb
	Power Cable Quantity	0
	Weight Per Foot Per Power Cable	n/a
	Coaxial Cable Quantity	0
	Weight Per Foot Per Coaxial Cable	n/a
	Cable Attachment Method	Wire wrapped to leg of tower every 3 ft.

Radio/Antenna	
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Type 2:		
Radio		
Manufacturer	BaiCells	
Frequency	3.50 GHz	
Link To Product Spec Sheet:	https://www.ispsupplies.com/core/media/media.nl?id=917297&c=393682&h=b1d1f627bf1ddea534f7	
Quantity	4	
Weight Per Unit	8.8 lbs	
Physical Dimensions /Unit (WxLxH)	13" x 8 1/2" x 4 1/8"	
Input Power Consumption	<65W	
Mounting Location (Tower or Ground)	Tower	
Antenna		
Height Requested	8' mast between 282-290 – different one from above	
Acceptable Height Range	250 - 290	
Manufacturer	Alpha Wireless	
Link To Product Spec Sheet:	https://alphawireless.com/ds/AW3697.pdf	
Quantity	4	
Weight Per Unit	23.2 lbs	
Physical Dimensions	47.2" x 11" x 3.3"	
Direction facing (N, E, S, W)	One facing each direction	

	Antenna Attachment Method	A clamped standoff to an 8 ft mast – same mast for all antennas/radios at this height
	Attachment Method Total Weight	15 lbs – will support all antennas/radios at this height
	Attachment Method Dimensions	8' mast, 2" diameter
	Ethernet Cable Quantity	0
	Weight Per Foot Per Ethernet Cable	n/a
	Power Cable Quantity	4 (integrated with fiber)
	Weight Per Foot Per Power Cable	0.061 lb
	Coaxial Cable Quantity	0
	Weight Per Foot Per Coaxial Cable	n/a
	Cable Attachment Method	Wire wrapped to leg of tower every 3 ft.

Radio/Antenna Type 3:		
Radio		
	Manufacturer	Ubiquiti Rocket 5GHz
	Frequency	5 GHz
	Link To Product Spec Sheet:	https://dl.ubnt.com/datasheets/RocketAC/Rocket5ac_DS.pdf
	Quantity	4
	Weight Per Unit	8.81 oz
	Physical Dimensions/Unit (WxLxH)	6.38 x 3.31 x 1.46"
	Input Power Consumption	8.5W max
	Mounting Location (Tower or Ground)	Tower
Antenna		
	Height Requested	8' mast between 282-290 – same one as BaiCells above
	Acceptable Height Range	250 - 290
	Manufacturer	RF Elements
	Link To Product Spec Sheet:	https://rfelements.com/assets/Uploads/HG3-TP-S30-Datasheet.pdf
	Quantity	4
	Weight Per Unit	4.1 lbs
	Physical Dimensions	13.6 x 8.6 x 11.2 in.
	Direction facing (N, E, S, W)	One each direction
	Antenna Attachment Method	A clamped standoff to an 8 ft mast – same mast for all antennas/radios
	Attachment Method Total Weight	Same mast listed previously
	Attachment Method Dimensions	Same mast listed previously
	Ethernet Cable Quantity	4
	Weight Per Foot Per Ethernet Cable	0.046 lb
	Power Cable Quantity	0
	Weight Per Foot Per Power Cable	n/a
	Coaxial Cable Quantity	0
	Weight Per Foot Per Coaxial Cable	n/a
	Cable Attachment Method	Wire wrapped to leg of tower every 3 ft.

Additional Space Required At Site? (Y or N)	Y
If Yes, Approximate Dimensions	A NEMA3 outdoor enclosure near the base of the tower approximately 3' by 3'. Equipment space in a shed/building provided by PEMB would also be acceptable.
Total Power Requirements	1000 watts max for all equipment. Power is standard 110v outlets
Additional Site Requests	24x7 access. Preferred unescorted, but if an escort process is required, and we can utilize it 24x7 in the case of an emergency, that would be acceptable.

Additional Comments/Requests	Note that all equipment on tower will fit on two 8' stand-off masts at different heights. We are a little flexibly with the exact height and will be willing to go a little lower if required.
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The proposed Tower Agreement is shown in Exhibit 4.

Reporting and Proof of Performance

Quarterly on the following dates of each year or the next business day March 31, June 30, September 31, December 31 or if a weekend, the next business day

Each report shall include the following:

- * Number of residential customers served;
- * Number of business and government customers served;
- * Number of business and government customers served who have received service credits under the following schedule:

Network Uptime – Wireless circuit	Length of 100% packet loss	Credit Against Monthly Services
	0 - 120 minutes	0%
	120-240 minutes	10%
	240-360 minutes	25%
	360 minutes and above	50%
- * A map showing locations of business, government and residential customers. Can be in google maps or similar format;
- * A map showing the frequency used to deploy service for each main and feeder antenna/radio;
- * Age of the OB, LLC network equipment and wireless equipment used to provision broadband service in this sector and expected upgrade date of equipment;
- * Equipment firmware and software upgrades since the last reporting period;
- * Number of service tickets opened;
- * Amount of funds spent and the amount of grant funds spent per sector, broken down into labor, materials, engineering, project planning, project management, installation of broadband service in the sector and other administrative expenses;
- * Written summary of the project's status; including challenges;
- * Present reports before the County Board of Commissioners up to 2 times per year.

Annual and Final Report - The Annual Report will include a review of performance and activities over the entire project period and will include a one-page program summary. This will be submitted in annual form on the annual anniversary of the contract signing and be submitted in final form on the fifth (5th) anniversary of the contract signing.

In that brief annual and final summary, Open Broadband, LLC will describe the Project, how it was implemented, to what degree the established Project objectives were met and the difficulties encountered, what the Project changed, and its total cost(s) for each Sector.

In addition to accounting for the use of the Project funds during the term project, the Annual and Final Reports will include a detailed final financial report by cost category showing all expenditures during the entire term of the Grant Award. In addition, when build out is complete Open Broadband, LLC will provide the County with a map of its network (i.e. equipment, towers, etc.) in the counties. An updated map will be completed along with the final report. Open Broadband, LLC shall submit and present the annual and final reports before the County Board of Commissioners at mutually agreed upon meeting dates.

Cost Estimate:

Open Broadband forecasts the network build to complete over a 4-year time period. For budget by category and year see Exhibit 1 – Provided in a sealed envelope.

Other Information, advice, counsel

At Open Broadband, we believe that once broadband infrastructure is available, the conversation quickly shifts to ‘how do you leverage it?’. Through our efforts with NC Hearts Gigabit and Charlotte Hearts Gigabit we can bring both an economic development, and a Digital Inclusion focus to Amelia and Dinwiddie Counties. Open Broadband would be happy to help in these efforts, regardless of the carrier selected for county broadband services.

Thank you for the opportunity to respond to the RFP. We welcome questions and additional conversations about working together to foster greater broadband service.

Kent Winrich
Chief Technology Officer/Managing Member
Open Broadband, LLC
919-924-3389

Exhibit 1

Cost Budget - RFP-19-050719

Open Broadband, LLC forecasts a 3-year project to provide both Dinwiddie and Amelia Counties with broadband service. Cost categories and expenses per year as budgeted as follows:

	Year 1	Year 2	Year 3	Total
Capital Leases for Towers and Fiber	\$ 294,000	\$ 294,000	\$ 294,000	\$ 882,000
Equipment: Network and Customer w/licenses	\$ 610,000	\$ 610,000	\$ 168,000	\$ 1,388,000
Network, Eng., and Capitalized Labor costs	\$ 492,000	\$ 132,000	\$ 132,000	\$ 756,000
Local Area/Project Manager and Marketing	\$ 108,000	\$ 108,000	\$ 108,000	\$ 324,000
Support: OSS and Call Center	\$ 10,752	\$ 21,504	\$ 30,720	\$ 62,976
TOTAL	\$ 1,514,752	\$ 1,165,504	\$ 732,720	\$ 3,412,976

Business and residential customer statements of installations shall be evidence of deployment. Open Broadband, LLC shall keep records of customer installs and present most recent monthly report, as outlined in the RFP response.

Exhibit 2

User Cost – Broadband in Dinwiddie and Amelia Counties

i. The minimum contract period for subscriber data services and whether a month-to-month option is available.

Residential service is all month-to-month and no contract is required.

Businesses/government/education users may be asked to enter a contract as additional support and installation requirements often result in a minimum time period to recoup costs.

ii. Monthly service rates for residential, small office, and businesses.

Monthly Rates

Residential- 25Mbps down/3Mbps up \$39.99 + \$99 Installation

Residential- 25Mbps down/25Mbps up \$49.99 + \$99 Installation

Residential – 50Mbps down/50Mbps up \$59.99 + \$99 Installation

Residential - 100Mbps down/100Mbps up \$99.99 + \$99 Installation

Residential -200Mbps down/200Mbps up \$139.99 + \$99 Installation

Residential-1000Mbps down/1000Mbps up Quoted individually

Residential-This service is month to month with no overages fees.

*Business and Government- 25Mbps down/25Mbps up \$80 + \$150 Installation

*Business and Government – 50Mbps down/50Mbps up \$120 + \$150 Installation

*Business and Government - 100Mbps down/100Mbps up \$150 + \$150 Installation

*Business and Government - 200Mbps down/200Mbps up \$225 + \$150 Installation

*Business and Government - 1000Mbps down/1000Mbps up \$575+150 Installation

* Business and Government rates are based on a 3-year agreement that includes a service level agreement

iii. Cost of subscriber equipment, if any.

There are no equipment costs unless a business/government/education user has a specific need. Such needs will be quoted on an individual case basis and require customer agreement.

iv. Standard shipping, if any, for subscriber equipment. Cost of overnight or expedite shipping.

There are no shipping costs unless a business/government/education user has a specific need. Such needs will be quoted on an individual case basis and require customer agreement.

v. Cost of on-site installation.

See installation pricing in section

vi. Activation fees, if any.

Nothing other than the installation fee.

vii. Cancellation fee schedule.

None for residential; it is all month-to-month

Businesses, governments, and education may have cancellation fees per the term of the negotiated agreement.

Exhibit 3

Wi-Fi Authentication and Data Analytics Service

(applicable to any Wi-Fi zone)

Open Broadband offers a customized Wi-Fi Authentication & Analytics platform that empowers administrators with the ability to increase control over their Wi-Fi networks while simultaneously utilizing the analytics platform to derive user & platform statistics. This platform is cross site and cross network compatible enabling a wider range of data to be collected across geographical locations.

The end users experience is a simple login page followed by a brief, optional, communications page where important messages or advertisements can be displayed. The full authentication process occurs once per device, followed by a simple authentication in proceeding access, creating a routine access process.

Main Platform Features:

- Entirely Cloud Based – Designed for maximum speed, stability, and security through our Amazon Web Services hosted platform.
- Unlimited User Base – No monthly fees for increased user count or traffic meaning no surprises or throttling.
- Custom Login Branding – Customized login screen to the specific site to increase brand awareness and give customers the confidence to sign in.
- Easy Data Access – Full visitor information easily downloaded or integrated with several marketing automation providers to make it an easy process.
- Platform Dashboard and Analytics – Login and manage your Wi-Fi network 24/7 anywhere in the world including a full suite of analytics and reporting options
- Engage and Communicate – Login page, engagement page, and account page can all be customized to deliver content.
- Social authentication through Facebook, Google, and LinkedIn, or Email enables customers a multitude of sign-in options.
- Wi-Fi Analytics is compatible with nearly 100% of devices on the market today through any standard web browser.

Analytics & Metrics:

- User quantity
- User location (on network)
- User location history (on network)
- User frequency of access
- User bandwidth
- User last seen
- User access time
- User profile information (social profile, email, etc.)

- User device types
- User device registrations
- Custom Data Available

Initial Setup includes:

- Setting up accounts
 - Amazon Web Service (AWS)
 - Stripe (if payments are collected)
 - SendGrid (email integration)
- AWS deployment of database and Wi-Fi Analytics services
- Configuring all email templates
- Configuring all branding and images
- Configuration of one network
- Configuration for access points
- Setup of service monitors and alerts
- Help with configuring initial routers

Monthly Service includes:

- Management of application scale and load balancing.
- Service uptime monitoring.
- Rapid response support for outages related to application stack.
- 48-hour response for noncritical issues.
- Periodic inspection of service quality.
- Configuration support for 1 network with up to 50 access points.
- 1 hour per month generating custom reports.

Exhibit 4

TOWER ANTENNA AGREEMENT

This agreement made and entered into as of this _____ day of _____, 201__ by and between _____, organized and existing under the laws of the State of North Carolina, (hereafter referred to as "Tower Owner"), and Open Broadband, LLC, an Internet Service Provider organized and existing under the laws of the State of North Carolina, (hereinafter referred to as "Open Broadband").

The term "**Tower**" is defined as a structure that may stand apart from or be attached to another building or structure. Examples include radio towers, cell towers, television towers, building rooftops, poles, park structures, and water towers.

WITNESSETH:

WHEREAS, the Tower Owner owns towers suitable for placement of fixed-wireless antennas to provide high-speed internet service; and

WHEREAS, Open Broadband desired to install, remove, replace, maintain, and operate a wireless broadband service system facility, including mounting antennas on the towers and a weather utility service box approximately 2' x 3' to house the communications service system fixtures and equipment (or equivalent space provided by Tower Owner), and necessary appurtenances; and in consideration of the provisions, terms, conditions and covenants contained herein, the Tower Owner and Open Broadband do mutually covenant and agree as follows:

1. Antenna Space and Cabling. Tower Owner hereby agrees to provide space on its towers and rooftops for fixed wireless antennas and mounts at locations to be selected by Open Broadband so long as they do not cause issues with tower loading or wind shear, and do not interfere with the openings to the tower, ladders, braces, paint removal, or painting of the structure and is in full compliance with all state and/or federal laws or the rules and regulations of any agency or instrumentality thereof. As required, Tower Owner also agrees to allow Open Broadband to attach outdoor Ethernet cable to the towers/roofs to connect the antennas to electronics located at or near the tower. Open Broadband is responsible for all installation and maintenance costs of their equipment, and will work in good faith with the Tower Owner for agreeable placement locations and design.

Mounting: Open Broadband plans to mount antennas on a standoff mast on the water tower railing, on a standoff mast on the Rohn 25 tower. The cost of these attachments are the responsibility of Open Broadband. We understand that the Town may use a maintenance

company for their water towers. If the Town and their maintenance company have additional requirements that would result in a different mounting method, the parties agree that any such material additional cost will be borne by the Town.

The initial locations are

2. Electronics and Power. Tower Owner hereby grants access to Open Broadband to place electronics at a suitable location near the tower. This may be an outdoor utility box or a small amount of rack space in an existing room owned by the Tower Owner. Tower Owner will provide a 120-volt AC power socket for the minimal power draw of the antennas. Power access is required to provide the service and is included in the lease. Power consumption will be minimal with use in the range of 1-2 amps.
3. Term. The term of this agreement (the "Initial Term") is _____ () years, beginning on the date of late signature on this Agreement. This agreement shall be automatically renewed for an additional _____ () year period, unless Open Broadband or Tower Owner provides notice of intention not to renew not less than sixty (60) days prior to the expiration of the Initial Term or any Renewal Term.
4. Rent. It is understood that tower space is a requirement in order for Open Broadband to provide service. The Town agrees that the lease rate for Tower space on all town-owned towers to Open Broadband will have a monthly payment of: **\$0/month**

This is a valuable consideration, and is valid only as long as Open Broadband is providing high-speed internet service in the community.

5. Title and Quiet Possession. The Tower Owner represents and agrees (a) that it is the owner of the sites, (b) that it has the right to enter into this agreement, (c) that the person signing this agreement has the authority to sign, (d) that Open Broadband is entitled to access the sites on either an escorted basis, or independent basis, as determined by the Tower Owner. Access includes inside any security fence or area, 24x7x365 throughout the terms of the agreement so long as Open Broadband is not in default of this agreement.
6. Installation. In no event shall Open Broadband pierce or drill into the exterior of a water tower. Open Broadband agrees that it will provide the Tower Owner a written proposal addressing the installation of antenna and that such proposal shall be approved by the Tower Owner and their

representative prior to installation. Each approved proposal will be added as an Attachment to this Tower Antenna Agreement.

7. Interference. Open Broadband will resolve any technical problems with other equipment located at the sites on the installation date.
8. Maintenance of Area. Open Broadband shall make no alterations to the tower or related facilities which will compromise or impair the integrity of the structure. Open Broadband shall exercise special precaution to avoid damaging the facilities of the Tower Owner, and Open Broadband hereby assumes all responsibility for any and all loss or such damage created by Open Broadband, its employees or agents. Open Broadband agrees to make an immediate report to the Tower Owner of any installation and maintenance of Open Broadband's facilities. General tower maintenance (painting, etc.) is the responsibility of the Tower Owner. The Tower Owner shall not move, disconnect or adjust, in any way, Open Broadband's equipment without the supervision of an Open Broadband representative on site. Open Broadband acknowledges and agrees that it shall be responsible for moving or protecting its equipment during any repairs or renovations to the tower and the Tower Owner shall incur no liability to Open Broadband for any injury, expense, or claim incurred by Open Broadband during any such repair or renovation.
9. Indemnity. Open Broadband shall carry insurance to indemnify, protect, and save harmless the Tower Owner from any and all claims and demands for damages to property and injury to or death of persons, including payments made under any Workers' Compensation Laws, or under any plan for employee's disability and death benefits which may arise out of or be caused by the erection, maintenance, presence, use or removal of Open Broadband antennas, cable, equipment and necessary appurtenances at the tower site. Open Broadband shall also indemnify, protect, and save harmless the Tower Owner from any and all claims and demands of whatsoever kind which may arise directly or indirectly from the operations of Open Broadband's facilities, including by not limited to taxes, special charges by others, claims and demands for damages or less for infringement of copyrights, libel and slander, unauthorized use of frequencies, etc.
10. Termination. Either party may terminate this lease upon sixty (60) days notice without liability for further rent or damages at any time after the initial terms of three (3) years. Tower Owner may terminate this lease after three (3) years upon giving Open Broadband sixty (60) days notice of termination.
11. Hazardous Substance. Open Broadband shall not introduce or use any such substance on the site in violation of any applicable law. Open Broadband understands that if the Tower Owner needs to remove the old paint and repaint the tower and the old paint contains sufficient levels of lead that it will require special handling and containment in its removal. Open Broadband agrees to cooperate fully with the Tower Owner in whatever steps are necessary for the

removal of the old paint and the repainting of the tower. Open Broadband agrees to hold the Tower Owner harmless of any interruption of service or possible damage of their equipment during this process.

12. Miscellaneous. (a) This agreement applies to and binds the heirs, successors, executors, administrators and assigns of the parties to this agreement; (b) this agreement is governed by the laws of the State of North Carolina; (c) this agreement constitutes the entire agreement between the parties and supersedes all prior written and verbal agreements, representations, promises or understandings between the parties. Any amendments to this agreement must be in writing and executed by both parties; (d) if any provision of this agreement is invalid or unenforceable with respect to any party, the remainder of this agreement or the application of such provision to persons other than those as to whom it is held invalid or unenforceable will not be affected and each provision of this agreement will be valid and enforceable to the fullest extent permitted by law.
13. Insurance. Open Broadband will maintain General Liability and Umbrella insurance coverage, a copy of which will be provided to the Tower Owner. Open Broadband will also maintain Workers Compensation Insurance, and will provide a copy of insurance to the Tower Owner prior to performing any work.

Signature below commits each party to the terms of this agreement.

Tower Owner

Open Broadband, LLC

By: _____

Print Name: _____

Date: _____