CIT BROADBAND
CENTER FOR INNOVATIVE TECHNOLOGY

Virginia's Middle Peninsula

Broadband Study Recommendation

Findings and recommendations

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Disclaimer

Technology and telecommunications are changing rapidly every day. CIT Broadband has made our best effort to apply current knowledge and experience to the business and technical recommendations in this study. We believe the recommendations made in the first half of 2013 are accurate and representative of the current state of the broadband industry. These recommendations may not accurately represent broadband technology advances over time.

This study and associated broadband recommendations are for planning purposes only and are not intended to replace formal engineering studies that are required for broadband infrastructure implementation. This study information is not suitable for building a network or system and is not expressed nor implied.

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Executive Summary

In July 2012, the Thomas Jefferson Institute for Public Policy released its annual "Virginia Economic Forecast" report which stresses the importance of broadband and the need for lawmakers to pursue policies that will promote affordable, wide-spread broadband.

"To maximize the benefits to all of Virginia, broadband internet access has to be affordable, widely available, and deep in terms of its functional capacity. Undoubtedly, private sector firms and entrepreneurs need to lead this initiative with the Virginia government primarily providing a level playing field so competition and innovation can flourish."

In October 2012 staff of the Digital Policy Institute published an article highlighting the many ways that citizens can benefit by having broadband. These benefits include financial savings, entertainment savings, increased productivity, educational benefits, improved voice communications with savings, societal participation, informed electorate, healthcare access, improved public and emergency services, and enhanced environmental protection by reducing the carbon footprint of consumers and businesses. Entrepreneurs can save business startup costs by leveraging the Internet for online accounting services, marketing materials, voice-over-IP, developing their own business website, mobile applications to achieve productivity and efficiency, incorporating their business using online tools, and video conferencing to save in travel costs. There are significant reasons for every community to have broadband connectivity options.

The Middle Peninsula region identified several goals related to broadband service expansion including economic development, expanded education opportunities, improved healthcare, and telework options for their citizens. The region wants to explore opportunities to expand broadband service while avoiding long term debt and mitigate financial risk.

The region's strengths include having a regional broadband authority and having many existing vertical assets in close proximity to un-/under-served areas. There are weaknesses too, such as the majority of the region is very sparsely populated making the business case for broadband providers difficult to justify the investment. The region has opportunities in regards to wireless technologies with a number of wireless Internet service providers in the area including the recent partnership between King and Queen County and Gamewood Technologies.

Icon Broadband Technologies did a thorough assessment of the Middle Peninsula and Northern Neck Peninsula in 2008. Although some changes have occurred since 2008, those findings still have value for both areas in terms of future plans for fiber deployment when funding becomes available.

CIT's recommendation offers an alternative strategy to bringing broadband to un-/underserved areas. This strategy can co-exist with fiber technologies in the future and would provide citizens and businesses with a competitive broadband environment.

This document provides examples of various models for broadband deployment throughout the Commonwealth. In consideration of the Middle Peninsula's goals we recommend the region form a public-private partnership to build a wireless network throughout the region. Wireless broadband technology is the most cost effective technology to deploy in sparsely populated areas such as the Middle Peninsula. A partnership with a wireless provider will limit financial investment and risk by leveraging existing assets and provide the region with two public-private partnerships supporting wireless broadband networks. An alternate approach is for the region to work with King and Queen on expansion of their network but that approach does not provide the backup for the region as having two partnerships could accomplish. This document identifies the gaps in coverage throughout the region and identifies key vertical assets that could be leveraged by a wireless network to provide service as well as specific recommendations for stipulations of the partnership. CIT identified two areas that need at least one additional tower – northern Essex County and central King William County.

The Middle Peninsula localities – as with all regions throughout the Commonwealth – need to make modifications to local policies (zoning, building codes and permitting) to create a "broadband friendly zone". The recommended changes are detailed in this document and will lower deployment costs and expedite broadband deployment for all providers – wireline, such as cable and DSL, as well as wireless.

CIT recommends that the region's local government leaders partner with all incumbent providers – cable companies, telephone providers and wireless Internet service providers. Share with the providers the policy changes that are recommended in this document and determine if there are other barriers to broadband deployment. Share with the providers the findings of this study in regards to gaps in coverage and explore options for expanding all existing services to address the deficiencies.

CIT recommends the region's community leaders work with existing community organizations to provide digital literacy training options for broadband adoption and utilization. This document includes a section on education resources for awareness and adoption many of which are online and could be marketed through existing community channels. The true benefits of broadband for a community cannot be realized without proper education as there are a number of citizens that do not see the need for connectivity. The lack of online access will limit the resources available to assist citizens and can limit education and job opportunities.

Finally, the region must answer two major questions:

1) What role does the Middle Peninsula Planning District Commission or the Broadband Authority want to take in broadband expansion efforts?
2) What model does the region want to follow in terms of a public-private partnership?

CIT strongly believes the Middle Peninsula has two very good options for proceeding with a fixed wireless broadband solution to expand broadband services for the citizens of the region. Answering the above questions will determine which option is best for the region.

RECOMMENDATIONS

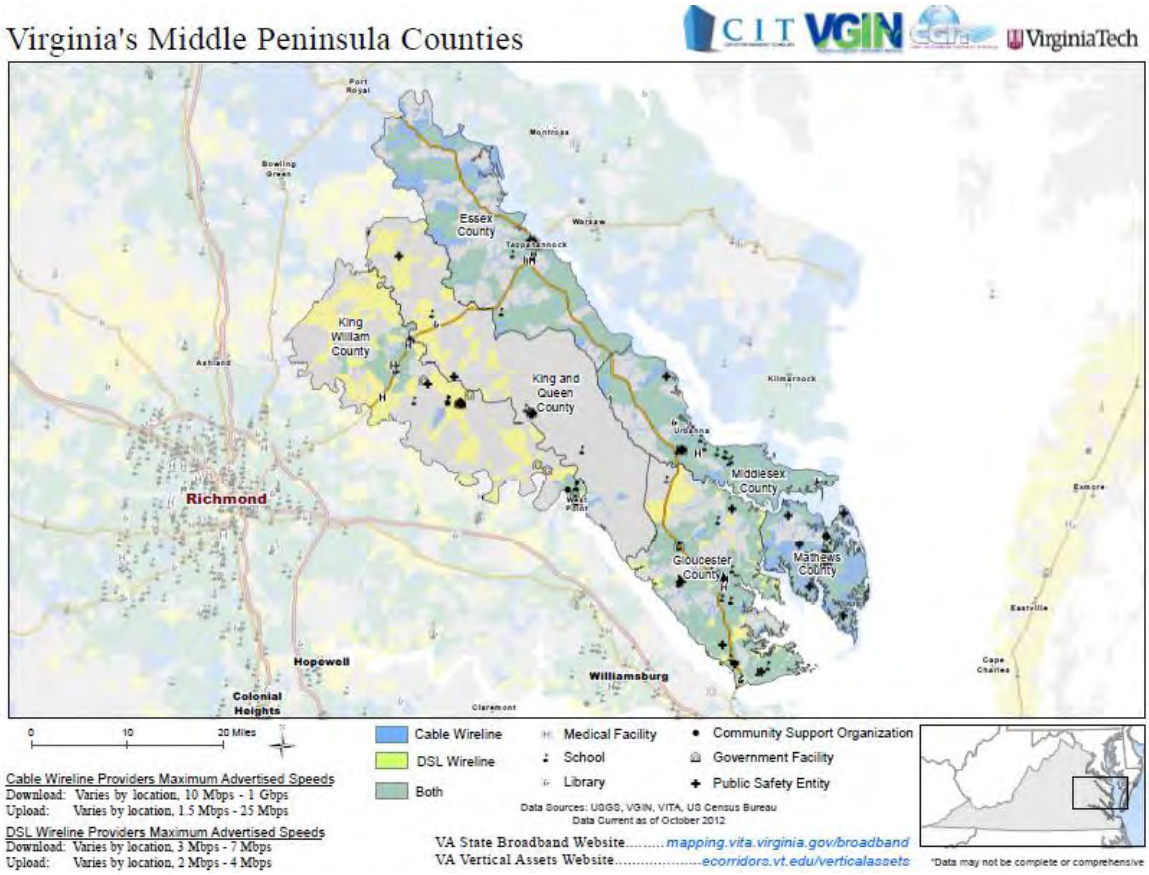

Figure 1 MPPDC DSL, Cable Coverage with CAIs

FACILITATE CITIZENS LOCATING PROVIDERS

Many localities that are working to bring broadband to their constituents are finding that many times citizens just do not know the providers that are available. It is recommended that the planning district website and all localities' websites in the area (counties and towns) include a list of Internet service providers in the area with contact information. This will make it easier for citizens or businesses moving to the area to contact existing providers and evaluate broadband options. It is also recommended that each website include a link to the Virginia broadband map as it supports the ability to search for providers based on an address (http://mapping.vita.virginia.gov/broadband/).

ENSURE A BROADBAND "FRIENDLY" ZONE

It is important that all local building and zoning ordinances facilitate broadband deployment and not inhibit construction or expansion. One of the first lessons Google learned from its fiber project in Kansas was that government needs to start waiving regulations, fees and bureaucracy if it wants private companies to build broadband networks. Every locality is encouraged to expedite the permitting process for telecommunications deployment and reduce costs of that deployment wherever possible. Providers consider all costs associated with infrastructure builds when planning deployments and expansions – localities need to help make these builds cost effective to encourage expansions. Localities should include broadband infrastructure into all of their plan reviews just as they do for other utilities.

Every attempt was made to review all county and town ordinances in regards to the following recommendations; however as that is an arduous process it is recommended that the local planning and building staff consider these recommendations for their locality. Following are just a few of the steps that localities are encouraged to take to ensure their communities are prepared to support broadband telecommunications deployment today and in the future.

Telecommunications Wiring

Local ordinances should include updated guidelines for telecommunications wiring in all buildings and homes for CAT5/6 wired directly to the central circuit using "home run wiring" or "star topology", not branched or daisy chained. All use of CAT3 and non-twisted pair wiring should be discontinued.

Each point where the wiring is chained opens up the possibility of interference, power influence, and improper wiring termination. For FTTH and even DSL in conjunction with IPTV, it is extremely important to have home runs. POTS (plain old telephone) service only takes two wires (1 Pair). 100Mbps Ethernet takes 4 wires (2 pairs); 1,000Mbps takes 8 wires (4 pairs). A CAT5/6 wire is twisted pair and has 4 (twisted pairs). The reason for the twist is to reduce "cross talk" between pairs, especially if they are used for separate services (for example: you can use 2 pairs for 100Mbps Ethernet and 1 pair for phone service).

Renovations of older structures should include provisioning non-metallic conduit, to allow telecommunications services to enter the building, feeding into centralized "communications rooms". The non-metallic conduit should be equipped with radius elbows that won't kink the telecommunication cables. The conduit should be adequately spaced from electrical wiring. Conduit and electrical wiring should never cross paths, if possible. Renovation blueprints and other documentation should always include telecommunication conduit routes.

Wiring Policies Findings

No reference to type of wiring to be used in buildings or homes was found in any of the county or town local ordinances. All local code should be modified to specify telecommunications wiring as indicated in the recommendation above.

Grounding Codes

All localities should ensure that grounding codes are up-to-date and adhere to the residential and commercial codes. Common grounding in buildings is critical to equipment protection and aids in limiting power surges, lightning damage and power influence. Improper building grounding can impact the delivery of broadband services to an entire neighborhood, not just the improperly grounded building.

AEP has recently updated their policies and will no longer allow other utilities to attach a grounding clamp to the meter base. There is a grounding/bonding bus bar that is being placed on some newer houses. The grounding/bonding bus bar is attached to a ground wire that goes back to the panel box and has a series of set screws for other utilities to attach under.

Grounding Policies Finding

No reference to grounding codes to be used for buildings or homes was found in any of the county or town local ordinances. All local code should be modified to specify ground wiring as indicated in the recommendation above.

Permitting Policies

All permitting policies should be reviewed and modified to facilitate broadband deployment and expansion. Permitting requirements vary by locality and some require weekly or daily permits instead of an overall project permit. This type of granular permitting creates delays which equates to additional expense and budgeting issues, and administrative overhead for both the service provider and locality staff. Some localities depend on permits for tracking where work is being conducted. Some service providers recommend requiring maps and weekly updates (not permits) to indicate where infrastructure work is being done and when. Localities should expedite the permitting process as it relates to telecommunications construction such as towers, huts, etc. and control fees where possible.

Permitting Policies Findings

No indication that the Middle Peninsula localities require daily/weekly permits for projects. There appeared to be no specific consideration for telecommunications projects or exceptions for towers, huts, etc. All local code should be modified to expedite the permitting and review process for broadband deployment and infrastructure projects.

Utility Zoning for Telecommunications

Very few Virginia localities have setup utility zoning. Normally, the lots that telecommunications huts or co-location buildings are built on do not need to be as large as a residential or commercial lot. The facilities need enough land to have a grounding field, for

earth grounding electronic equipment, and room for backup power such as a generator which may require fuel storage tank when natural gas is not available at the site. Excessive zoning requirements like setbacks and green spaces can inhibit a provider's ability to purchase or use a site; it should be possible for these sites to have small footprints.

Utility Zoning Findings

No indication was found that the Middle Peninsula localities have implemented utility zoning. There appeared to be no specific consideration for telecommunications projects or exceptions for towers, huts, etc. as related to setbacks and lot size. All local code should be modified to include utility zoning to ease the construction of telecommunications equipment.

"Dig Once" Policy

Considered by many to be the easiest and most effective policy change to help expedite and reduce the cost of future broadband deployment. "Dig once" policies are designed to reduce the number and scale of repeated excavations for the installation and maintenance of broadband facilities in rights of way.

The largest expense of building out broadband infrastructure is the construction phase. "Greenfield utility deployments" (development of utilities like telecommunications, water, electric, etc., before buildings, roads and sidewalks are paved) are always less expensive than deploying to an area that is already developed.

A few ways localities can facilitate broadband deployment though "dig once" policies:

- Require developers to have large utility easements that allow for placement of all utilities, including telecommunications infrastructure or conduit, underground before roads or paved and sidewalks are poured.
    - this can be taken a step further by defining standards for where each type of utility is placed in the utility easement in order to minimize utilities crossing each other and the need for "pot holing" to locate other utilities.
- Localities can partner with developers to plan the installation of open-access conduit systems (including service access pedestals and/or hand holds) throughout any new development at the time other underground utilities are installed, ensuring the conduit system is brought to the main development entrance where telecommunication providers can access the conduit for service delivery.
- When a locality plans to renovate, repair or build new streets, sidewalks, parking lots etc., open access conduit could be installed when the ground is open. During the planning stage, all service providers should be notified of the opportunity to utilize the conduit or to coordinate with the locality for new infrastructure installation. If open access conduit is installed, it could be leased to service providers thus paying for itself over a period of time. It can also be used to manage tight right-of-way areas.
- The open access conduit system would need to strategically place adequate hand holds and/or pedestals for service providers to use and to house splice cases.

"Dig Once" Policy Findings

Although there was some reference to conduit for broadband support in a few comprehensive plans, there was no specific indication that the Middle Peninsula localities have implemented a "dig once" policy. All local ordinances should be modified to include a "dig once" policy and reference an open access conduit system. Ideally there should be an open access conduit system plan for each locality.

We recommend that all localities encourage fiber deployment in duct or conduit installation rather than direct burying of fiber. All localities should offer joint trenching with local government conduit or duct installed alongside private duct so that the localities begin to deploy a duct system that can be leased out to generate revenue and as a way to preserve right-of-way for future use.

Partner With Incumbent Providers

It is important that local government leaders meet with the incumbent providers – cable and telephone companies – to share the above recommended policy changes. The incumbent providers should be made aware that local governments are going to make policy changes to improve infrastructure construction and make broadband deployment easier and less costly. This should encourage further build-outs throughout the region. Discussions with the existing providers may uncover additional barriers to broadband deployment that should be included in these policy changes.

Share the identification of the broadband service coverage gaps identified in this report with the providers to discuss un-/under-served areas near their coverage. Discuss what it would take to expand their coverage and bandwidth for the future.

It would be beneficial to discuss with these providers what skills they see lacking in community workforce. Local governments, through their workforce development resources, design programs to address these skill deficiencies, meeting the needs of the local providers and promoting job growth.

Fixed Wireless Technology

As mentioned earlier, fiber is the ideal technology for delivering broadband services. However, the cost to deploy that technology is very high and may not be feasible for years and may have to be deployed in phases over many years. The study performed in 2008 by Icon Broadband Technologies presents a solid recommendation for a middle-mile fiber solution and that recommendation should be considered whenever future funding is available for the area to deploy fiber.

This recommendation is to pursue a fixed wireless solution that can deliver broadband service to CAIs, businesses and citizens. Certainly some facilities may require connectivity greater than can be provided by today's fixed wireless technology but the majority can easily be serviced by this technology. Fixed wireless technology is easily deployed and portable so it can be re-deployed to other unserved areas as wireline providers expand their services. This is a solution for today and tomorrow as it can augment wired and cellular networks and future fiber deployments.

Fixed Wireless Technology Facts

Fixed wireless is the most cost effective technology to deliver broadband to residences and businesses – especially in rural and low-population density areas. This technology leverages radio frequencies – licensed or unlicensed – to transmit signals between towers and to businesses and residences. These networks are referred to as point-to-multipoint as one transmitter can transmit to many customer sites. Fixed wireless technology can deliver high throughput over reliable and scalable networks. Providers have a "head end" location that supplies their wireless network with multiple fiber Internet services providers for redundancy. This fiber-fed Internet service is then distributed across the wireless technology and can span 25-30 miles for backhaul and up to 15-20 miles for customer sites.

This technology is not affected by weather but does depend on line-of-sight (LOS) or near-line-of-sight (nLOS) to a transmitter. Tree canopy and hills can disrupt signal, however, the technology is advancing rapidly and there are some WiMax version that have proven very good at transmitting through tree canopy. Some wireless Internet services providers (WISPs) are now using utility poles to mount equipment and 'hop' into neighborhoods that do not have LOS to existing towers. Equipment does require some electric power but there have been successful implementations utilizing solar in some of the more remote tower locations. Recent technology advances have moved to software upgrades which allow providers to push out new features without having to physically touch the equipment.

Fixed wireless technology is delivering broadband service to millions of customers around the world in many different environments. The technology has exceptionally low outage rates and has advanced quickly over the last several years. The fixed wireless equipment can be co-located on towers with all other types of equipment without interference which allows areas to leverage existing vertical assets. This technology can provide tiered service models allowing customers to choose the bandwidth speeds they need between 1Mbps to 55Mbps and possibly beyond. It has very low latency that is consistently 5-7 milliseconds which is lower and more predictable than some other technologies.

There are no trenches to dig and no copper or fiber to lay making deployment easy and affordable. The technology has been proven for over 10 years all over the world and the latest technology easily supports triple-play (voice, video and data).

A Public-Private Partnership

A public-private partnership with an Internet service provider can limit the region's financial exposure while expanding broadband options and potentially increasing job growth. As outlined in the appendix, Franklin County has proven to be a very sustainable model and realized growth during an extremely tough economy. Franklin County local government benefited in many ways from this partnership over the past eight years including improved communications, lowered telecommunications costs and several temporary communications support during different initiatives.

In Franklin County the local government contributed some general fund investment early in the partnership – funding equipment and infrastructure such as towers. As the network grew and the private partner's business expanded, the county had little need to invest more money. The Virginia legislation that supports the formation of a wireless broadband authority positions local authorities to be able to assist a private partner with obtaining a low cost loan. A low cost loan could assist the private partner during the initial network build as most wireless providers have a one to two year return on investment and that initial capital outlay can be difficult. However, it is advised that this should only be considered if the private partner qualifies for a loan on their own.

Development of a marketing and communication plan can help generate both public support for the partnership and increased subscriptions – "take rates". Higher take rates play an important role in generating initial cash flow for the private provider and ensuring financially sustainable broadband service.

There are some different models on how to construct the public-private partnership. Franklin County's model was based on providing the partner with access to all county-owned vertical assets at no monetary cost to the provider but an exchange of services to the county. This greatly limited the financial risk to the county while lowering the deployment costs for the provider. There was the potential risk to county services and the broadband network if the private partner failed at business management or decided to close the business. However, since the county primarily invested in infrastructure such as towers, those investments would continue to be beneficial for years to come. The King and Queen County model and one formed years ago in King George County, is founded on the county covering the costs of the equipment and upstream Internet service while the private partner invests time and resources to design, build, operate and maintain the network. This latter model could potentially put the county at risk should something happen in the partnership and the private partner ends the relationship. The county would then own all the equipment but potentially not have the expertise or resources to maintain the operations. As mentioned earlier, fixed wireless technology is advancing rapidly and hence can become obsolete and outdated in three to five years.

It is critical to the partnership no matter which model is formed, to have a detailed agreement for the operation and maintenance of the service and supporting infrastructure. The partnership plan must lay out any ongoing responsibilities for all members within the partnership. There needs to be a responsibility to keep the network equipment up to date and regularly upgrade and expand the network.

As the nation has observed the Google fiber project in Kansas we have learned that equipment subsidies coupled with term contracts offer benefits to the consumers. Local

governments or the regional authority could attempt to leverage the DHCD CDBG grant to fund the customer premise equipment costs for low-income eligible citizens to offset the full cost of deployment. Local government could then establish an assistance program for qualified (low-income, unemployed, etc.) residents to help mitigate the one time install fee, underwrite some amount of the monthly pricing package or offer discounts. This assistance improves community life and speeds broadband adoption. The assistance program could be done as a pilot program and should require the recipients to commit to a minimum contracted period of service with penalties assessed for early termination to recover the costs.

Leverage Existing Vertical Assets

The previous study conducted by Icon Broadband Technologies prioritized the census tracts based on community anchor institutions and population density. It does appear that some of these priorities should be adjusted as current coverage data indicates expansion of service in some areas since 2008. Areas that we believe should be lower priority include southern point of Middlesex County (tract 9512) and southern portion of Mathews County (tract 9514) as these appear to now be served by multiple providers. Another factor in an adjustment to the prioritization is King and Queen County's wireless initiative. A view of the census tracts for the region for reference follows.

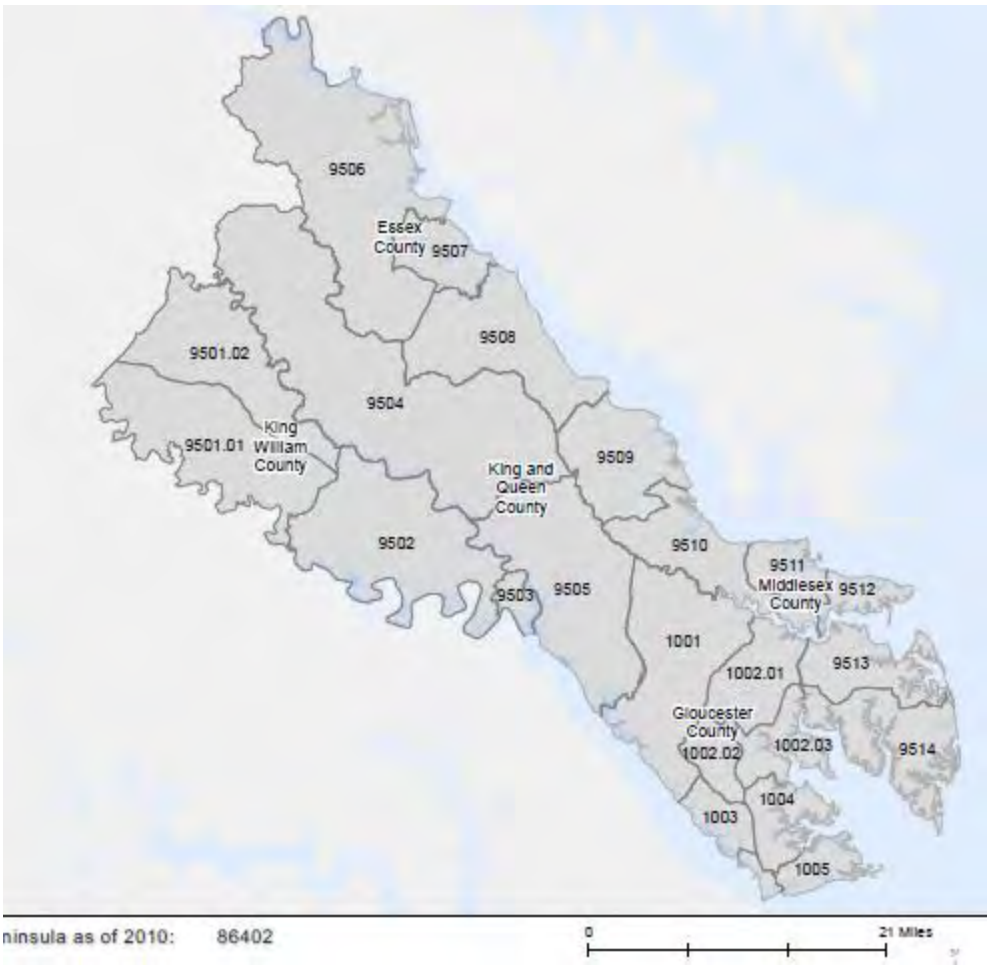

Figure 2 Middle Peninsula Census Tracts

The modified suggested prioritization is as follows:

	County	Census Tract
Phase I	King William	9501
	Essex	9507
	Gloucester	1002
Phase II	Essex	9506
	King & Queen	9504
	Gloucester	1002
	King William	9503
Phase III	Essex	9508
	King and Queen	9506
	King William	9502
	Middlesex	9509
	Mathews	9513

This prioritization is considered in regards to listing the vertical assets in this particular order. However, the chosen private partner may need to build-out differently

depending on where their head-end service is located. The prioritization should certainly be included in an RFP/RFI to assist the provider in planning the build.

New Communications Towers

There is a need for additional towers specifically in the following two areas. One would be in King William County in the northern portion of the 9502 census tract area. Areas noted in red in the map view of that area below are not suitable for tower location based on state and federal regulations. It is recommended that suitable locations within the census tract are explored for a new tower.

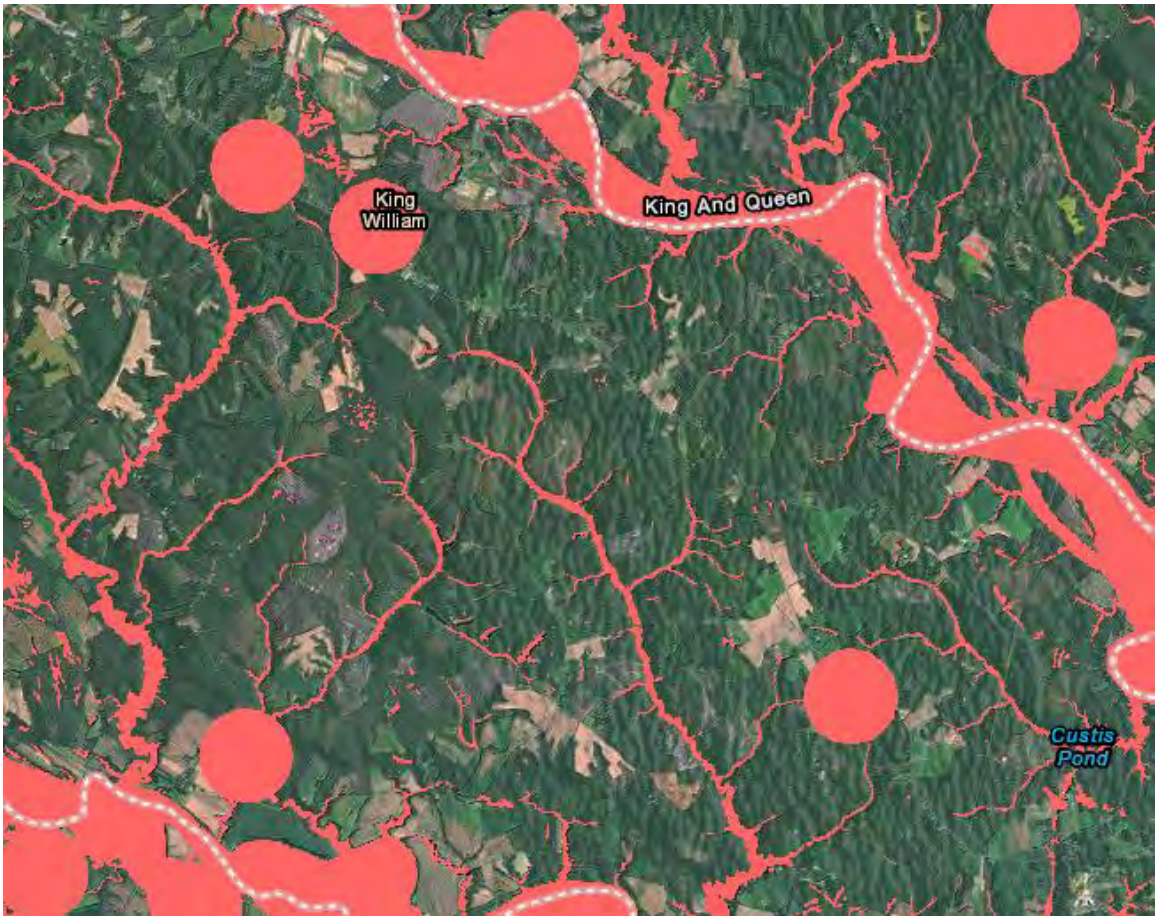

Figure 3 King William Census Tract 9502 – Unsuitable areas for tower are denoted in red

It would also be very beneficial for an additional tower in the northern area of Essex County – in the 9506 census tract. However, as depicted in the map below, there are few areas that are suitable for tower construction. It is recommended that Essex County explore these areas to locate a new tower when funding becomes available.

Figure 4 Essex County Census Tract 9506 – Unsuitable Tower Locations are depicted in red

ISSUE AN RFP/RFI FOR A PRIVATE PARTNER

It is recommended the authority issue a Request for Proposals or Request for Information to locate a private wireless Internet provider partner. The request should include many of the details in this report including key vertical assets, aggregated demand, and prioritization of census tracts.

Additionally the request should stipulate the following terms to be met by the provider:

- Customer Service
  - no phone tree – there should be a person to answer the phone.
  - no voice mail – there should be a person to leave a message.
  - measurements of customer service and business metrics -- tracking results through reporting to the Authority at least twice per year – such as number of calls for tech support, total customers, and average wait time.
  - they should have a customer service strategy – steps or staff to go through so everyone is consistent in delivery of customer service.
- Network Build Best Practices

- build a modular network as this will allow for upgrades without rebuilding the entire network
- network should not be based on wi-fi technology as there are too many problems with that technology
- document the network strengths, weaknesses, opportunities and threats (SWOT) and document contingency plans
- ensure full redundancy, as much as possible considering the limitations on upstream fiber providers in the area.

CIT Broadband will be happy to assist with the development of an RFP/RFI and would assist with the review of the proposals or documents.

Broadband Adoption and Awareness

Providing all citizens and business with affordable broadband is a necessity and the goal of many communities and governments. In addition to providing broadband options, we must also ensure that citizens and businesses are aware of and prepared to leverage the many benefits that having broadband affords them. These benefits include the following:

- Financial savings
  - Lower costs by telecommuting, engage in commerce and online savings, and manage personal and business finances through online applications and services.
- Increased Productivity
  - Businesses expanding their use of broadband can increase their competitiveness in their market – increasing economic growth
- Educational benefits
  - Distance education opens doors to many that cannot afford to move to a university or have needs to stay at home to assist family members.
- Voice communication
  - Broadband provides the opportunity to leverage the Internet for voice communications and reduce telecom expenditures for both citizens and businesses. Online meetings provide ability to share documents and applications and eliminate costly travel for many meetings.
- Community Participation
  - Broadband provides social avenues that allow citizens to be more active in their society through engaging government services and community organizations to name just a few. Citizens can be more engaged and informed in government affairs.
- Improved Healthcare Access
  - Broadband supports telehealth which is important to providing improved healthcare in rural areas. The Veterans Administration has expanded home monitoring systems and has documented the improved health and savings

from these systems. Electronic health records and health information exchange between doctors and health systems offers improved diagnosis and healthcare and are dependent on broadband connectivity.

- Improved Public Safety
    - Law enforcement and public safety first responders are better positioned to protect and serve communities when they have fast and reliable access to information and communications through broadband connections.

Communities must provide educational resources to citizens and businesses to ensure they realize all the benefits of broadband and not just deliver broadband options. There are several online options providing digital literacy training and many community educational organizations – community colleges and workforce development centers – positioned to provide public courses.

The Middle Peninsula should provide the following resources and local programs to community organizations to ensure all are aware of the programs that are available. Consider that average "take rates" – the percentage of citizens that actually purchases broadband services when they are available – are about 60-65%. This indicates there are many citizens and businesses that have an option for broadband but may not see the need for that connectivity. This is where community outreach for awareness and education could impact citizens that do have broadband options. Once they are aware of the benefits, they could leverage the service to improve quality of life through expanded education, job opportunities and healthcare.

It is important for the region to especially target the small businesses to ensure they are leveraging broadband to improve and grow their business. CIT's Virginia e-commerce assessment results show that small businesses are impacted the greatest by leveraging the Internet and this can directly result in job growth in the region. It is recommended the region share the following resources and any local programs with the chambers and any other local business organizations.

Following is a list of current online resources to provide training for citizens and businesses:

- Start-Up Savings
    - created by the Internet Innovation Alliance (IIA) and the Small Business and Entrepreneurship Council (SBE Council) to show businesses how broadband can lower costs and barriers to business startup.
    - http://internetinnovation.org/small-biz/
- Microsoft's Online Digital Literacy training
    - Microsoft has created an extensive curriculum for all skill levels for free. This online training is focused on Microsoft products but does include the very PC and online basics. It does not require that you own the Microsoft products but there is a requirement that it is accessed by a Windows PC using Microsoft's Internet Explorer browser. The curriculum includes assessments to ensure participants are mastering the lessons.
    - http://www.microsoft.com/about/corporatecitizenship/citizenship/giving/programs/up/digitalliteracy/default.mspx
- DigitalLiteracy.Gov

    - a portal created by the Obama Administration to provide a plethora of online resources delivering digital literacy training and services.
    - http://www.digitalliteracy.gov/
- Digital Literacy Portal
    - a web portal created through a collaborative project run by Link Americas Foundation (LAF) and Kempster Group promoting Information and Communication Technologies and Digital Literacy training. The portal provides many resources available for training including materials.
    - http://www.ictliteracy.info/ICT-Training.htm