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**REPORT ON THE MUNICIPAL COMMUNICATIONS  
FACILITIES AND BROADBAND SERVICES NEEDS  
PROJECT FOR THE CITY OF NORFOLK, VIRGINIA**

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## INTRODUCTION AND BACKGROUND

### PROJECT OVERVIEW

At the request of the City of Norfolk, Virginia (City) and its outside counsel, Moss and Barnett, LLC, CBG Communications, Inc. (CBG) has assisted the City in a Municipal Communications Facilities and Broadband Services Needs Study designed to provide the City with recommendations regarding the next generation of facilities and broadband services required to meet the City's existing and future communications needs. As part of this, the recommendations focus on both municipally owned and leased facilities and services, the Institutional Network currently provided by Cox Cable Communications (Cox) and the needs of businesses, organizations and residents that make up the key constituent communities in the City.

This Study involved five key project elements:

- **Internal meetings with City personnel** -- designed to review the needs of internal City stakeholders and the constituencies they serve throughout the City;
- **Assess future communications needs of the City** -- designed to determine the needs of various stakeholder groups, including businesses, organizations and residents;
- **Use of the I-Net** -- designed to determine how the City's current network infrastructure was performing, along with an analysis of any limitations or problems and cost, and determine needs and directions for the future;
- **Review options for municipal ownership** -- designed to determine cost versus benefits of municipal ownership of various communications infrastructure and comparison with infrastructure from other providers in order to find the most efficient and cost-effective ways to meet the City's future communications needs; and
- **Improving broadband speeds and broadband availability** -- designed to look at options that would improve speeds and availability to commercial regions and the public.

Review and analysis in all these areas then led to the creation of this overall detailed Report.

CBG employed a number of information gathering methodologies and engaged in related activities in order to meet the project objectives. The study methodology is described in more detail below. As part of the Municipal Communications Facilities and Broadband Services Needs project, CBG performed a variety of tasks. Specifically, these tasks included:

- Review of a wealth of existing background information.

- Engaging in communications network work group activities, where follow-up questions were reviewed and additional information was gathered. This also included discussion of the City's current network's performance and potential for the future as well as a detailed focus on the goals and objectives for the City's future communications facilities and related broadband services.
- A tour of the expanse of the existing Institutional Network and a review of possible offshoots for the future.
- Assistance in facilitation of the Connect Norfolk Broadband Working Group, including making two presentations and facilitation of breakout discussions with community, military, business and educational representatives.
- Development of notes from these discussions and assistance in steering the further workings of the group based on goals and objectives obtained from the initial meetings.
- Development of an internal Broadband Facilities and Services Questionnaire, distributed to key agencies within the City government and analysis of the information received.
- Review of the current Master Services Agreements and Amendments between the City and Cox concerning the provision, specifications and cost of Institutional Network services currently utilized by the City.
- Conduct of a Needs Assessment related to the Institutional Network and recommendations for the future in support of negotiations with Cox and future directions for municipally-owned facilities.
- Development and implementation of a Business Broadband Survey, along with analysis of the results to determine the overall broadband needs of the business community and the constituencies that businesses serve, which led further to recommendations on the improvement of broadband facilities and services for business use.
- A comparison with other similarly situated jurisdictions around the country in order to help develop potential options for municipal ownership of certain communications facilities, developing partnerships to expand facilities and services and ultimately to achieve a higher degree of broadband access and capacity provision throughout the City.

All of the foregoing information gathering, review and analysis efforts resulted in the development of the options and recommendations for broadband service and infrastructure development, implementation and deployment designed to help guide the City as it makes critical current and future decisions based on the information reported herein. This information

can also be used to provide support for the development of grants and other funding in order to help achieve the aims of the City in expanding broadband infrastructure and services for all of the City's constituent communities.

CBG's Project Manager for this project was Tom Robinson, President. The CBG Project Team included Dick Nielsen, Senior Engineer, who performed much of the technical information gathering and analysis; Krystene Rivers, Research Associate, who assisted all of the Team Members in their various tasks; and Dr. Constance Ledoux Book, who helped develop all survey instruments and analyzed the information gathered from the various questionnaires and surveys.

CBG would like to thank the City of Norfolk Department of Communications and Technology and others for their invaluable assistance in working with CBG to help facilitate expeditious, efficient and effective data gathering. Also, CBG wishes to thank the many local community, business and other representatives who provided assistance in bringing together critical participants for work group meetings, interviews, discussions and other information gathering efforts.

## **SECTION A**

### **INTERNAL MEETINGS WITH CITY PERSONNEL**

## **INTERNAL MEETINGS WITH CITY PERSONNEL**

### **FINDINGS**

In order to establish the baseline information needed to proceed on multiple elements of the Municipal Communications Facilities and Broadband Services Needs Project for the City of Norfolk (“City”), CBG worked with the Department of Communications and Technology (“ComTech”) to establish a variety of internal meetings with City personnel. An initial conference call was held with key stakeholders to discuss overall goals and objectives of the project, logistics, timelines and the study process. After agreeing on these elements, it was determined that initial internal meetings would be held on June 29 and 30, 2016.

#### **Meetings with Communications and Technology Staff**

Beginning on June 29th, meetings were held with a variety of Communications and Technology staff to initiate the first portion of the project. The first meeting with the ComTech Director and principal staff members was held to establish two key focal points of the Municipal Communications Facilities and Broadband Services Needs Project. These two points are:

- Refreshing and enhancing the City’s Institutional Network (I-Net), and in the process,
- Help to build a Connected City.

Regarding refreshing and enhancing the I-Net, key objectives were to develop ways to increase access to backbone infrastructure, facilitate greater provision of services to institutions, businesses and residents, and help lower the cost of broadband services.

Regarding building a Connected City, discussions that City staff had with Norfolk residents, indicate that people feel empowered when they have more tools at their disposal, and understand how to use those tools. Broadband is a critical tool to help facilitate empowerment.

Branding the City as a “Connected City” also helps market the City as being on the leading edge of technological advancement and connectivity and, therefore, helps attract new businesses and new residents, while retaining existing businesses and residents.

Moreover, a “Connected City” means a connected internal City infrastructure as well as external City infrastructure and the bridging of the two. For example, the City has developed public WiFi in various locations, and continues to pursue additional implementation at the City’s Waterfront (thus contributing to its rehabilitation and enhancement). It also wants to potentially partner with others to bring WiFi to underserved neighborhoods.

ComTech’s objectives are in line with City-wide priorities, specifically in the following ways:

<b>City-Wide Priority</b>	<b>ComTech’s Direct or Indirect Involvement</b>
Accessibility, Mobility and Connectivity	ComTech has direct involvement in this priority, by leveraging the internal and external communications opportunities afforded by the I-Net; participation in the development of public WiFi; and serving as the storehouse and provider of Open Data.
Economic Vitality and Workforce Development	ComTech has indirect involvement in this priority by providing supporting infrastructure, services and systems that help boost the economy and facilitate workforce development
Environmental Sustainability	Again here, Comtech has indirect involvement by providing the supporting systems that positively help enable and sustain a high-quality environment.
Life-Long Learning	ComTech has direct involvement in this priority, by helping facilitate faster and higher capacity Internet in libraries and greater access throughout the City to promote a culture of learning for residents of all ages.
Safe, Healthy and Inclusive Communities	ComTech has direct involvement in this City-wide priority by providing connectivity, data system and other support for the City’s Public Safety agencies.
Well-Managed Government	ComTech is critically involved in this City-wide priority in supporting the business systems and processes that underpin the City as an efficient and effective data-driven organization that is able to effectively engage the Norfolk community.

Regarding existing efforts, ComTech staff indicated that its network infrastructure development activities and its support for economic development activities has, together with the efforts of other agencies in the City, helped bring 6,000 additional jobs to the City. This includes: ADP moving some of its operations to Norfolk, implementation of a new IKEA store, development of an outlet mall and other new business development.

ComTech has also been integrally involved in the refurbishment of the Waterside District, helping implement broadband capabilities within the District. ComTech also supports the Mayor’s efforts to compete effectively in the region, understanding that other cities within the

region are also pushing hard to expand broadband access, availability and utilization within their jurisdictions. At the same time, Norfolk is cooperating with other cities like Virginia Beach to engage in regional broadband initiatives.

In 2015, Norfolk was named one of Google's E Cities and this has resulted in additional economic development. ComTech is also active in facilitating the efforts of the ConnectNorfolk group (profiled later in this Report) and partnering with organizations like the Downtown Norfolk Corporation to expand broadband access, availability and affordability in the City. The City Council is also highly interested in connectivity and broadband access issues.

Regarding the provider landscape, as noted in other sections of this Report, Cox is the leading provider of broadband services in the City. Cox is the largest provider of services for the City's Institutional Network and is currently engaged in negotiations with the City on the continuation of portions of the I-Net with expanded capabilities.

As part of their dominance, Cox also provides the greatest amount of broadband services to the residential and business communities, including a current focus on its Gigablast Internet access service. These services are provided both over direct fiber infrastructure as well as through its HFC cable system network that provides both residential and business class high-speed Internet service.

Verizon also provides DSL services within the City to both residential and business customers, as well as older connection technology such as T-1 links. Recently, though, Verizon has been pushing its wireless services over its terrestrial landline-based services, as being the way forward for high capacity, affordable high-speed Internet access in the future. Verizon currently has 4G LTE service in the City and is looking to migrate this to 5G in the foreseeable future.

There are also a number of private providers who provide fiber-based and other ISP and data communications connectivity services, primarily to institutions and businesses. Lumos is one such provider who is now working with the City on sharing infrastructure development opportunities. This partnership with Lumos has resulted in being able to replace much of the City-wide, ring backbone infrastructure that has been, in the past, leased from Cox as part of the I-Net, but is becoming a City-owned I-Net.

Specifically, the City is currently partnering with Lumos and other providers on a \$3.6 million project to share construction costs, conduits and fiber optic cabling so that by the end of 2017, the City owns, rather than leases, its entire backbone ring. The City currently spends approximately \$200,000 per year in lease of fiber optic and other connections from Cox and other providers and looks to substantially reduce this cost while increasing capacity and network reach. This project also involves the Virginia Department of Transportation (VDOT), which is developing fiber optic cabling in State highway rights-of-way for its Intelligent Transportation System (ITS) and other signaling and communications purposes. The City's Public Works Department is managing the construction side of the project, while ComTech will develop the communications signal transport technology and system. Ultimately, there will be 55,000 feet of 72 strand fiber in the ring, together with empty conduits for network growth over time.

The City also wants to continue to leverage its capabilities under the City Code's requirement that each provider, as part of their permit application for the placement of facilities in the right-of-way, must provide the City with at least one duct for its municipal uses. This is contained in City Code Section 42-59. (b). This is the basis, for example, of the City using ducts for its ring that have been provided by Level 3 as part of its agreement for use of the right-of-way.

The existing City-owned network is profiled in Section C covering the City's current and planned Institutional Network found later in this Report.

The City would ultimately like to provide conduit access to the Schools, such that they could leverage the City's Institutional Network, as well as potentially pull their own fiber. Right now, the Norfolk Public Schools (NPS) spend approximately \$500,000 a year to procure managed services for their network.

As the City develops its City-owned and operated backbone ring, it has established these critical requirements:

- **Network nodes that are geographically located at mission-essential sites --** This will ensure that, regardless of the network connectivity upstream or downstream to other sites, mission-essential sites can continue to function during any kind of network failure.
- **Redundant operation --** The ring itself will be bi-directional, with diverse path entry so that any cuts would enable connectivity to continue to all sites.

Additionally, there will be redundancy in the equipment, so that an equipment failure at any node would not cause the network to go down.

Ideally, while the network currently is planned to function as a hub and spoke, ultimately there could be a completely diverse path second ring where each site would have connections to another ring and another node in case of a catastrophic failure. The cost benefit will need to be evaluated, once the initial nodes and ring are fully operational, for a length of time that establishes its network availability and uptime.

- **Scalability --** There will be expandability in each chassis and the network will utilize gigabit Ethernet transport using wavelength division multiplexing (WDM), such that there will be a full 12 channels of capacity allowing for substantial growth over time in cost-effective increments.
- **Layer 3 operation --** The City currently utilizes leased Cox Layer 2 transport services and manages the quality of service at the application layer. With the new ring, the City will use layer 3 devices so that it can provide quality of service through the same devices that provide the Layer 2 transport system. This will allow the City to employ a variety of data traffic shaping and other mechanisms to ensure the most efficient utilization of the network.

The City's current network provides an interconnection switch at the Cox headend on Village Avenue to route traffic from all the leased Cox fiber circuits and the leased Cox cable modem circuits on to the Wide Area Network. This traffic then interfaces with City-owned fiber connections that star back through the City's main switch at the Granby Municipal Center data center, as well as through the City Hall data center switch. Currently, that is a City-owned switch that Cox manages. The City will need to develop a collocation agreement with Cox to ensure that the implementation of a new Layer 3 switch at this site can continue to interconnect all leased Cox circuits into the City's new ring.

What will occur with all the remote sites that will not be on City-owned fiber when the ring is fully completed later in 2017, will need to be evaluated. There are a wide range of remote sites that require variations in capacity based on the number of users and applications needed. For example, libraries have substantial capacity requirements because they are sites where the public can access the Internet and that need access for staff to massive amounts of information. On the other end of the spectrum is the cemetery where there are only four people in the office who essentially only need office applications.

In order to facilitate the various applications and capacity needs, the City currently uses a variety of connectivity types; everything from T-1s to direct fiber connections. The City will be developing a long-term strategy to continue to cost-effectively migrate these to higher capacity connections as needs and available infrastructure dictate.

The City also wants to look at greater wireless/wireline integration, where the fiber optic connections can serve as backhaul for multiple wireless applications (be it providing public WiFi, accessing public safety communications through portable and mobile devices, or backhauling wireless monitoring and control systems).

The City also sees a continuing need for a bigger and bigger Internet pipe. Recently, the City saved 18% on their increase from a 200 Mbps Internet pipe to a 1 Gbps pipe, through a most favored nation's clause that required Cox to match the price quoted from Lumos.

As the City nodes are implemented, they are being placed with substantial battery backup capability and will use transport protocols that load balance versus a hot standby so that any kind of failure is instantaneously handled.

### **Meetings with Development Department Officials**

Enhancing connectivity for institutions and organizations besides the City, as well as commercial businesses and residents, was discussed with Development Department officials prior to a tour of the City along the current and planned ring infrastructure. At this meeting, it was discussed how it is very important to both retain and attract large businesses (i.e., large employers) such as Norfolk Southern, and more recently ADP. While there are a number of factors that influence a decision to stay within an area or relocate to an area, access to advanced communications networks is certainly one of the critical components. Accordingly, as the City's fiber backbone

is developed, it will need to leverage this high-capacity infrastructure to help retain and attract business. In order to do this, it is anticipated that the City will work to:

- Continue to attract other high capacity data networking and Internet service providers, like Lumos, to utilize the City's backbone and then expand into the multiple neighborhoods off of the nodes.
- Partner with organizations and providers to establish either municipal facilities that provide high capacity, no or low-cost access to the Internet for underserved and unserved populations within the City, or public/private partnerships to facilitate a provider's provision of affordable access to the Internet. One example is the City's current exploration of development of a wireless Internet access system with the local public broadcaster, WHRO.
- Leverage its past, current and anticipated future relationship with Cox (the largest provider of Internet access services within the City) to explore partnerships to expand affordable Internet service from Cox to more homes within the City.
- Provide Internet access as a public amenity in public spaces.
- Help facilitate, through the City's own infrastructure and public/private partnerships, an expansion of services within the Innovation Corridor and other areas in the City to help entrepreneurs, technology startups and other small businesses advance their technological environment and grow their businesses.
- Work with institutions, such as colleges, universities and hospitals, to leverage their communications networks and capabilities to continue to expand access to communications technology and high speed, high capacity services for all constituent groups in the City.

### **Tour of the City's Current and Planned Fiber Optic Backbone Route**

After the meeting with Development Department personnel, a "windshield tour" of the City's current and planned fiber optic backbone route was conducted, in order to understand the areas where nodes would be placed and look at various areas of the City where targeted communications network development would be beneficial. This tour began downtown and proceeded north, east, south and west through the City to review and discuss ideas for potential development along and from the backbone upon its completion.

Specifically, windshield tour drive-out began at ComTech's departmental offices and then proceeded westerly along Brambleton Avenue up to and past Eastern Virginia Medical School (EVMS) and Sentara Norfolk General Hospital. Children's Hospital is also in that medical center area. This portion of the network is complete and was put together as a joint venture with VDOT. It was also discussed that the Chelsea neighborhood of the City near the medical center complex could be a focal point for expanded broadband development, as well as businesses

located along this section which includes industrial riverfront businesses, the Norfolk Southern coal piers and others.

We then proceeded in a northerly direction along Route 337 up towards Old Dominion University and the crossing of the Lafayette River. We passed a number of older urban sections, including the Park Place neighborhood. It is in this area that the City was working with WHRO to establish a trial project that would provide wireless broadband to underserved residents in this area, as well as to businesses in a new shopping center and anticipated new mixed-use development.

At Fire Station No. 12, we turned east along Route 165, continuing along a path that is part of a current joint venture with VDOT, anticipated to be completed prior to the November, 2017 full backbone activation. Along this area, there are enterprise zones south of the Norfolk Naval Station as well as the new Fitness and Wellness Center being developed.

Just past Route 460, continuing along Route 165, before heading south along Interstate 64, right at an I-Net node, another section of the I-Net backbone has been completed which is not a part of the VDOT joint venture. This section turns northerly along Tidewater Drive for a short distance and then runs into the Central Business Park before again traveling easterly on Route 170. Here again, there are opportunities for both business and residential development, as well as connections into a radio tower for backhaul purposes. When Route 170 reaches Route 194, a spur of the network turns north and goes up towards the Chesapeake Bay. Half of this segment is completed, and there is a section between Jennifer Street and Dudley Avenue that has not yet been completed, as well as another section along the waterfront and Route 160 that goes past the Ocean View Community Center towards Ocean View Park. There is additionally the Pretlow Library, a service center and additional opportunities for development in that area.

Beginning back along Route 170 and continuing south, there is a long stretch of the network where, in some cases, there is conduit but no fiber. In other cases, construction work needs to be done. This section proceeds down Route 165 and Route 13 (Military Highway) until it reaches Route 58 and turns west. This section along Virginia Beach Boulevard connects up right before Broad Creek with a completed section that continues back into the downtown area.

Along the uncompleted section are multiple City facilities including the City Water Authority, Precinct No. 2 and Fire Station No. 14, a variety of schools and other educational facilities and Lake Taylor Hospital.

Following the completed section past Broad Creek, it passes Fire Station No. 10, Precinct No. 1 and then, at Broad Creek Park, turns southeasterly on Balantine Boulevard until it reaches Interstate 264 and goes past Norfolk State University. At Brambleton Avenue, while it continues westerly, there is also a spur that goes across the eastern branch of the Elizabeth River along Route 460 until it gets to Berkeley Avenue where it turns westerly and over to Fire Station No. 8 and a library branch in the section of Norfolk that borders on Chesapeake. The City is looking at potentially bringing the spur back into the ring (creating a sub-ring) by crossing the river again, utilizing the Interstate 264 bridge. At Norfolk State University, the main ring continues easterly, has a small spur that goes up Park Avenue towards Brambleton Ave. where it again touches

Norfolk State University and goes southeasterly into Harbor Park over to Interstate 264 and then up to the main ring again. It then continues west to the MacArthur Center and then north back to the I-Net node at the ComTech departmental offices.

Overall, then, the backbone network is continuing to be developed so that spurs can be made at strategic points along major arteries and to key institutions. It also contains enough initial excess, and opportunities for expansion of, capacity to meet the City's internal needs, as well as help leverage the network to partner with multiple providers to increase service to institutions, businesses and residents.

### **Meeting with Division of Transportation, Department of Public Works**

As part of CBG's initial site visits and set of meetings, we met with the Team headed by DPW's Transportation Division that is working on the fiber optic I-Net backbone project. The group is comprised of a variety of Transportation Division staff as well as ComTech staff. Its purpose is not only to manage the project from an administrative, fiscal oversight, construction and implementation point of view, but also to:

- Interface with project partners such as VDOT and private providers like Lumos.
- Ensure that the proper physical infrastructure is developed including conduit, both new and augmented; fiber cabling, both new and augmented; and splice point, manhole, hand hole and node locations.
- Ensure the security of the network
- Ensure the leveraging of all available assets including conduit placed by Level 3 as part of its right-of-way usage agreement requirements in 1995 and 1996.
- Approve cost proposals for various links of the network to be installed by contractors, and issue work orders.
- Review and develop projections, obtain cost proposals and issue work orders for additional links until the project is completed.

This project management group is known as the Fiber Optic Networking Work Group and focuses on the development and anticipated utilization of the network City-wide. Various discussion points were brought up as the meeting progressed including:

- **Amount of fiber infrastructure** -- The group discussed that where some of the existing fiber and conduit is at 12 strands or 24 strands, it needed to be increased to 96 strands so that the ring would have full 96 strand capabilities throughout.
- **Interties, sub-rings and redundancy** -- The group discussed that there needed to be, of course, ties into the Cox cable infrastructure until that infrastructure maybe completely supplanted.

There should also be interties into the colleges and universities to leverage their fiber assets, such as ODU and its interconnection to the Internet as well the high capacity backbone between all State of Virginia colleges and universities.

Potential development of a sub-ring for the Norfolk Public Schools.

Also, the group was looking at interstitial rings to form a truly redundant network throughout the City.

- **Network applications** -- The group talked about a number of different network applications that are envisioned over the fiber system. This includes the wide variety of data communications supporting computers City-wide, everything from learning labs at the libraries and computers at the zoo to traffic signal communications.
- **Video** -- A variety of video applications were discussed including:
  - Security camera video;
  - Video to personal devices;
  - Video to vehicles;
  - Video from portable cameras that are wirelessly enabled;
  - Fire training video.

A digital video management system was discussed to monitor, archive and ensure delivery of video from all these different sources over the network.

- **Network management** -- Network management may be outsourced to groups such as Light Brigade out of Denver, Colorado.

## Visioning Discussion

A final meeting was held with ComTech staff to discuss visions, short and long-term strategies and next steps related to development of the network and the Municipal Communications Facilities and Broadband Services Needs project. These discussions focused on working with and providing information for both internal and external constituencies. City priorities, for instance, regarding its internal network are to own and control as many fiber and other communications assets as feasible, with leasing dark fiber that it activates, operates and manages as the second focus, and obtaining managed services as a third option.

As it builds out for internal needs, the City wants to be able to provide facilities to private providers such as Lumos to expand their network to institutions, businesses and residents in a variety of way. This would include:

- Leasing City-owned dark fiber to private providers;

- Leasing conduits from the available 2” and 4” conduits that it owns as part of the project; and
- Leasing out inter-duct in conduits where it may run its own facilities.

In pursuing the development of its own network and helping facilitate the expansion of private provider networks, the City wants to continue to implement the Connected City concept. This will better interface Public Safety, Public Schools and the Norfolk City Government itself with neighborhoods throughout the City, thus helping facilitate open government, more effective educational initiatives and better community involvement in helping ensure secure and safe neighborhoods.

Not only does this benefit the residents of Norfolk, but also the many tourists that come to Norfolk each year and additional tourists that Norfolk wants to attract.

Specifically, the three tenets of building a Connected City are:

- Expanding broadband (Internet access) accessibility and capability throughout Norfolk;
- Increasing access to public WiFi; and
- Supporting Smart City initiatives.

Overall, this will allow the City to lead the region in technological innovation.

In the region, multiple initiatives are currently happening which are helping focus the City’s efforts. Besides the expansion in capability and capacity of the City’s fiber optic backbone, the cities in the region are working together to look at sharing resources and leveraging each other’s initiatives and activities. For example, Virginia Beach is working with Mid-Atlantic Broadband on a “landing area” for its high capacity, high speed transatlantic fiber optic backbone. Connecting into this infrastructure initiative will help increase the reach and utility of the City’s own infrastructure.

Verizon and other private providers are increasing their capabilities. While Verizon seems to be moderating or reducing its investment in high speed Digital Subscriber Line (DSL) technology, it is rapidly advancing its Fifth Generation (5G) wireless technology and plans to roll such out aggressively in the Tidewater region beginning in the foreseeable future. Verizon sees this as responding to the need for affordable, high capacity wireless access. While industry analysts believe that this will help improve capabilities, especially for portable and mobile high-speed Internet access, and for those that depend largely on their smart phones and portable devices for access even at home, it is still a shared medium and would not, for example, guarantee any individual’s capability to constantly access the speed of connectivity needed.

Similarly, Cox has indicated that it will continue to advance its “gigablast” technology designed to deliver up to gigabit speeds, especially to businesses, but even to the home. Here again, the

capacity is shared on the Cox cable modem-based network and will experience a slow down in capability as more and more users off any given node work to access the Internet.

The ultimate goal is to work to get a combination of high capacity, affordable infrastructure to individual homes, businesses and institutions throughout the City, as well as leverage as many wireless resources as possible for portable and mobile access. This would mean, for example, working to leverage City assets and resources to help develop fiber to the home and fiber to the premises for residential and business use, as well as developing WiFi for public spaces and, in partnership with other providers for residential and business use as needed, to ensure that there is always ready portable and mobile access.

As part of its Connected City initiative, the City is currently in the process of:

- Renegotiating the Cox Cable Franchise Agreement related to the Institutional Network and municipal services to obtain the highest degree of capabilities and reach at the most affordable cost;
- Expanding its own fiber infrastructure, especially the capabilities of the fiber backbone ring around the City;
- Leveraging the right-of-way to ensure that, as private providers utilize it to provide services, infrastructure is available for public use; and
- Employing emerging technology. By utilizing leading edge technology, the City can make sure that it can efficiently and cost-effectively move in the directions needed to constantly react to the changing broadband climate.

Part of the overall strategy is to focus its efforts on the future communications needs of the City as a whole. This includes working with a number of stakeholder groups to get their attitudes, perspectives, opinions, interests and needs related to broadband communications and communications technology before determining a way forward. The City's current efforts in this regard are profiled in the next Section.

## **SECTION B**

### **FUTURE COMMUNICATIONS NEEDS ASSESSMENT**

## FUTURE COMMUNICATIONS NEEDS ASSESSMENT

### I. Future Communications Needs of Norfolk Stakeholders

#### FINDINGS

As part of the project tasks for the elements focused on assessing the future communications needs of the City, CBG worked with ComTech staff in developing two initiatives; one focused at internal stakeholders and the other focused at external stakeholders. Regarding internal stakeholders, in August, 2016, the Chief Information Officer met with City Department heads and indicated to them that ComTech and CBG were going to develop and distribute a questionnaire focused on the broadband communications and technology needs of City Departments and agencies, focused on administrative needs as well as external client and constituent needs. Responses to the questionnaires were received in late August and early September, 2016, were compiled and analyzed and reported back to ComTech. The results of the internal administrative needs are largely profiled in the next Section of this Report, "Use of the I-Net." Results of the questionnaire related to provision of services to external stakeholders are discussed later in this Section.

A second part of assessing the City's broadband communications and technology needs was focused on external stakeholders and is being developed in conjunction with the work of the Connect Norfolk Working Group. The Connect Norfolk Working Group is made up of representatives from a variety of business, community and institutional organizations that further represent the various facets of the Communities of Interest in Norfolk related to broadband access and utilization throughout the City.

As part of their initial workings and discussions on the activities that the group should engage in in order to best meet their mission, it was determined that CBG and the City would conduct a Business Broadband Survey. This Survey was completed in late January, 2017 and is discussed in detail below. The full findings are presented in Exhibits B-4 through B-7.

#### **Needs of External Stakeholders**

Assessing the communications needs of external stakeholders began with discussions with Development Department personnel and the tour of the City backbone infrastructure where areas of the City that are currently considered underserved or need more affordable access were pointed out and discussed. As part of planning the next steps in the Municipal Communications Facilities and Broadband Services Needs project, it was determined that the Connect Norfolk Broadband Working Group, whose first meeting was slated for early August, should be integrally involved with this element of the Study.

The Connect Norfolk Broadband Working Group is made up of stakeholders and City leaders working together concerning issues of expanding City broadband accessibility and capability. The Group was initially divided into two subgroups: Community and Business. This division

allows members to share their unique perspectives on the future needs for broadband and have an impact on the Communities of Interest they represent. The Group is officially a City of Norfolk Advisory Committee. The Community subgroup has representatives from Norfolk Public Schools, Norfolk institutions of higher learning and other groups whose mission is to improve the lives of all Norfolk residents. This includes representatives from:

- Tidewater Community College;
- Old Dominion University;
- The Norfolk School Board;
- Norfolk State University; and
- The Norfolk Redevelopment and Housing Authority.

The staff support for this subgroup includes the City's CIO, the ComTech Manager of Communications and the Assistant Director of the City's Department of Neighborhood Development.

The second subgroup consists of leaders in Norfolk's business and military community. Specifically, the organizations represented include:

- The Greater Norfolk Corporation;
- Grow, which is an entrepreneurial small business;
- Dominion Enterprises, a large employer;
- Centura Hospital;
- DIA, a large creative business;
- The Port Authority; and
- The U.S. Navy (representing the military base).

City staff support for this subgroup includes the same as for the Community subgroup, except the Department of Economic Development is represented while the Department of Neighborhood Development is not in this subgroup.

An agenda was set for the first meeting to help it dovetail into the Broadband Services portion of the Study. It was held in the Slover Library Community Boardroom and began with a City Manager welcome message, a CIO overview presentation, a presentation by CBG on the purpose and intended outcomes of the Group and then initial subgroup discussions. As a last activity, the subgroups were united to share information with all Group members. A detailed synopsis of the

key discussion points during Connect Norfolk's August, 2016 meeting is included as Exhibit B-1.

During the introduction and welcome message from the City Manager, he noted several key issues for the Group including:

- Reinforcing that improving connectivity is one of the six major priorities of the Norfolk Administration.
- It's important to focus on developing public/private partnerships in order to get the needed investment to expeditiously increase broadband in the City.
- There will be synergies in working with other jurisdictions in Tidewater (16 in all), especially with neighboring Virginia Beach, in order to develop regional approaches that will most efficiently meet some of the broadband needs determined.
- As the Group's work proceeds, it will be important to think about the "low hanging fruit" initiatives that can be pursued in order to achieve successful outcomes early on that can be further built upon.

The CIO presented information to the Group showing the current status and planned development of the City's Institutional Network and the outcomes that are desired from the expansion of reach, capability and capacity. This discussion is consistent with the information presented in this Report in Sections 1 and 3. A copy of the current I-Net backbone and future growth area map is attached to this Report as Exhibit B-2.

CBG then made a presentation to the Group to serve as a foundation for the discussions and activities to come. This presentation included certain broadband fundamentals, examples of what other jurisdictions are doing regarding broadband enhancement in their cities and regions and key questions designed to guide the discussion of the Community and Military and Business subgroups in their breakout sessions.

As the group provided feedback, three important early issues emerged that Group members wanted to make sure were part of the subgroup discussions and would be addressed in the recommendations for moving forward. These included:

- For small business, it is important to focus on the high cost of high speed services, relative to the cost to expand for larger businesses. Anecdotally, those familiar with small business operations and broadband services available to small business indicated that large businesses are getting 100 times the bandwidth for the same cost in some cases, as small businesses are paying for bandwidth that is 100 times less.
- Even though much of the focus is on the development of fiber infrastructure for both backbone and distribution purposes, it will be important to ensure that high

speed, wireless broadband access is also part of the mix. The Military noted that this is an especially important consideration for them.

- Broadband communications are critical for emergency operations, and ensuring access to the highest capability and capacity broadband throughout Norfolk for public safety, first responders and other emergency workers needs to be a critical focal point of the Study and the Group's workings.

## **Connect Norfolk Work Group Breakout Sessions**

As indicated above, the large group broke into two subgroups to explore a number of question areas described at the end of the opening presentation. The key findings from the small group discussions are provided below.

Prior to breaking into subgroups, it was reiterated to the Connect Norfolk group what their overreaching charge is. Specifically, Connect Norfolk is designed to:

- Create a vision and develop recommendations regarding the next generation of technological infrastructure and broadband services that will be required to meet the City's existing and future communications needs;
- Assess how the City can improve broadband availability and speeds to specific stakeholders (residential, commercial, government and educational) within the City, as well as within the region; and
- Develop an engagement strategy to ensure wide participation by a broader group of stakeholders.

For their particular breakout discussions, Working Group participants were asked to draw on their own experience and that which they are aware of from other members of the sector they represent and focus on four key points:

- How do you and your organization use broadband, the Internet or other network services at your organization, for both internal services and for external services, clients and customers?
- What works now for your organization and your clients/customers (and, because of this, what should be reinforced)?
- What doesn't work now or won't work in the future (and, because of this, what needs to be changed)?
- What should the City of Norfolk do about it?

## **Business Subgroup**

Attached to this Report is Exhibit B-3 which is the PowerPoint presentation used to help facilitate both the large group and small group breakout session discussions, as well as Exhibit B-4 which are the key concepts that emerged from the meeting. A highlight of the key concepts discussed included:

- Access to ultra-high-speed broadband Internet is critical for all businesses to thrive.
  - Achieving this access has been difficult, especially for smaller businesses. It is expensive and not easily attainable without high cost dedicated fiber installation.
  - To remedy this, the City should consider a more collaborative approach to obtaining high capacity broadband for all businesses.
  - Getting more competition into the market is key because it should be the driver in making broadband more affordable and accessible.
- Regional cooperation is important.
  - Businesses in different areas of the Tidewater Region are competitors, but there is a need to partner to achieve common goals and there are entities (such as the Navy) that can serve as a bridge for cooperation.
- High capacity connections between large data centers are critical to attract large businesses and institutions to the region.
  - Universities are utilizing 100 Gbps pipes to the Internet and other large capacity networks.
  - These are needed for all big businesses and institutions in Norfolk
  - There should be a way to partner and advocate for these types of connections for all that need them.
- There needs to be a regional strategy to help businesses and organizations with cyber security issues.
- The need to retain and attract highly skilled talent, develop the workforce and support expanded economic development runs hand in hand with access to high capacity broadband.

- Increasing accessibility to and the affordability of high-speed Internet in entrepreneurial areas like the Innovation Corridor will help attract and retain a high level of talent.
- Partnering with entities like Lumos and Mid-Atlantic, and interconnecting with the regional Corporate Landing project will help reinforce the commitment of the City to be a Connected City and lead to more R&D moving here.
- There should be a higher degree of promotion of Norfolk's efforts to attract businesses and expand its broadband environment through a focused public relations/outreach campaign.
  - Ways to do this include creating a big splash in areas that are developing and vibrant like Chelsea.
  - Pursue a number of successful short-term fixes.
  - Find out what the business community really needs and respond to that (the Business Broadband Survey profiled later in this Section was an outgrowth of this discussion point).
- It will be important to incorporate and potentially jump ahead of the curve, related to access to affordable wireless broadband. The availability of high capacity broadband for residential and business use is a top five priorities; for many, top one or two.
  - Even if schools and education are the number one priority of the City, high capacity broadband is needed to support education by enabling both school system and student access to the Internet.
  - Critical municipal services are supported by broadband. Ultra high-speed connections to big business, the Innovation Corridor and public spaces are critical short-term "wins".

## **Community Subgroup**

Key concepts and needs that emerged from the community subgroups were the following:

- Reliability was indicated as good by large institutions, such as the Norfolk Public Schools (NPS) and Old Dominion University (ODU). In residential situations, though, reliability is compromised by multiple devices trying to access the same shared connection and not enough capacity for high definition video and other services.

- The affordability of high capacity access is good for institutions, but problematic, especially for residents and smaller organizations.
  - Forty percent (40%) of those in public housing have no income at all.
  - Even a low cost Connect to Compete program from Cox is too much for many of those in a lower income household.
  - There are ways to drive down costs, including:
    - Owning the fiber network;
    - Partnering to reduce costs;
    - Leveraging available infrastructure;
    - Working on a regional basis.
  - The affordability of high capacity access is good for institutions, but problematic, especially for residents and smaller organizations.
- It's important for the network to be resilient so that entities can react to emergency situations.
- High capacity broadband access provides a high degree of flexibility.
  - This enables access to cloud-based services, which are becoming the preferred form of providing applications and software-based services.
- High speed access is critical to gaining employment.
- Redundancy in networks helps increase the availability and utility of broadband access.
  - Continuous uptime is critical for both internal and external services so even high cost redundant connections will prove useful.
- The greater the speed and scalability of the network, the more useful it is.
  - Many services require substantial download time if you don't have a fast network.
  - Entities like NPS with their "Bring Your Own Device to School" program, now find that 19,000 devices can be working to access the same network on any given day.
- Technology is extremely important to education in today's world.

- Much educational instruction is now offered through online learning and courses.
- Students pay attention to the level of broadband access when they are choosing post-secondary schools.
- High-speed broadband access is critical for research activities at educational institutions in Norfolk.
- The importance of available, high capacity broadband for schools and residents is certainly in the top five priorities.
- It will be important that ultimately access to fiber is capable City-wide.
- It will be important to improve regional cooperation and partnerships.
- There needs to be low or no-cost access to high capacity broadband for those at lower socioeconomic levels.
- Over time, there needs to be cost-reduction strategies for high speed broadband access.

At the end of the discussion, the group determined that the Business Broadband Survey should go forward, and analyzing, interpreting and initiating actions based upon the results will be one of the focuses of the Group as it continues to move forward with its mission.

## II. Business Broadband Needs Assessment

### INTRODUCTION

From December 2016 to February 2017, a telephone survey of 400 randomly selected businesses in the City of Norfolk sought to better understand the local broadband and high-speed internet climate. This effort is part of a larger charge to strategically enhance connectivity, stimulate economic development and close the digital divide in Norfolk. Sampled businesses responded to twenty (20) questions posed to determine engagement with high-speed Internet service (broadband), and satisfaction with current service and providers, as well as a deeper understanding of the applications driving demand for greater bandwidth capacity in the area.<sup>1</sup>

To generate a random sample and conduct phone interviews, the City's consultant, CBG Communications, engaged Issues and Answers, a local market research firm that conducts telephone surveys and focus groups. Issues and Answers has more than three decades of experience and as a local company was able to generate a strong response rate among businesses.

The responding sample included 300 businesses from a random sample registry. The names of the businesses, the services they provide, the year the businesses were established, the number of employees they had and the annual sales volume of those businesses were all included in the sample registry. This added value to the survey process in that it creates a snapshot of the economic and physical impact of the businesses in Norfolk. Additionally, the City is specifically interested in developing itself as a regional bio-technology hub and increasing the presence of both entrepreneurial and large employers. To more fully understand the needs of these companies, 100 additional businesses in Norfolk were surveyed from a sample drawn by Norfolk's Department of Development.<sup>2</sup> These businesses also provided similar characteristics related to services, size, annual sales volume and employees, so a full snapshot of these could be provided for the responding sample in the study.<sup>3</sup>

A full listing of names of businesses that responded to the study is included in the document Exhibit B-5. The industries of technical/science, administrative, retail and trade, as well as technology, engineering and healthcare were all well-represented in the sample.

Businesses were collapsed into the federal reporting system known as the North American Industry Classification System (NAICS). This is the standard used by federal statistical agencies in classifying businesses for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy.

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<sup>1</sup> The Business Broadband Study Survey instrument utilized in the study marked with responses is attached as Exhibit B-4.

<sup>2</sup> The random sampling of businesses of N=400, results in a margin of error of  $\pm 5$  points.

<sup>3</sup> To ensure the validity of the responding sample, the name and title of the respondent was provided to the telephone interviewer, as well as confirmation of the name of the business.

Beyond understanding who responded, for the purposes of this study, it is significant to understand the scale of the business, such as how many people are employed at the company and what are the annual sales of the company. These features allow a stronger understanding of how well represented the business landscape in Norfolk was in the study. Additionally, later in the study these characteristics are used to report on overall broadband satisfaction among businesses in Norfolk.

A diversity of business was represented. The following chart illustrates the responding businesses by their NAICS code.

Table 1: Responding Sample by NAICS Code

<b>Type of Business</b>	<b>Frequency</b>	<b>% of Responding Sample</b>
Accommodation and Food Services	12	3.0
Accounting Services	1	.3
Administrative/Support/Waste Management/and Remediation Services	36	9.0
Advertising & Marketing Services	1	.3
Agriculture/Forestry/Fishing and Hunting	1	.3
Airlines	1	.3
Arts/Entertainment/and Recreation	11	2.8
Automobile Rental & Leasing	1	.3
Automotive Parts & Accessories Stores	1	.3
Automotive Repair & Maintenance Services	3	.8
Bars & Nightclubs	1	.3
Business Services Sector	1	.3
Cement & Concrete Product Manufacturing	1	.3
Clothing Stores	5	1.3
Coffee Shops	2	.5
Commercial Printing	1	.3
Commercial Real Estate Brokerage & Management	1	.3
Construction	28	7.0
Consulting Services	1	.3
Consumer Product Rental	1	.3
Control, Electromedical, Measuring & Navigational Instruments Manufactures	1	.3
Convenience Stores & Truck Stops	4	1.0
Crop Production	1	.3
Dentists	1	.3
Drywall, Plaster, Acoustic & Insulation Contractors	1	.3
Educational Services	6	1.5
Electrical Contractors	2	.5
Electrical, Plumbing & Hardware Wholesalers	1	.3
Fast-Food & Quick-Service Restaurants	4	1.0

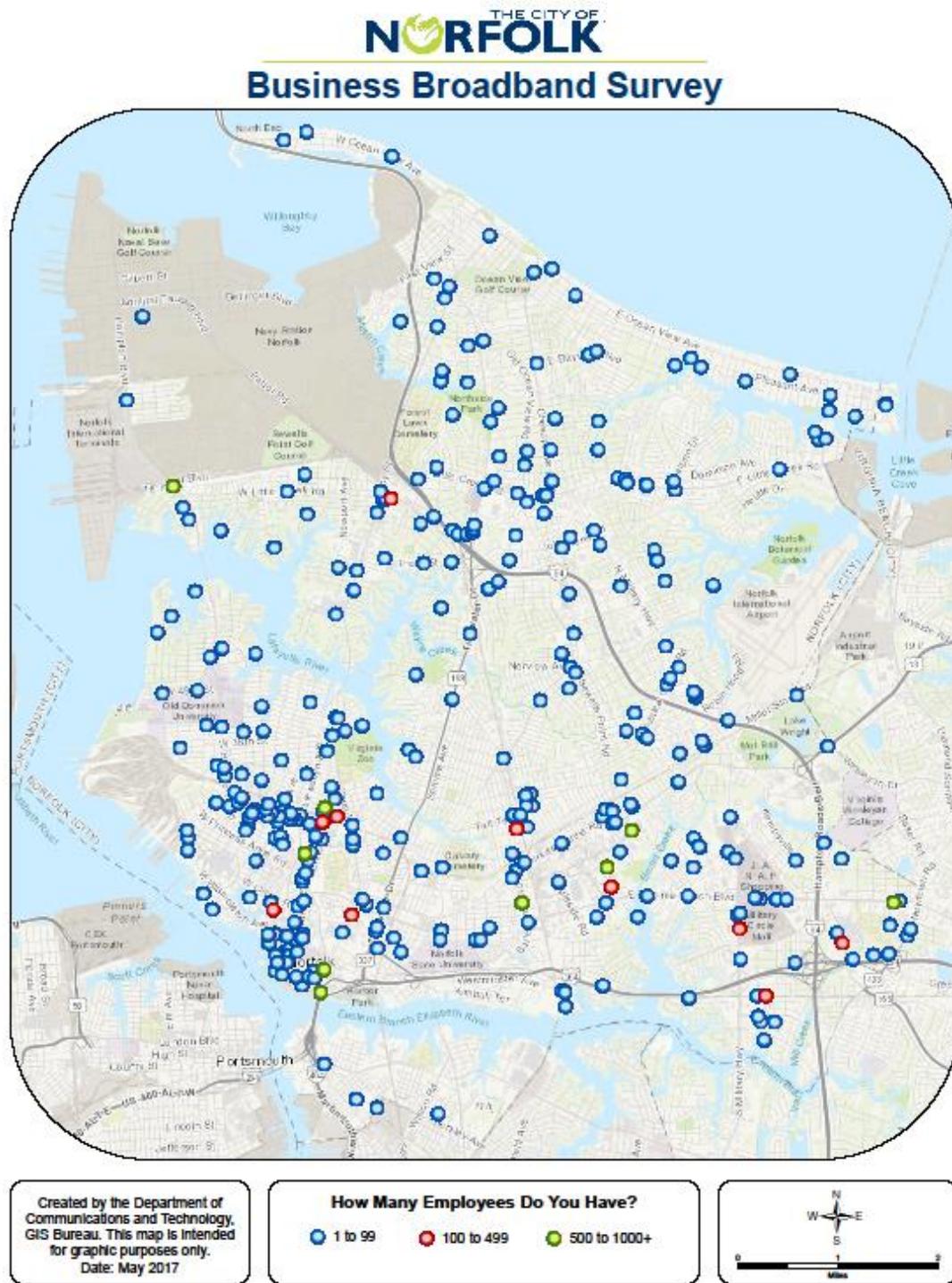
<b>Type of Business</b>	<b>Frequency</b>	<b>% of Responding Sample</b>
Finance and Insurance	9	2.3
Freight Forwarding Services	1	.3
Gift, Novelty & Souvenir Stores	1	.3
Government	3	.8
Grocery Stores & Supermarkets	2	.5
Health Care and Social Assistance	20	5.0
Health Supplement Stores	1	.3
Home Centers & Hardware Stores	1	.3
Home Health Care Services	2	.5
Hotels, Motels & Resorts	2	.5
Industrial Equipment Wholesalers	2	.5
Industrial Supply Wholesalers	2	.5
Information	2	.5
Insurance Agencies & Brokerages	1	.3
Jewelry Stores	1	.3
Laundry Facilities & Dry-Cleaning Services	1	.3
Legal Services	1	.3
Management of Companies and Enterprises	1	.3
Manufacturing	18	4.5
Market Research & Polling Services	1	.3
Media	1	.3
Medical & Diagnostic Laboratories	3	.8
Membership Organizations	1	.3
Office Supply Stores	1	.3
Other Services (except Public Administration)	50	12.5
Physicians	1	.3
Professional/Scientific/and Technical Services	60	15.0
Public Schools K-12	2	.5
Radio Broadcasting & Programming	1	.3
Railroads	1	.3
Real Estate	1	.3
Real Estate and Rental and Leasing	13	3.3
Religious Organizations	2	.5
Residential Real Estate Brokerage & Management	2	.5
Restaurants	4	1.0
Retail Trade	22	5.5
Securities Brokerages	1	.3
Self-Storage Services	1	.3
Shoe Stores	1	.3
Social Assistance	2	.5

<b>Type of Business</b>	<b>Frequency</b>	<b>% of Responding Sample</b>
Toy & Hobby Stores	1	.3
Transportation and Warehousing	10	2.5
Utilities	2	.5
Warehousing & Storage	1	.3
Wholesale Sector	3	.8
Wholesale Trade	9	2.3
Wireless Telecommunications Services	1	.3
<b>Total</b>	<b>400</b>	<b>100.0</b>

Businesses responding to the study also represented a broad range of years in business in Norfolk. The range of years from business start-up in Norfolk was from 1800 to 2016. The median (mid-point) was 1989 and the most common response (mode) was 2014.

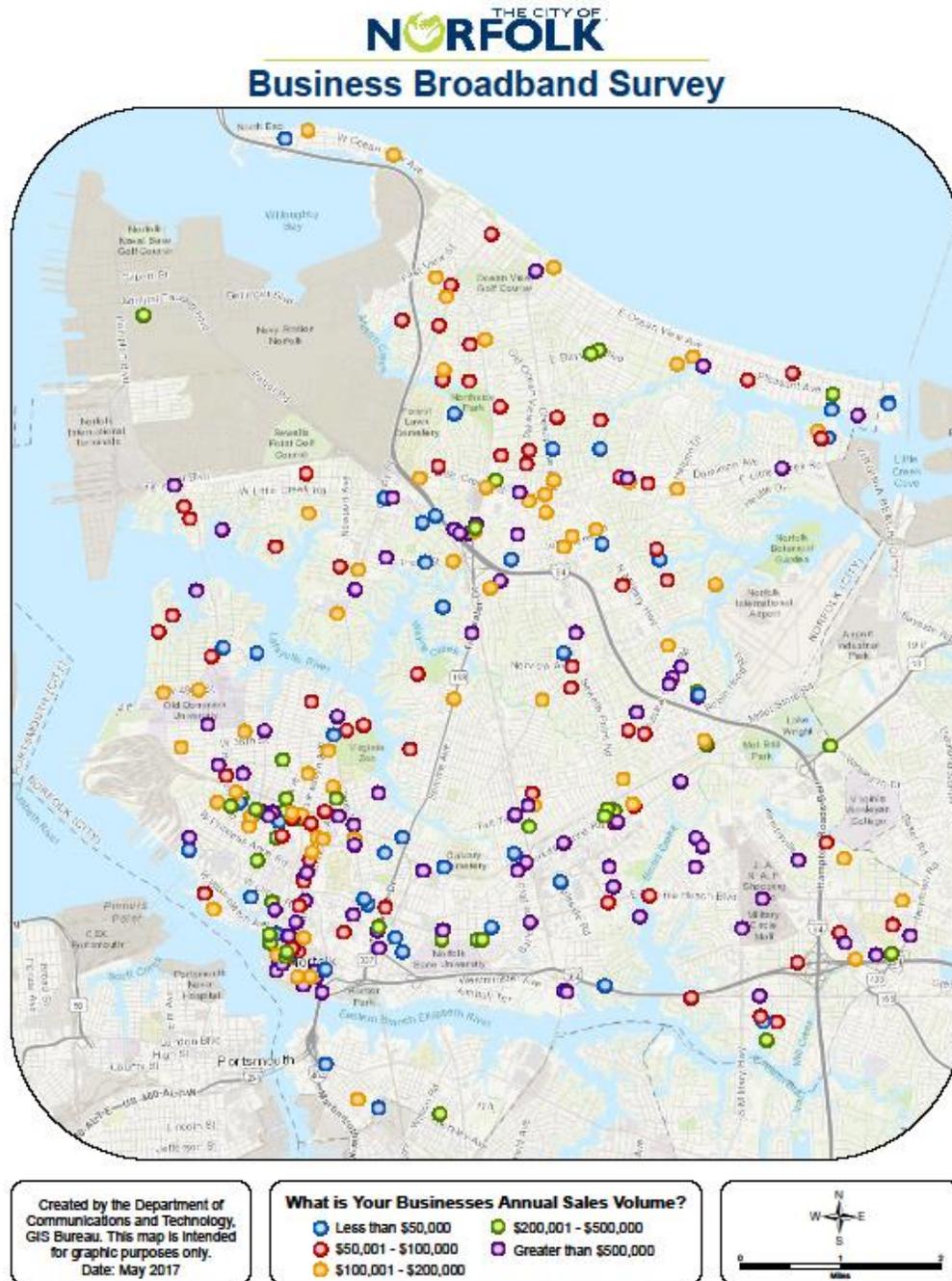
When considering the number of employees, the range among responding businesses was one (1) employee to more than 1000 employees, the average was 10 employees and the mode was two (2). The largest employers were in Manufacturing, Warehouse and Storage, Business Services Sector, and Wholesale Parts.

Figure 1: Number of Employees of Norfolk Businesses



When considering the data by annual sales volume, the range was \$7,729 to \$1 Billion. The average annual sales volume across the sample was \$1,027,753. The median was \$139,547 and the mode was \$70,000.

Figure 2: Annual Sales Volume of Norfolk Businesses

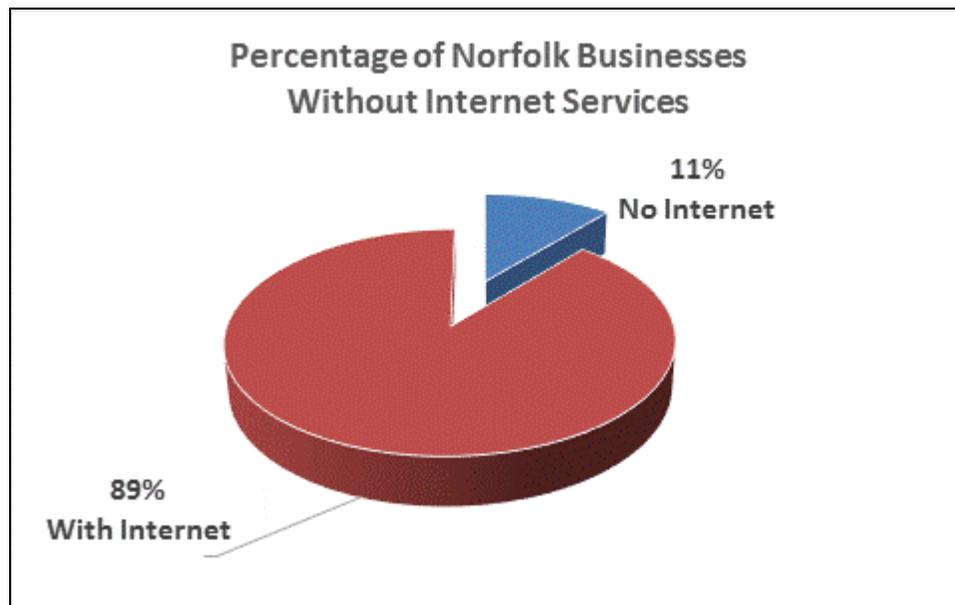


## **KEY FINDINGS**

### **Businesses without High Speed Internet Service**

Of the responding sample, 11% of businesses did not subscribe to the Internet. When considering those by type of business, several were food service and restaurant locations (pizza, bakery, chicken), auto repair, and retail shops (salons, barber shops).<sup>4</sup>

Figure 3: Percentage of Businesses without Internet Service

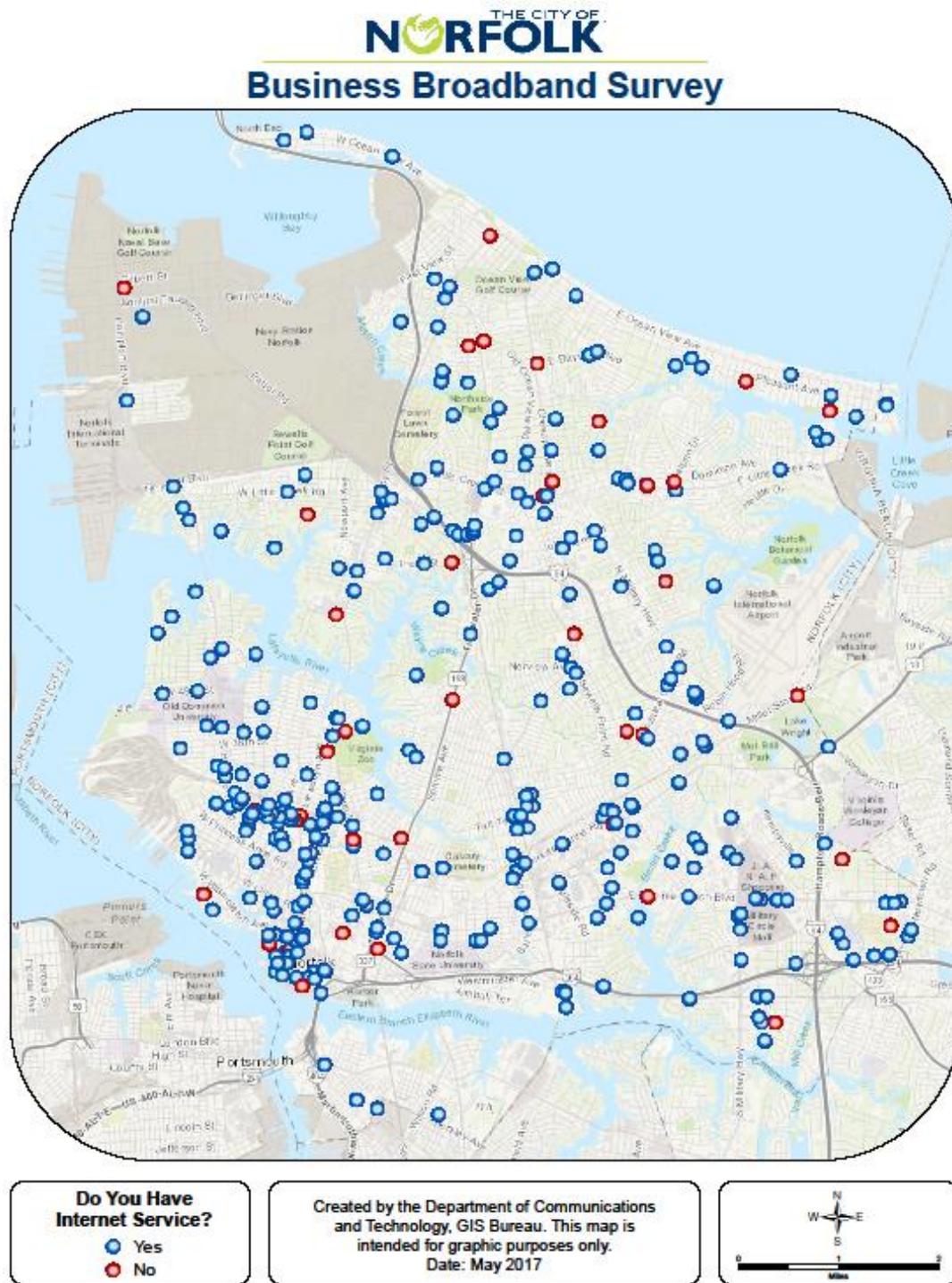


When considering who does not have high speed Internet access, a geographical map illustrates that these businesses are spread out throughout the City, including along major thoroughfares and in the downtown area. It is evident that high-speed internet is available, and so non-adoption is likely based on a perception of value versus cost.

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<sup>4</sup> Exhibit B-5 includes the names of businesses that reported not having Internet service, shown with an asterisk.

Figure 4: Map of Responding Businesses With and Without Internet Service



In explaining why, they didn't have high speed Internet, most indicated it wasn't needed because of the nature of their work (38%) or that another company supports their Internet Service (16%) needs.

Of the 11% of businesses surveyed without Internet service one-fifth (20%/N=9) indicated that they planned to subscribe to an Internet service in the future. Of those, the majority (56%) indicated in the next 3 months. This finding is consistent with the national averages on businesses without broadband service.<sup>5</sup>

### **Businesses with High Speed Internet Service**

The majority of businesses in Norfolk do have high speed Internet service (89%). The primary provider is Cox, supplying 79% of the responding sample with service, and Verizon supplying 14% of responding businesses' broadband services.

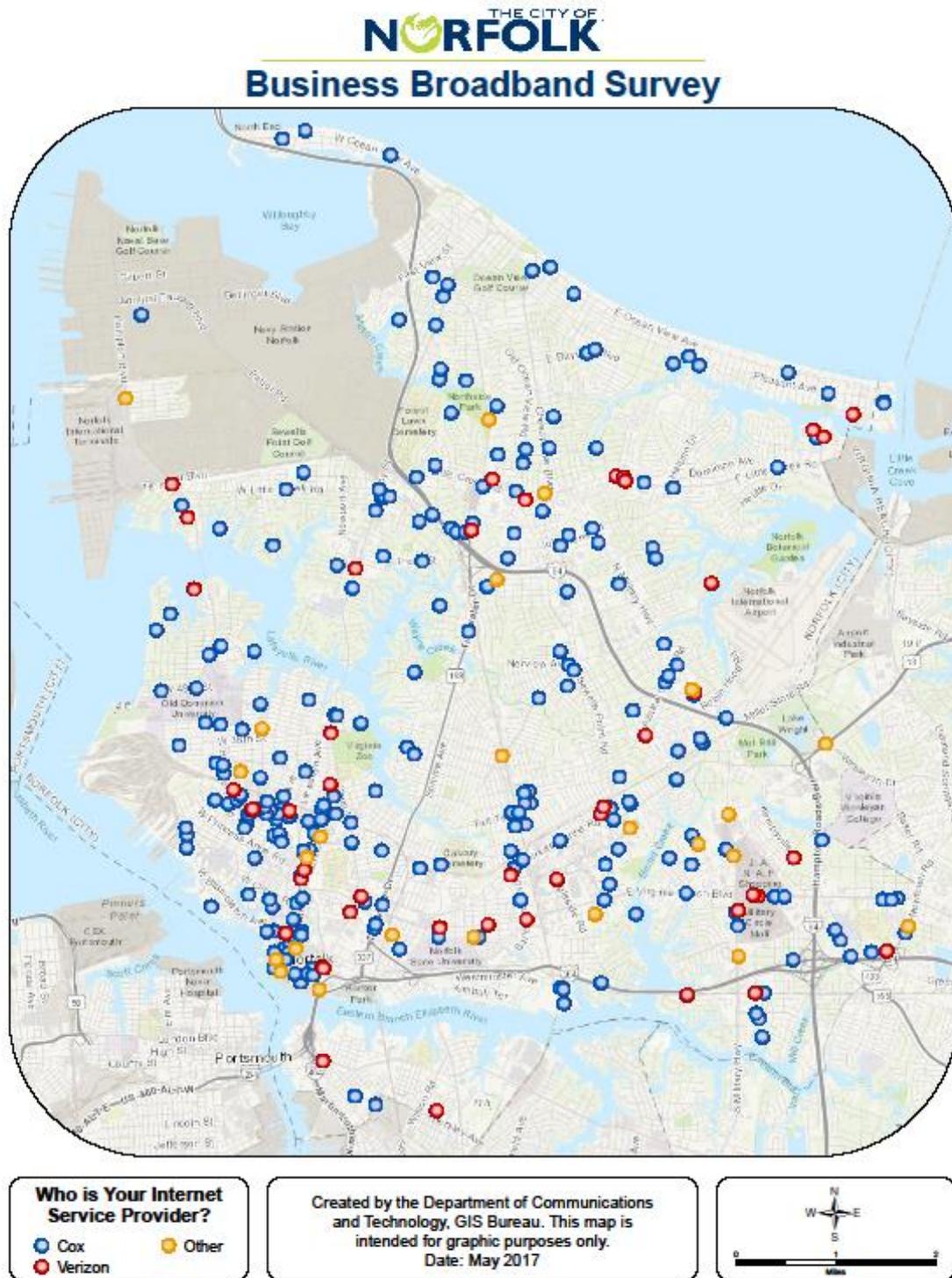
Seven percent (7%) of businesses are using "other" services, such as, AT&T, T-Mobile or XO Communications service.

A spatial map illustrates providers by location in Norfolk. This map provides key insights into where each provider's infrastructure is being used by responding businesses.

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<sup>5</sup> In a recent national study of small business broadband needs by the United States Telecommunications Association, it was found that 12% of small businesses did not have Internet access at their business location. [https://www.ustelecom.org/sites/default/files/documents/UST.BDS\\_Comments\\_June28.2016.fn1.pdf](https://www.ustelecom.org/sites/default/files/documents/UST.BDS_Comments_June28.2016.fn1.pdf). However, a national study of all businesses conducted by the FCC in 2010 found that among all businesses large and small, 95% have Internet access. <http://reboot.fcc.gov/blog/6?entryId=1030540>

Figure 5: Map of Responding Business by Provider and Location in Norfolk



Respondents were asked what type of Internet connection they had. A cable modem supplies almost two-thirds of businesses with their needs (64%). Fiber to the premise supplies 3% of businesses' high-speed Internet access and 13% rely on DSL. Subscription prices vary by bandwidth. Two percent (2%) of Norfolk businesses still have T-1 lines and 10% are using Fixed Wireless.

Table 2: First Response to Question Regarding Type of Internet Connection

Satellite Broadband (700 Kbps)	3%
ISDN (64 to 124 Kbps)	1%
Fiber to the Premises (various speeds usually at 1GB and greater)	3%
DSL (up to 8 Mbps)	13%
Fixed Wireless (1.5 Mbps to 1G)	10%
Cable Modem (up to 100 Mbps)	64%
Mobile Wireless (Aircard) (varies by subscription)	2%
T-1 Lines (24 lines at 1.5 Mbps)	2%
Other	3%
1. "Broadband" (N=3)	
2. Wireless/WiFi (N=1)	
3. Fiber (N=1)	
4. Hotspot (N=1)	
5. Metro e (N=1)	

Figure 6: Type of Internet Connection at Businesses in Norfolk

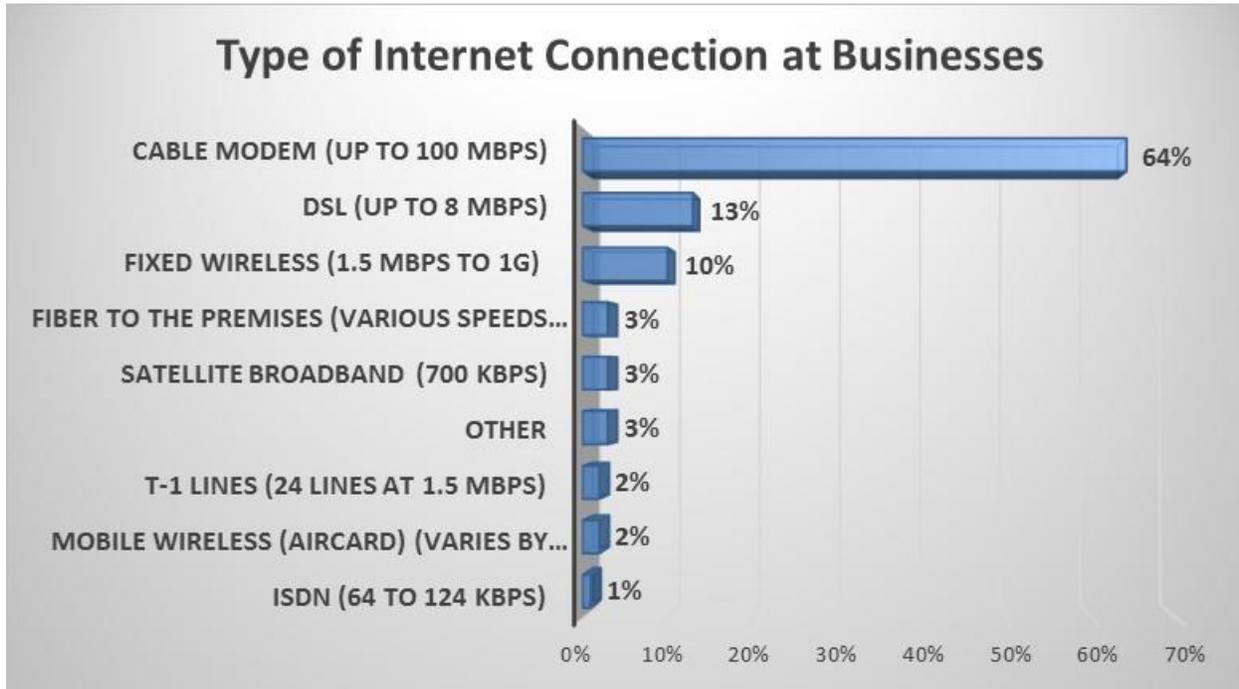


Figure 7: Map of Responding Business With and Without Cable Modem Internet Services in Norfolk

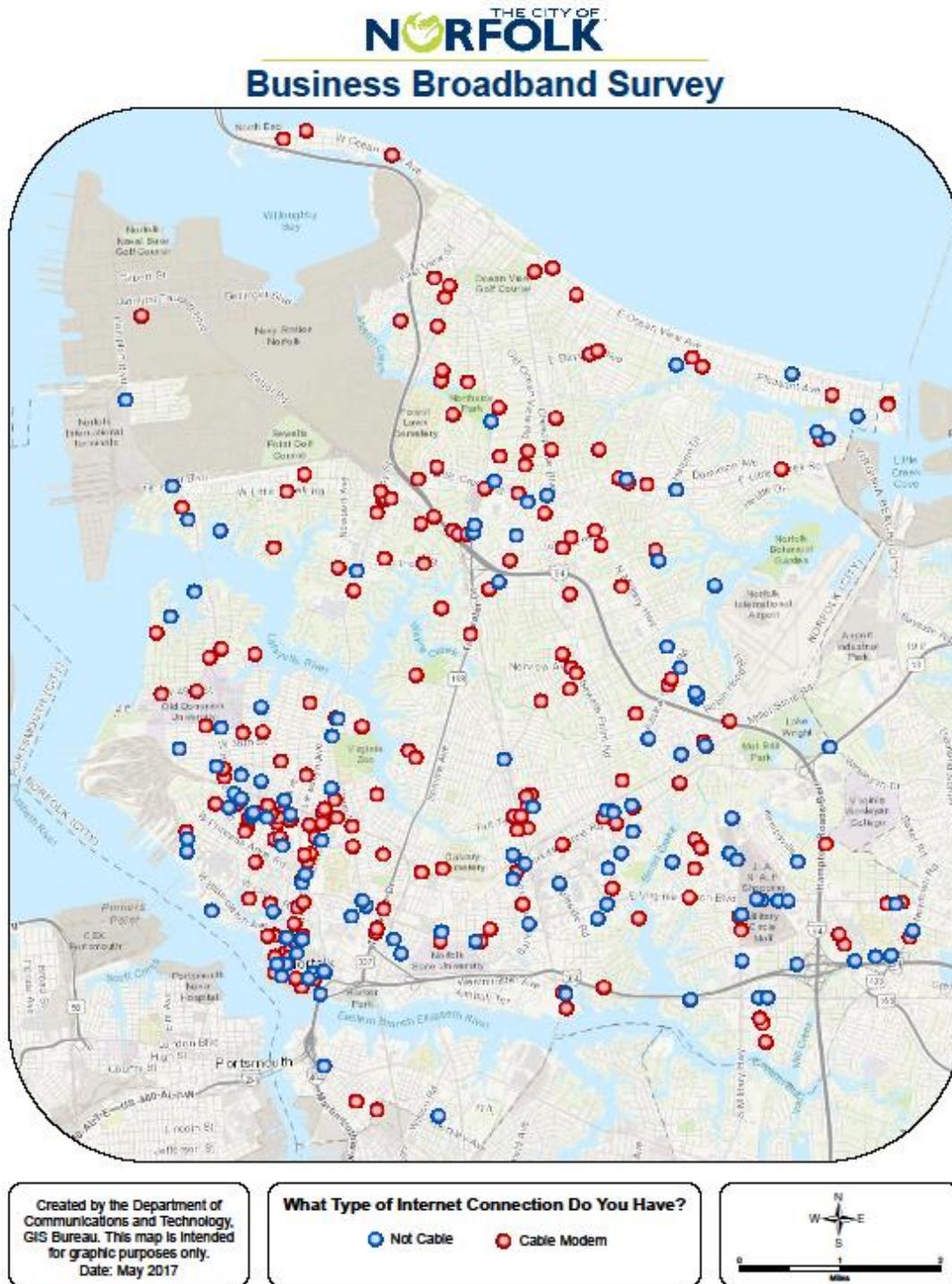
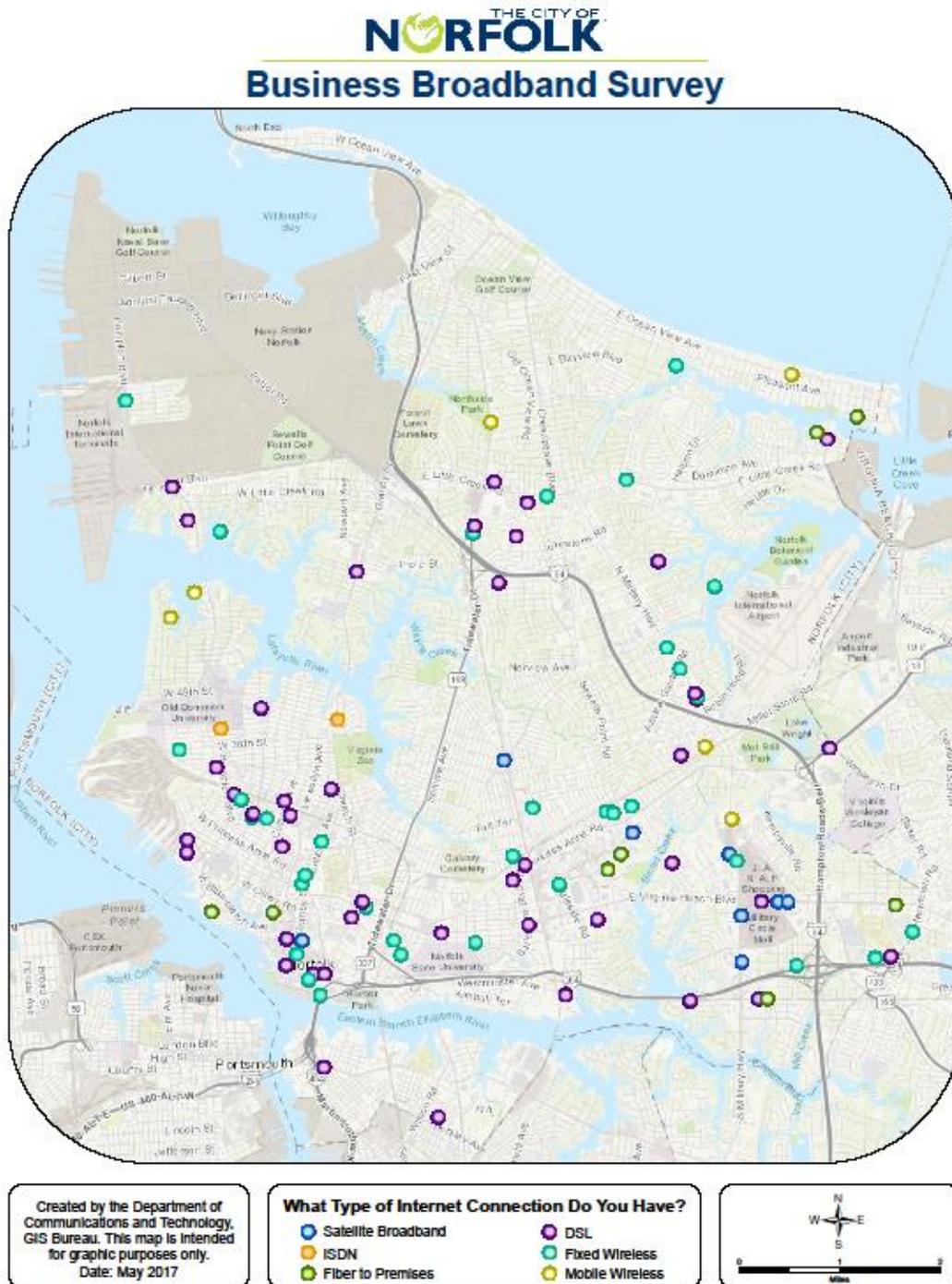


Figure 8: Map of Responding Business by Non-Cable Modem Internet Connections in Norfolk



Businesses were further asked about the speed of their Internet service and the monthly cost of that service. Previous studies find that businesses are often not able to articulate the specific broadband speeds available from their provider.<sup>6</sup>

In an effort to provide the most accurate response to speed and cost, if the respondent were unable to answer the question, the interviewer asked if someone else at the business could and was transferred to that person whenever available. For each type of service, the table below illustrates the responding sample who were able to articulate speed. Businesses utilizing Satellite Broadband, ISDN and DSL connections were the least likely to articulate a specific speed and cost of service. This likely means that businesses that struggle to resource their bandwidth needs are also struggling to understanding the current levels of Internet speeds they have. The range on broadband cost in Norfolk is \$16 per month to \$7,995 per month. The average among businesses ranges from \$84 to \$975.

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<sup>6</sup> Several research projects conducted by CBG over the last five years have found that around one-third of businesses have staff that are able to articulate a speed. This is same finding is echoed in publications to support, particularly small businesses, selection of broadband service. <http://www.business.com/technology/lightning-fast-determine-how-much-internet-speed-your-business-really-needs/>

**Table 3: Respondents Who Could Name their Type of Internet Connection (First Mention<sup>7</sup>), Speed and Monthly Cost**

<b>Type of Internet Connection</b>	<b>Number Responding Yes (N=132/37%)</b>	<b>% of Total Users Responding Yes</b>	<b>What is the speed? <sup>8</sup></b>	<b>How much do you pay each month? (range and median)</b>
Dial-up Line Connection	1	100%	23 Mbps*	Don't Know
Satellite Broadband	3	27%	4-100 Mbps	Range: \$60-\$205 Mean: \$107.25 Median: \$82
ISDN	1	25%	64 Kbps	Don't Know
Fiber to Premises	7	64%	3-100 Mbps	Range: \$100-\$1000 Mean: \$504 Median: \$600
DSL connection	10	21%	8 Mbps-3G*	Range: \$30-\$713 Mean: \$537.66 Median: \$105
Fixed Wireless	17	44%	4 MBps-1G	Range: \$19-7995 Mean: \$614.13 Median: \$115
Cable Modem	81	35%	5 Mbps-5G*	Range: \$0-\$2000 Mean: \$84 Median: \$84
Mobile Wireless	4	57%	4 Mbps-4G LTE	Range: \$120-2500 Mean: \$975 Median: \$305
T-1	4	57%	1 Mbps-20 Mbps	Range: \$0-\$1112 Mean: \$520.67 Median: \$450
Other	4	36%	20 Mbps-1G	Range: \$68-\$350 Mean: \$143.25 Median: \$77.50

Based on the findings of this study, providing businesses with professional development and education related to managing their broadband contracts would likely be of high value, particularly as a small business development tool.

<sup>7</sup> Sixteen businesses (16) reported having two types of Internet connections at their respective businesses.

<sup>8</sup> All speeds are self-reported by the respondents. In the case of those with an asterisk (\*), the type of internet connection reflected is not capable of providing the maximum speed reported.

## The Contract Environment Related to Business Broadband Services

The majority of businesses reported that they had to sign a contract for broadband service (55%). Of those that reported signing a contract, almost three in five reported that the contract term was not for more than 2 years (58%).

When considering the environment around broadband contracts for businesses in Norfolk, one finds that the engagement in contracts by Verizon and Cox customers is similar. Among Verizon subscribers, 65% indicated being in a contract and 54% of Cox subscribers reported being in a contract.

The length of broadband service contracts was reported between 1 and 10 years. The average broadband contract was 2.22 years and the most common response was 2.0 years. Verizon customers reported slightly shorter contract lengths (1.97 years) than Cox subscribers, 2.21 years. Other providers (T-Mobile, AT&T, XO Communications) terms were the longest at 2.88 years.

Table 4: Respondents' in Contracts by Service Provider and Average Length

Broadband Provider	% of Respondents with Current Contract	Average Length of Contract
Verizon	65%	1.97
Cox	54%	2.21
Other	50%	2.88

## Characteristics of Broadband Service and Satisfaction Levels

A series of broadband characteristics was posted to respondents, where the interviewer asked about levels of satisfaction with broadband provider’s performance in each of the areas.

Table 5. Satisfaction with Broadband Characteristics Among Norfolk Businesses

<b>Service Issue</b>	<b>Very Satisfied</b>	<b>Satisfied</b>	<b>Dissatisfied</b>	<b>Very Dissatisfied</b>	<b>Don’t Know/Not Applicable</b>
Cost of broadband/internet/network service	7%	49%	21%	7%	17%
Speed of the on-line connection	23%	58%	13%	5%	1%
Billing practices of your provider.	16%	61%	7%	3%	12%
Reliable access to the Internet.	31%	56%	10%	3%	1%
Ease of use.	31%	62%	5%	1%	1%
Customer Service/Technical Service Representative’s knowledge when you call for service.	23%	52%	9%	5%	12%
Service/Installation technician’s ability.	24%	50%	5%	5%	15%

In this assessment, “cost of internet/network service” receives the most dissatisfaction (28%), followed by the “Speed of the online connection” (18%). “Customer Service Representative’s knowledge” ranked as the third least satisfied area among businesses with 14% dissatisfied.

Figure 9: Map Illustrating Businesses Reporting Dissatisfaction with Internet Speeds



Receiving the highest satisfaction levels among responding businesses were the categories “ease of use” (93% very satisfied or satisfied) followed by “reliability”, 87% (very satisfied or satisfied).

### **Broadband Speed and Throughput Needs in Norfolk**

When testing activity online at each of the businesses, the first three responses to “what applications has your broadband connection supported” were reviewed. E-mail applications drew the largest first response by far at 95%. This was followed by file sharing, Internet telephone, video conferencing, website applications, research, and business to business functions. The reported activity online is a snapshot of the applications driving high speed Internet needs in Norfolk.

Table 6: Business Applications Driving the Need for Business Broadband Capacity in Norfolk

<b>Application**</b>	<b>First Mention (N=355)</b>	<b>Second Mention (N=346)</b>	<b>Third Mention (N=334)</b>
Email	95%	1%	.3%
Videoconferencing	1%	30%	1%
File Sharing/Transfer	1%	33%	25%
Internet telephone	1%	8%	15%
Retail Transactions	.3%	15%	20%
Website Application	1%	5%	23%
Business to business function	1%	3%	4%
Online Education	--	2%	2%
Banking	.3%	2%	4%
Monitoring Functions (Security, Energy)	--	--	1%
Research	1%	1%	4%
Telecommuting	--	--	.3%
Appointments/Scheduling	--	--	1%
Other: Please describe	1%	.3%	1%

\*\*A full listing under the “Other” category is available in Exhibit B-6 (This not only includes the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> mentions above (N=6), but all 14 mentions of “Others” provided by businesses).

E-mail is clearly the first and foremost application driving broadband needs in Norfolk among the responding sample. This is tied to the fact that it is a common application across all business, no matter the size or type of service they provide.

File transfer demands is cited as the most common application driving additional bandwidth capacity in both the second and third responses.

In the second mentioned response, another important application driving bandwidth speeds was videoconferencing. This feature is likely driven by companies with satellite offices and national and global footprints.

In the third mentioned response, other applications driving bandwidth demand are retail transactions and website applications. Internet telephone follows these mentions and suggests a future leading function of bandwidth needs will be driven by the continued integration of voice and data.

Table 7: Top Total Mentioned Business Applications Driving Broadband Speeds in Norfolk

1. E-mail
2. File Sharing/Transfer
3. Retail Transactions
4. Videoconferencing
5. Website Applications
6. Internet Telephone

### **Use and Provision of WiFi**

A series of questions was posed related to provision of WiFi services internally at Norfolk businesses surveyed, as well as provided externally to clients. Three in four (74%) of responding businesses indicated that they provided on site WiFi services to employees within their businesses.

When asked about the speed of the WiFi connection, the majority (75%) could not articulate that speed. Of those that could articulate a speed, there was a range offered (N=45) and several (N=14) also used the number of users to describe speed.

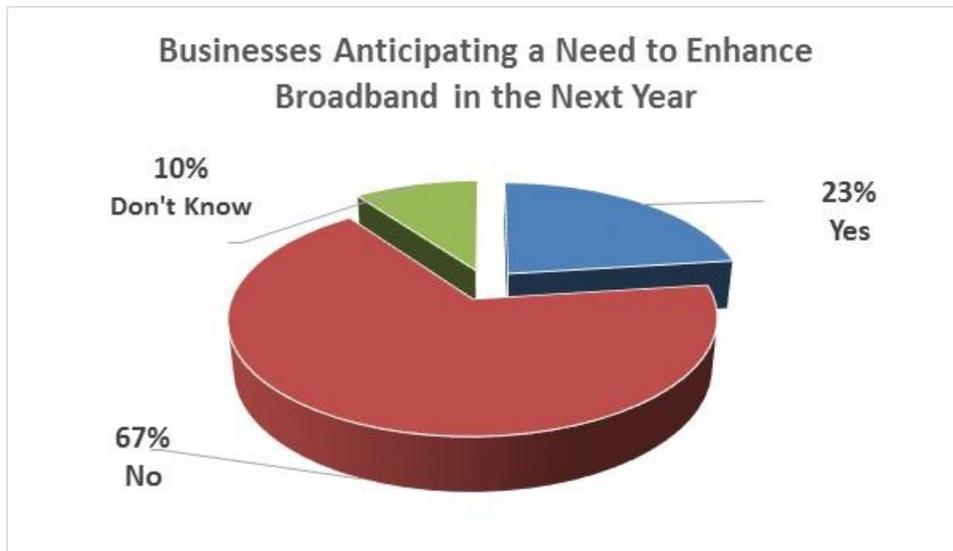
Five percent (5%) of respondents indicated the number of users/employees at their businesses (indicating that the WiFi system served anywhere from 3 to 100 employees). It is evident then, that the use of WiFi is important for internal business operations.

Additionally, one in five (22%) of responding businesses indicated that their WiFi systems supported public or retail clients, such as automobile repair waiting rooms and coffee shops.

### **Need for Increased Capacity**

Nearly 1 in 4 businesses said they will need to increase their bandwidth capacity in the next year (23%). The applications driving additional needs are increased throughput/capacity needs for file sharing, employee growth, and increased needs for video/streaming/conferencing.

Figure 10: Percentage of Businesses Anticipating a Need to Enhance Broadband Access in the Next Year (N=355)



The following map illustrates the locations of businesses in Norfolk that reported they need enhancements to their broadband service within the next year.

Figure 11: Map of Businesses Needing Enhanced Broadband Access in the Next Year



When considering the types of businesses that need enhancements to broadband in the next year, clear demand exists among Norfolk businesses for additional broadband in the Professional/Scientific and Technical Services, Administrative Services, and Health Care Sectors.

Table 8: Top Categories of Businesses Reporting Additional Broadband Enhancements Needed in the Next Year (N=82)

1. Other Services (except Public Administration)	12%
2. Professional/Scientific/and Technical services	12%
3. Administrative/Support/Waste Management/and Remediation Services	10%
4. Retail Trade	6%
5. Health Care and Social Assistance	5%

The applications driving needs among these businesses include growth in business, employee growth, video conferencing/streaming and data/file storage.

When asked how much additional speed they thought they would need (N=82), Thirty-three percent (33%/N=27) weren't sure of the speed/bandwidth needed, followed by 32% that could identify a range from 100 Mbps to 2 Gbps. Those that could not articulate the need in terms of bandwidth (22%), but indicated that they needed "more", "double it", "faster", "more megabits", "more speed", etc.

This finding again demonstrates that there is a significant need in Norfolk to provide local businesses an opportunity for professional development in managing their broadband/high-speed Internet connectivity efficiently and effectively.

For those that did not anticipate additional broadband needs in the coming year (N=238), an additional question was posed about whether they might need additional capacity in the future, and 29%/N=69 indicated needing expanded broadband in the future. When asked how soon in the future the expansion was needed, the most common response was don't know (33%), followed by one to two years (30%), three to five years (25%), more than five years (3%), depends on business needs (4%), depends on changes in technology (3%), and other (1%).

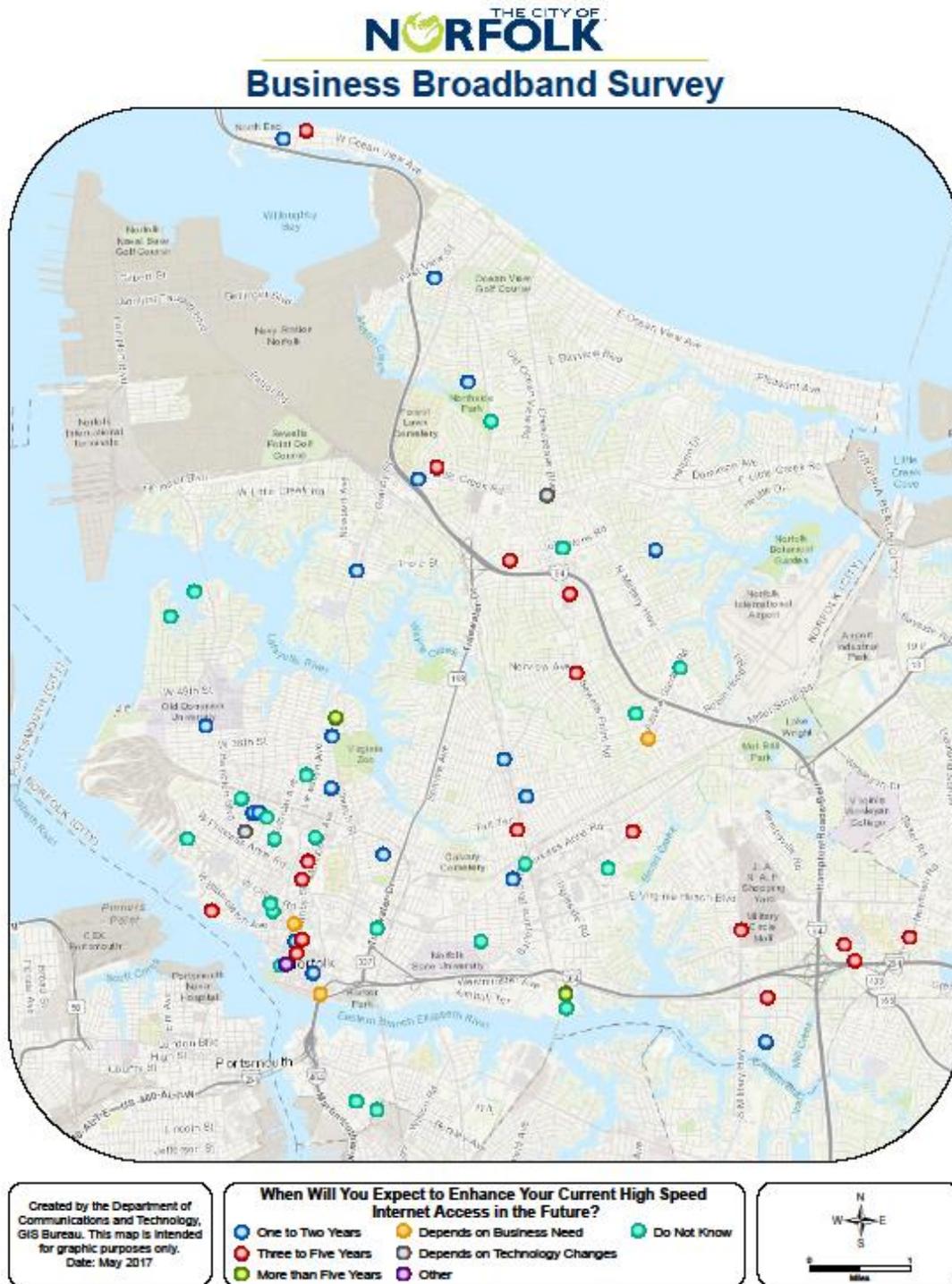
This finding illustrates that beyond the 1 in 4 that need broadband enhancements this year (N=82), the group that anticipates additional bandwidth in the future is also significant, approximately 1 in 5 (19%).

Table 9: Timetable for Enhancement of Current High-Speed Internet Access by those Not Expanding in the Next Year (N=69)

1.	One to two years	30%
2.	Three to five years	25%
3.	More than five years	3%
4.	Depends on business need	4%
5.	Depends on changes in technology	3%
6.	Other	1%
7.	Don't Know	33%

The following map illustrates the locations of businesses in Norfolk that reported they need enhancements to their broadband service not this year, but in the future.

Figure 12: Map of Businesses Needing Enhanced Broadband Access not this Year, but in the Future



## Importance of a Robust Internet Connection Among Norfolk Businesses

Eighty percent (80%) of businesses with Internet service said it was “very important” to day to day operations. Another 10% said it was “important.” **Clearly high-speed Internet service is an essential part of business operations in Norfolk.**

Respondents were also asked if it would be beneficial if the Broadband/High-Speed Internet environment in Norfolk was enhanced for their clients or customers. A substantial majority (74%) indicated that it would be beneficial. These respondents noted a variety of ways in which it would be beneficial concerning their ability to provide services to their clients or customers.

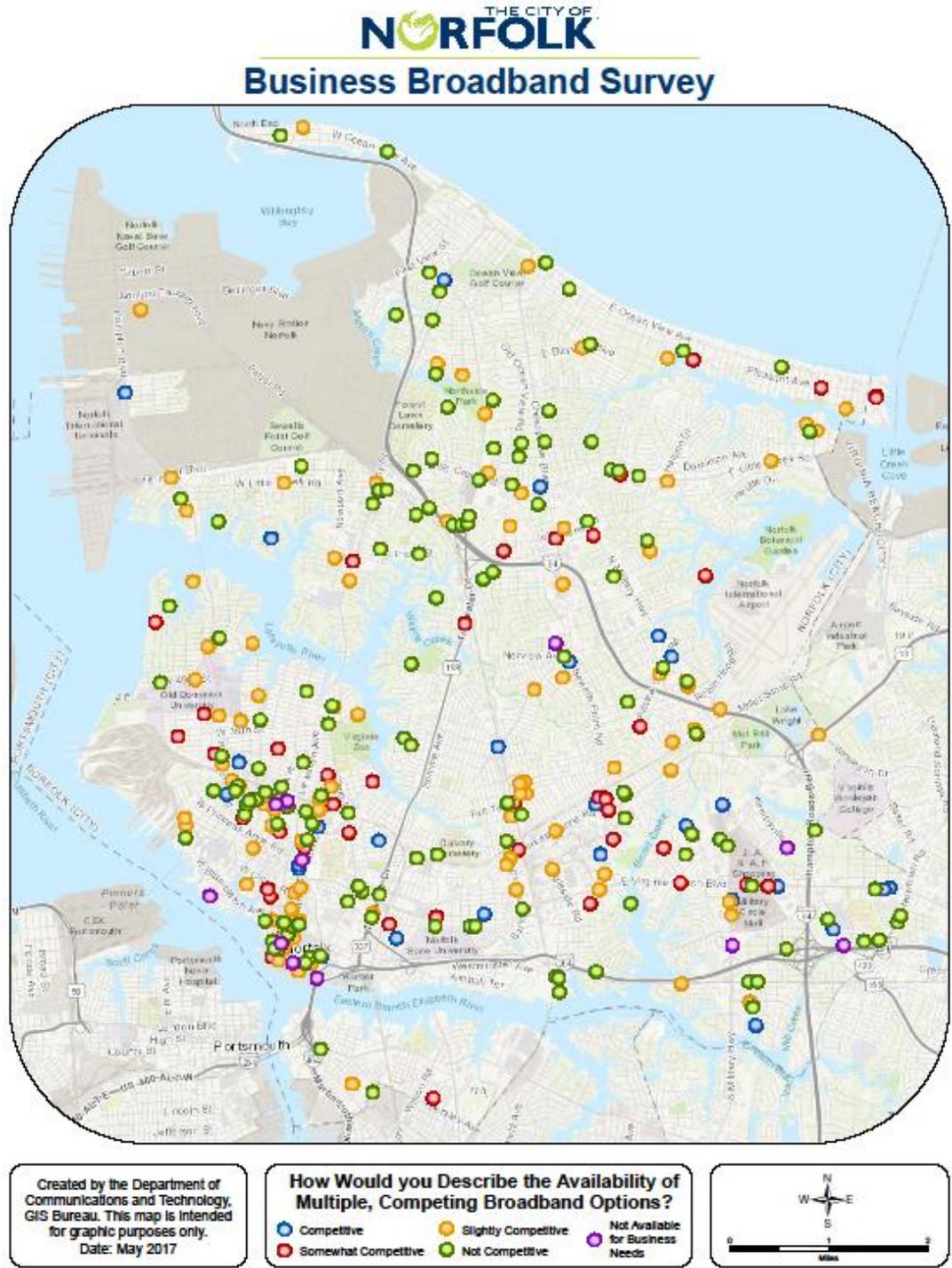
The majority indicated, in both the first and second response, that it would enable them to do business more efficiently. This was followed by, for both the first and second response, that it would enable the provision of services faster with more speed. Other responses included: the ability to access better WiFi service, the facilitation of stronger/better connections to their clients or customers, that it would support good customer service, provide easier file sharing and other benefits.

Businesses were asked how competitive the high-speed Internet sector was in Norfolk and only 10% said it was “Competitive, with several options.” The most common response was “Not Competitive at All, only one provider option” (41%). The next most frequent response was “Only Slightly Competitive, two providers” by 30% of businesses. Clearly, the majority of businesses report that the high-speed Internet access environment in Norfolk is not very competitive.

Table 10: How Competitive is the Norfolk Broadband Provider Marketplace?

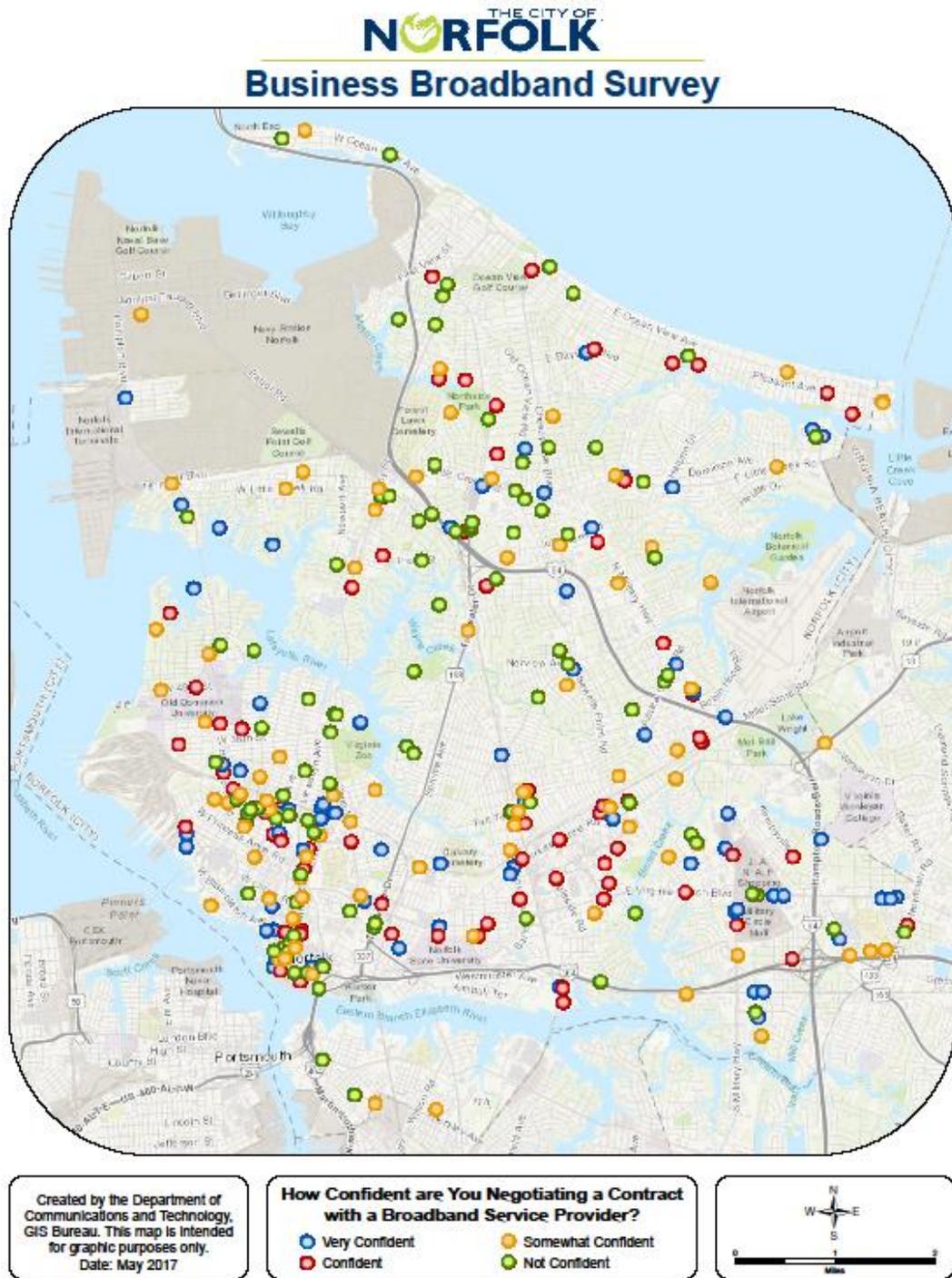
1. Competitive, several options	10%
2. Somewhat Competitive, a handful of options	15%
3. Only Slightly Competitive, two providers	30%
4. Not Competitive at All, only one provider option	41%
5. There is not a broadband option available that is suitable for my business.	3%

Figure 13: Map of How Businesses Describe the Availability of Multiple, Competing Broadband Options



Based on the respondent's characterization of the competitiveness of the marketplace, they were asked how confident they were in their abilities as a business to negotiate a contract with a broadband service provider for the bandwidth/speed that they need, at an acceptable price. The majority (51%) indicated a low confidence level, with the largest response being "not at all confident" at 28%. This indicates, for half the businesses, that the lack of a competitive market place plays heavily on their confidence level that they can achieve affordable, high-speed internet.

Figure 14: Map of How Confident Businesses are in Negotiating a Contract with a Broadband Service Provider in Norfolk



## **Significant Differences Found in Survey Responses Among Businesses in Norfolk**

An effort was made to understand the data set through a deeper analysis of significant trends and variances in the responses. Four questions were further analyzed using a statistical test to determine significant differences.

The first analysis was related to which company provided Internet service. While the majority of responding businesses did not have differences dependent on who their broadband provider was, there are a few that are worth noting.

Cox customers were more likely to report levels of dissatisfaction with cost, as well as to describe the competitiveness of the broadband environment lower. Verizon DSL customers were more likely to report dissatisfaction with Internet speeds and reliability of the service. Those who have opted for “other” providers were more likely to report satisfaction with billing and were more likely to have a greater number of employees.

The second analysis was related to the type of business by NAICS code. Five tested areas had significant differences by type of businesses: cost, reliability, how important broadband availability is to the business, competitive landscape in broadband offerings and the number of employees a business reported.

Business categories reporting lower satisfactions with cost were more likely to be from construction, healthcare, and retail. These businesses also were more likely to have less than 50 employees.

Business categories more likely to report lower satisfaction with reliability were largely from the supply/chain, scientific research and construction arenas.

Business categories more likely to rate availability of broadband in Norfolk as more important included construction, manufacturing, retail, supply/chain, information services, real estate, education and healthcare.

Business categories more likely to report concerns with the competitiveness within the Norfolk broadband marketplace included construction, manufacturing, retail, and scientific/research.

The third analysis was related to the annual sales volume of businesses. This characteristic had two significant differences in the responses. Those businesses with lower annual revenues were more likely to report dissatisfaction with billing practices and those with greater annual revenues were more likely report that robust broadband availability in Norfolk was very important to day-to-day operations of their businesses.

The fourth analysis was related to the number of employees reported. This analysis was found to be the most discriminating among those tested. In other words, the size of a business is a critical factor in the how the broadband environment in Norfolk is experienced. Businesses in Norfolk with fewer employees are more likely to be dissatisfied than larger businesses with cost, speed,

billing practices, reliability of the service and ease of use. At the same time, they are less likely to report a competitive broadband market and confidence in their ability to negotiate a contract effectively.

### **Final Open-Ended Comments Made in Survey**

In a final question, respondents were offered an opportunity to make open-ended comments. The majority opted not to do so (70%). Those commenting, 1 in 3 responding businesses, had a variety of observations, with the most frequent one being the desire for more competition (49%). This was followed by 12% of respondents indicating they wanted Verizon FiOS, Other (7%) and 6% indicating the newest/fastest technology was not available to them.

Table 11: Summary of Open Ended Comments Made by Businesses at the Close of the Survey

#### First Response Top 10 (N=125)

1. Need more options/competition in the City	49%
2. Wish had Verizon FiOS	12%
3. Other	7%
4. Newest/fastest technology not available	6%
5. Should be available everywhere	6%
6. Too expensive	5%
7. Want Google Fiber	4%
8. Happy with Broadband access	3%
9. Unhappy with Cox	3%
10. Want Hot Spots in the City	2%
11. Don't Know	2%

### III. Second ConnectNorfolk Working Group Meeting

On April 20, 2017, the 2<sup>nd</sup> meeting of the ConnectNorfolk Working Group was held. The purpose of the meeting was to provide an update on the status of Norfolk's fiber optic I-Net backbone development project; review the results of the Business Broadband Survey; and hear examples of other technologies being employed, as well as other projects under development, within the State of Virginia. This was followed by a discussion of next steps for the Group.

At the meeting, opening comments were made by the new (since the previous meeting in 2016) Norfolk City Manager concerning some of the progress that the City has made overall, as well as the Administration's continuing vision of for the ConnectNorfolk Working Group. Key comments made by the City Manager included:

- The work of the ConnectNorfolk Group was consistent with the City's focus on ensuring that the Norfolk community remains creative, collaborative and connected;
- The City has real financial challenges that has created a technology backlog and the City was looking at effective ways to approach this backlog; and
- The City has a commitment to transparency in providing open data, which recently contributed to Norfolk being named as a "What Works City".

Next, the Chief Information Office (CIO) of Norfolk made a presentation (Attached as Exhibit B-7) concerning technological and communications-related developments and progress within Norfolk since the 2016 ConnectNorfolk Working Group meeting. Highlights of the CIO presentation included:

- The City continues to move forward with others in the region on various projects with the ultimate goal of providing uniform access to ultra-high-speed broadband at a competitive price point.
- The City anticipates completing and activating its Citywide fiber optic ring backbone before the end of 2017.
- Norfolk's I-Net now connects to the Virginia Beach I-Net which will allow connect between regional college campuses as well as connection points to the Virginia Beach Trans-Oceanic Landing Point Project.
- Norfolk continues to work with provider partners.
- Norfolk continues its outreach efforts to residents concerning its technological progress.
- Norfolk continues to support Smart City initiatives, such as the installation of Smart Meters downtown.

- The City is committed to the expansion of wireless technologies and is continuing to pursue ways to attract 5G investment.
- Norfolk is refreshing the Norfolk.gov website and developing a mobile app.

The CIO's PowerPoint presentation is attached as Exhibit B-9.

In a discussion that occurred both during and following the CIO's presentation with ConnectNorfolk Working Group members, key areas discussed included:

- The more user-friendly website is anticipated to launch in August, 2017.
- The City will provide educational opportunities for non-tech savvy residents regarding access to open data.
- While the City is working with others in the region to attract investment to the entire region, it was noted that for some providers and technologies there are more attractive factors concerning Norfolk's demographics (i.e., as a higher density, urban environment) and these individual market characteristics should be focused on as well.
- The group also discussed how to best market the City and discussed this as a potential focus for a smaller subgroup of the current ConnectNorfolk Working Group.

The next presentation was made by CBG, concerning the results of the Business Broadband Study which is described in detail above (See also Exhibits B-4 through B-7).

The Key takeaways for the ConnectNorfolk Working Group concerning the results of the study included that ConnectNorfolk could well serve the City's businesses and their broadband related needs by:

- Helping develop education and training related to Broadband, especially for small businesses.
- Serving as an independent clearinghouse for Broadband provider and application information for all Norfolk businesses.
- Developing ideas for aggregating business demand.
- Continuing to help spur competition in the Norfolk broadband marketplace.

A discussion that occurred both during and after CBG's presentation included opinions expressed by group members that:

- 5G could meet business needs by targeting areas where businesses feel underserved and over-priced.
  - 5G should also be a regional priority.
- The City also needs to understand what new businesses they are not attracting based on the current broadband climate. This discussion included group participants indicating that:
  - If you are not retaining certain types of businesses because of a lack of broadband, you are certainly not attracting those same types of businesses, and
  - Where industries are thriving in comparable cities that have a more robust broadband environment, but those types of business aren't in Norfolk, then you can reasonably determine that the City would need a more robust broadband environment to attract those businesses.
- Fiber that is coming into the Mid-Atlantic hub will give Norfolk some fresh capabilities for expanding the broadband market.
- The City needs clearly stated objectives of how it wants to proceed forward, and what support it is willing to give to meeting those objectives in order to attract more broadband investment.

Another presentation was made by the Broadband Program Administrator for the Center for Innovative Technology (CIT), a State Chartered quasi-governmental group that focuses on promoting the development and access to technologies across the State.

The Administrator's presentation focused on several elements, including:

- Because of the underserved and unserved nature of rural areas, there's typically a greater focus on these areas.
- The State has not defined what "Broadband" means to it, so the State basically just defines different speed capabilities per census block.
  - Accordingly, it will be important for Norfolk to determine how it defines "Broadband"
- The CIT has a demand aggregational tool and other educational tools that it can provide to the City and the business community in pursuing some of the objectives discussed earlier.
- The CIT will review markets across the State and perform Needs Assessments, but then leaves it to the locality to determine how best to meet the needs. It will be important for Norfolk to consider a variety of different types of new and emerging technologies including:

- millimeter-wave fixed wireless technology
- low earth orbital satellites (LEOS)
- Television white space
- The Virginia Beach next generation network, a middle-mile open access network, as well as the Ashburn Virginia Smart City Gramercy District project would be good models to replicate in Norfolk.

A number of discussion points came up during and after the CIT's presentation. These included:

- There is a potential GO VA project that could be developed that needs to include anchor institutions from across the region.
- A Regional Tech Council would be helpful in solidifying regional objectives as well as attracting broadband investment and private providers.
- It was discussed that the CIT wants to convene a meeting of potential Smart Cities to explore replication of the Ashburn, Virginia project.
- Group participants indicated that broadband needs to be seen as a utility, because it is a foundational driver of economic development.
- It was discussed that it will be important for the elected official level and the City administration to have a full commitment for the initiatives suggested and proposed by ConnectNorfolk in order for those to gain traction.

After the CIT's presentation, there was a discussion on next steps for the group. The key next step is for group members to express their interests in smaller subgroups and then these subgroups would be implemented to carry various tasks forward. It was also discussed that it would be helpful to develop a Summit with various regional groups that are also pursuing broadband expansion to share ideas and collaborate on initiatives.

### **III. Needs of City Agencies related to External Stakeholders**

As discussed further below related to City agencies, organizations, departments and divisions concerning their internal networking requirements, responses to the City of Norfolk Departmental Broadband Questionnaire in late August and September of 2016, also reviewed the needs of City entities concerning the provision of their services to external entities such as residents, businesses, nonprofit organizations and other client and customer entities.

A wide range of City Departments responded, including: public safety entities such as Police and Fire; internal agencies such as General Services, Finance and Budget and Strategic Planning; those that deal largely with members of the public such as Human Services and Recreation, Parks and Open Space; service agencies such as Utilities; those that deal with nonprofits and individual members of the public such as the Norfolk Community Services Board and the

Cultural Facilities Arts and Entertainment Agency; and those that deal with the members of the public and businesses such as Planning.

Regarding the services these entities provide to the public, all of them indicated that high-speed access to the Internet was integral to their ability to successfully deliver services to the public. Agencies then noted that such access allows their department “to stay connected with the public”, “to provide access to job postings and to process applications”, to support departmental efforts “to provide services to customers/citizens”, to gain “rapid and efficient access to websites and data”, to gain access to cloud-based software products for use in their work for the public, to perform work in the field for citizens, to support portable and mobile services throughout the City in order to respond to citizen needs and incidents, and to maintain “a high level of transparency”.

Regarding access to portable and mobile technologies for service delivery purposes, nearly all respondents thought it was very important, with the rest saying that it was important. Agencies indicated that this level of importance is due to portable and mobile technologies ensuring “better and more efficient customer service”; providing “improved services at lower cost”; facilitating the “need for communication and efficient input of data in the field”; and the fact that services are performed throughout the City and access to technology is needed throughout the City, such that you can “work securely from anywhere, on any device with just an Internet connection”.

When asked what technologies and applications were most needed by Norfolk residents and businesses to help further their department’s ability to provide necessary services, again high-speed access to the Internet was number one, with over 84% of respondents indicating that it was necessary. Reasons given for the criticality of such access was that it will provide more “ease of access to City services for ... citizens”; it allows for “transparent access to information and data”; it is “an efficient means to provide information to/from our customers/citizens versus mailings and allows 24/7 access”; it enables access to a host of data that the City provides including property information, building permit data, site plan reviews, planning applications, applying “for public assistance using the Commonwealth’s ‘Common Help’ web application”; connecting citizens “with services provided by our community partners”; and “communicating with patrons of the arts”.

Departments were asked what they believed the barriers were to residents and businesses accessing technologies and applications that would better help them receive and access City services. They indicated the number one barrier was cost, followed by technical issues and that residents and businesses lack the necessary hardware and software, and that they need training. When asked why they believed that these were issues, agencies indicated that “for many of our citizens, high-speed Internet is simply a luxury they can’t afford”; residents do not have computers; there are “varying degrees of computer literacy/knowledge;” and there are economic barriers to residents/businesses accessing technologies/applications.

Agencies overwhelmingly (77%) believe that it is very important to have universal availability of these technologies and applications for both their departments and City residents in the future. They indicate that more and more information and communication will incur online and so the ability to have sufficient online access will be critical. Agencies indicate that it “should be the

primary line of communication with customers” and this will both enhance the ability to communicate and help keep costs in check. It also puts tools in the hands of citizens so that they have more efficient access to information they need. Others indicate that “the public has come to expect these services as a daily part of their lives”, and still others indicate that it supports the “transparency of services” and helps improve community relations and engagement.

All respondents indicated that access to these communications technologies and applications will be very important for workforce and economic development for City employees as well as for the entirety of the Norfolk workforce. It helps increase user productivity and helps support more efficient operations. One respondent indicated “today, the availability of broadband communications is equal to the availability of knowledge.”

Agencies were also asked what emerging/new communications technologies and applications will be critical to the ability to deliver services to the public in the future. They indicated technologies and applications such as: more automation; more and enhanced wireless communications; greater use of personal/portable devices; the “ability to videoconference from your desktop”; “augmented reality mobile platforms”; more interactive experiences; GIS-enabled service request applications; more on-demand video tutorials; more access to big data, open source software and cloud-based solutions; and “better ways to connect with community partners through secure information technology”.

Respondents were also asked what additional community, business and government partners they envision they will need to connect with in the future. Responses included: “targeted messages to citizens who may be impacted by a project/emergency work”; “additional ways to get more people involved in community meetings such as online meetings/real time polling”; more federal partners related to Affordable Care; “integrating systems where possible with their partners” in order to lead to significant improvement in communications and operation efficiency; and continuing to support a “global reach”.

Near the end of the Survey, respondents were asked to indicate their ideal broadband communications technology and application environment for the department and the public they serve within the next 10 years. Agencies indicated that there needed to be the ability to continue to increase speed, capacity and portability; employ more automation, geographic information systems access and videoconferencing; have database systems that employees and the public can access from any device, indicating that “employees should not be tied to a desk to access/share information”; provision of high-speed Internet access in all of the community centers and public WiFi access in all recreation centers and parks; and development of “a communications environment that supports privacy of confidential information, but also provides seamless service to internal and external customers”.

## **SECTION C**

### **INSTITUTIONAL NETWORK REVIEW AND NEEDS ASSESSMENT**

## **INSTITUTIONAL NETWORK REVIEW AND NEEDS ASSESSMENT**

### **INTRODUCTION**

The report section that follows is focused on the Institutional Network (I-Net) Needs Assessment and encompasses findings on the third task “Use of the I-Net”, and portions of all of the other task categories. The I-Net is broadly defined as that network which currently provides internal communications connectivity for City agencies, departments, and allied organizations. It is currently connected to approximately 150 facilities.

### **FINDINGS**

#### **Network Overview**

A large part of the makeup of the I-Net is currently Cox Cable Communications’ (Cox) managed service connections, hereafter called “Cox I-Net”. These Cox managed services reflect a variety of different communications connections and connection speeds – everything from Cox cable modem connections to Cox FTTP (Fiber to the Premises) connections which carry up to gigabit speed communications traffic. There is a total of 98 of these connections which are delineated and explained further below.

Over time, the City has been developing its own, especially fiber optic, connectivity in partnership between various City and State agencies and fiber optic network companies separate from Cox. A central focus as further explained below, is to complete development of a fiber optic ring that circumnavigates the City to provide a broad backbone for City communications, and the first phase of development is under way. The City backbone is slated to be completed by November 2017. The City will then review its options for establishing other connections, especially for communications corridors with high capacity needs, as well as connections to implement municipal Wi-Fi provision and high capacity connections to critical agencies. Currently, the City has its own fiber based connections to nearly 50 sites (herein after called, “City I-Net”).

The Findings that follow discuss the use and integration of the existing Cox and City I-Nets and the needs for the future I-Net, as it integrates into the City’s overall plan to expand broadband communications for City government, allied entities (such as educational and medical institutions) and the residential and business community.

#### **Existing Institutional Network**

The City’s overall Wide Area Network (WAN) is comprised of a variety of different types of Institutional Network and other connections. It includes 12 sites connected utilizing an OC-192 SONET ring (10 Gbps in bandwidth) as the backbone for the network. This ring is subdivided into multiple rings with 1 Gb per ring. Most sites have one ring, some have 2 and three sites have 3 rings. This enables, on the backbone, a highly redundant, fault tolerant transport architecture, ensuring a high reliability for backbone communications. The backbone sites are

listed in Exhibit A of the Commercial Services Agreement (CSA) between Cox Communications Hampton Roads, LLC and Cox Virginia Telecom, Inc. and the City, dated July 31, 2005.

The ring sites are then connected to a variety of remote sites via various types of connections. Those that are considered Cox I-Net sites are covered by the CSA as well as Amendments 1, 2, 3, 4 and 5 to the CSA. They are both fiber optic star connections out of the Cox central office/headend on Village Avenue and hybrid fiber coaxial (HFC)-based connections utilizing cable modem DOCSIS services.

Specifically, the leased Cox fiber circuits are provided to 60 sites which include:

- Multipurpose centers
- Large recreation centers
- Wellness Centers
- Two Department of Human Services (DHS) locations
- Community Services Board (CSB) Treatment offices
- Animal Protection
- Juvenile Detention Center
- K9/Pistol Range
- Multiple Fire Stations
- Western Branch Pump Station
- Multiple Branch Libraries

The leased Cox cable modem circuits are provided to 38 sites which include:

- Small recreation centers
- Aquatic centers
- Community Resource Centers
- City Cemeteries
- CSB Community Homes
- Second Chance Homes
- Storm water pump stations

Together, the current backbone connections, leased Cox fiber circuits and the leased Cox cable modem circuits make up the Cox I-Net as defined in Section 6.05 of the Cable Franchise Agreement between the City and Cox, as well as the CSA and its amendments. Beyond the Cox I-Net, the City's wide area network includes the City-owned fiber cable I-Net, as well as a variety of wireless communications, including both public safety communications and SCADA monitoring and control sites. The City owned fiber cable largely fans out in a star configuration from two locations: The Granby Municipal building, and the City Hall data center. Those sites connected by City fiber from the Granby Municipal building include:

- Slover Memorial Library
- Seldon Arcade
- Downtown Parking Garages

- Parking Administrative Offices
- Norfolk Police Department Administrative Offices
- Norfolk Fire and Rescue Administrative Offices
- Recreation, Parks and Open Spaces (RPOS) Administrative Offices
- SCOPE
- Chrysler Hall
- Department of Human Services (DHS) Main Office
- MacArthur Center
- MacArthur Foundation
- MacArthur Memorial
- Nauticus
- Halfmoon Cruise Terminal
- The Battleship Wisconsin
- Storm Water Pump Station #1
- Criminal Justice Services
- General Services Offices
- Convention Visitors Bureau
- Development Department (at the BB&T Building)
- Waterside
- Waterside Garage and Administrative offices

Those City-owned fiber sites whose connections star out from the City Hall data center include the following:

- Central Energy Plant
- Print Shop
- New Courts Building
- School Board Building
- Public Safety Building
- Norfolk Jail/Sheriff's Office
- Boxing Center
- City Hall Garages
- Commercial Place Garage
- HR Training
- Amtrak station
- Fire Station #1
- Fire Station Supply Center
- Smart Traffic Center
- A variety of Traffic Signals (using their own, separate Layer 2 network)

As specified in the CSA amendments, the Cox I-Net fiber based connections are provisioned anywhere from 1.5 Mbps to 10 Mbps, and the cable modem connections are business class connections which are guaranteed to provide at least a 1 Mbps symmetrical transfer rate. The City I-Net connections are all provisioned at up to 1 Gbps.

## **I-Net Users' Experience and Applications**

Multiple discussions were held with Communications and Technology Department networking personnel and an internal Governmental Departmental Broadband Network questionnaire was developed for key user agencies. Specifically, 12 agencies responded, including:

- Office of Budget and Strategic Planning
- Finance Office
- Police Department
- Department of Utilities
- Planning and Community Development Office
- General Services Agency
- Fire and Rescue Department
- Norfolk Community Services Board
- Department of Human Services
- Cultural Facilities, Arts and Entertainment Office
- Department of Recreation, Parks and Open Spaces
- Department of Human Resources

The results of those discussions and analysis of the questionnaire responses indicate the following: Overall. The I-Nets and the rest of the City's WAN facilitate a wealth of data communications applications over the network. This includes multiple cloud-based and hosted data applications. Specific uses include email, financial management, backup data storage, behavior health management, commonwealth attorney case management, city attorney case management, facilities maintenance, police in-car camera and body camera systems, access to Pictometry online for aerial oblique image capture, access to the internet and provision of the City's internet and intranet web sites. For both internal administrative operations and provision of external services, high speed access to the internet was indicated by 100% of agency respondents as being relied upon to provide necessary support services for staff, as well as to deliver services successfully to the public. For administrative operations, the top uses of the network were for accessing both office (word processing, spreadsheet, etc.) applications as well as remote access to databases. This was followed by access to graphics and GIS mapping applications.

Regarding services to the public, the order of application use was similar, with all applications listed achieving nearly 2/3 or greater criticality to the agencies overall.

It is important to note that most of the agencies indicated that a crucial broadband communications technology and application needed by Norfolk residents and businesses to help further their departments' ability to provide necessary services, was high speed access to the internet, indicated by over 84% of respondents.

Additionally, over 3/4 of respondents said it was very important for the broadband communications technologies and applications listed to be universally available to their departments and City residents in the future, in order to provide necessary, high quality services.

Regarding system reliability and the ability of the network to facilitate the operations of the critical communications technology and applications noted by agencies, most entities indicate that the network has had “sold reliability”, with both the system and access to it rarely being down. Issues that were noted included: slowdowns in the network, including “poor speed and capacity at peak hours”; network latency; “significant slowdowns at lunch time and the end of the work day”, and similar issues. General Services noted that the inability to live stream “presents an ongoing challenge”. In fact, the biggest complaint for all agencies was rooted in having insufficient capacity, including the inability to access certain applications, inability to use certain applications because of insufficient capacity, and the need to upgrade equipment and add more storage space.

Both the staff of the Communications and Technology Department and key City agencies had much to say as to what should occur related to the future network and this is discussed in the next section.

### **The City’s Future I-Net Needs**

The City has been actively working to build out its own fiber ring which will replace the current backbone infrastructure that was designed and installed in 2005. This project is anticipated to be completed by November 2017, will replace all of the current core sites, add new larger capacity switches at these sites and will replace the leased fiber on the ring from Cox. It will move from a SONET Ring architecture to a true gigabit Ethernet architecture with fault tolerant, dual redundancy. At this writing, the project, which is being conducted in conjunction with the Department of Public Works, Virginia Department of Transportation (VDOT) and a variety of network providers Networks, is both a public and private partnership. It is about half completed at this time. The new nodes and the increased network capacity will position the City to expand high capacity reach of its I-Net and WAN, and potentially allow expansion of the network into locations that are not currently served by fiber optic infrastructure, as well as further replace leased lines over time.

The City, however, will need to maintain a variety of Cox or other leased connections, and expand those connections, for at least the near term, until it has the capital resources to continue to expand infrastructure that it owns and/or controls. As noted by Communications and Technology staff and other Norfolk agencies, the key needs that must be met in both the near and longer term, by the evolving I-Nets and the WAN include the following:

- **More Mobility** -- In the Government Departmental Broadband questionnaire, more than 3/4 of respondents indicated that it was Very Important to be able to access portable and mobile technology for administrative operations. Nearly all of the remainder said that it was Important. Similarly, these same agencies said it was Very Important or Important for their agencies to have access to portable and mobile technologies for service delivery purposes. While this need places a significant focus on the use of wireless communications to provide network services to these portable and mobile technologies, the primary backhaul for the

wireless technologies is most likely going to be high capacity fiber optic connections from towers and other receive sites.

Specifically, these high capacity backhaul connections will be needed along the main backbone ring as well as along major pathways out from ring nodes into central administrative locations, such as the Police Department headquarters and to tower and antenna sites throughout the City. They will support a variety of wireless distribution systems for mobile and portable applications.

For example, when considering the new technologies and applications that departments anticipate will be critical to their administrative operations in the future, the Police Department noted in their response in the questionnaire that many of their vendors are “abandoning hardware dependent resources in favor of Wi-Fi enabled capabilities. For example, several in-car camera systems under review rely heavily on wireless routers to handle the video ingestion process. Transitioning to wireless capability will allow the department... to utilize emerging technologies.” As part of this, the Police Department is looking for more wireless hotspots at City building locations. Similarly, the Department of Finance is looking for enterprise mobile application services to facilitate operations. General Services indicates that its highest future application need is the use of mobile applications, and the Norfolk Community Services Board indicated that it needed “Better computer connectivity through wireless data networks”.

Overall, the improvement that received the most responses in the departmental questionnaire was “More Mobility”, with 92% of respondents indicating that this type of improvement was needed to the City’s Network over the next two to three years.

- **Greater Capacity** -- Greater Capacity was the second most popular response category at 85%, indicating that improvements were needed in capacity to the City’s Network over the next two to three years. This is needed to enable faster connections, handle larger and larger map and image files, and replace current application suites, which will provide better business processes and greater availability of information, but also require more network capacity. Additionally, more video will be needed, including streaming and video conferencing in both the near and longer term. More robust connectivity for both mobile and stationary users is going to be needed for more personnel to access “big data”, including graphic intensive data, electronic health records, and as yet unknown applications.

For the I-Nets and the rest of the WAN, this means expanding the capacity in both the backbone and all lateral connections from the nodes, as well as expanding the capacity of switches and storage systems.

For the City’s evolving backbone and its own fiber infrastructure, while this may mean swapping out switches in some cases, in many cases it only requires

changing out cards in existing chassis (for example going from 10 Mbps to 100 Mbps or even 1 Gbps on lateral connections).

For leased I-Net connections from Cox, this could mean a considerable increase in cost of hundreds of dollars per month per connection. Additional detail on the impact of meeting this need through leased lines, rather than City owned infrastructure, is described further below.

- **Faster Speeds --** In tandem with Greater Capacity, 69% of respondents indicated that improvements in enabling faster speeds of connection are needed to the City's Network over the next two to three years, especially when applications go from internally, to externally hosted. For example, many respondents noted that the services they need are migrating to cloud-based technologies. This included the Finance Office that indicated that "Cloud-based technologies are countless". Similarly, the Office of Planning and Community Development indicated that they needed "continued use of cloud storage" and were also increasing cloud/digital file management because it "decreases costs and increases efficiency and organization". The Fire and Rescue Department indicated that it was increasingly moving to cloud reporting. Human Services also noted the need for more "cloud-based solutions". All of this, because it requires real-time connections through the network to high volumes of data, requires faster speeds. For example, this means moving from 1.5 Mbps connections to 10 Mbps connections. Similarly, it means moving from 10 Mbps to 100 Mbps connections, from 100 Mbps to 1 Gbps connections and so on.

As discussed above, the recurring cost of leased lines versus the recurring cost of City-owned and managed services are substantial, whereas the recurring costs of using City-owned infrastructure, once the construction and installation costs are incurred, are relatively minor and incremental.

Additionally, new services such as voice over IP (VoIP) telephony are a goal of the City in the next two years, as well as the expanded use of telepresence tools. In each case, while specific connections for these applications may take only a small amount of bandwidth, when considering providing VoIP and telepresence applications to all City personnel and agencies, and the fact that these are real-time services, the totality of the connections needed will again require both higher capacity and faster speeds on the network.

- **Lower Costs --** When queried on the Departmental Broadband questionnaire about what barriers have kept them from accessing necessary technologies or applications, the most frequent response was Cost at 82% of respondents (9 out of 11 respondents) indicating this as a substantial barrier. For example, the Department of Utilities indicated that "cost = budgetary concerns". The Norfolk Community Services Board indicated that "Sustainable technology funding is and will continue to be a challenge". The Office of Recreation, Parks and Open Spaces (RPOS) indicated that "there are no identified funds" to support the types

of technology that they need. The Human Resources Department said that “cost is the primary consideration in providing greater use of mobile devices”.

These same agencies indicated that they believe cost (10 out of 12 respondents) is also a barrier to residents and businesses accessing technologies and applications that would enable better provision of City resources to them via the internet and other communications network applications.

The use of leased lines again poses an ongoing challenge to minimizing costs. For example, the existing I-Net provides 10 Mbps symmetrical fiber-based services costing over \$550 per month, per site, as negotiated in 2005 and 2006. The current market rate for such services, especially when considering that the fiber optic cabling for these connections has been depreciated and the cost has already been amortized, would indicate a cost that should be 50% lower than it is currently, for this type of connectivity. Similarly, 1 Mbps symmetrical bandwidth on the HFC cable modem system is priced at approximately \$320 per month. Standard business class modems, while asymmetrical, will provide substantially greater connectivity both upstream and downstream for approximately \$100 per month, or 2/3 less. The cost for 1 Gbps backbone services has also dropped substantially in the marketplace to approximately 1/2 of what is currently being paid by the City to Cox. Specifically, connections that were priced at approximately \$1,500 per month are now provided in the market for approximately \$800 per month.

To meet the above needs for higher capacity, faster speed, and more mobility, while at the same time reducing costs, the City will need to consider working to substantially reduce the leased costs of its existing connections and continuing to migrate to its own connections.

- **More Definitive Performance Standards** -- Over 1/2 of the departmental respondents indicated that, while their experience to date has been good, they were going to need assurances that even higher reliability will be provided in the future for their communications connectivity. This includes not only ensuring high quality, continuous provision of the applications and services that they need over the network, but also providing them with greater security.

Here it would be helpful to have more definitive performance standards in the Cox I-Net CSA. Specifically, there are currently only rebates of the MRC (Monthly Recurring Charge) if there are extended outages. Beyond this, the network should be considered eligible for rebate when performance is below standards. The equipment on the network is managed by the City, and the performance of the equipment will have a substantial impact on the overall network performance. However, the network itself, in the way that it is designed and provisioned, can also have an impact. Accordingly, standards, consistent with industry standards for a high quality, high capacity, fiber optic based network, should be developed for:

- Latency
- Jitter
- Throughput
- Packet Loss
- Network Availability

## CONCLUSIONS AND RECOMMENDATIONS

After reviewing the current state of the City's WAN and I-Net connections, its Cox I-Net connections, the City's plan for evolution of its own fiber infrastructure, and the experience and needs of City agency users for both their administrative operations and the provision of services to the public, CBG recommends that the following be pursued with Cox in franchise negotiations:

1. **Higher Capacity Connections** -- For each type of connection on the Cox I-Net there should be a migration in speed/transfer rate and for many, also in type of infrastructure. Also, the City is moving to replace the Cox I-Net backbone with its own infrastructure, with continuing interconnection to the Cox headend for porting the I-Net connections over to the City's ring, and this should continue until completed in November 2017.

For Cox's fiber I-Net-based connections, there should be an initial move to upgrade the capacity and speed/transfer rate from the current 10 Mbps to, at a minimum, 100 Mbps connections. There should also be the provision for further migration to 1 Gbps in the future.

For the cable modem-based services, these should first continue at a lower cost with higher capacity, consistent with the pricing of standard business class cable modem service. However, over time there should be an evaluation of what it would cost to replace these connections with fiber optic connections that can then be migrated to 100 Mbps, 1 Gbps and higher. As part of working to extend fiber to these locations, we recommend that the City work with Cox to develop a public/private partnership such that the City and Cox could share in the cost for the expanded fiber optic infrastructure or in the utilization of conduit. In exchange, the City would keep a portion of the fiber or conduit for its own use and management, while Cox would be able to expand the capacity of its system to residents and businesses.

2. **Lower Cost for Leased Lines** -- As indicated herein, the current cost paid by the City is significantly above the going market rates for the types of connections leased. Accordingly, we recommend initially that the cost of existing connections be reduced, and that the cost for future upgrades should be substantially lower than the costs currently quoted for those types of connections, and more in line with current market and industry trends.
3. **More Definitive Performance Standards** -- As indicated above, there should be performance standards for throughput, jitter, latency, packet loss and network availability that are consistent with industry standards. Specifically:
  - a. Jitter (each way) < 2ms
  - b. Latency (each way) < 10 ms

- c. Throughput - 99.9% of contracted bandwidth
- d. Packet Loss (each way) < 0.001%
- e. Network Availability (annualized per location) < 99.995%

While we understand that the equipment placed by the City may be most responsible for meeting such standards, if problems are experienced when the City's equipment is functioning properly, there should be a review of the fiber connectivity provided for that link by Cox to determine if problems with the fiber cabling are causing the parameters to fall below standards.

Another issue to pursue with Cox, supported by the data provided herein, is that any CSA and any appropriate amendments should be established for Cox I-Net connections going forward for the period of time needed before the City is able to provide its own connectivity, either through partners such as VDOT and Lumos, or on its own volition, and then manage and control pertinent links itself.

Further, any public/private partnership that can be established through the I-Net development process with Cox to expand broadband capabilities to residents and businesses would also be highly beneficial.

## **SECTION D**

### **OPTIONS FOR MUNICIPAL OWNERSHIP**

## **INTRODUCTION**

Local governments all across the country are taking an active role in the development of municipally owned, co-owned, sponsored, facilitated and supported, high-capacity fiber optic broadband infrastructure (and in some cases services) to help expand the broadband infrastructure and services climate for their institutions, residents and businesses, with the ultimate goal of having ubiquitous, ultra-high speed broadband available everywhere within their municipal boundaries (and often as part of a collaborative, regional approach).

Norfolk is one of these local governments. The question for the City going forward, is how best to proceed, and build upon its current foundational efforts regarding the ownership of municipal broadband infrastructure.

## **FINDINGS**

As discussed throughout this report, there are many reasons, as documented by the attitudes, opinions, needs and interests expressed by the constituent groups reflected, that the City is and should continue to be involved in active pursuit of helping to define the broadband climate both now and in the future. Additionally, multiple studies confirm, that easy, affordable access to broadband services is a key feature in keeping and attracting businesses of almost every type, especially technology and other similar sectors that are forecast to lead economic growth in the foreseeable future. Further, a recent study suggests that having the ability to offer cost-effective gigabit (ultra-high speed) connections to especially businesses, but also to residents, can increase the gross domestic product (GDP) of a jurisdiction by over one billion dollars.

Around the country, there are many options being pursued related to municipal ownership, from those offering a complete range of broadband infrastructure and services (often public power communities that have been able to expand their expertise into telecommunications and cable TV like Chattanooga, Tennessee and Lafayette, Louisiana) to those that only have municipal infrastructure assets to offer such as towers and conduit. The city of Boston, Massachusetts is an example here, which long ago developed a “common conduit” process, that not only has provided for multiple available conduits for the City and providers for the relatively easy placement of wireless infrastructure throughout the City, but also has resulted in a substantially less continual right-of-way disturbance than in other jurisdictions. The ability to access conduit infrastructure throughout the City is said to be one reason why it is the only new jurisdiction in several years where Verizon has agreed to a franchise to provide FiOS ultra-high-speed broadband services as well as phone and cable television.)

Local governments in Virginia, except in a few cases, are constrained legally from providing telecommunications services, including broadband, directly to businesses and residential consumers. Norfolk is one of these constrained jurisdictions. However, Norfolk can own broadband infrastructure, provide services to itself, lease conduit and fiber to private entities and partner with these entities to help them expand their broadband footprint. The City is currently actively engaged in this effort.

For a number of reasons, we believe that the City is on the right path related to this form of municipal ownership. As discussed in the next report section, should continue this effort, and in fact expand it as it is financially capable, to continue to maximize its efforts going forward. The experience of other jurisdictions around the country is that there is no down side to both continuing and expanding this effort as budgets may allow. Specifically:

- **While no telecommunications asset is future proof, fiber optic infrastructure and conduit is about as close as you can get** – Jurisdictions that explored municipal ownership opportunities with wireless assets in the past have in some cases been left with older, unused technology hanging on street lights, municipal buildings, and public safety towers, because the technology changed so quickly, and, by the time it was installed and ran into technical problems (such as municipal WiFi not penetrating dense soil age and stucco building exteriors), it was no longer useful.

However, fiber optic transport, has been around for decades and only gets better in its ability for a single strand of glass to provide higher and higher capacities of digital information. Additionally, the types of conduit being installed today are forecast to last far into the future. Accordingly, we don't believe that the City's fiber infrastructure investment will be supplanted by newer technology in the foreseeable future (except for new equipment, which is forecast to need replacement, migration, and upgrades in the future as a normal occurrence in any transport system), and therefore won't be unusable, abandoned or stranded as an asset.

- **Costs are shared** – Because the City is engaging in public/private partnerships, it is not sharing the cost burden alone for the provision and development of ultra-high-speed services to the City's constituent groups.
- **The City is an anchor tenant** – Above all, the investment will always prove useful, because the City is providing infrastructure for and services to itself. As the City is able to continue to migrate from leased lines, it will continue to save costs well into the future, while increasing its capabilities. This alone serves to help maximize its investment.
- **Risk is mitigated** – By working with private provider partners, the City also shares in their expertise, their return on their investment, and their desire to increase supply for the demand that the City and their private partners help stimulate and meet. Like in many other ventures, there is strength in numbers and the whole ends up being greater than the sum of its parts (the City both provides expertise, as well as gains expertise, by partnering with multiple entities that essentially have the same infrastructure and services goal, but for different reasons and applications).

## **RECOMMENDATION**

Based on all the factors analyzed related to the City of Norfolk's current and planned activities, and the environment within which the City is able to proceed, we believe that the City is moving in the right direction with efforts set that it can reasonably take to continue to expand wireline infrastructure in Norfolk and help that wireline infrastructure also ultimately integrate with high capacity wireless broadband systems.

In the next section of this report, CBG explores continuing and additional strategic directions that the City can take to expand and maximize its investment.

## **SECTION E**

### **INCREASING BROADBAND SPEEDS AND AVAILABILITY**

## **STRATEGIC DIRECTIONS FOR INCREASING BROADBAND SPEEDS AND AVAILABILITY**

### **INTRODUCTION**

The final part of the study included a review of all the information gathered and analyzed so that recommendations could be made related to options that the City can pursue in both the near and longer term to improve broadband speeds and availability to institutions, commercial and non-profit organizations, and the public at large.

As indicated in the previous section, we believe that the City, based on a comparative analysis of its current broadband focus with best practices related to municipal broadband infrastructure development and utilization, the experiences of other similarly situated jurisdictions, and the regulatory and legal limitations that the City is under, especially State of Virginia regulation and law, is squarely on the right track in its use of public/private partnerships, its leveraging of available assets and its involvements of, and with, various constituencies related to its current efforts. These efforts have already shown success, enabling private partner providers to offer higher capacity, high reliability fiber optic connections at lower cost than other competitors, including the incumbent local exchange carrier (ILEC) Verizon, and the dominant cable communications company Broadband provider, Cox Communications.

Building on this foundation, with multiple initiatives we believe, will continue to strengthen the City's ability to help determine its broadband future, as well as increase the availability, utilization and capacity of broadband structure and services within Norfolk.

Based on our analysis, we recommend pursuing the options described below. In some cases, as noted below, it will be important for the City to develop and implement pilot projects, before committing a substantial amount of resources in order to determine the effectiveness, timing and overall implementation of the option described.

Each of these pilot projects, as well as the other initiatives noted, should be evaluated on at least an annual basis, to determine their success, based on a set of metrics that can be variously applied, depending upon the initiative or project. Such metrics include:

- How does the initiative/project contribute to increasing availability of ultra-high-speed internet to ultimately all areas of the City (universal availability)?
- How does the initiative/project contribute to increasing access and adoption of available broadband (digital equity)?
- How does the initiative/project contribute to an increase in the number of available service providers (competition)?
- How does the initiative/project increase retention and attraction of sustainable businesses (economic development)?
- How does the initiative/project contribute to controlling or reducing costs (affordability)?

## **RECOMMENDED OPTIONS**

- **Develop spurs and interties with a high return on investment** – When the City’s fiber optic backbone is completed, the next logical evolution of City-owned infrastructure is to connect up to other high capacity networks, as well as develop spurs that will help foster both local and regional economic, social and educational development. From the information gathered, initial options for spurs off of the network could be:
  - Those needed to continue to interconnect with other local and regional high capacity networks.
  - Those needed based on private partner providers business plans. For this initiative, it will be important for the City to work with existing and future partner providers to understand their business plans and their client base and work with them to develop spurs along business corridors and among types of businesses that partner providers see as providing as short and acceptable return on investment as possible. From the business needs survey and other information gathered, a likely initial spur could be:
    - The area between Route 337, 23<sup>rd</sup> Street, Culley Ave. and Princess Anne Road, where multiple businesses indicated they needed immediate increases in speed.
- **Work with wireless providers to develop backhaul for both existing and emerging technologies** – The City already has experience in providing a wireline backhaul for publicly accessible WiFi. It should expand its outreach to emerging technologies such as white space providers and millimeter-wave technology system providers. This is clearly an area that the City would need to work with the provider to develop a pilot, proof of concept project that has specific metrics assigned and evaluated before moving forward. A caveat to this need would be if the provider has already demonstrated success in other similarly situated markets.

Additionally, the City may want to expand its outreach to Verizon and other 5G wireless providers. As indicated by a number of study participants regarding a 5G roll-out in the Tidewater region, because of Norfolk’s high density and its building rooftop availability, as well as the availability of public and other communications towers and other vertical assets, the City could help a wireless provider substantially cut both the cost and timing of 5G entry into the market. Although not specifically related to the I-Net, the City will want to potentially work with the business community to develop an inventory of vertical assets that can be used for antenna placement, while at the same time determining what type of backhaul is available already or may be needed in the short term.

- **The City should continue to engage in Smart City initiatives, especially those that would be synergistic with higher capacity broadband development** – While the Ashburn Smart City demonstration projects are a goal of the State to replicate in other places, Ashburn typical of essentially a large suburban, not urban, area. Developing the same, similar or different concepts in Norfolk would enable the City to demonstrate

viable Smart City project elements in a more urban environment. Accordingly, success of these initiatives in Norfolk would help better define their success in other large urban areas in the State.

Also, since Smart City initiatives rely on a high degree of connectivity to be successful, working on Smart City applications that could be piloted and expanded throughout both the City and the State, could attract a substantial amount of additional broadband investment in the City to support those Smart City initiatives, knowing that there will be additional possibilities for investment and revenue generation for private entities in other areas in the State.

- **Work to develop additional funding resources including repurposed City funds, as well as other non-City funding sources** – This, at the outset, could include the City, as it reduces its reliance on leased lines, taking the recurring cost savings and transferring it to the Capital side of the ledger for the development of more infrastructure.

Beyond this, as the City works to expand both its public and private partner base, its ability to work with entities to obtain grant fundings will increase. This will certainly be true for startup projects, especially for entrepreneurial and leading-edge opportunities. The City would need to evaluate the various opportunities to ensure that once the grant funds are exhausted for the startup project, that the recurring costs could be handled by other public or private partners, or could be a new line item in the City budget (that again potentially come from show savings elsewhere).

- **Reinvigorate the Regional Technology Council** – As noted by the CIT, an active Regional Technology Council was instrumental in the development of ultra-high-speed broadband in Southwestern Virginia in a number of locations. In fact, a review of a high-speed community networks listed by the ILSR (the Institute for Local Self-Reliance), shows a preponderance high-speed gigabit projects that are either municipally or county-oriented, in the Southwestern portion of the State, with others along the I-81 corridor in the mid and northwestern part of the State and one in Danville Virginia, in the mid-southern part of the State. None of these types of projects are noted in the eastern portion of the State. The CIT notes how important a Regional Technology Council is in helping to coordinate and leverage the various efforts of individual localities within the region.

The CIT, however does tout the efforts of Virginia Beach and Norfolk in developing next generation networks which are designed to be municipally-sponsored digital highways for private provider partners. The ongoing work of Norfolk and Virginia Beach together along with the other CIOs in the Tidewater region, could easily morph into a Regional Technology Council that can have an even greater positive impact, both on the region as whole and on individual localities.

Beyond this, the efforts of the ConnectNorfolk group could act as a local Technology Council, that could then feed up into the Regional group.

- **Continue to work on the demand side, as well as on the current efforts concerning the supply side** – As noted in the Business Broadband Survey, there is a substantial lack of knowledge related to service offerings that are available to different businesses, and the utilization of high speed broadband for business development, especially on the part of smaller businesses. It will be important for the ConnectNorfolk group to follow through with the City on some of the stated objectives to not only increase educational efforts for the business community, but also to act as a clearing house, especially as there may develop more multiple competing broadband options for businesses.

On the Residential side, these same efforts could occur with non-profit institutional and other organizational partners that are currently involved in increasing residential broadband adoption.

Ultimately, while broadband supply needs to increase to satisfy current demand, additional demand can be generated through adoption spurring efforts, which can then lead to attracting more private provider partners on the supply side.



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## **EXHIBITS**

# **REPORT ON THE MUNICIPAL COMMUNICATIONS FACILITIES AND BROADBAND SERVICES NEEDS PROJECT FOR THE CITY OF NORFOLK, VIRGINIA**

Prepared By:

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**Prepared: August 7, 2017**

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## **EXHIBIT B-1**

# **CONNECTNORFOLK NOTES FROM AUGUST 2016**



**Meeting Notes Matrix**

**Meeting Date & Location:**

**August 4, 2016/Slover Library**

Introductory remarks given by Marcus Jones, City Manager

- In his opening remarks, the City Manager noted several key issues, including:
  - The importance of developing public/private partnerships to increase broadband in the City
  - There should be synergies in working with the other jurisdictions in Tidewater (16 total), especially in neighboring Virginia Beach, in developing regional approaches to meeting some broadband needs
  - Improving connectivity is one of Norfolk’s six priorities
  - It will be important to think about how “low hanging fruit” can be pursued so that successful outcomes are achieved early on
- The City Manager stressed that the ConnectNorfolk working group was very important and that their input would be used to help steer the City’s direction for improving broadband access in the City

**Business Sub-Group**

Key Themes	Sub-Theme	Specific Issue or Idea	Sector represented (when known)
<b>Business access to (ultra) high-speed broadband internet</b>	Critical for all businesses to thrive	Have large files not compatible with business class cable modem capabilities from Cox <ul style="list-style-type: none"> <li>• Contention in late afternoon when several of provider’s customers were trying to use node simultaneously</li> <li>• Had to pay Cox an installation fee for more fiber but it improved the service</li> <li>• Convinced Cox to cut price but still paying 50X as much as large business</li> </ul>	Private sector (small business)
	Businesses are starved for high-speed internet	In current tech zones, it is the responsibility of individual customers to negotiate best deal. The City should consider a more collaborative approach to achieve the high capacity broadband for any business that desires it	

Broadband Facilities and Services Needs Report

	Inequality in pay structure for large and small businesses	Able to gain private dedicated fiber from Lumos priced about the same as the small business	Private sector (large business)
		<p>Accessible, affordable broadband internet is critical in both facilitating training and enabling a trained workforce to support businesses and institutions</p> <ul style="list-style-type: none"> <li>• Competition should be the driver in making broadband affordable</li> <li>• Without competition, we are at the mercy of the most dominant provider</li> </ul>	
	Value vs. Cost from Cox	Cox pricing is high for what is provided	Private sector (large business & mid-size ad firm)
<b>Regional Cooperation</b>	Businesses are competitors but need to partner to achieve common goals	<ul style="list-style-type: none"> <li>• Navy could serve as a bridge for cooperation</li> <li>• Norfolk should develop interconnections with both the Navy and the Port</li> </ul>	
	Department of Defense could serve as a model	<ul style="list-style-type: none"> <li>• Bandwidth is a current chokepoint</li> <li>• Both tactical and operational networks</li> <li>• Interconnections occur with Emergency Operations of surrounding jurisdictions related to mutual aid agreements</li> <li>• Naval Base has residential housing with Cox internet, phone and cable</li> </ul>	Department of Defense
<b>Big Data flow</b> (high capacity connections between large data centers)	Necessary to attract businesses and institutions to the region	Universities are at 100 GB per second to the internet and other large capacity networks (most are in medical center area where high capacity connections are needed for telemedicine and other medical applications)	
		ConnectNorfolk should advocate and provide assistance in bringing larger capacity connections to businesses and institutions of Norfolk	
	A need exists for offsite data storage locations	Business and institutions that rely on big data need to build or lease properties to house data centers and off-site storage solutions	
<b>Cyber Security</b>	NSU received a grant to research new and improved ways to protect business and utility data	Cybersecurity is ultimately the responsibility of individual organizations or businesses but must also be a collaborative strategy from a regional perspective	

Broadband Facilities and Services Needs Report

<b>Economic and Workforce Development</b>	There is a great need to retain and attract highly skilled talent	Norfolk is losing talent to other markets that have better broadband services	Private Sector (small business)
	Innovation Corridor – focus on increasing available accessible affordable high speed internet should start here	<p>How to begin?</p> <ul style="list-style-type: none"> <li>• Team with partners like Lumos and Mid-Atlantic</li> <li>• Interconnect with entities also developing high speed internet such as a connection from the east side of the city-owned i-net to Virginia Beach, allowing an interconnection into the “Corporate Landing Project”</li> <li>• Start this work asap as it will lead to more R&amp;D moving here</li> </ul>	
		July 2017 – a critical date to have the essential backbone in place	
<b>Public Relations/ Outreach</b>	More work needs to be made to promote Norfolk’s efforts to attract businesses– Virginia Beach is getting all the good PR	<p>Some wondered whether high capacity broadband really made a difference to businesses considering a move here</p> <ul style="list-style-type: none"> <li>• Norfolk’s Economic Development representative indicated it was a high priority</li> </ul>	
	Low-hanging fruit	<ul style="list-style-type: none"> <li>• Create a big splash in areas that have changed their vibe from old and stagnant to developing and vibrant, like Chelsea</li> <li>• Pursue short term fixes while making a five-year commitment to ubiquitous high capacity broadband throughout the city</li> </ul>	
	Survey business community to find out exactly what they need rather than work from anecdotes.		
<b>Wireless Broadband</b>	Does this represent an opportunity to jump ahead of the curve?	It has been discussed with Verizon. The City could be a test bed for rolling out Verizon’s 5G service.	
<b>Rankings/ Wrap Up</b>	Importance of available high capacity broadband for residential and business use	<ul style="list-style-type: none"> <li>• Most participants ranked this in the top 5</li> <li>• Military indicated it was in the top 10</li> </ul>	
	Other ideas	If schools and education are the # 1 priority of the City, high capacity broadband supports education by enabling student access to the internet	
		Critical municipal services are supported by broadband – it also provides the opportunity for the city to generate revenue	
		Best short term “win” – pursue ultra-high speed connections to ADP, Norfolk Southern, Slover, Waterside, HRT and the Innovation Corridor	

**Community Sub-Group**

Key Themes	Sub-Theme	Specific Issue or Idea	Sector represented (when known)
<b>Reliability</b>	Norfolk Public Schools indicates that their reliability is very good – 99.99% uptime		Norfolk Public Schools (NPS)
	ODU indicated their reliability is high, enabling them to have more flexible use of the network	<ul style="list-style-type: none"> <li>• Other services, such as Netflix are desired, but are only useful if there is a high capacity connection</li> <li>• Often, in residential situations, four to five devices are trying to access the same connection</li> <li>• High definition video is only possible through the use of high speed broadband access</li> </ul>	ODU
<b>Affordability</b>	Norfolk Public Schools indicated their access was near affordable but they would like to see better rates		NPS
	For residents	<p>NRHA provides housing to 3400 people</p> <ul style="list-style-type: none"> <li>• 40% have no income</li> <li>• Even Cox's <i>Connect to Compete</i> program at \$9.95 is too much for these families</li> <li>• Getting Wi-Fi into communities might help</li> <li>• Many are not technologically savvy</li> </ul>	
		<p>Ways to drive down costs:</p> <ul style="list-style-type: none"> <li>• Own the fiber (TCC does not own infrastructure – they rely on Verizon and Cox)</li> <li>• Partner to reduce costs</li> <li>• Continue to leverage available infrastructure (current high capacity 100 Gig connection from Norfolk to Ashburn leverages state educational infrastructure)</li> <li>• ODU motto – “to out compute is to out compete”</li> <li>• TCC sees these as regional issues</li> </ul>	
<b>Resiliency</b>	NRHA indicates that access is critical to react and recover from issues such as flooding	Also, NRHA is looking at broadband access as they remodel their properties	NRHA

Broadband Facilities and Services Needs Report

<b>Flexibility</b>	ODU indicated that their broadband access provided a high degree of flexibility	For example, many services are becoming cloud-based and high capacity broadband access is the only way to reach these services effectively	ODU
<b>Workforce Development &amp; Economic Development</b>	High speed access is critical to gaining employment		ODU
	Research and education are driven by the ability to deliver support for such programs	If you can successfully market for research funding, this in turn increases economic and community development	
<b>Redundancy</b>	Redundancy in networks helps increase the availability and utility of broadband access	<ul style="list-style-type: none"> <li>• ODU indicated that redundant networks are critical today</li> <li>• ODU has a high cost Cox connection used for redundancy that goes to Atlanta</li> </ul>	
<b>Speed &amp; Scability</b>	NPS indicated they need more speed continuously in network	YouTube provides lots of educational videos that require a substantial download time	NPS
		<p>NPS is focused on bring your own device program (BYOD)</p> <ul style="list-style-type: none"> <li>• Devices are not just accessing the network, they are looking for high capacity to access a substantial amount of content</li> <li>• 19,000 devices could be accessing on a given day</li> <li>• 9 sites were recently added for BYOD</li> </ul>	
	NPS indicated they needed a more scalable network	The current network is Cox managed services to all sites and they believe the services aren't being delivered as efficiently as possible	NPS
<b>Education</b>	Technology is a significant enabler for students, staff and faculty	<p>Much of the educational instruction is offered through on-line learning and courses</p> <ul style="list-style-type: none"> <li>• It leads to a higher graduation rate</li> </ul>	ODU
	Access to high capacity broadband is critical to recruiting students	Students pay attention to broadband access when choosing their schools	
	Access to high capacity broadband is critical to recruiting faculty	It is critical to support the research activities of a number of educational institutions in Norfolk	
<b>Rankings/ Wrap Up/ Next Steps</b>	Importance of available high capacity broadband for schools and residents	Most participants felt that the top leader in their institutions would rank this among their top 5 priorities	
	Improve access to fiber citywide		
	Improve regional cooperation and partnerships		

	Increase access in housing communities	Pair this program with a device/computer program and training programs	
	Develop cost reduction strategies	Develop a public assistance program for financial assistance for broadband similar to the program that is used for reduced or free lunch	

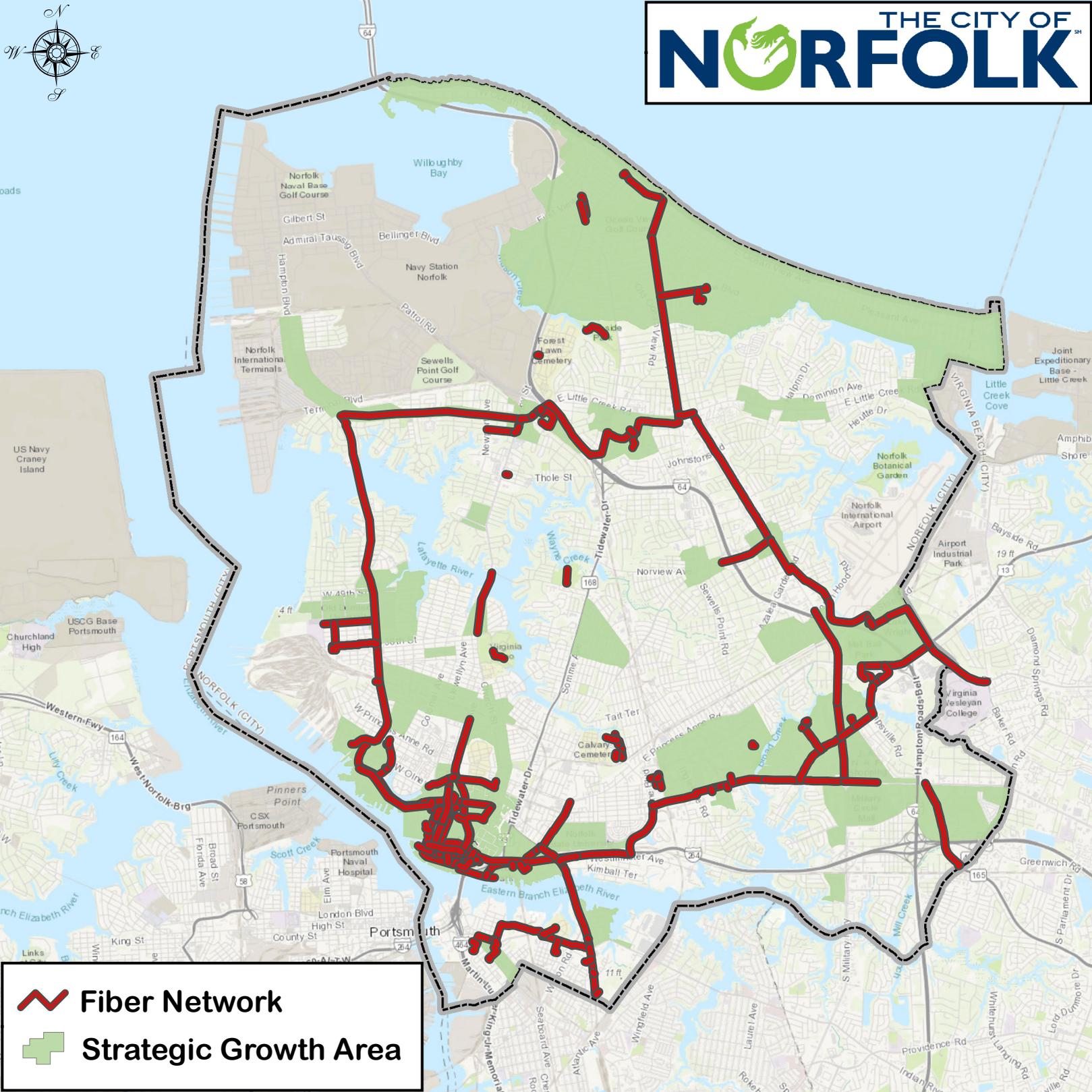
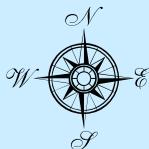
**Combined Group**

**Wrap Up & Next Steps**

- The beginning of the wrap up session included summaries of the discussions that occurred in both subgroups
- It was reinforced that this was the initial meeting of the ConnectNorfolk group and that many themes had been discussed
- The City will review all the information discussed and begin to determine a set of priorities for the full group and subgroups to focus on
- It was discussed that a follow on meeting of the group would be scheduled in approximately two months
- In the interim, a survey instrument will be developed in the coming weeks to find out what the broad diversity of the business and institutional community is thinking about broadband and what it needs, to further help steer ConnectNorfolk’s efforts
  - This survey will be one of the upcoming focuses of the group as it will require those that represent various sectors (small business, large business, education, etc.) to promote the survey and ConnectNorfolk’s efforts overall with members of their sector to obtain as much data as feasible

## **EXHIBIT B-2**

# **MAP OF NORFOLK'S CURRENT I-NET BACKBONE AND FUTURE GROWTH AREA**



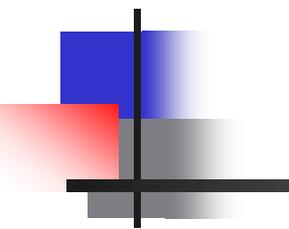
 **Fiber Network**

 **Strategic Growth Area**

## **EXHIBIT B-3**

# **CBG POWERPOINTS FOR FACILITATING AUGUST 2016 CONNECTNORFOLK MEETING**

# Discussion on Broadband and CONNECTNORFOLK with Government Agency Stakeholders



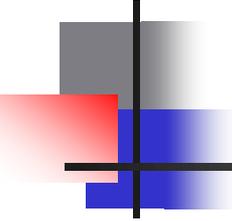
Presented by:  
Tom Robinson, President

CBG Communications, Inc.  
73 Chestnut Rd, Suite 301  
Paoli, PA 19301  
Phone (610) 889-7470

[robinson@cbgcommunications.com](mailto:robinson@cbgcommunications.com)

**NORFOLK, VA**

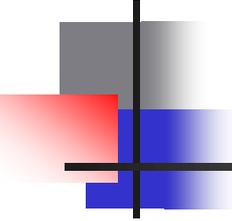
**AUGUST 2016**



# Introductions

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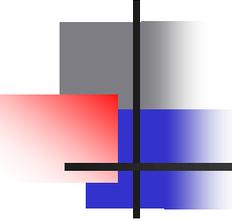
- Government Agency Stakeholders
- CBG Communications
  - Tom Robinson
- Communications and Technology Staff



# Objective

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- One of the objectives of the project is to determine current network, technology and application-related needs and interests of Norfolk government agency (internal) stakeholders concerning use of:
  - Broadband communications technologies
  - Internet access
  - Other video, voice and data communications
  - The Institutional Network (I-Net)
  - Other wide area network utilization



# Government Use of Broadband

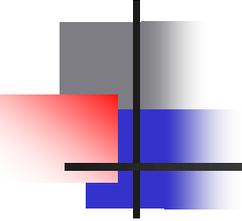
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- We need to look at Broadband communications technologies, networking and applications from two perspectives:
  - First, as they relate to administrative operations
  - Then, as they relate to delivery of services to your specific clients or the public at large.

# What is Broadband?

- Multiple answers to this question
- Characterized by its ability to provide multiple services over a single connection





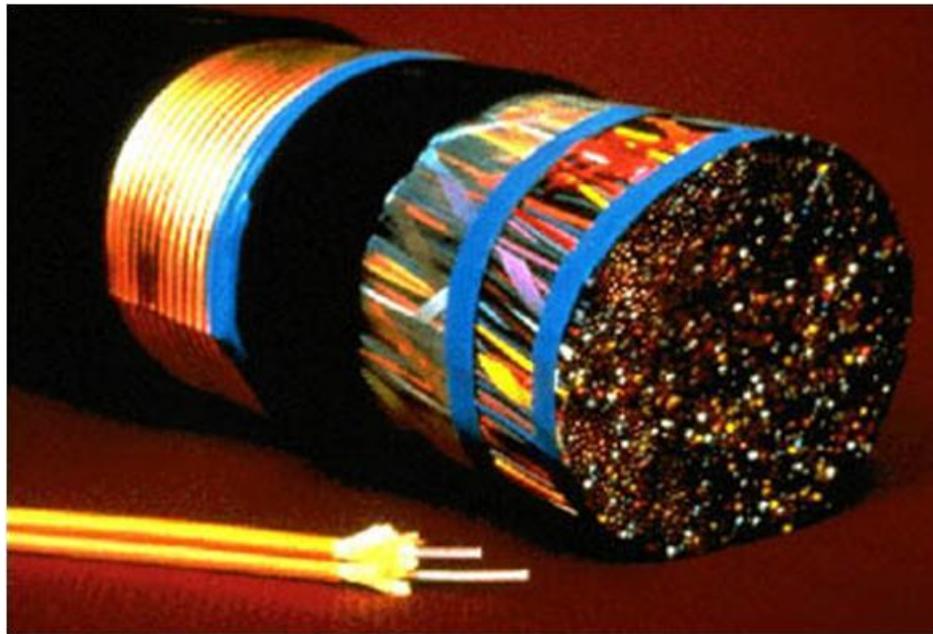
# What will Broadband be?

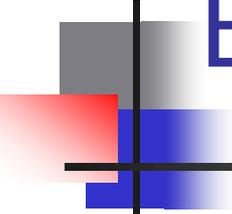
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- Future Federal focus is 100 Mbps to every premise/facility
- Future provider/City focus is 1000 Mbps (1 Gigabit per second) to every premise/facility – creating a “Gigabit Community”

# Broadband Technology Elements

- Wireline
  - Fiber optic infrastructure
  - Also copper such as twisted pair (phone lines) and coax (cable TV)

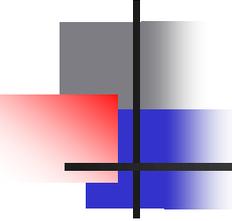




# Broadband Technology Elements

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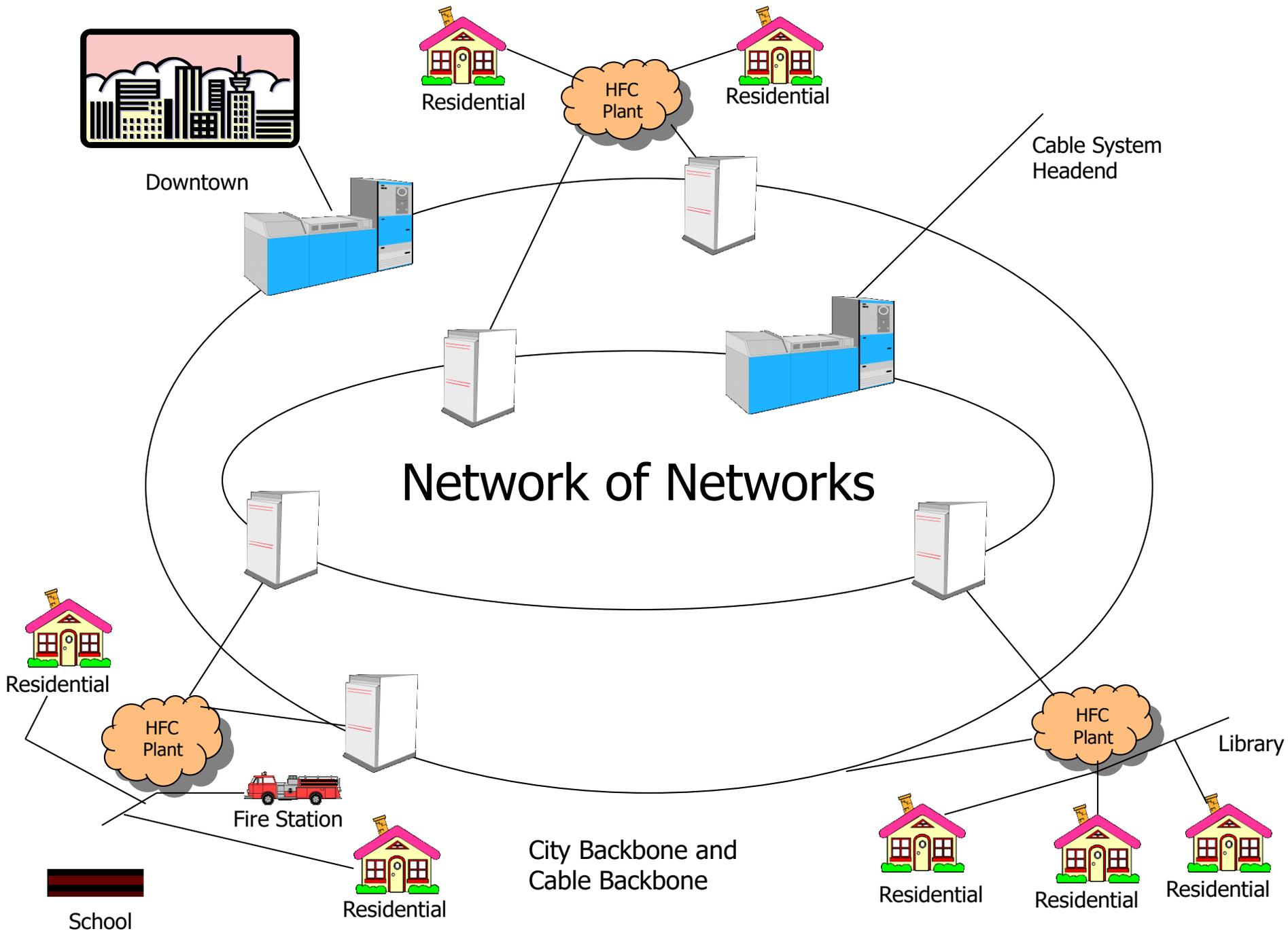
- Wireline, cont'd
  - Current and advanced transport methodologies
    - Such as Gigabit Ethernet (1 billion bits per second)
    - 10 Gbps, 40 Gbps, 100 Gbps
  - Switched services
  - Network Interfaces
    - NIUs, NIDs, ONTs, home gateways, etc.
  - Information appliances
    - In the house/business/institution and portable

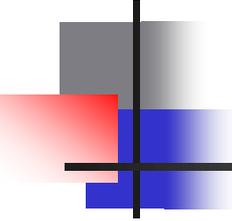


# Wireless Technology Options

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- Best effort services
  - 100% of network's throughput is shared by all users
  - Every user gets equal priority on and access to the network
- Priority-based services
  - VoIP
  - Emergency communications
  - IP video

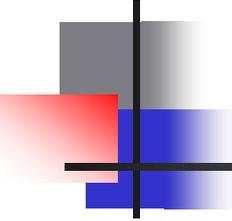




# Examples of Gigabit Communities

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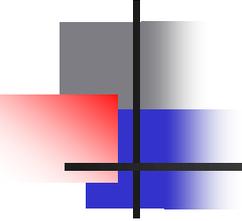
- Google Cities Examples
  - Kansas City, Kansas/Missouri
  - Austin, Texas
  - Atlanta, Georgia
- Other Examples
  - Lafayette, Louisiana
  - Chattanooga, Tennessee
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# Characteristics of Gigabit Communities

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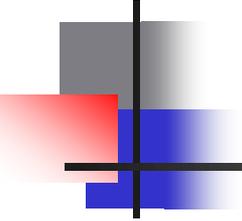
- Working to achieve, ubiquitous, affordable, access to, and use of, high capacity broadband services
- Working to achieve ubiquitous understanding, and efficient, effective use, of the Internet and on-line services
- Working to achieve the highest quality of life for its residents and the best economic environment for its businesses.



# Government Agency Broadband Needs, Interests, Concerns and Issues

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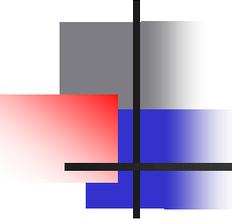
## Upcoming Questionnaire with Key Questions



# Key Questions - Administrative

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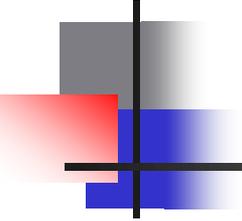
- What types of broadband communications technologies and applications do you rely on for your agency's administrative operations and to help you provide necessary support services to staff?
  - What are the top 3?



# Key Questions - Administrative

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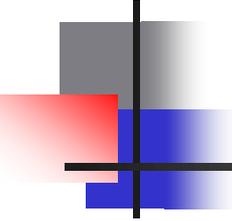
- What communications technology don't you have access to at your agency that you need for administrative operations?
- What are the barriers to accessing those technologies?
- How important is access to portable and mobile technologies for administrative operations?



# Key Questions - Administrative

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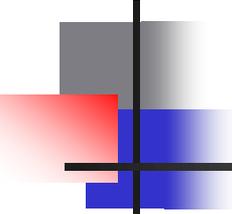
- What are the emerging technologies that you anticipate will be critical to your administrative operations in the future?



# Key Questions – Services for the Public

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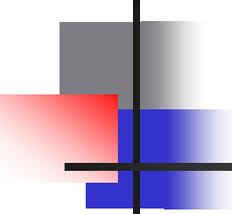
- What broadband communications technologies and applications are integrated into your agency in order to successfully deliver services to the public?
  - What are the top 3?



# Key Questions – Services for the Public

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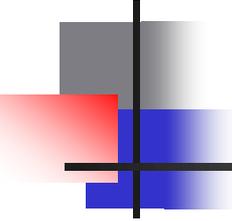
- How important is it to have access to portable and mobile technologies for service delivery purposes?
- What are the broadband communications technologies and applications needed by Norfolk residents and businesses that help further your agency's ability to provide necessary services?
  - How do they help?



# Key Questions – Services for the Public

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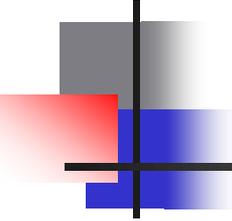
- What are the barriers to residents and businesses accessing those technologies and applications?
- How important is the universal availability of these technologies and applications to your agency and City residents in the future?
- How important is the use of broadband communications technology for employee, workforce and economic development purposes?



# Key Questions – Services for the Public

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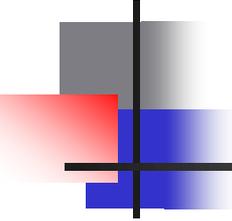
- What are the emerging communications technologies and applications that you anticipate will be critical to your ability to deliver services in the future?
  - How will you need to integrate them?



# The City's Current Network

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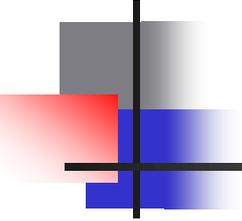
- A feature of the Cox cable franchise is the Institutional Network (I-Net). This Institutional Network allows for high speed data, broadband internet, telephone and other communications connectivity between and among government agencies and other organizations. It is part of the City's overall wide area network (WAN).
- Tell us about your experience using the City's Network:
  - Reliability
  - Speed
  - Capacity
  - Efficiency



# The City's Current Network

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- Has the City's current network management and operational structure met your needs?
  - If so, how?
  - If not, why not and what needs to change?
- How important is the City's Network to the government services that you provide?

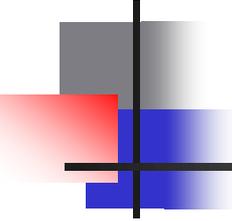


# The City's Future Network

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- When you think of the use of broadband communications technologies and applications, and the City's Network, what needs and interests over the next two to three years do you anticipate having?

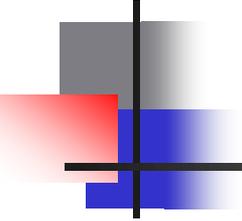
• <b>New Connections</b>	• <b>Applications</b>
• <b>Speed</b>	• <b>Mobility</b>
• <b>Reliability</b>	• <b>Equipment</b>
• <b>Capacity</b>	• <b>Management</b>



# The City's Future Network

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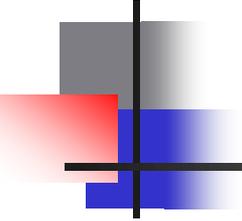
- Now think further out, what is the ideal broadband communications technology and application environment for your agency and the public you serve in ten years?
  - What would be some of the key issues that would need to be kept in mind?
  - What constraints do you see that will need to be overcome in order to reach your goals and meet your needs?



# Closing Question

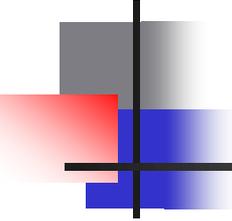
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- Is there anything else that you would like to say about broadband communications technologies, the I-Net, or the City's Network in general and their relationship to your agency?



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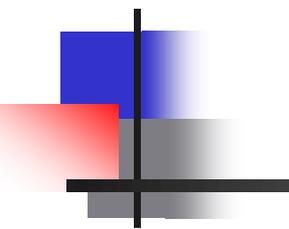
# Q & A and Additional Discussion



Thanks for your time today!

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# Discussion on Broadband and CONNECTNORFOLK with Community and Business Stakeholders



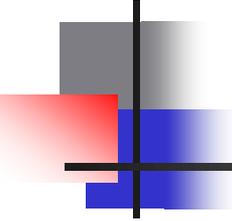
Presented by:  
Tom Robinson, President

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73 Chestnut Rd, Suite 301  
Paoli, PA 19301  
Phone (610) 889-7470

[robinson@cbgcommunications.com](mailto:robinson@cbgcommunications.com)

**NORFOLK, VA**

**AUGUST 2016**



# Introductions

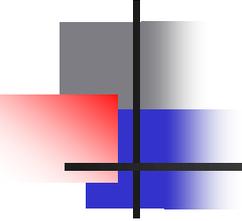
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- Community and Business Stakeholders
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  - Tom Robinson
- City Staff

# What is Broadband?

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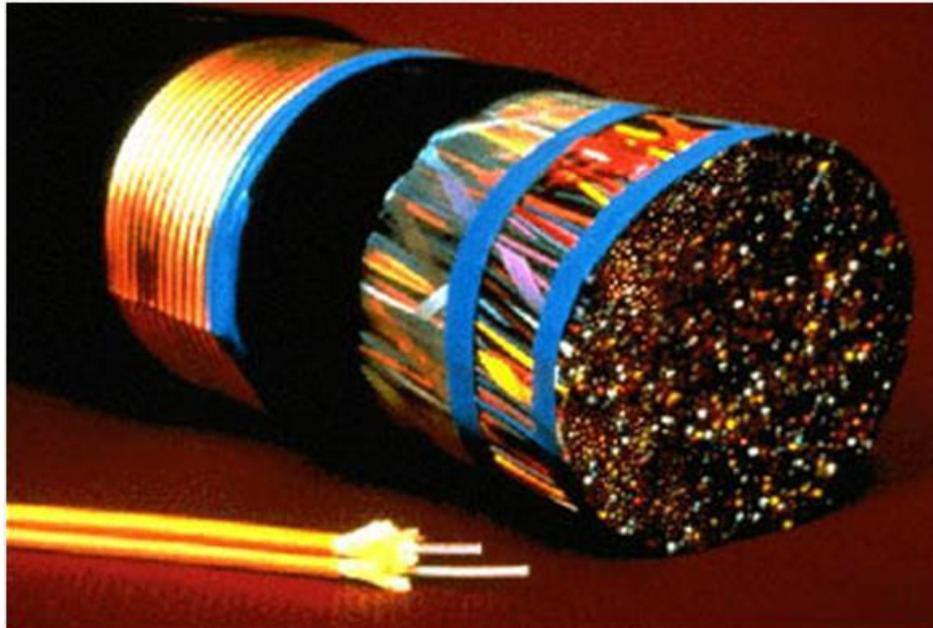
# What will Broadband be?

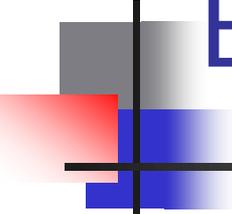
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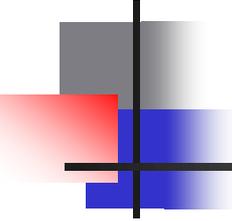




# Broadband Technology Elements

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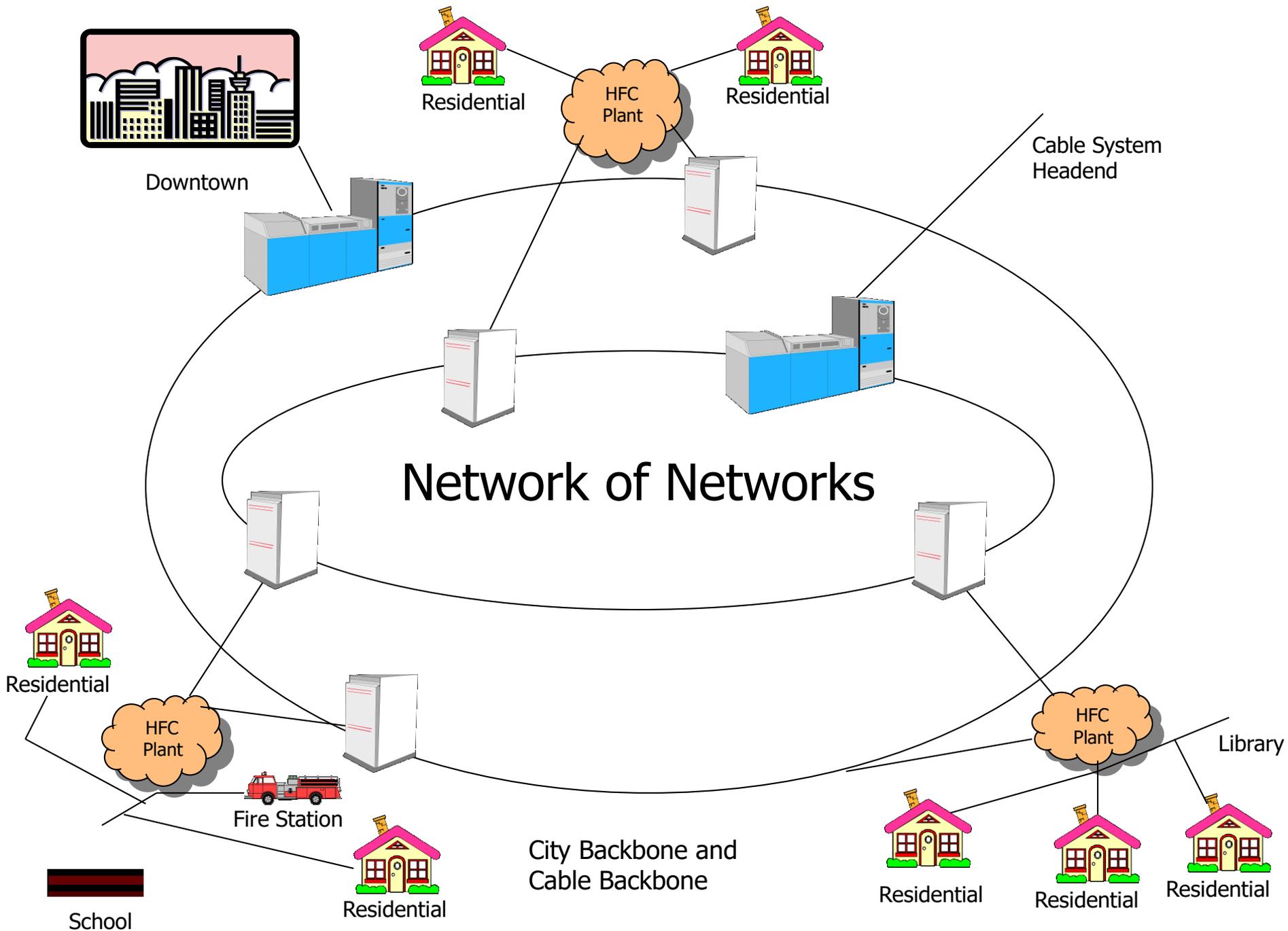
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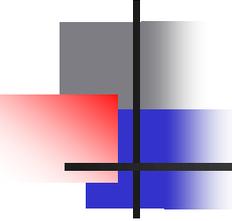


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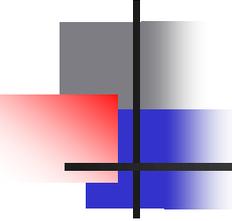




# Examples of Gigabit Communities

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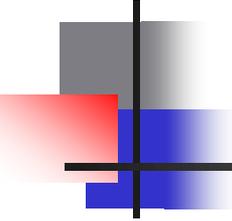
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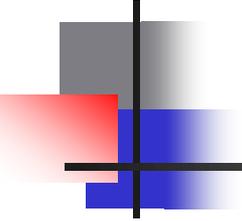
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- Working to achieve ubiquitous understanding, and efficient, effective use, of the Internet and on-line services
- Working to achieve the highest quality of life for its residents and the best economic environment for its businesses.



# Overall Key Points of Discussion

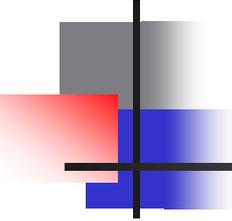
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- How do you and your organization use Broadband, the Internet or other Network Services at your organization?
  - For Internal Services
  - For Client/Customer/External Services
- What works now for your organization and your clients/customers?
  - What should be reinforced?
- What doesn't work now or won't work in the future
  - What needs to be changed?
- What should the City of Norfolk do about it?



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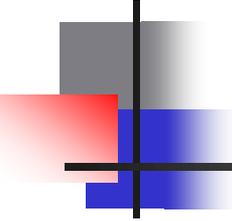
# Breakout Discussions



# First Key Question

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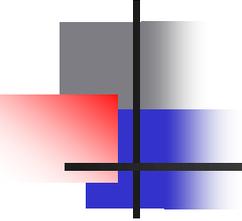
- Think about the work that you have done over the last year.
  - Were there instances when your internet or broadband service or internet service provider made all the difference in whether those projects or delivery of services were successful or not?
    - How?



# Second Key Question

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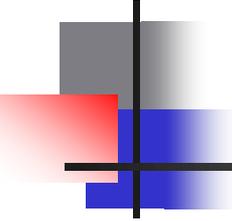
- What are the key traits of broadband services that provide "successful" experiences?
  - Speed of connection
  - Reliability
  - Affordability
  - Availability
  - Other



# Third Key Question

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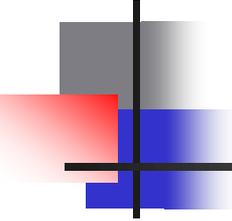
- Have you attempted and then failed at recent initiatives, or simply weren't able to participate or launch a program or service, because you or your clients/customers didn't have enough broadband service, capacity or other related features to launch the program or service with confidence?
  - Describe your experience and the problems you faced.



# Follow-up Questions

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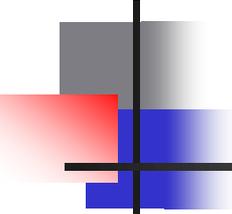
- From your experiences, how then would you answer these questions:
  - Where is broadband access needed in Norfolk that it's not currently?
  - Who needs to adopt broadband for your organization's programs or services to be truly successful?
  - If cost is the issue, what is the "right" price?



# Follow-up Questions

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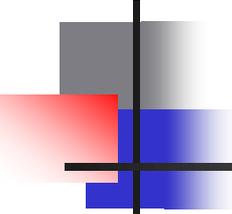
- From your experiences, cont.:
  - Is there a need for a better trained workforce related to broadband and Internet services and technology?
  - Are there critical equipment needs, like computers?
  - Are there concerns about security of the Internet?



# Priorities for Norfolk

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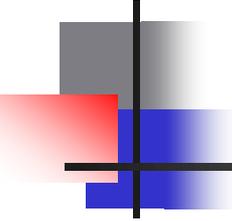
- We want to leave here today with an understanding of how important this issue is to your organization in Norfolk
  - If you were creating a list of priorities for your organization, where would you rank addressing, the issues of broadband capacity, access and affordability? First, fifth, tenth – or not on the list!



# Priorities for Norfolk

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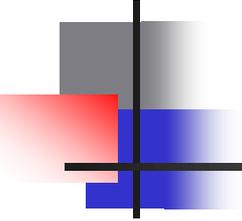
- If you were creating a list of priorities for the City of Norfolk, where would you rank addressing the issues of broadband capacity, access and affordability? First, fifth, tenth – or not on the list!



# What Should the City of Norfolk Do About These Issues?

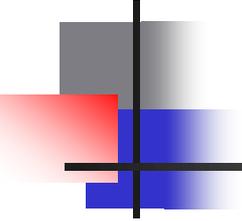
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- What actions should the City take to help ensure efficient and reliable broadband services for all residents, businesses and organizations in Norfolk both now and in the future?



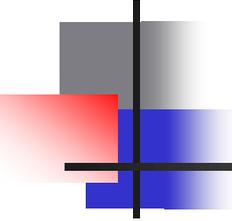
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# Return to Large Group



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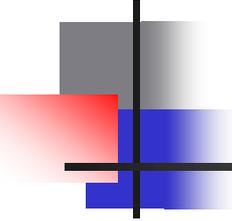
# Review Findings with Large Group



# Closing Question

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- Before we close ... is there anything else that you would like to say about broadband or high-speed Internet technologies or services in Norfolk?



Thanks for your time today!

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## **EXHIBIT B-4**

# **NORFOLK BUSINESS BROADBAND SURVEY MARKUP**

EXHIBIT B-4

NORFOLK BUSINESS BROADBAND SURVEY

(N=400)

Hello, my name is \_\_\_\_\_. This is not a sales call. I'm calling on behalf of the City of Norfolk. The City is conducting a short survey to determine the broadband, also known as high speed Internet, needs and interests of local businesses. The results of the survey will be used to help the City gain a better of understanding of your access to broadband and how that access lends itself to economic opportunity. Your business was randomly selected among permitted businesses in Norfolk. Would you take a few minutes to respond to the City's survey?

1. Do you have Internet service at your business? (N=400) (Appendix B provides a full list)
  1. YES (go to Q6\*) 89% (N=355)
  2. NO (continue) 11% (N=45)

\*Would it be possible to speak to the employee that manages your Internet services contract?

IF NO INTERNET ACCESS IS AVAILABLE AT THE PLACE OF BUSINESS:

Thank you. We'd like to verify the name of your business. (Appendix B provides a full list)

2. Is the name of your business \_\_\_\_\_? (N=45)
  1. YES 98%
  2. NO 2%

2a. If NO, what is the name of your business? (N=1)

First Response

1. Air Center

3. Does this business provide \_\_\_\_\_ services? (N=45)
  1. YES 84%
  2. NO 16%

3a. If NO, what services does this business provide?

First Response (N=5)

1. Business to Business functions
2. Photography
3. Local Bakery
4. Memorials
5. Retail Store

4. Why do you not have Internet service at your business? (N=45)

First Response

- |    |   |     |
|----|---|-----|
| 1. | Internet service isn't available  | 7%  |
| 2. | I'm not comfortable using the internet  | 4%  |
| 3. | My business doesn't need internet service   | 38% |
| 4. | I don't know how to use the internet  | 4%  |
| 5. | Another company supports my internet service needs  | 16% |
| 6. | Internet is too expensive   | 4%  |
| 7. | Other (N=12)  | 27% |
|    | a. Each person has to purchase their own service  |     |
|    | b. I don't want Internet  |     |
|    | c. I just moved, have not gotten it hooked up yet   |     |
|    | d. I run it out of my home and the person who owns my home is paying for internet so why would I pay if they are.                     |     |
|    | e. I use my smart phone instead of a modem. Also, they wanted \$200 a month for something I could do for an extra 10 dollars a month. |     |
|    | f. It's a nonprofit sports club.  |     |
|    | g. Mobile business that works out of the home   |     |
|    | h. Provide own internet   |     |
|    | i. Use everything on my phone   |     |
|    | j. We use our phones.   |     |
|    | k. Work by word of mouth.   |     |
|    | l. Would like to have internet service but say I have an outstanding bill that needs to be handled. Please call and get this handled. |     |

5. Do you plan to establish Internet service? (N=45)

- |    |            |     |
|----|------------|-----|
| 1. | YES        | 20% |
| 2. | NO         | 67% |
| 3. | Don't Know | 13% |

5a. If YES, when? (N=9)

- |    |  |     |
|----|--|-----|
| 1. | In the next three months                     | 56% |
| 2. | In the next six months.                      | 22% |
| 3. | In the next year.                            | 11% |
| 4. | I'm not sure when, but I will in the future. | 11% |

IF YES, THEY DO HAVE INTERNET ACCESS: (N=355)

Thank you. We'd like to verify the name of your business. (Appendix B provides a full list)

6. Is the name of your business \_\_\_\_\_? (N=355)
- 1. YES 94% (N=334)
  - 2. NO 6% (N=21, interviewer confirmed new name of business)

We'd like to know if and how you currently utilize broadband/high speed Internet services and what impact it has on your business success here in Norfolk.

Data and Internet Service Providers

- 6a. Who currently provides your business's local data communications and Internet service and connections? (N=355)

- 1. Verizon. 14%
- 2. Cox Communications. 79%
- 3. Other: \_\_\_\_\_ 7%

Top 3 Other Mentions (N=25)

- 1. AT&T (N=7)
- 2. T-Mobile (N=2)
- 3. X-O (N=2)

7. What type of Internet connection do you have?

First Response (N=355)

Satellite Broadband (700 Kbps)	3%
ISDN (64 to 124 Kbps)	1%
Fiber to the Premises (various speeds usually at 1GB and greater)	3%
DSL (up to 8 Mbps)	13%
Fixed Wireless (1.5 Mbps to 1G)	10%
Cable Modem (up to 100 Mbps)	64%
Mobile Wireless (Aircard) (varies by subscription)	2%
T-1 Lines (24 lines at 1.5 Mbps)	2%
Other (N=10)	3%
1. "Broadband" (N=3)	
2. Wireless/WiFi (N=1)	
3. Fiber (N=1)	
4. Hotspot (N=1)	
5. Metro e (N=1)	
6. Don't Know (N=3)	

Second Response (N=16)

Dial-Up	6%
Satellite Broadband (700 Kbps)	6%
Fiber to the Premises (various speeds usually at 1GB and greater)	6%
DSL (up to 8 Mbps)	6%
Fixed Wireless (1.5 Mbps to 1G)	13%
Cable Modem (up to 100 Mbps)	38%
Mobile Wireless (Air card) (varies by subscription)	13%
Other (N=2)	13%
1. WiFi (N=1)	
2. T-1 (N=1)	

8-9. What speed is that (*INSERT FIRST RESPONSE FROM Q7*) connection? (N=355)

Type of Internet Connection	N=132/37%	% Responding Yes	What is the speed? <sup>1</sup>	How much do you pay each month? (range and median)
Dial-up Line Connection	1	100%	23 Mbps*	Don't Know
Satellite Broadband	3	27%	4-100 Mbps	Range: \$60-\$205 Mean: \$107.25 Median: \$82
ISDN	1	25%	64 Kbps	Don't Know
Fiber to Premises	7	64%	3-100 Mbps	Range: \$100-\$1000 Mean: \$504 Median: \$600
DSL connection	10	21%	8 Mbps-3G*	Range: \$30-\$713 Mean: \$537.66 Median: \$105
Fixed Wireless	17	44%	4 MBps-1G	Range: \$19-7995 Mean: \$614.13 Median: \$115
Cable Modem	81	35%	5 Mbps-5G*	Range: \$0-\$2000 Mean: \$84 Median: \$84
Mobile Wireless	4	57%	4 Mbps-4G LTE	Range: \$120-2500 Mean: \$975 Median: \$305
Frame Relay	0	0%	Don't Know	Don't Know
T-1	4	57%	1Mbps-20 Mbps*	Range: \$0-\$1112 Mean: \$520.67 Median: \$450

<sup>1</sup> All speeds are self-reported by the respondents. In the case of those with an asterisk (\*), the type of internet connection reflected is not capable of providing the maximum speed reported.

Type of Internet Connection	N=132/37%	% Responding Yes	What is the speed? <sup>1</sup>	How much do you pay each month? (range and median)
Other	4	36%	20 Mbps- 1G	Range: \$68-\$350 Mean: \$143.25 Median: \$77.50

If respondent does not know the speed:

Is there an employee at your business that might know and be able to discuss the speed of your connection? *Take name and number for future callback.*

10. Did you have to sign a contract to establish your Internet connection with (*INSERT FIRST RESPONSE*)? (N = 359\*) (4 respondents indicated having two service contracts)

Verizon (N=51)	
Yes	65%
No	20%
Don't Know	16%
Cox Communications (N=280)	
Yes	54%
No	28%
Don't Know	18%
Other (N=28)	
Yes	50%
No	29%
Don't Know	21%

- 10a. If YES, what is the term/length of your service contract with (*INSERT FIRST RESPONSE*)?

Verizon (N=33) (In Years)	
1	21%
2	55%
3	9%
5	3%
Don't Know	12%
Range	1-5
Mean	1.97 years
Mode	2

Cox Communication (N=151) (In Years)	
1	17%
2	40%
3	15%
5	4%
10	1%
Don't Know	23%
Range	1-10
Mean	2.21 years
Mode	2
Other (N=14) (In Years)	
2	21%
3	29%
5	7%
Don't Know	43%
Range	2-5
Mean	2.88 years
Mode	3

11. Please rate the following aspects of your services by checking the appropriate column. (N=355)

Service Issue	Very Satisfied	Satisfied	Dissatisfied	Very Dissatisfied	Don't Know/Not Applicable
Cost of broadband/internet/network service	7%	49%	21%	7%	17%
Speed of the on-line connection	23%	58%	13%	5%	1%
Billing practices of your provider.	16%	61%	7%	3%	12%
Reliable access to the Internet.	31%	56%	10%	3%	1%
Ease of use.	31%	62%	5%	1%	1%
Customer Service/Technical Service Representative's knowledge when you call for service.	23%	52%	9%	5%	12%
Service/Installation technician's ability.	24%	50%	5%	5%	15%

12. In the last 30 days, which applications has your broadband data communications/Internet Access connection supported? *CODE ALL MENTIONS, PROMPT WITH 'ANYTHING ELSE?'* (N=355)

Application**	First Mention (N=355)	Second Mention (N=346)	Third Mention (N=334)
Email	95%	1%	.3%
Videoconferencing	1%	30%	1%
File Sharing	1%	33%	25%
Internet telephone	1%	8%	15%
Retail Transactions	.3%	15%	20%
Website Application	1%	5%	23%
Business to business function	1%	3%	4%
Online Education	--	2%	2%
Banking	.3%	2%	4%
Monitoring Functions (Security, Energy)	--	--	1%
Research	1%	1%	4%
Telecommuting	--	--	.3%
Appointments/Scheduling	--	--	1%
Other: Please describe	1%	.3%	1%

\*\*A full listing under the “Other” category is available in Appendix C (This not only includes the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> mentions above (N=6), but all 14 mentions of “Others” provided by business).

12a. Does your Internet connection support a WiFi system for your employees for portable/mobile device access? (N=355)

- 1. YES 74% (N=264)
- 2. NO 25% (N=89)
- 3. Don't Know 1% (N=2)

12b. If YES, what is the capacity/speed of that WiFi system? (N=264)

Responses

- 1. Don't Know/Not Sure (N=198) 75%
- 2. 2.4 Mbps to 5G (N=45)<sup>2</sup> 17%
- 3. Articulated response in the number of users/employees (3 to 100) (N=14) 5%
- 4. High/Fast (N=2) 1%
- 5. Slow/Not fast enough (N=5) 2%

<sup>2</sup> These are self-reported speeds by the respondent, and may not reflect the speeds that WiFi is capable of.

12c. Do you provide public/client access to the Internet through WiFi at your business? (N=355)

- |               |             |
|---------------|-------------|
| 1. YES        | 22% (N=78)  |
| 2. NO         | 76% (N=271) |
| 3. Don't Know | 2% (N=6)    |

12d. If YES, what is the speed/capacity of the WiFi network you provide? (N=78)

Responses

1. Don't Know/Not Sure (N=52)
2. 128 Kbps to 50G (N=20)<sup>2</sup>
3. Slow (or some other description) (N=6)

13. Do you anticipate that you will need to enhance your current broadband/high speed Internet access in the next year? (N=355)

- |               |             |
|---------------|-------------|
| 1. YES        | 23% (N=82)  |
| 2. NO         | 67% (N=238) |
| 3. Don't Know | 10% (N=35)  |

13a. If YES to 13., what are the applications that are driving a need to enhance your high-speed Internet services? (N=82)\*\*\*

Top 3 First Mentioned Responses

1. Need faster/better/more reliable connection (N=17)
2. More /increased/business/higher volume of work/growth (N=14)
3. Video (conferencing/streaming) (N=7)

\*\*\*Full listing is available in Appendix C

13b. If YES to Q.13, What additional levels of speed/bandwidth do you anticipate needing to meet your business demands? (N=82)

Responses

- |  |     |
|--|-----|
| 1. Don't Know (N=19)/Not sure (N=8)              | 33% |
| 2. Double it/faster/More/300x's faster (N=18)    | 22% |
| 3. Specific Mbps offered (100 Mbps to 2G) (N=26) | 32% |

Specific Speeds Offered

- 100 Mgbps (N=12)
  - 1 Gig (N=4)
  - 150 Mgbps (N=2)
  - 50 Mgb (N=2)
  - 200 Mgbps
  - 2 Gig
  - 10 Mgbps
  - 1300 or 1400
  - 30 Mgbps
  - 500 Mgbps
- |                 |     |
|-----------------|-----|
| 4. Other (N=11) | 13% |
|-----------------|-----|
- Fiber N=5)
  - FiOS (N=2)
  - Additional service that is reliable.
  - Whatever is the best available at the time.
  - Just to simply better access to internet.
  - It needs to hold 10 computers and 50 cells without lag.

13b.1 If "Don't know to 13b above: (N=19)

Follow: Is there someone with your organization that might be able to provide this information?

- |        |        |
|--------|--------|
| 1. Yes | (N=1)  |
| 2. No  | (N=18) |

If YES: *Schedule callback if employee is not available.*

13b1a. If NO: How do you make decisions about the broadband speed you need to establish at your organization? (N=18)

- |    |                                      |       |
|----|--------------------------------------|-------|
| 1. | By the number of employees           | (N=1) |
| 2. | Based on demand/growth               | (N=6) |
| 3. | Price/Demand balance                 | (N=3) |
| 4. | Ask provider/consultant what we need | (N=5) |
| 5. | Don't Know                           | (N=3) |

13c. If No to Q.13, Do you anticipate you will need to enhance your current high-speed Internet access at some point in the future? (N=238)

1.	Yes	29% (N=69)
2.	No	59% (N=127)
3.	Don't Know	18% (N=42)

13d. When do you think you need to enhance your current high speed Internet access in the future? (N=69)

1.	One to two years	30%
2.	Three to five years	25%
3.	More than five years	3%
4.	Depends on business need	4%
5.	Depends on changes in technology	3%
6.	Other	1%
7.	Don't Know	33%

14. How important is a robust broadband Internet connection to the day-to-day operations of your business? (N=355)

1.	Very Important	80%
2.	Important	10%
3.	Somewhat Important	6%
4.	Not at All Important	3%

15. Would it be beneficial to you if the broadband/high speed Internet environment in Norfolk was enhanced for your clients or customers? (N=355)

1.	YES	74%
2.	NO	18%
3.	Don't Know	8%

15a. If YES, how would it be beneficial to your ability to provide services to them? (N=262)

First Response (N=262)\*\*\*

1.	Faster/More Speed	23%
2.	Better WiFi Service	7%
3.	Stronger/Better Connection	10%
4.	Do business more efficiently	38%
5.	Easier file sharing	1%
6.	Good customer service	2%
7.	Any improvements a help	4%
8.	Other	10%
9.	Don't Know	7%

\*\*\*Full listing is available in Appendix C

Second Response (N=42)

1. Faster/More Speed	26%
2. Better WiFi Service	12%
3. Stronger/Better Connection	17%
4. Do business more efficiently	38%
5. Other	7%

16. When you sought broadband/high speed Internet services for your business at your location, how would you describe the availability of multiple, competing broadband options (N=355):

1. Competitive, several options	10%
2. Somewhat Competitive, a handful of options	15%
3. Only Slightly Competitive, two providers	30%
4. Not Competitive at All, only one provider option	41%
5. There is not a broadband option available that is suitable for my business.	3%

17. Given your answer to the preceding question, how confident are you in your ability as a business to negotiate a contract with a broadband service provider for the bandwidth/speed you need at an acceptable price? (N=355)

1. Very Confident	23%
2. Confident	26%
3. Somewhat Confident	23%
4. Not at all Confident	28%

18. Do you have any other comments about high speed Internet or broadband service availability in Norfolk? (N=400)

YES – 30% (N=125)

NO – 70%

First Responses (N=125/30%)

1. Need more options/competition in the City	49%
2. Wish had Verizon FiOS	12%
3. Other	7%
4. Newest/fastest technology not available	6%
5. Should be available everywhere	6%
6. Too expensive	5%
7. Want Google Fiber	4%
8. Happy with Broadband access	3%
9. Unhappy with Cox	3%
10. Want Hot Spots in the City	2%
11. Don't Know	2%

Just a few more questions for classification purposes only.

Q19. What year was this business started? (N=400)

Range: 1800 to 2016

Median: 1989

Mode: 2014

Q20. What is the annual sales volume for this business? (N=400)

1	Under 1 Million	71%
2	1 to 4.9 Million	14%
3	5 to 9.9 Million	2%
4	10 to 24.9 Million	1%
5	25 to 74.9 Million	1%
6	75 to 199.9 Million	.3%
7	200 to 499.9 Million	0%
8	500 to 999.9 Million	1%
9	1 Billion+	1%
10	(DO NOT READ) Don't know	10%

Q21. What is the number of employees for this business? (N=400)

1.	1-4 Employees	55%
2.	5-9 Employees	16%
3.	10-19 Employees	12%
4.	20-49 Employees	7%
5.	50-99 Employees	4%
6.	100-249 Employees	3%
7.	250-499 Employees	.3%
8.	500-999 Employees	.5%
9.	1000+ Employees	2%

The City of Norfolk greatly appreciates your cooperation in completing this survey. If you have any questions related to the survey, contact \_\_\_\_\_.

**EXHIBIT B-5**

**NORFOLK BUSINESS BROADBAND SURVEY  
RESPONDING BUSIENSSES**

**EXHIBIT B-5**

**ALL BUSINESSES THAT RESPONDED TO THE NORFOLK BUSINESS BROADBAND  
SURVEY**

**RESPONDING BUSINESSES<sup>1</sup>**

7 CITIES TAX REFUND SERVICE  
7-ELEVEN  
7-ELEVEN, INC.\*  
7-ELEVEN, INC.  
A&M AUTO REPAIR INC\*  
A+ ECONOMY LODGING, INC.\*  
ABC CONSULTING INC  
ACCOUNTING EXECUTIVE SVCS LLC  
ACCURATE DRAFTING INC  
ACE LOCKSMITH CO  
ADVANCED TEMPORARIES INC  
AFFILATED AGENCIES OF VIRGINIA  
AFFORDABLE COIN LAUNDRY  
ALDRSGATE UNITED METHODIST CH  
ALL JOY HANDYMAN SERVICES LLC  
ALL SEASONS GROUNDS MGT INC  
ALLIED CONSTRUCTION TECH INC  
ALS ELECTRIC INC  
ALZHEIMERS ASSOCIATION  
AMEDIATE LLC  
ANDRE MARQUEZ ARCHITECTS INC  
ANDREWS UPHOLSTERING INC\*  
ANJELLA PAULETTE DAY SPA\*  
ANN MAID CLEANING SERVICER  
ANNE PRINCESS AUTOMOTIVE CTR  
ANZELL AUTOMOTIVE, INC  
APPLIED INDUSTRIAL TECHNOLOGIES - D  
AREA STORAGE I  
ART FX INC  
ARTISAN BAKEHOUSE HOLDINGS LLC  
ARTISTRY IN HAIR LLC  
A-SHARP EVENTS LLC  
ATC BUILDING INC  
ATLANTIC ASSET MGT GROUP INC  
AUXILIARY SYSTEMS INC  
AXIS UTILITY CONSTRUCTION INC

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<sup>1</sup> Businesses without internet access are denoted by an asterisk\*. Four (4) businesses chose not to provide their name.

B3 CONSULTING SERVICES LLC  
BARRYS PERFORMANCE IMPORTS  
BAYVIEW COMMUNITY PHARMACY  
BAYVIEW VETERINARY CLINIC\*  
BE BLISSFUL  
BEACH CONSULTANTS INCORPORATED  
BERNAS CONSULTING SERVICES LLC\*  
BEST VALUE HARDWARE INC\*  
BETHANY FREE WILL BAPTIST CH  
BLENS SOLUTIONS LLC  
BOBBY B WORRELL JR  
BODACIOUS PIZZA LLC\*  
BOLD MARINER BREWING CO LLC  
BOOK EXCHANGE  
BORZOI GROUP INC  
BOWSER ENTERPRISES  
BPW/KLP PROPERTIES LLC  
BRABBLE INSULATION, INC.  
BRANDLYNN ANES PHOTOGRAPHY LLC\*  
BREWSTERS CHICKEN\*  
BUILDING BLOCKS SERVICES LLC  
BUSINESS WEB TRAINER LLC  
BYRD & BALDWIN BROS STEAKHOUSE  
C TECH INC  
C&R CUSTOM PAINTING\*  
CAL'Z PIZZA, INC  
CAMA ENTERPRISES INC  
CAPITAL CONCRETE, INC.  
CARING HANDS, LLC  
CARROLL TRUCKING INC  
CARTER ELECTRIC CO\*  
CARTER PETTREY INC  
CATHOLIC CAMPUS MINISTRY  
CAVANAUGH NELSON & COMPANY PLC  
CELERITY CYCLING\*  
CHARIS SUPPORT SERVICES INC  
CHECKERED FLAG MOTOR CAR COMPANY, I  
CHESAPEAKE BAY STEEL INC  
CHESAPEAKE MARINE RFRGN  
CHRISTIAN REFORMED CHURCH IN NORTH  
CHRYSLER MUSEUM INCORPORATED  
CINDY LEE INC  
CITA LOGISTICS LLC  
CITY OF NORFOLK  
CLOUD SCIENCE LLC  
CLOUDMASTER AVIATION SVCS LLC

COASTLINE PLUMBING INC  
COGIC MEM HM FOR THE ELDERLY  
COLONIAL CREMATORIUM INC  
COLONIAL WLDG FABRICATION INC  
COMPASS INSUR SOLUTIONS LLC  
COMPASS YOUTH SERVICES, LLC  
CONTINENTAL RESEARCH ASSOCIATES, IN  
CORPREW CAHILL LTD\*  
COVENANT PRESBYTERIAN CH USA  
CRESCENT PROPERTY MGT LLC  
CUTTY SARK MARINA INC  
D & D APPRAISERS  
D & G SIGNS INC  
D AUTH ILLISTRATION INC  
D W BOYD CORPORATION  
DASHIELL JR PE INC ROBERT G  
DAVENPORT BARBER SHOP\*  
DEEP SPACE ECOLOGY LLC  
DENT RX  
DESIGNS, INC.  
DIBERT VALVE & FITTING CO INC  
DISPOSE RECYCLE LLC  
DISTRIBUTION PROC SYSTEMS  
DKT ASSOCIATES LAND SURVEYORS  
DOCKLANDING ENTERPIRSES INC  
DOMINION TOWER FINCL ASSOC LLC  
DONS MOBILE AUTO REPAIR INC\*  
DOOR MASTERS INC  
DOUG PILLEY CREAVTIVE CONSLT  
DOXA ENTERPRISES INC  
DR LUCYS LLC  
DUCK HOME AND PEST SERVICES  
DYNAMIC MARINE INC\*  
EAGLE HOMEOWNER NETWORK LLC  
EAST BEACH INSTITUTE INC  
EAST COAST COMPUTERS  
EASTERN PEST SERVICES LLC  
ECLIPSE WINDOW TINTING  
EHI LTD OF VIRGINIA  
ELLEN PLLC FITZENRIDER DR  
EPISCOPAL DIOCESE OF SOUTHERN VIRGI  
EXCEL FOUNDATION INC  
EXECUTIVE EVENTS LLC  
FAIR PRICE VARIETY SHOP LLC\*  
FAITH ACADEMY SCHL EXCELLENCE  
FAMILY AUTO DETAILING LLC

FAMILY OPTOMETRIC ASSOC PC  
FANCY FRANS JEWELRY LLC  
FASTENAL COMPANY  
FINK'S JEWELERS, INCORPORATED  
FIRST CALVARY BAPTIST CHURCH  
FITNESS FIRST HEALTH AND WELLN  
FLEET SERVICES INC  
FOUR SEASONS GARAGE DOORS LLC  
FRACHT FWO INC.  
FREDERICK E MARTIN III DDS  
FREE MASN HARBOUR CONDOMINIUMS\*  
FRIENDS OF HAMPTONS ROADS  
FUNDAMENTAL MISSIONS INC  
GALLERTY AT MILITARY CIRCLE  
GERLOFF INC CHARLES W  
GETEM MANUFACTURING CO INC  
GHENT LAMP & SHADE INC\*  
GOLDMAN ADVERTISING CORP  
GOODY GUMDROPS & CO  
GRANDY BISTRO & DELI  
GRAY8 LLC  
GRAYS BODY SHOP INC  
GREAT SCOTT TREE SERVICE  
GREENLINK MKTG ADVISORS LLC  
GREGORY M HUTCHINS D D S  
GUTTERMAN IRON & METAL CORP\*  
H R BUILDERS INC\*  
HAMPTON RUBBER COMPANY  
HARBORS EDGE CHRTRBLE FOUNDATION  
HAROLD POLLACK  
HARRELL & HARRELL INC  
HARVEY LINDSAY COMMERCIAL REAL ESTA  
HCEC GROUP LLC  
HEADING HOME BASEBALL LLC  
HEALTH FOOD CENTERS INC  
HEARTS OF HOPE FOUNDATION INC  
HI 5 BALLOONS AND CANDY  
HIGHLAND BEARS AND MORE  
HOMES BY JAKE INC  
HOPE STILL FOUNDATION  
HORTENSES BARBER SALON\*  
HOST TERMINALS INC  
HOUSE OF DAVID  
HUGHES DOUGLAS JOHN DDS PC  
HYVAL INDUSTRIES INC  
I ORGANIZE U LLC

I&M AUTO REPAIR\*  
IA ELECTRIC LLC  
IHEARTCOMMUNICATIONS, INC.  
IMAGES IN LIGHT INC  
INFANT CARE CENTER LIGHT YEAR  
INGRAM E CLIFTON JR CPA  
INTELLIGENT DESIGNS INC  
ITMS INC  
IUEC LOCAL 52 INC  
JAMES BARRY ROBINSON INSTITUTE  
JAMES REIF  
JASON T SMITH  
JAZ ENTERPRISES FLORIDA LLC  
JH ENTERPRISE INC  
JOHN SCHAEFER M D  
JOINT APPRENT COMM PLBG HTG AC  
JONATHAN YOUNG  
J-PRO PROPERTIES LLC  
JPS CONSULTING  
JUMPING HURDLES INC  
JUSTSMART ELCTRLOGY STUDIO LLC  
K & D ROUNDS LDSCP SVCS INC  
KAYAK NATURE TOURS LTD  
KELLAM GALLERIES  
KELLAM PICKRELL COX TAYLOE PC  
KENNETH PORTER ADVISORY LLC\*  
KIMBERLY ROGERS  
KOBUKAN MARTIAL ARTS VA LLC  
KORSLUND & KORSLUND PC  
L & B INVESTMENTS LIMITED  
L & J VISION CENTER INC  
LA MONDUE LAW FIRM PLC  
LAKE WRIGHT LLC  
LARRY R SPENCER  
LAW OFFICES RICHARD J SERPE PC  
LAWNS PLUS\*  
LAWSON REALTY CORPORATION  
LEARNING CHILD DEV CTR LLC  
LEWIS ACCOUNTING  
LIBERTY PARK RHF HOUSING INC  
LITTLE DOG DINER LLC  
LLC SNOW BIRD  
LUNDQUIST ASSOCIATES LTD  
M D WELL PUMP\*  
MACK BROWN CPA  
MACKEY INK LTD

MAMA LAUS PANDA CAKES LLC\*  
MANHATTAN  
MARCRAFT SYSTEM LLC  
MAR-KINS INSPECTIONS LLC  
MARRICK LLC  
MARSHALLS OF MA, INC.\*  
MASTER KLEAN LLC  
MCDONALD'S RESTAURANTS OF VIRGINIA,  
MCGOWAN CONSULTANTS INC  
MEDIATION CTR OF HAMPTON ROADS  
MID-ATLANTIC REALTY & ASSOC  
MIDDLETON, INCORPORATED, E. G.  
MILTON KING INC  
MIRMAN LAW FIRM PLLC  
MOHENIS SERVICES, INC.  
MR TS LOCK & KEY\*  
MRS BENNETTS BAKERY LTD\*  
MUDDY PAWS DOWNTOWN  
MY FEET UP  
NANCY CHANDLER ASSOCIATES INC  
NATE KINNISON PHOTOGRAPHY  
NAVIS ENERGY MGT SOLUTIONS LLC  
NEIGHBRHOOD CMNTY ASSN MGT INC  
NETTEK LLC  
NEW LIFE PROGRAMS  
NEYRA INDUSTRIES, INC.  
NORFOLK BEARINGS & SUP CO INC  
NORFOLK CASA INC  
NORFOLK LASER ENGRAVING\*  
NORFOLK PRINTING CO  
NORFOLK PUBLIC SCHOOLS  
NORFOLK PUBLIC SCHOOLS  
NORFOLK TIRES AND RIMS  
NORFOLK TRUCK CENTER INC  
NORTHFIELD MEDICAL MFG LLC  
NORTHWESTERN MUTUAL FINANCIAL  
O K MOVING & STORAGE CO INC  
OCEAN LEARNING CENTER INC  
OCEAN RESTORATION LLC  
ON GRID INFRSTRUCTURE SVCS LLC  
ORGANIC FOOD DEPOT COMPANY  
OTTACAM AUTOMOTICE INC  
OUTREACH AFRICA, INC.  
PAGE HOUSE  
PARAMOUNT GREENHOUSE & NURSERY  
PARIS CONTRACTING & ELEC SVCS\*

PERRY LEMLEY  
PHILLY STYLE STEAKS & SUBS  
PIZZERIA UNO CHICAGO BAR & GRILL  
PLANET SMOOTHIE  
PLURI LANGUAGE SERVICES  
PORTAL AUTOMOTIVE INC  
POSITRON EMISSION TOMOGRAPHY INSTIT  
PREFERRED COMMERCIAL CLG LLC  
PRIMM & COMPANY INC  
PROGRAMS MGT ANALYTICS TECH INC  
PROTEJE INC\*  
RAYS BODY & PAINT SHOP INC  
REAL ESTATE APPRAISALS SVCS  
REDGATE PROPERTIES LLC  
REGUS CORPORATION  
RELIABLE 1 LLC  
RENOVATION SPECIALTIES  
RENT LEASE INC  
RENT-A-CENTER, INC.  
RICHCORP FISHING CHARTERS\*  
RICK KIEFNER JR  
RISING SUN OAKMONT LLC  
RON HESS ARMS COMPANY  
ROSAURA DE JESUS DE GOMEZ  
ROYAL MACE LLC  
S L NUSBAUM REALTY CO. (INC)  
SAMS SON CONSTRUCTION LLC\*  
SCHLATRES PAINTING  
SCHNEIDER LOGISTICS TRANSLOADING AN  
SCHURMAN FINE PAPERS  
SCIENCE SIMULATORS LLC  
SCOTT & CO RUG CLEANERS INC  
SECURITY INSURANCE AGENCY INC  
SERVICEMASTER CO  
SEVEN CITIES GRANITE  
SHIPSHAPE INC  
SI2 LLC  
SIEMENS INDUSTRY, INC.  
SKINNIES RECORDS INC  
SMITTYS BARBERSHOP III INC\*  
SNUG HARBOR PROPERTIES LLC  
SOUTHRN ENRGY SOLUTN GRP  
SPACEMAKERS INC  
SPARTAN SUITES/ AMBLING  
SPICER COMPANY INC FRANK  
ST THOMAS A M E ZION CHURCH

STAR PRINTING CO INC  
STARBUCKS CORPORATION  
STARBUCKS CORPORATION  
STEPHEN DOWNS ARCHITECT  
STEVE COOK INC  
STEVES AUTO SALES INC  
STUDIO 29\*  
STYLES BY FRAN\*  
STYLES SENSATIONAL  
SUNFLOWER FLORIST INC  
SUPPLY DIVO INC  
TERESA A SHENOUDA MD  
TERRIES BREAKFAST & LUNCH  
TEXAS PNEUMATIC TOOLS, INC.  
THE FRESH MARKET INC  
THE LAW OFFICE OF DANIEL P MCNAMARA  
THE NICHOLSON COMPANIES INC  
THE POINT AT PICKETT FARM  
THE TALBOTS INC  
THERMCOR INC  
THOMAS A NATCHUS PHARMACIST\*  
THREE SWALLOWS IMPORTS  
THRIFT STORE USA INC  
TIDEWATER ARTS OUTREACH  
TIDEWATER FLAT GLASS DIST LLC  
TIDEWATER FLEET SERVICES LLC  
TIDEWATER HOME CARE, INC.  
TOP HAT LIMOUSINES INC  
TRANSITIONAL LIFE CONNECTIONS  
TROPICAL CONSTRUCTION INC  
TURNKEY BUILDING SERVICES LLC  
UNIQUE TOUCH MASSAGE INC  
VAAD HAKASHRUS OF TIDEWATER  
VAMAC, INCORPORATED  
VANGUARD INDUSTRIES EAST INC  
VEDHA CAPITAL LLC  
VIA DESIGN ARCHITECTS PC  
VICCELLIO CONSTRUCTION INC  
VINCENT HANCOCK  
VINCENT JACKSON  
VIRGINIA CHILDRENS CHORUS  
VIRGINIA DENTAL LABORATORIES  
VIRGINIA ORCHESTRA GROUP INC  
VISTA CONSTRUCTION LLC  
VISTA PRO LLC  
VIVIAN J PAIGE CPA PC

VOICE OF EMPOWERMENT  
WAGS DOGGIE DAYCARE  
WALKER KENNESHA  
WALTER STRYKER  
WARREN AUTO REPAIR  
WB CONTRACTING GROUP INC  
WELLS FARGO ADVISORS, LLC  
WENDY'S INTERNATIONAL, LLC  
WENDY'S INTERNATIONAL, LLC  
WESLEY MEM UNTD METHDST CH  
WILLCOX ANDERSON SAVAGE CC  
WILLIAM CURTIS BAILEY  
WIRELESS CONCEPTS LLC  
WISE TECHNICAL INNOVATIONS  
WOMENS WORKOUT & FITNESS CTR  
WOUNDED WHEELS

## **EXHIBIT B-6**

# **NORFOLK BUSINESS BROADBAND SURVEY OPEN RESPONSES TO SPECIFIC QUESTIONS**

**EXHIBIT B-6**

**FULL LIST OF OPEN CODED RESPONSES TO CERTAIN QUESTIONS**

Q12. In the last 30 days, which applications has your broadband data communications/Internet Access connection supported? (N=27) (This not only includes the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> mentions above (N=6), but all 14 mentions of “Others” provided by business)

**Other**

All of the above  
All reservations are online. Credit card processing.  
Bid jobs  
Business applications and billing application  
Data entry  
Downloading software  
Everything else  
Fax  
Membership list so people can join to get a discount.  
Miscellaneous  
Music  
Networking  
Our electronic medical records  
Our entire stock and inventory are online.  
Project management  
Proprietary applications  
Refused  
Social networking  
Streaming and file downloading  
Transfer large documents  
Truck order, inventory  
Videos through a tv.  
We do VPN as well.  
We have our own personal websites also.  
We prepare tax returns.  
Wifi for customers and the ATM  
Will be updating.

13a. What are the applications that are driving a need to enhance your high speed Internet services?

Online testing.

More sales system, social media.

Electronic health record.

Increase in web applications.

The retail transaction software.

No particular one.

Video conferencing and voice telephone.

Photo shot.

Wireless security system.

File sharing.

Our training applications.

Just our overall business needs bringing connectivity to our corporate office.

Our worship software.

No.

Wifi speed and access.

All business applications.

All business applications.

I'm using Verizon right now. The tower I'm using is so far away that it causes problem with the internet and they can't or won't do anything about it. I'm thinking switching back to Cox.

Web programming and web usage.

Higher speeds better quality.

To catch up with the times.

More users.

Reliability.

IP phone solution.

Speed.

We are a library and the increased need would be because of public use and access. The better broadband speed the faster we get things done.

Video conferences and playing games.

Bus database controls all stores.

All the ones mentioned earlier.

Insurance that uses internet base.

Business.

Email transactions.

Our electronic medical records.

Storage space and emails devices we use and phone.

Advertising.

Speed.

State testing for students.

VPN applications.

Internet telephone.

More use of the wifi.

Could be a need for video conferencing.

I need something better than DLS at an affordable rate.  
Expanding more employees.  
Adding more staff.  
Growth.  
Probably trading.  
To watch videos. It's slow.  
The video conferencing and file sharing.  
It's generally that I need higher speed of internet to help with online video applications.  
I need a better internet.  
I would like for faster download and uploads.  
Increase services.  
I'm not sure.  
If I could get Verizon instead of Cox.  
I like higher speed.  
It depends on if we expand or not.  
We moved the mobile phone into a computer system. There is a need for better internet for the company as it grows.  
Need more speed.  
Just simply a better access to internet visibility.  
Slow some times.  
Scheduling, use of my fax and email.  
Increase in business.  
Media capacity.  
Move to bigger office.  
When a lot are using the internet the speed slows down.  
Just more data.  
Dysfunctionality.  
Upgrade to.  
I don't know.  
Increased productivity  
Clerical computing, downloading data.  
Video conferencing and remote monitoring.  
Increase clientele.  
General access capacity for all.  
I want something faster.  
We need to access labor and parts guide online.  
We need to download large blueprints and we need a high frequency to do this and now the computer stalls out when the broadband is slow.  
Simple operations because we get knocked out too much.  
Faster speed.  
Reservation system. Presentations that are being performed.  
More speed.  
Everything just uses more and more bandwidth as we go.

15a. How would it be beneficial to your ability to provide services to them? (N=262)

Faster

Offers better workflow and speed.

I don't know.

The services that we provide as long as they're able to access it when able.

Stronger the connection the easier for us to do our job.

Faster work.

Better access.

Our functioning, we would have a quicker response time.

If we had faster internet we would be able to offer a wireless hot spot to our customers.

They would be able to better communicate with us and it would make booking easier.

More competition with Cox.

We have the best offer that gives us more to offer our residents as well.

It would enhance my ability to give them better service.

We would be able to better demonstrate our products and services to them.

For our internal business practices it would help as we are constantly speaking with people in Africa. It would help to have the enhancement to help up to keep that contact smooth and uninterrupted.

I just feel it would be.

Anything that is quicker is better.

I don't know.

Make purchase easier for customers.

I think especially if it held more data.

Be able look up troubleshooting information.

It would be easier to provide files and have higher quality of communications.

People are all about the wifi service.

I don't know.

You would be able to provide services.

I don't know.

Just make everything faster.

Not sure.

Just to have an alternate source.

I can be more efficient.

We use our wifi quite a bit in the office. We use it on our jobs sites with trailers with laptops.

Speed, ordering parts, following up with customers when their wheels are done.

We would be able to prepare and transfer the tax returns faster. Service customers quicker.

Make us quicker and go to paperless environment.

I don't know how.

That probably would be something that would be very well received.

Make it so if I had clients to do file sharing with to easily do this.

I couldn't say.

Making sure we are getting them trained right.

Fewer outages.

Helps a lot.

Offer a way to communicate.  
Everything we do in our office is online.  
Be very important.  
When we have conferences from time to time, it is kind of slow and choppy.  
Website shows all the flowers that customers pick.  
Speed of transactions.  
What we have is too slow. I do everything on the internet. It should be three times as fast as it currently is.  
Make more money.  
Helpful to us.  
Real good.  
It would improve speeds of transactions and access to clients.  
We could provide them to get the information they need.  
To provide more efficiently.  
Faster speed.  
Providing wifi.  
Offer more reliable and higher speed on the wifi.  
Faster speed and gets things done quicker.  
Give me a better perspective on how to do day to day transportation.  
In this building, if it were improved, it would help. This building is spotty. It depends on where you are as to how well it works.  
Just in contact.  
Multitude of reasons.  
Better it works, the faster I can provide services.  
I could function. Services are terrible.  
Enables us to provide better and faster service and more secure.  
Not sure.  
Make it quicker.  
They could pick up our radio station streams and such much easier.  
Contact services for free.  
Better access to everything.  
Any improvement is improvement.  
There is an ever increasing need for personal public use, be it banking, education, job applications, social reasons. Even though people have their phones and at home Internet there is still an increasing need for internet access at the public libraries.  
Better access.  
Strength in signal would eliminate interruptions.  
Faster connections.  
If I had a faster network connection I would be able to serve and process more customers more quickly.  
Faster speeds on emails.  
Information faster.  
More and more services are becoming more available to parents and in house staff.  
Easier to get done quicker.  
We would get more done, quicker services.  
It would make work in the office faster and the software we use.

It's good for everyone.  
Provide more services to them and families as needed.  
Faster service, scheduling online for our customers, paperless.  
Making it easier to get on the internet and have the tools ready to use on hand.  
Be able do more business quicker and more efficiently.  
We need other companies to compete with Cox.  
In terms of speed. Ease of access.  
Allow them to be able to order discounted rate via our website.  
For research purposes.  
Upload faster. Skype communications would be better.  
I don't know.  
Make the clients happier.  
More reliable and more options.  
I don't know maybe it would drop the prices down.  
No idea.  
Always looking for the latest and greatest.  
Not really, we do everything pretty old school.  
The ability to have access to materials we need.  
It would better help my clients.  
It would be very important it would help us get our work done better.  
Make it more efficient.  
Video conferencing and remote sessions and monitoring.  
Quicker.  
The more efficient we can be to provide services.  
Saves time the faster you can access information.  
We can communicate more efficiently.  
The quicker response time would be faster.  
Faster and better service.  
I don't know.  
They would be able to access my website through internet instead of calling.  
Our communication with them would be better. In our business we upload a number of videos and photos for our clients. Faster would be beneficial.  
It would enable us to provide better services to our employees.  
If it was something that was actually free everyone could access, they would not have to look for free service.  
It has got to help.  
They would know it is there.  
It would make credit card transactions faster.  
It will help expanding access on several computers and then help with billing.  
We could decrease the amount of time that clients spend in the office.  
I don't know.  
I would just say it would be a back up because we are a church so we never know what our volume is going to be for special occasions or whatever.  
The speed could be better, it would limit the bussing.  
Allow better access.  
It might be cheaper and faster.

Everybody should have it available. That's about it except I look forward to Norfolk expanding. Great public relations for the city.

Basically mobile devices would be able to do billing and quoting. The better the system works, the better my business runs.

Very.

If we had a more reliable and cheaper connection it would allow us to rely on the internet services and use more cloud services.

Quicker research. Provide service faster.

When customers come in it would give them an opportunity.

It would help with employee interaction at the company.

Worship software.

It would be important.

I don't really know.

Everything we do is with the internet. This is a cell phone store. The better the internet the better our service to the customers.

It would allow us to do it at a quicker speed.

I would be able to download faster and streaming would be better and I can respond to my customers better.

Provide more wifi to our clients and customers.

We could get access quicker without buffer.

We would be able to offer them service.

A faster internet is better.

They will be able to find us easier.

Enhancement to current services.

Liability and speed.

Yes. We would be able to do transactions a lot faster. The software we use is very intense and uses a lot of the bandwidth. We would be able to run the management software and provide services without long wait times.

Better faster and more reliability.

I would love it if we could have FIOS all over the whole city. Fiber optic would be great.

Since we have had Cox we have had a lot of problems with the connection. I have a child care service. When the internet is not working the system we used to swipe for checking children in and out, it makes it a real problem. That system is connected with our pay system.

Faster speed.

Not beneficial for us, more for customer.

It would make it easier to use internet at faster speeds.

Gives quicker access for the customers.

In our billing, we use our email for our billing system. Our website is out there for advertising and service related requests.

Move things along faster.

Faster transfer of information.

Make education easier.

They will be able to see their energy status.

I think there would be happier customers. We have trouble getting decent wifi access for them.

When it shuts down our business comes to a halt.

Amazingly beneficial because I can get things done faster.

It would be faster and easier for us to access.

I don't know.

The faster the better. Downloading and uploading faster.

If it was at a higher percentage it would be incredible.

Better connections and service.

Be more efficient in my job and not have to reset servers twice a day. I could read emails as they come in. It is very slow. I would think maybe more providers in the market would be better also but the speed. The speed is the issue.

Customers would be happy.

Moving faster.

Any need help we can get will be great.

It would make us more productive.

They can communicate with us.

Telecommunications and video chat and proposals.

They would be able to use the internet to access their private information.

I have to have it.

It would just be good to have time saving and reliability.

Any time you enhance something it is good.

It would make everything run faster for everyone in the store.

Better to get our name out there.

Everything we do is via the internet.

We could function better now it is so slow.

Getting around faster. More efficient.

We do online orders if we don't have something in stock, custom printing.

For having a free wireless internet access.

I wouldn't have to pay 3000 dollars to bring service to the building.

Without a robust connection we would not be able to operate.

Increase the efficiency.

Higher speed overall.

Everything would run a little faster.

If they can reduce the cost I could pass savings on to my clients.

Through sending invoices, running credit card services.

Ability to upload and download information faster.

I don't know for sure.

Let everything work better and more efficiently.

All business applications.

More efficient.

It would be beneficial for everyone, the marketing, the students. It would make my tables go faster.

Providing wireless for customers with more security.

Make things faster and more efficient.

We would like to get things done faster. It takes a long time to do anything we need to do.

Day to day operations.

It would make contacting them easier.

We wouldn't have to wait as long to load pages when you're using different browsers, it would be helpful.

Allowing it to be more efficient and getting more work done.  
Allow us to accomplish many tasks for our business.  
Faster communication.  
It would allow me to be more beneficial with my time.  
More efficient.  
It would make things better.  
Things would get done faster. More convenient.  
They would have a better broadband experience.  
It's a trickle down, we are all connected and if it works more efficient.  
To provide an increase speed and capacity.  
We would be able to supply a better service.  
Faster connections.  
Not sure.  
Cox has always had problems losing packet loss, they need to work on that. They've been here four times in a month.  
Help us save money. Hopefully let us do more.  
Hotel systems.  
Speed and reliability.  
We need better customer service options for the internet service available.  
Faster internet.  
Allowing behavior healthcare services to clients.  
Just knowing my clients don't have to burn data.  
Functionality for my clients and if it is not working for them that is a problem.  
Everybody is connected through the internet.  
If it was faster it would make my job easier.  
As long as it's cheaper.  
Broadcasting from religious station.  
With more data to internet connection with efficiency and downtime.  
Make it easier to transfer images to other medical facilities.  
Make things faster. Get clients in and out faster.  
Better access. Better speed.  
Their ability to be able to find us, being able to find us for services that they might need.  
We are a mall so if we had broadband we provide more service.  
It will be more stable connectivity.  
Get the word out of events faster. Wider database of recipients.  
Make it easier to contact residents.  
Need a faster internet for my emails.  
Be more effective.  
Make it faster to serve clients.  
Faster and availability to communicate better.  
It would enable them to get in touch with me wherever they were.  
Anything that is enhanced is beneficial.  
Response time a lot faster.  
Make things faster.  
More options.  
Cost.

Not sure.

Just help with more reliable access, more progressive with other areas.

It helps me do more research.

Make easier for access.

Make it easier and faster.

Conducting research, I run an art gallery.

I could stay connected and do productivity.

Improvements would be better.

Not having disrupted service.

Ease of use.

Free, fast and dependable.

Faster we can process transactions, the faster we can service more clients.

Faster.

It wouldn't be a monopoly.

A lot of the customers security system goes through phone or internet.

18. Do you have any other comments about high speed Internet or broadband service availability in Norfolk? (N=125)

My only concern is that as economic activity increases, the broadband capacity needs to increase as well. It would be nice to have more choices in broadband companies.

Would like more competition.

Just that I wish they would bring in fiber.

We need more options.

If I could relocate to an area with better broadband service, it would help me to better serve my customers.

Just that the more competition the better. If there were more services brought in it would improve the prices and quality of the services.

I wish we had more choices than Cox.

They need to bring in more competition.

I love it at my house.

I am in favor of competition. We need more.

It's very slow or non existent.

Wifi all over the city.

More areas in Norfolk need to have Verizon FIOS.

Need to provide Verizon service.

Just call Verizon.

We just need internet.

I think the availability is poor and they need to add FIOS as an option.

We need more reliable competitors.

Where I was at, I was at the end of the line. They didn't have FIOS internet.

Wish there was more providers. One provider just doesn't cut it. Need more choices.

No competition and only have one provider.

Infrastructure is terrible. Norfolk is terrible and wants phone company to pay for infrastructure.

It's limited. We don't have FIOS.

It would be better for the consumer to have more choices and better prices for internet service.

No, we are pretty good here, it is just when you get into the outlining cities.

They cannot get billing right on anything let alone broadband.

Norfolk needs to allow competitive access for multiple cable and broadband access.

I would like to see the price come down.

I love to get FIOS.

I would like to see a bundle price option.

It would be nice if there was competition.

I would like to see it available.

I would like to see more providers.

Needs to be more available to pay online.

I would like to have FIOS.

We can't afford for our systems to shut down.

I am not real happy with the service.

It's really good.

We need more of a variety.

More competition for the internet.

The city should talk to Google and get their internet installed.  
I like more variety. More competition to Cox.  
Great idea to make wifi available throughout the city.  
Norfolk has only one provider which is Cox.  
It doesn't exist other than Cox, I can't get FIOS.  
We want FIOS. We want the choice of another provider.  
Just needs to be faster.  
We need a better internet options in our area. Hopefully a better system. We are on Carlo Drive and we can't get any good internet because of the light rail or so the internet company says.  
Need more options.  
No, it would be hugely beneficial if it were here.  
Need more options.  
I would like to see more competitors.  
The broadband companies say that there is competition for services in the Norfolk area but actually each company serves by zip code. So each company only services specific zip codes.  
There is really no overlap in service.  
It's limited. There is just one provider.  
I would like to Verizon FIOS available so we would have a choice.  
We only have Cox and that is it. The area I live in they don't have the Verizon version available and Verizon has no intention to bring it to our area to my knowledge. So through Verizon I can only get dial up.  
Public places in Norfolk should have free internet access so I do not need to be charged and private places.  
It should bring in more distributors so they can get better pricing, but I think Cox is the only internet provider in Norfolk so it's an monopoly.  
Need more choices.  
That availability sucks.  
I wish it was better.  
I would full support bringing in an addition fiber options from major players.  
I want FIOS.  
It is very reliable. The number of times that our service has been down has been maybe twice a year and then for very brief periods for maybe half an hour or so even during the hurricane we did not lose service.  
It would be beneficial to have it available internally. We don't use it for our internal business but the customers use it very often. Customers use it when finding our business.  
I think we need other options to provide competition to keep the prices down.  
Need FIOS or something similar.  
Why are you running Lumos and Cox when I can't hook up to either one without a large surcharge.  
I think it's a shame that Verizon hasn't been able to come in.  
It needs external hard drive of 3 terabytes built into the wireless router standard.  
When is fiber coming.  
Verizon FIOS would be nice to have but Cox runs a monopoly around here and goes up every year.  
If they offer internet access for everyone, I don't want to have to pay extra for my internet.  
Need to open doors to other companies.

Not enough broadband providers.  
It is fine with me.  
I wish they would offer something else.  
It would be nice to have the option to have FIOS service. We are limited in our options.  
They should have FIOS.  
Companies that compete.  
We really are very limited.  
I would like to see FIOS offered.  
Multiple providers available.  
Needs improvement.  
They should make it available in public places.  
We need more providers.  
The city needs to become wifi friendly. Wifi hot spots.  
Have some competitors to choose from.  
We only have Cox, we would like fiber, but the city has blocked out some providers.  
It sucks.  
Cox is not the most reliable. It goes down sometimes.  
I know that Cox can give me what I want, I just don't know about the price.  
It's generally on par.  
I was hoping we would get Verizon DSL or something with faster speed.  
I would like to get FIOS in our area.  
I could definitely use faster service.  
I wish there were more choices.  
Get Google high speed internet.  
I wish there were more options.  
I wish Verizon FIOS was an option here and there needs to be more than two providers here.  
They need more options in my area.  
Speed it up. Make it cheaper.  
It is what it is, you take what you're given.  
I think they should allow other companies to compete and bring down the price.  
I wish there was more than one. I wish we had FIOS.  
I would welcome it. My guys do a lot of work on there.  
There needs to be more choices.  
Need more options.  
I would love to have more options. I would love to have FIOS.  
We need more choices. We would like to have FIOS. Connection goes in and out while I am using it.  
I would like to see more options. I have been shopping around for a while and just don't like the options.  
If seven counties could come in together to get DISH network to provide internet access would be wonderful to get rid of Cox competition.  
Cheaper construction cost for accessing new areas.  
I want FIOS in more areas. Allow more carriers to come in the area.  
Be nice to have other options.  
I think Cox takes advantage because they are the only option. The pricing is unfair. We need more providers to choose from.

I wish we had choices. We need competitors.  
It would be great to have it and to be improved.

I wish I had FIOS.

Just bring us more options.

Need more competitors. The cost is ridiculous. I am paying an extra 30 a month for a service I don't need any longer but I am afraid to have it disconnected because they will mess up and shut everything off.

I would like to have other than Verizon for phones and internet.

Encourage more competition.

Not where I live.

Not knowledgeable about it.

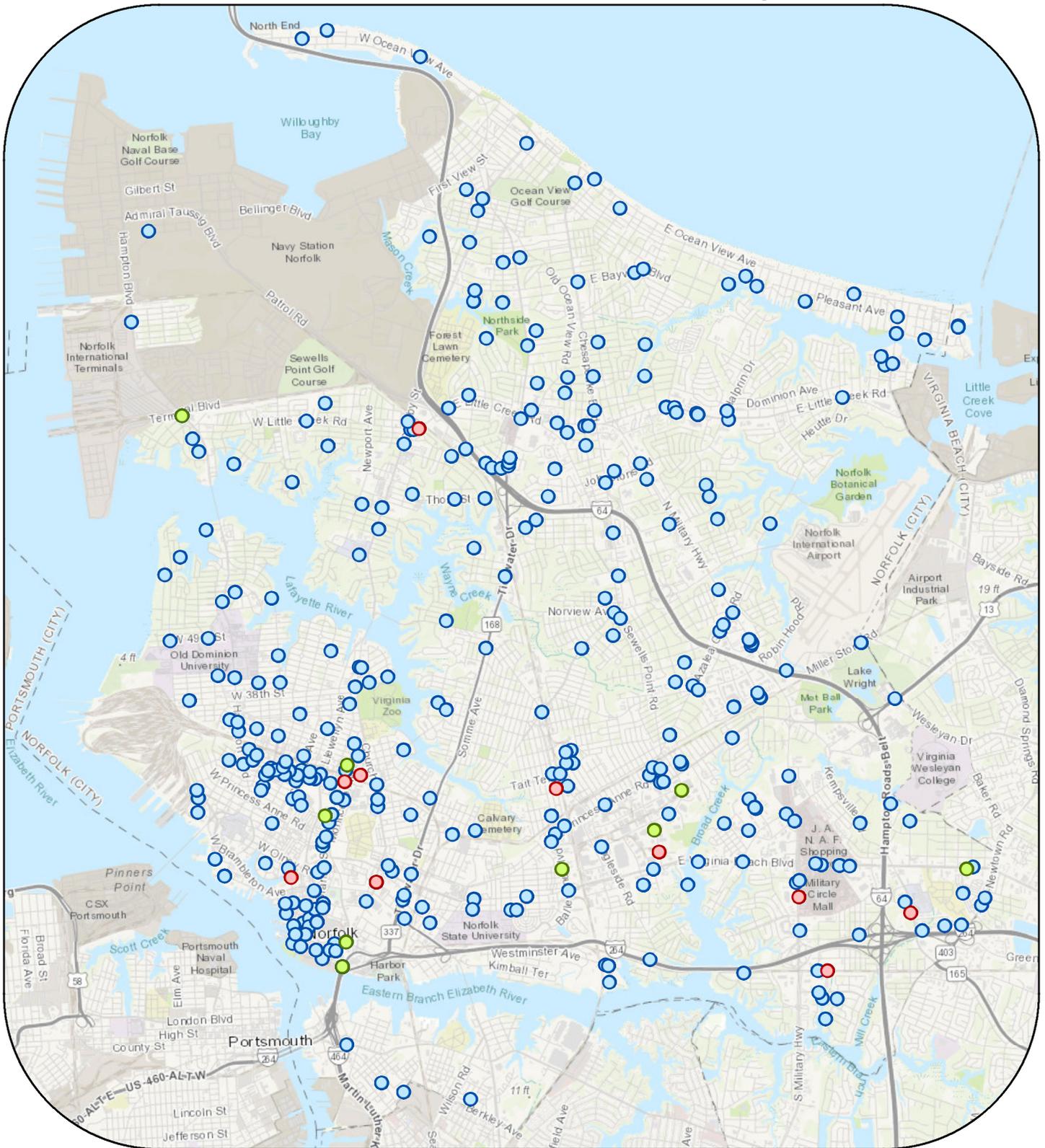
## **EXHIBIT B-7**

# **NORFOLK BUSINESS BROADBAND SURVEY MAPS**

## **Table of Contents**

1. Map of Responding Businesses Number of Employees of Norfolk Businesses
2. Map of Responding Businesses Annual Sales Volume of Norfolk Businesses
3. Map of Responding Businesses With and Without Internet Service in Norfolk
4. Map of Responding Businesses With and Without Cable Modem Internet Service in Norfolk
5. Map of Responding Businesses by Non-Cable Modem Internet Connections in Norfolk
6. Map of Responding Business by Provider and Location in Norfolk
7. Map Illustrating Norfolk Businesses Reporting Dissatisfaction with Internet Speeds
8. Map of Norfolk Businesses Needing Enhanced Broadband Access in the Next Year
9. Map of Norfolk Businesses Needing Enhanced Broadband Access not this Year, but in the Future
10. Map of How Norfolk Businesses Describe the Availability of Multiple, Competing Broadband Options
11. Map of How Confident Businesses are in Negotiating a Contract with a Broadband Service Provider in Norfolk

# Business Broadband Survey



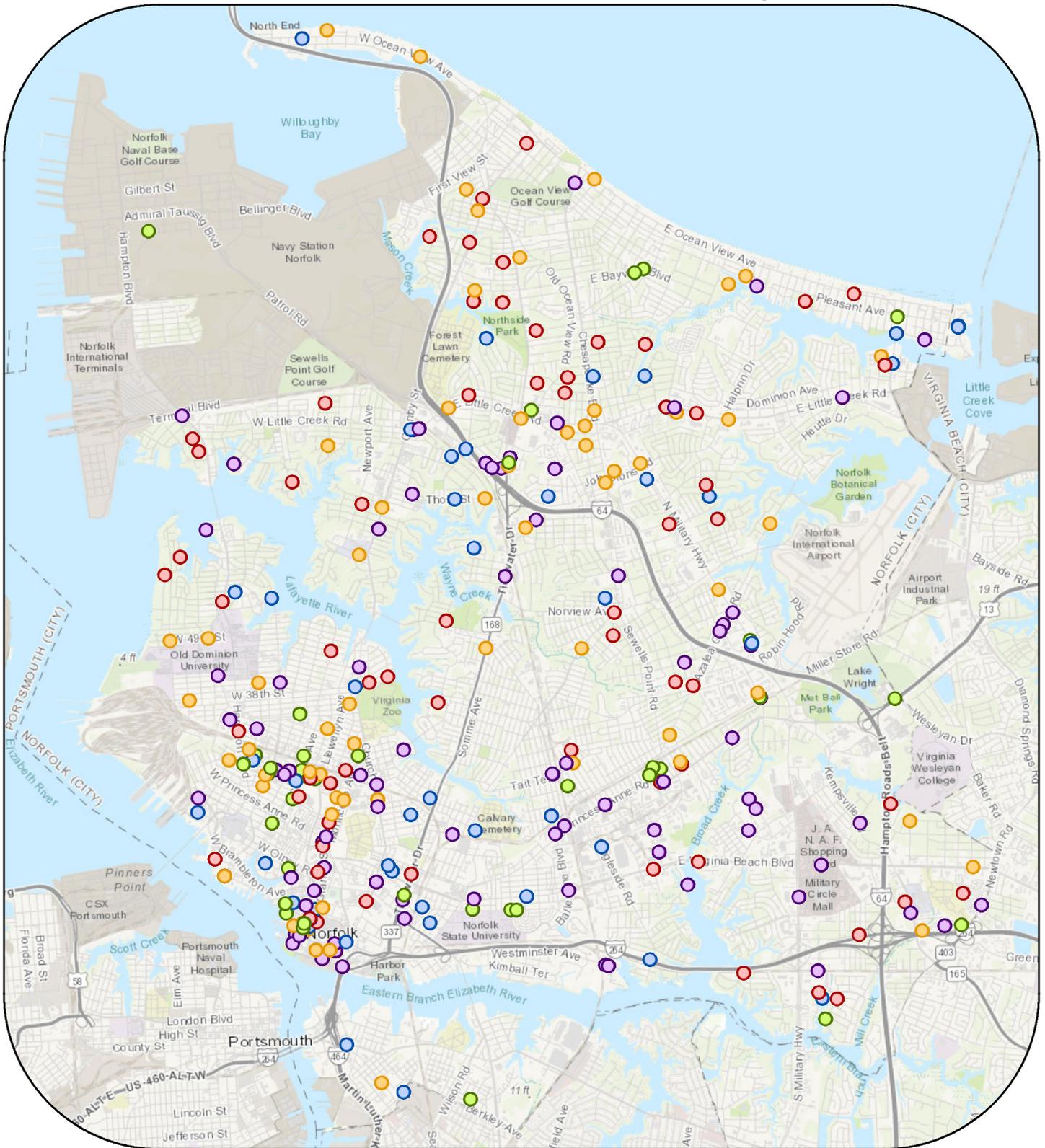
Created by the Department of Communications and Technology, GIS Bureau. This map is intended for graphic purposes only.  
Date: May 2017

**How Many Employees Do You Have?**

- 1 to 99
- 100 to 499
- 500 to 1000+

A north arrow pointing up, with 'N' at the top, 'S' at the bottom, 'E' on the right, and 'W' on the left. Below the arrow is a scale bar showing 0, 1, and 2 miles.

# Business Broadband Survey



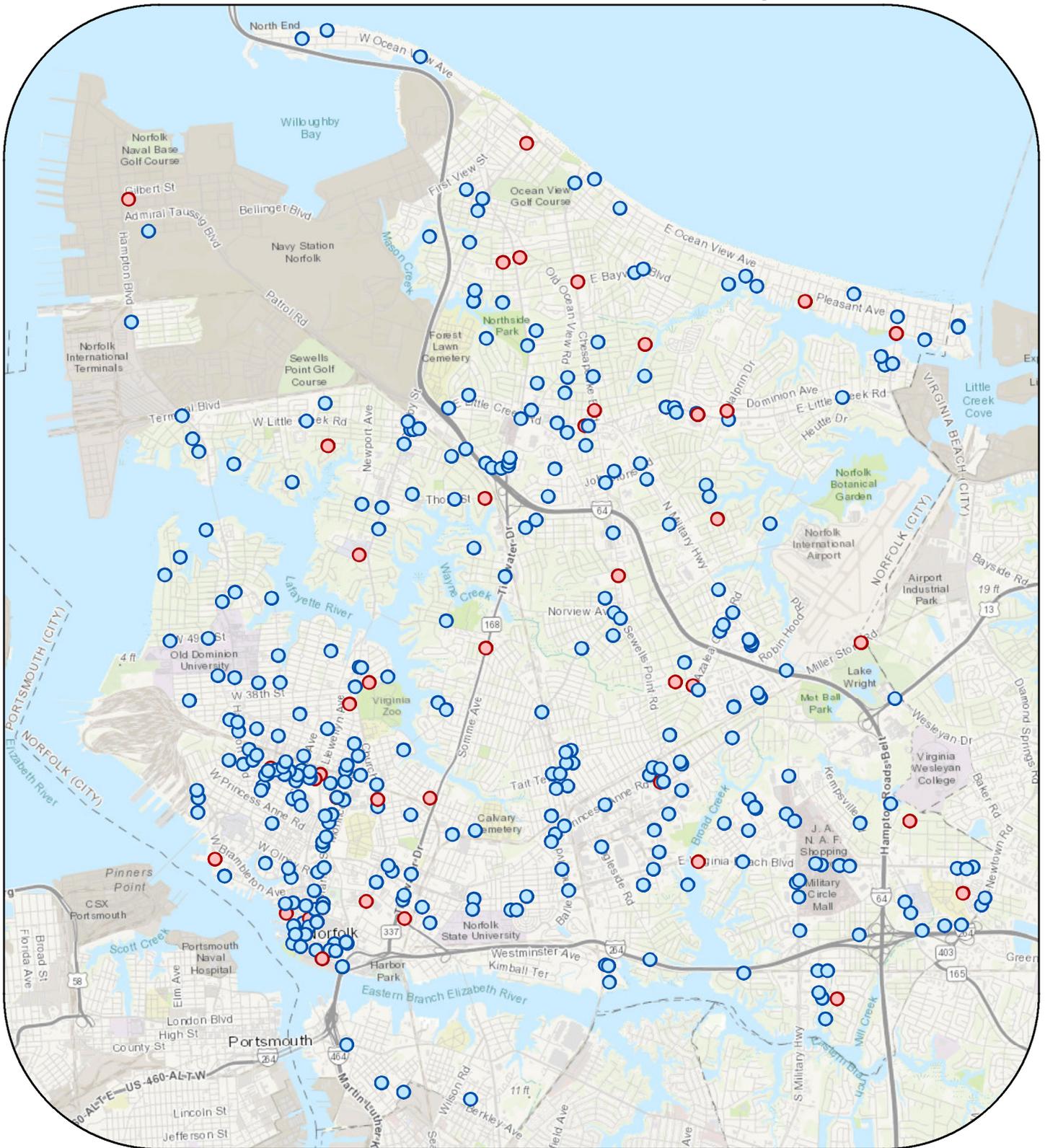
Created by the Department of Communications and Technology, GIS Bureau. This map is intended for graphic purposes only.  
Date: May 2017

**What is Your Businesses Annual Sales Volume?**

- Less than \$50,000
- \$200,01 - \$500,00
- \$50,001 - \$100,000
- Greater than \$500,000
- \$100,001 - \$200,000

0 1 2  
Miles

# Business Broadband Survey



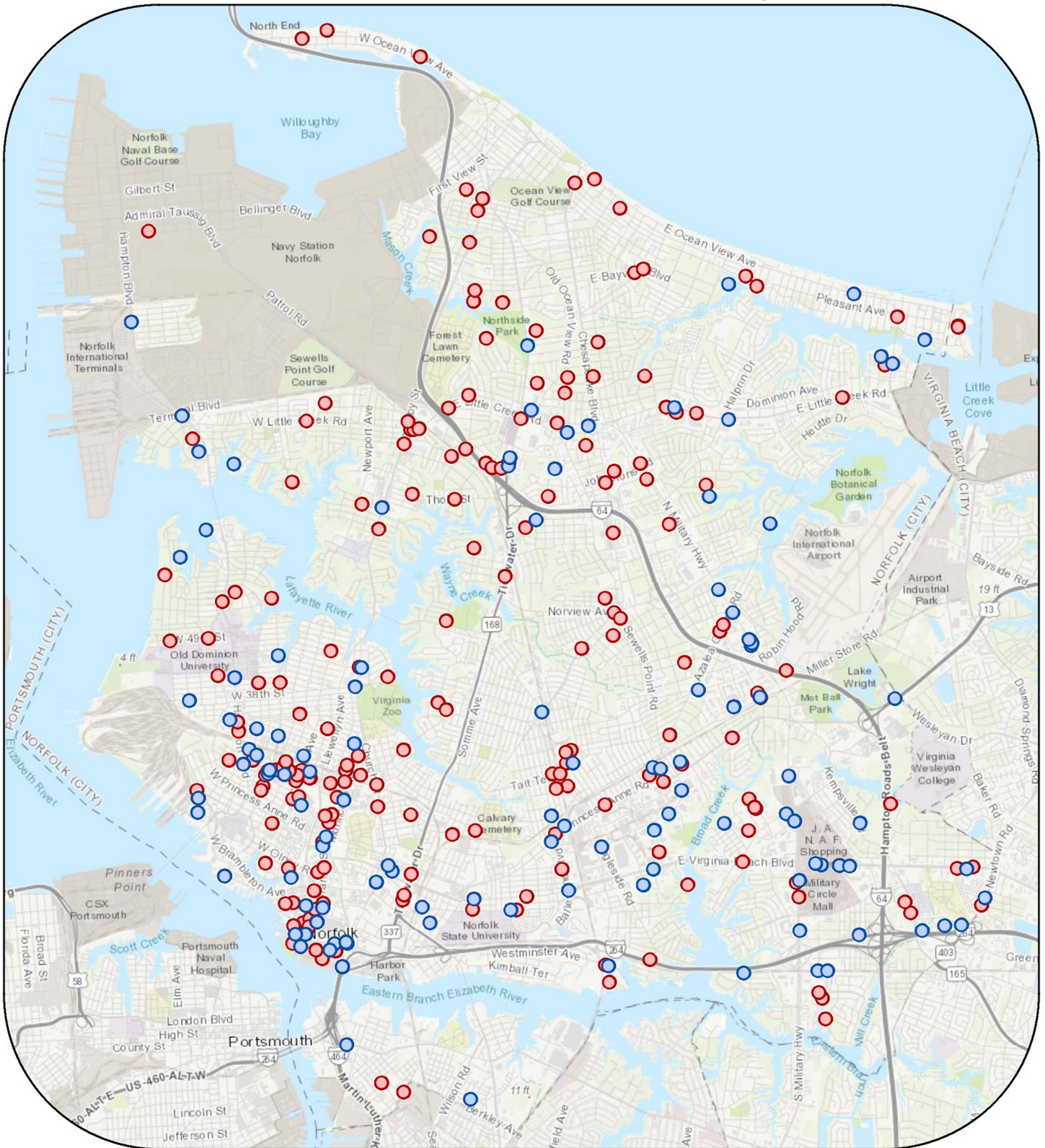
**Do You Have Internet Service?**

- Yes
- No

Created by the Department of Communications and Technology, GIS Bureau. This map is intended for graphic purposes only.  
Date: May 2017

0 1 2  
Miles

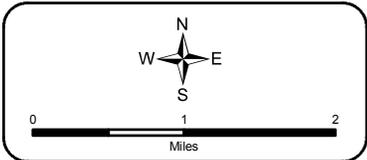
# Business Broadband Survey



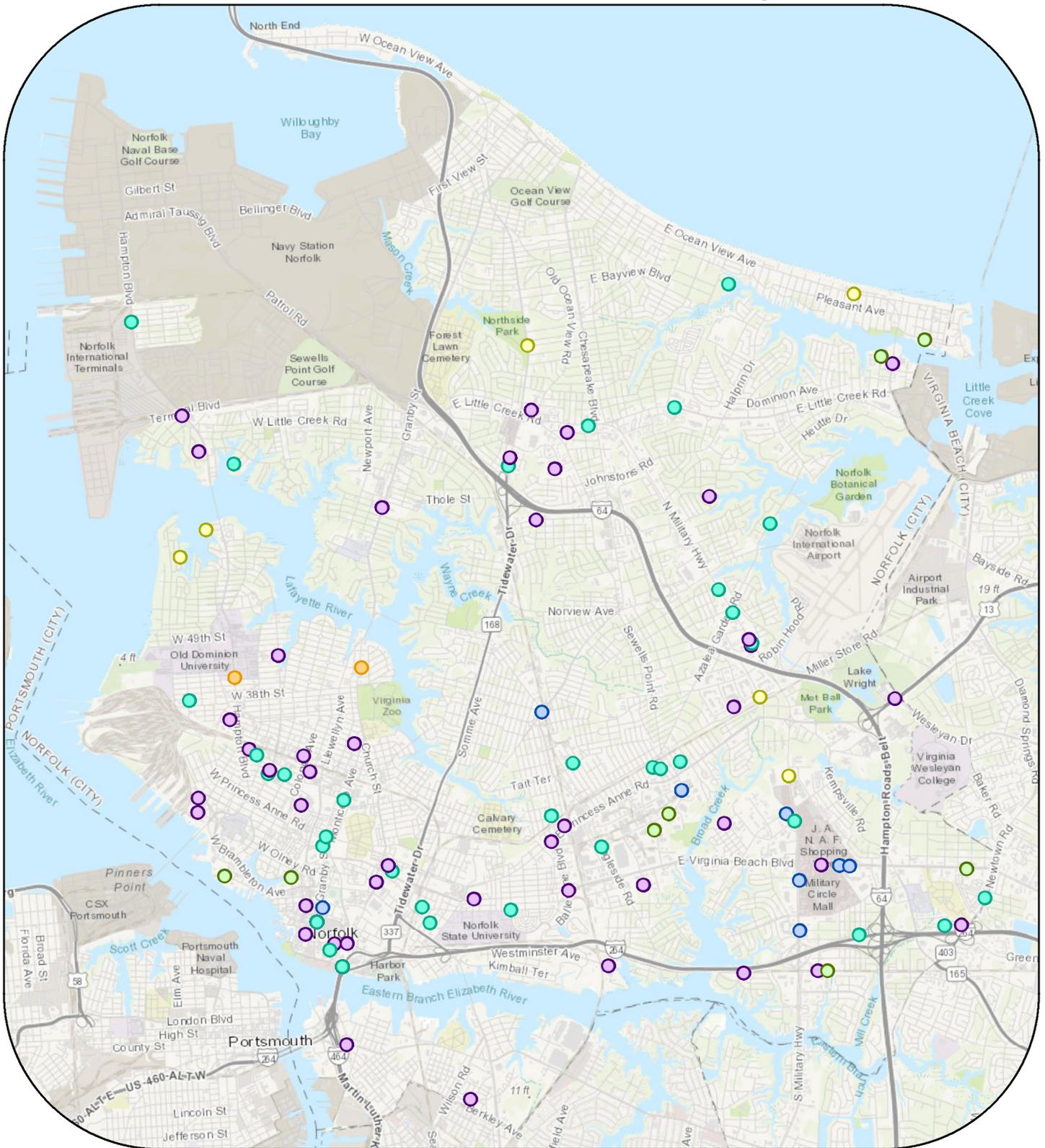
Created by the Department of Communications and Technology, GIS Bureau. This map is intended for graphic purposes only.  
Date: May 2017

**What Type of Internet Connection Do You Have?**

● Not Cable      ● Cable Modem



# Business Broadband Survey



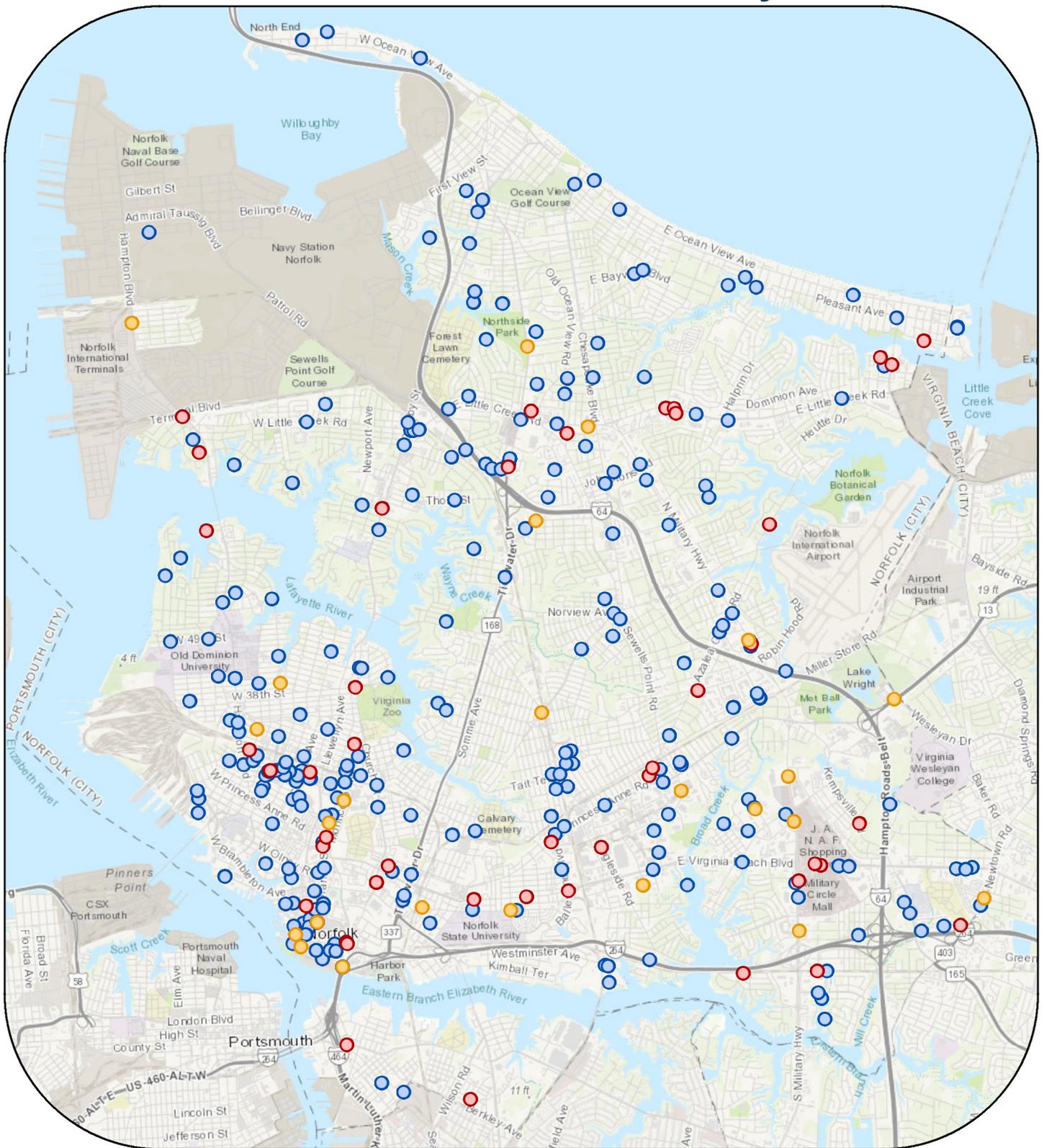
Created by the Department of Communications and Technology, GIS Bureau. This map is intended for graphic purposes only.  
Date: May 2017

**What Type of Internet Connection Do You Have?**

<span style="color: blue;">●</span> Satellite Broadband	<span style="color: purple;">●</span> DSL
<span style="color: orange;">●</span> ISDN	<span style="color: teal;">●</span> Fixed Wireless
<span style="color: green;">●</span> Fiber to Premises	<span style="color: yellow;">●</span> Mobile Wireless

0 1 2  
Miles

# Business Broadband Survey



**Who is Your Internet Service Provider?**

- Cox
- Verizon
- Other

Created by the Department of Communications and Technology, GIS Bureau. This map is intended for graphic purposes only.  
Date: May 2017

0 1 2  
Miles

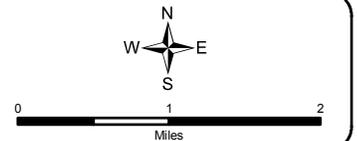
# Business Broadband Survey



### Speed of the Online Connection?

- Dissatisfied
- Very Dissatisfied

Created by the Department of Communications and Technology, GIS Bureau. This map is intended for graphic purposes only.  
Date: May 2017



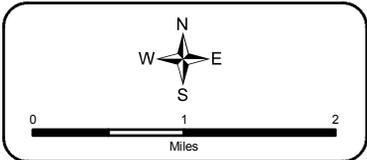
# Business Broadband Survey



**Will You Need to Increase Speed in the Next Year?**

● Yes

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Date: May 2017



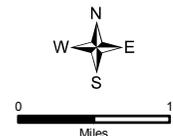
# Business Broadband Survey



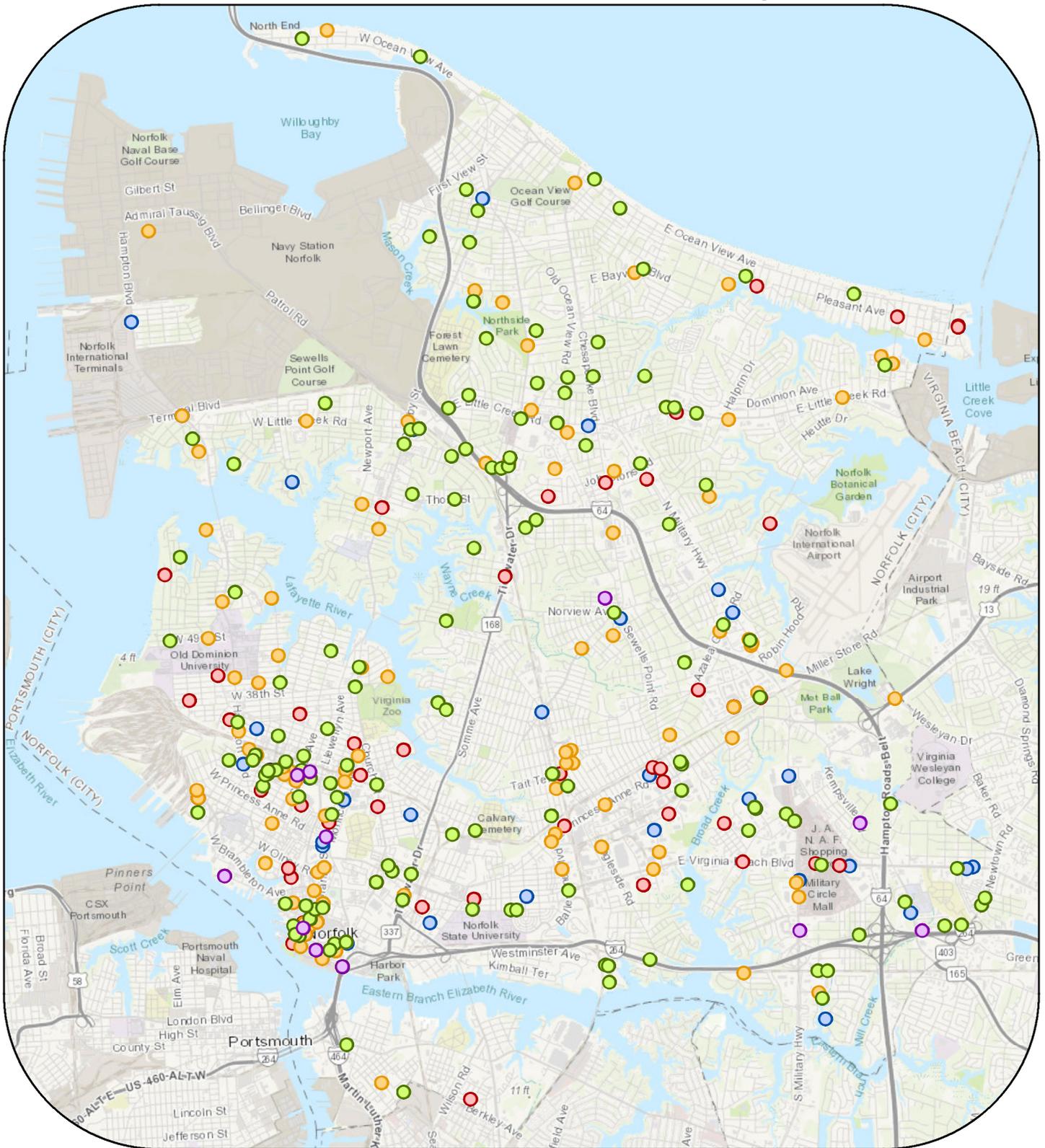
Created by the Department of Communications and Technology, GIS Bureau. This map is intended for graphic purposes only.  
Date: May 2017

### When Will You Expect to Enhance Your Current High Speed Internet Access in the Future?

- One to Two Years
- Three to Five Years
- More than Five Years
- Depends on Business Need
- Depends on Technology Changes
- Other
- Do Not Know



# Business Broadband Survey



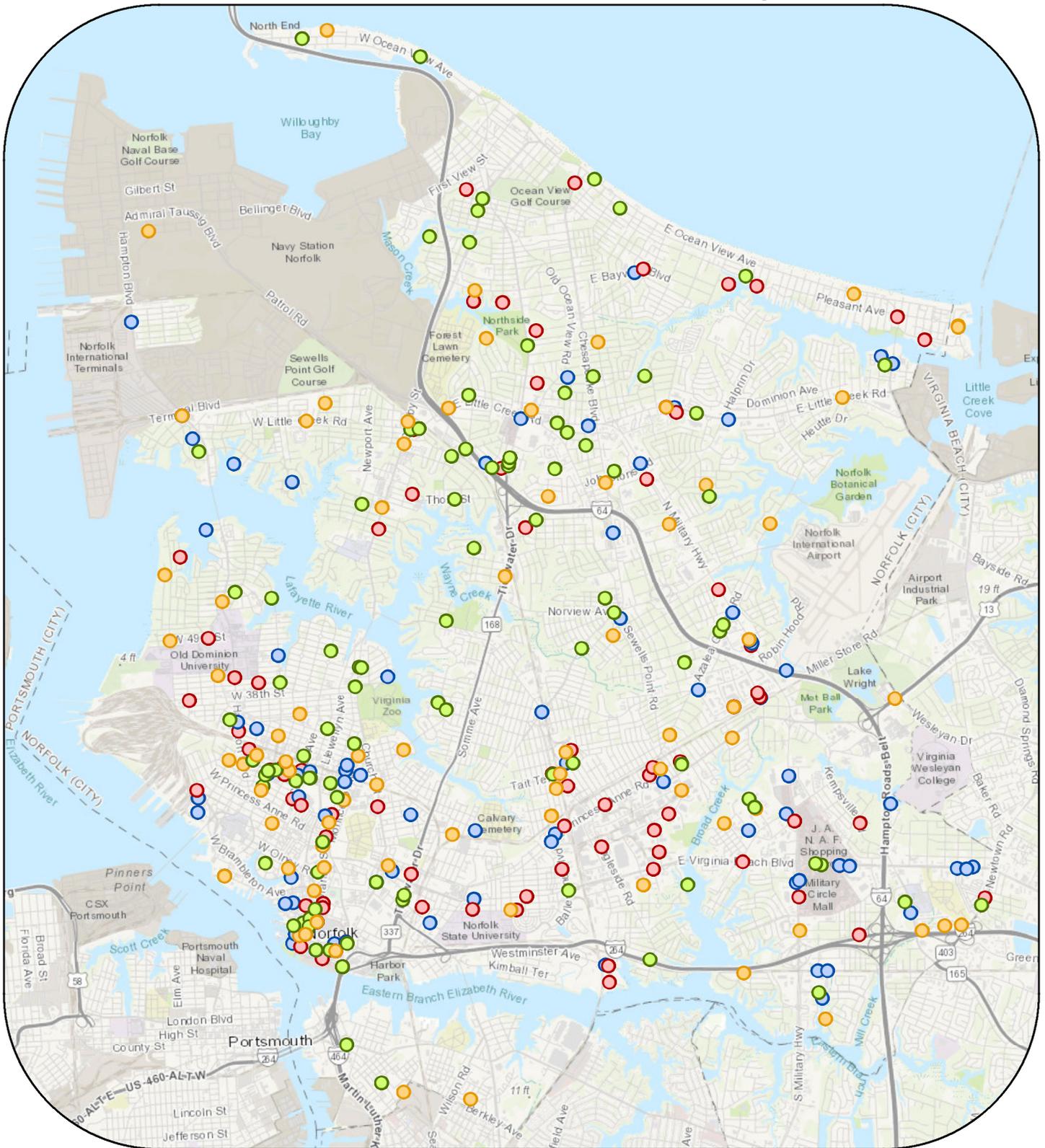
Created by the Department of Communications and Technology, GIS Bureau. This map is intended for graphic purposes only.  
Date: May 2017

**How Would you Describe the Availability of Multiple, Competing Broadband Options?**

<span style="color: blue;">●</span> Competitive	<span style="color: orange;">●</span> Slightly Competitive	<span style="color: purple;">●</span> Not Available for Business Needs
<span style="color: red;">●</span> Somewhat Competitive	<span style="color: green;">●</span> Not Competitive	

0 1 2  
Miles

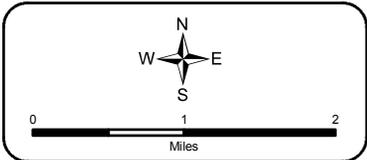
# Business Broadband Survey



Created by the Department of Communications and Technology, GIS Bureau. This map is intended for graphic purposes only.  
Date: May 2017

**How Confident are You Negotiating a Contract with a Broadband Service Provider?**

- Very Confident
- Somewhat Confident
- Confident
- Not Confident



**EXHIBIT B-8**

**CONNECTNORFOLK MEETING NOTES FROM APRIL  
2017**

## CONNECTNORFOLK WORKING GROUP MEETING – APRIL 20, 2017

### Opening comments by Doug Smith; Norfolk City Manager

Norfolk is becoming known as a diverse, accepting community.

- It is a waterfront community with a cutting-edge mentality.
- The City's focus is on a community that is creative, collaborative, and connected.
  - A Connected community is not only socially connected, but is connected by technological infrastructure.
- Every City, including Norfolk has real financial challenges
  - Because of this, there is currently a technology backlog that the City is finding challenging and looking at effective ways to approach this backlog.
- Norfolk was recently named as a "What Works City," in large part because of our commitment to transparency and Open Data.
  - One of the traits of Winning Cities is the ability to be transparent in all the things that it does. This is one of the underpinning factors that contributes to the push to provide Open Data.

### Presentation by Steven DeBerry; Norfolk Chief Information Officer (CIO)

- Much has occurred in the technology realm since we last met in August
- The City continues to move forward in its focus with others in the region to ultimately provide uniform access to ultra-high-speed broadband at a competitive price point.
- The City is on track to light up its ring encompassing the City in November/December 2017, helping to further the goal of Norfolk to be a "Connected City".
- The regional CIOs continue to meet to look at ways to collaborate.
  - Norfolk's I-Net already connects to Virginia Beach's I-Net, which will allow the connection of college campuses as well as a connection point to the Virginia Beach trans-oceanic landing point project.
- Norfolk continues to work with its provider partners
  - Lumos continues to partner with the City on both conduit and fiber infrastructure to connect to businesses.
  - FTS provides connection opportunities to vendors for providing applications to customers.
- The City continues to provide outreach to the public concerning its progress, such as promoting its selection as a "What Works City" and the progress we are making with open data and transparency.
- Norfolk continues to support Smart City initiatives
  - We have installed smart meters downtown
  - We are working on a smart parking application to show available spaces throughout the City and has implemented a related sensor pilot project.
- The City is committed to expanding the use of wireless technology and continues to look at ways to attract 5G investment from Verizon and others.
- As part of its commitment to provide Open Data, it is developing metrics that leverage the contributions of Open Data to support a safe, healthy, and inclusive community.
- The City is refreshing Norfolk.gov and developing a mobile app.

For additional detail, see Mr. DeBerry's PowerPoint Presentation.

**Mr. DeBerry addressed questions from attendees and provided the following responses:**

- The City will provide educational opportunities for non-tech natives (seniors) regarding access to Open Data.
- A more user friendly website is expected in August.
  - The mobile app will help access a safe neighborhood metric that is being developed.
- Regarding regional collaboration, the regional CIOs are trying to attract investment to the entire region
  - One attendee indicated that it might be more useful to focus on individual markets where there would be more attractive factors (such as Norfolk's higher density, urban environment) to telecommunications provider investment.
  - Also, Norfolk is an underserved market which might provide a stronger case for a provider to implement services and receive a better return on investment.
- A counter argument to looking at only market-by-market development is to be able to leverage, for example, the transoceanic landing fiber, which is centered in Virginia Beach, but will serve the whole region.
- Regional partnerships can be developed to better manage and open up network development to a host of providers
- One of the questions centered on, "How do we market ourselves?". It was determined that this would be a good focus for a smaller, breakout group.

**Presentation by Tom Robinson, President, CBG Communications, Inc. on the results of the Norfolk Business Broadband Survey**

The Business Broadband Survey has been completed and the results are in. The key points of the discussion included:

- About the survey:
  - A telephone survey was conducted of 400 Norfolk businesses. The majority were randomly sampled, plus a targeted sample was surveyed that was provided by the Department of Development.
  - All sizes and types of businesses spread across Norfolk responded to the survey.
  - The survey questions centered on broadband adoption, availability, uses, capacity, satisfaction, providers and needs for the future.
  - 76 "roll-up" NAICS codes were represented, including companies sized from one employee to more than 1,000, and startup dates from 1800 to 2016.
  - The largest categories of respondents included Professional/Scientific/and Technical Services, Administrative/Support/Waste Management/and Remediation Services, Construction, Retail Trade, Healthcare and Social Assistance, Manufacturing, and Other Services.
  - Annual Sales Volumes from less than \$50,000 to greater than \$500,000 were represented, with a median annual sales volume of \$139,547, and an average of just over \$1 million annually.
- The survey results:

- Eleven percent (11%) of businesses indicated they did not have access to internet at their business.
  - These were all small businesses and national studies indicate that nationwide, 12% of small businesses do not have internet access at their business.
  - These respondents were located across Norfolk.
  - The number one reason why the business perceived that it did not need internet access was that this service was not necessary to successfully conduct business.
    - This is an issue that education could overcome
    - Nearly every business could benefit by having internet access at the business if they understand its value to them
- How is internet supplied:
  - 89% surveyed do have internet access at their business
  - 64% obtain it through cable modem services from Cox.
  - 13% obtain it from DSL
  - 10% obtain it from Fixed Wireless
  - 3% obtain it from Fiber to the Premises
  - 3% obtain it from Satellite Broadband
  - 3% other
  - 2% T-1 Lines
  - 2% Mobile Wireless
  - 1% ISDN
- Only 37% of businesses could describe, but not with universal accuracy, their speed of connection and the cost they pay each month.
- This is consistent with national trends where most businesses cannot accurately describe what they are receiving for what they are paying.
- Over half of business respondents have contracts, averaging 2.22 years, for broadband service from their provider.
- The number one service-related issue concerning dissatisfaction with broadband services was Cost
  - 28% dissatisfaction with cost
  - 18% dissatisfied with speed
  - Dissatisfied businesses were spread throughout Norfolk
    - There were some clusters that could be analyzed further to determine if targeted efforts to provide more affordable, higher speed, access would be beneficial.
- Email is the number one business application driving the need for broadband. This is consistent with national data.
- file sharing/transfer and video conferencing are the highest applications driving the need for broadband.
- This continues in the third mention, along with retail transactions and website applications.
- 23% of those that have internet access anticipate a need to enhance their broadband in the next year.
  - The largest business category expressing immediate need is Professional/Scientific and Technical Services.
- Of those not enhancing in the next year:

- 30% need to enhance broadband access in one to two years
- 25% in three to five years
- 71% of businesses believe that the marketplace for broadband is either not competitive at all or only slightly competitive. Responding businesses again are spread throughout Norfolk.
- 52% indicate that they are not confident or only somewhat confident in negotiating a beneficial contract with a broadband service provider.
- 90% of responding businesses indicate that a robust broadband internet connection is important or very important to their day-to-day operations. This includes all the current and anticipated growth sectors in Norfolk.
- 74% of responding businesses indicate that it would be beneficial if the broadband/high speed Internet environment in Norfolk was enhanced for their clients or customers.
- Other key findings included:
  - Size of business makes a great difference in how broadband is experienced in Norfolk.
  - Availability of necessary broadband is most critical to organizations engaged in construction, manufacturing, retail, supply chain, information services, real estate, education and healthcare.
  - Those businesses with greater sales volume see robust broadband as critical to their day-to-day operations.
- Nearly 1/3 of survey respondents made additional comments at the end of the survey. Nearly half of those indicated that there needs to be more options/competition for broadband in the City.
- These initial findings indicate four key activities for ConnectNorfolk to consider becoming involved in. These include:
  - Helping develop education and training related to Broadband, especially for small businesses.
  - Serving as an independent clearinghouse for Broadband provider and application information for all Norfolk businesses.
  - Developing ideas for aggregating business demand.
  - Continuing to help spur competition in the Norfolk broadband marketplace.

For additional detail, see Mr. Robinson's PowerPoint presentation.

#### **Questions, Comments and Responses related to the Norfolk Business Broadband Study**

- 5G could meet several business needs, by targeting, using small cells, and high capacity, many areas where businesses feel underserved and over-priced.
- The study tells us what current businesses are not achieving. Does it tell us what new businesses we are not attracting?
  - If you are not able to retain certain types of businesses, you additionally are not able to attract them, so by looking at the results you can anticipate what businesses will not be attracted.
  - You can also look at a comparison with others that have a more robust broadband environment, and see what industries are thriving there and what industries are not thriving here. This will be a final focus of the overall Broadband Study.
- 5G should be a regional priority, because the overall market has 1.7 million people.

- Density, however, such as you have in Norfolk, is a game changer, because of lower rollout cost and higher take rates per square mile.
- Fiber that is coming into the mid-Atlantic hub gives Norfolk fresh capabilities and new opportunities to market Norfolk's capabilities starting at the end of this year and continuing in 2018.
- The City needs clearly stated objectives as to how it wants to proceed going forward to attract broadband investment.
- Should the City work to expand broadband focus on high-tech companies and corporate centers? Also, should there be a goal level that is set?
  - This will need to be an executive decision from the Mayor and Council as to how much the City is willing to invest in and pursue necessary broadband objectives.
- It was discussed that ConnectNorfolk should break into smaller subgroups to get consistent focus on several objectives. Objectives to focus on include:
  - Underserved areas and markets
  - How to increase competition
  - Broadband/internet educational programs
  - Improving Broadband in business corridors
  - How to best market the City's I-Net capabilities
- It was discussed that companies like ADP come to Norfolk for a variety of reasons and have the resources to develop the broadband they need. Perhaps, then, the large companies can take care of themselves. Accordingly, should the focus be on small and medium sized businesses?

**Presentation by Caroline Luxhoj, Broadband Program Administrator from the Center for Innovative Technology (CIT), along with Interactive Questions and Responses**

- The CIT is a State chartered, quasi-governmental group that focuses on several technological areas in support of promoting their development and access to these technologies across the state.
  - Because of the underserved and unserved nature of rural areas, there is typically a greater focus on these areas.
- The State has not defined what "Broadband" means to it, so the State basically breaks up maps of the State into different speed capabilities per census block.
  - It will be important for Norfolk to determine how it defines "Broadband" as it seeks to expand it within the City.
- The CIT has a demand aggregation tool which may be helpful to the City and its business community.
- The CIT also provides educational tools.
- The CIT looks at the economics of broadband as it applies to different markets throughout the State.
- When working with a community, the CIT performs a Needs Assessment, but the locality makes decisions based on the data determined.
- There are many other types of broadband technologies to consider besides fiber, cable modem, DSL, and other traditional forms of broadband delivery. There is also:
  - Millimeter-wave technology, a new type of fixed wireless, exemplified by the Starry organization project in Boston.
  - Its primarily an urban-based technology which could be useful to Norfolk.
  - SpaceX is currently re-invigorating the idea of Low Earth Orbit Satellites (LEOS)

- Microsoft and MBC are working on a TV whitespace project in Southside, Virginia.
- A group known as BNG, working with the Eastern Shore Broadband Authority, is also involved in white space projects.
- Regarding transoceanic cable and middle mile networks, there is the MAREA project scheduled to be completed in the Fall of 2017, which will be the only transoceanic cable landing point in the mid-Atlantic.
  - A new data center is being built because of the cable.
- Regarding the Virginia Beach next generation network:
  - It is being developed as a middle mile open access network, similar to what Norfolk is building.
- Through interconnections with other networks, it will link Tidewater Community College (TCC) campuses
  - It was discussed that there is also a potential GO VA project which needs to include anchor institutions from across the region (not just be a TCC connection project)
- It was discussed that there was no longer a Tech Council in the Tidewater area
  - A Tech Council would be helpful in solidifying regional objectives, as well as attracting broadband investment and private providers.
    - To reinvigorate the Tech Council, it was suggested that it might be helpful to model the Tidewater Tech Council after the one in Southwest Virginia, which has been extremely successful.
    - The CIT representative indicated that they would provide the Charter for the Southwest Virginia Tech Council for the group's review.
- One of the ConnectNorfolk participants indicated that the City needed "moxie" to be able to ambitiously and ardently pursue objectives that would help both residents and businesses.
- It was discussed that Ashburn, Virginia (built up recently and specifically designed to be a Smart City), was a good model, especially since the advent of its Gramercy District project.
- The goal is to replicate the Gramercy District in other places in Virginia and provide a "How-To" guide of how to implement Smart City initiatives.
  - One example was given related to Smart Dumpsters which have sensors which advise the Waste Management company when to pick up the full dumpster. This is far more efficient than making regular rounds when the dumpster often is less than full.
- The CIT indicated that it wants to convene a meeting of potential Smart Cities to explore replication of the Ashburn, Virginia project.
- CIT views Virginia Beach, Norfolk and Chesapeake among the Tidewater communities best able to leverage assets that they currently have and are developing.
- A question was asked related to public Wi-Fi. Cities in Virginia can certainly provide public Wi-Fi. It is the capacity at any individual access point or hotspot that dictate its utility to residents and businesses.
- It was discussed that broadband needs to be seen as a utility because it is a foundational driver of economic development.
- It was mentioned that at the elected official level and City administration level, there needs to be a full commitment for initiatives suggested and proposed by ConnectNorfolk to gain traction.
- It was discussed that there is a need for silos to focus on specific issues. However, there must be cross pollination between silos for everyone to understand what everyone is doing and how it impacts them.

For more detail, see Ms. Luxhoj's PowerPoint presentation.

**Wrap-up and Next Steps**

- It was discussed that the group would receive the PowerPoint presentations and meeting notes.
- The next step is for group members to express their interest in a subgroup, and then these sub-groups will be implemented to carry the tasks forward.
- There may also be a Summit developed of various regional groups that are all focused on broadband expansion.

ConnectNorfolk-Draft Meeting Two Notes

Edited by PTM: June 1, 2017

## **EXHIBIT B-9**

# **NORFOLK'S CHIEF INFORMATION OFFICER POWERPOINT PRESENTATION**



**CONNECT**NORFOLK

**Building a Connected City  
While Advancing a  
Regional Broadband Strategy**

**April 20, 2017**

# Presentation Outline

- Overview of today's meeting agenda
- ***ConnectNorfolk*** – Our role
  - Partnering to build a *Connected City*
    - In Norfolk
    - Across the region
  - Key take-aways from initial ***ConnectNorfolk*** meeting
- City of Norfolk update – Building a *Connected City*

# Key Takeaways from Initial *ConnectNorfolk* Meeting

- Access to (ultra) high-speed broadband at competitive price point
  - Regional cooperation
  - Business broadband survey
  - Public relations/outreach
  - Wireless technology
- 

# Expanding Norfolk's Institutional Network (iNet) Infrastructure While Advancing a Regional Broadband Strategy



- Backbone of the City's information technology infrastructure
  - \$4.1 million FY2017 project replaces perimeter backbone and switches
  - Provides broadband connectivity to critical city facilities
  - Enhances efficient and effective delivery of services to residents
  - Facilitates community engagement
  - Ensures sustainability/resilience
  - Fosters economic development and strategic partnerships including regional connectivity

# Building a Connected City

## Supporting Smart City Initiatives



- Use technology to enhance the quality of life for residents, businesses, and visitors
- Support data-driven decision-making
- Leverage existing data applications to improve real time responses, examples include:
  - ✓ Online permitting, inspection, and planning
  - ✓ Smart parking meters
  - ✓ STORM weather event analysis
  - ✓ TITAN storm surge tracking
  - ✓ Sensor pilot project
- Expand the use of wireless technology

# Building a Connected City

## What Works Cities Initiative Launched

- Norfolk selected to participate in Bloomberg Philanthropies' What Work Cities
  - 120-day engagement started in March
  - Goal: assist 100 mid-size cities to enhance their use of data and evidence to improve decision-making and engage residents
- Norfolk will focus on:
  - Develop open data processes to increase the availability and readability of data leading to transparency, accountability, and community engagement
  - Develop metrics to measure success to support the goal of Safe, Healthy and Inclusive Communities.

# What Works Cities Initiative Launched



# Building a Connected City Enhancing Web User Experience

THE CITY OF  
**NORFOLK**

GOVERNMENT  
Internal City Structure

BUSINESS  
Tools for Growth

SERVICES  
Provided by the City

COMMUNITY  
Resident Engagement

ENJOY NORFOLK  
Leisure & Visitors

HOW DO I  
Information Center

A to Z | Ask a Question | Departments | Staff

**RESILIENT**

Sustaining Our Wetlands

Payments

City Council

Events

Help Center

Job Listings

- Refresh Norfolk.gov
  - Preliminary refresh already accomplished (above)
- Develop mobile app

# Questions

## **EXHIBIT B-10**

# **THE CENTER FOR INNOVATIVE TECHNOLOGY POWERPOINT PRESENTATION**

# BROADBAND IN THE COMMONWEALTH

---

Caroline Luxhoj

Broadband Program Administrator

Center for Innovative Technology (CIT)

# Who is CIT?

- CIT is focused on innovation, entrepreneurship, research and development, and technology – all of which require broadband.
- The Broadband service line is the only state team focused solely on broadband.
- Funded by the state to provide technical assistance to localities and state agencies.
- Staff the Broadband Advisory Council and the Governor's Office of Telework Promotion and Broadband Assistance.
- Collaborate with industry experts, federal agencies and state broadband leaders across the nation.
- Broadband holistic and technology neutral.

**Broadband is necessary, complex and expensive – we are here to help!**

# Broadband Economics

$$\text{Profit/Sustainability} = \text{Revenue} - \text{CapEx} + \text{OpEx}$$

CIT improves the math for sustainability & future upgrades

How we entice the private sector to invest

INCREASE REVENUES 	LOWER COSTS 
<b>Adoption and Demand</b>	<b>Local Assets/Infrastructure</b> What you have that might be shared
Population Density	<b>Policies &amp; Fees</b> Reduce or eliminate fees for partners Streamline permitting
<b>Community Anchor Institutions</b> Residents, businesses, government facilities, healthcare	<b>Funding Options</b> Public & Private Investments
<b>*Red indicates variables local governments can affect</b>	

# CIT's Path to Better Broadband

## CIT performs Assessment

### Broadband needs

Assets that could be shared

County connections that should be improved

Policies, fees or process changes to lower costs

Community programs to ensure connectivity is leveraged to improve the community and lives

## Locality Makes Decisions

**Adopt Needs as Goals**

**Prioritize Goals**

Define desired **Role in PPP**

Specify any changes to **policy/processes/fees**

Specify what will be **shared/invested**

## CIT Provides

**Requirements** based on Decisions

**DRAFT Conceptual Phase RFP** seeking private sector solutions to meet the goals

**Funding Document** outlining all potential broadband funding opportunities

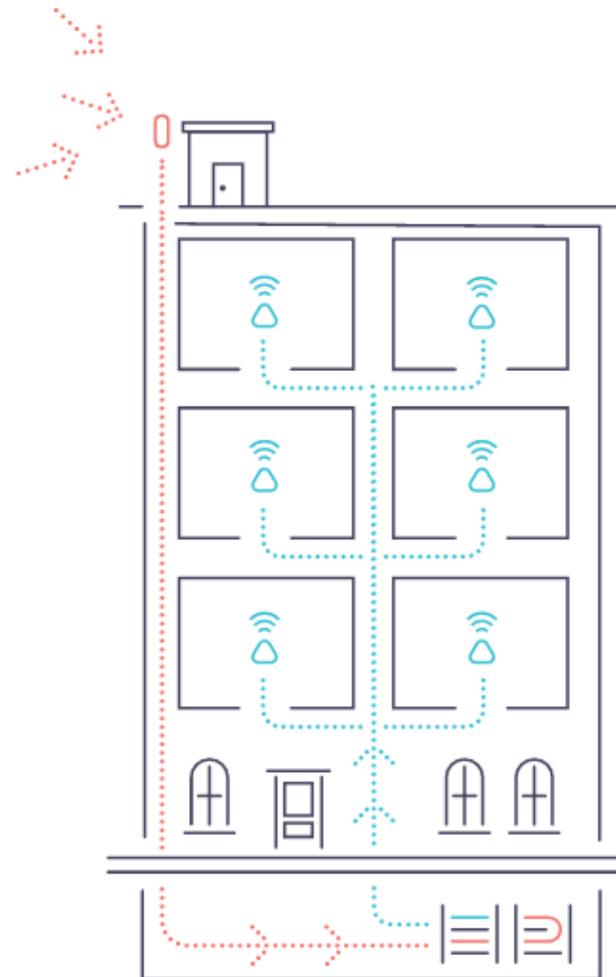


OTHER ITEMS OF INTEREST...

---

# Emerging Technology

- Millimeter-wave technology
  - EHF capable of gigabit speeds.
  - Starry
    - Pilot project in Boston
    - Claiming a range of over a mile.
- Low-Earth Satellite
  - SpaceX
    - Altitudes around 800 miles vs. 22,000 miles.
    - Latency similar to wired technology
    - Reduce or eliminate data caps.
    - Launching 2019
- TV Whitespace
  - Fixed wireless that is capable of penetrating obstructions.
  - Microsoft/MBC project in southside VA – largest TV Whitespace deployment in US.
  - Pending FCC approval.



# Transoceanic Cable and Middle Mile Network

- MAREA
  - completed by early Fall 2017.
  - Only landing point on the mid-Atlantic coast.
  - New data center.
- Virginia Beach's Next Generation Network
  - Middle mile open access network.
  - Would connect TCC campuses and Modeling and Simulation Center in Suffolk.
  - Potential GO Virginia project.



# Smart Cities



- “Internet of things” city-wide.
- Gramercy District
  - Ashburn, VA
  - First of its kind in the region.
  - First phase complete in 2019.
  - Goal is to be able to replicate it.

# QUESTIONS?

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Caroline Luxhoj

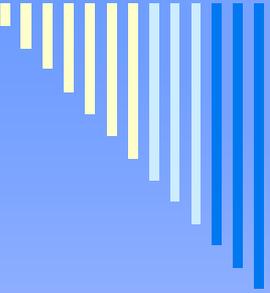
[Caroline.Luxhoj@cit.org](mailto:Caroline.Luxhoj@cit.org)

[www.wired.virginia.gov](http://www.wired.virginia.gov)



## **EXHIBIT B-11**

# **CBG POWERPOINT FOR CONNECTNORFOLK WORKING GROUP MEETING APRIL 2017**



# **PRESENTATION ON THE NORFOLK BUSINESS BROADBAND SURVEY TO THE CONNECTNORFOLK WORKING GROUP**

Presented by:  
CBG Communications, Inc.  
Thomas G. Robinson, President

Philadelphia Office:  
73 Chestnut Road, Suite 301  
Paoli, PA 19301  
610-889-7471  
[robinson@cbgcommunications.com](mailto:robinson@cbgcommunications.com)



# STUDY METHODOLOGY

- Random Sample (plus Targeted Sample)  
Telephone Survey of 400 Norfolk Businesses.
- All sizes and types.
- Respondents spread throughout Norfolk.
- Questions on broadband adoption, availability, uses, capacity, satisfaction, providers and needs for the future.



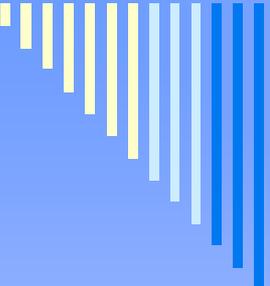
# RESPONDING SAMPLE BY NAICS CODE

Type of Business	Frequency	% of Responding Sample
Accommodation and Food Services	12	3.0
Accounting Services	1	.3
Administrative/Support/Waste Management/and Remediation Services	36	9.0
Advertising & Marketing Services	1	.3
Agriculture/Forestry/Fishing and Hunting	1	.3
Airlines	1	.3
Arts/Entertainment/and Recreation	11	2.8
Automobile Rental & Leasing	1	.3
Automotive Parts & Accessories Stores	1	.3
Automotive Repair & Maintenance Services	3	.8
Bars & Nightclubs	1	.3
Business Services Sector	1	.3



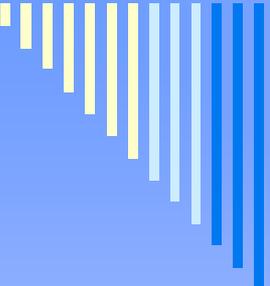
# RESPONDING SAMPLE BY NAICS CODE

Type of Business	Frequency	% of Responding Sample
Cement & Concrete Product Manufacturing	1	.3
Clothing Stores	5	1.3
Coffee Shops	2	.5
Commercial Printing	1	.3
Commercial Real Estate Brokerage & Management	1	.3
Construction	28	7.0
Consulting Services	1	.3
Consumer Product Rental	1	.3
Control, Electromedical, Measuring & Navigational Instruments Manufactures	1	.3
Convenience Stores & Truck Stops	4	1.0
Crop Production	1	.3



# RESPONDING SAMPLE BY NAICS CODE

Type of Business	Frequency	% of Responding Sample
Dentists	1	.3
Drywall, Plaster, Acoustic & Insulation Contractors	1	.3
Educational Services	6	1.5
Electrical Contractors	2	.5
Electrical, Plumbing & Hardware Wholesalers	1	.3
Fast-Food & Quick-Service Restaurants	4	1.0
Finance and Insurance	9	2.3
Freight Forwarding Services	1	.3
Gift, Novelty & Souvenir Stores	1	.3
Government	3	.8
Grocery Stores & Supermarkets	2	.5
Health Care and Social Assistance	20	5.0
Health Supplement Stores	1	.3
Home Centers & Hardware Stores	1	.3
Home Health Care Services	2	.5
Hotels, Motels & Resorts	2	.5



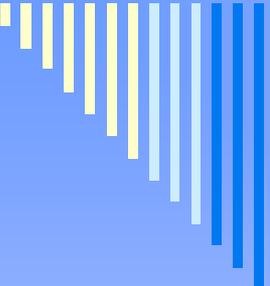
# RESPONDING SAMPLE BY NAICS CODE

Type of Business	Frequency	% of Responding Sample
Industrial Equipment Wholesalers	2	.5
Industrial Supply Wholesalers	2	.5
Information	2	.5
Insurance Agencies & Brokerages	1	.3
Jewelry Stores	1	.3
Laundry Facilities & Dry Cleaning Services	1	.3
Legal Services	1	.3
Management of Companies and Enterprises	1	.3
Manufacturing	18	4.5
Market Research & Polling Services	1	.3
Media	1	.3
Medical & Diagnostic Laboratories	3	.8
Membership Organizations	1	.3
Office Supply Stores	1	.3
Other Services (except Public Administration)	50	12.5



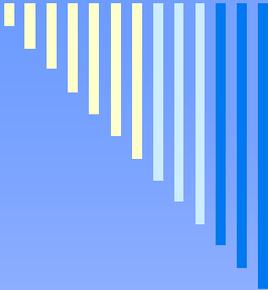
# RESPONDING SAMPLE BY NAICS CODE

Type of Business	Frequency	% of Responding Sample
Physicians	1	.3
Professional/Scientific/and Technical Services	60	15.0
Public Schools K-12	2	.5
Radio Broadcasting & Programming	1	.3
Railroads	1	.3
Real Estate	1	.3
Real Estate and Rental and Leasing	13	3.3
Religious Organizations	2	.5
Residential Real Estate Brokerage & Management	2	.5
Restaurants	4	1.0
Retail Trade	22	5.5
Securities Brokerages	1	.3
Self-Storage Services	1	.3
Shoe Stores	1	.3
Social Assistance	2	.5

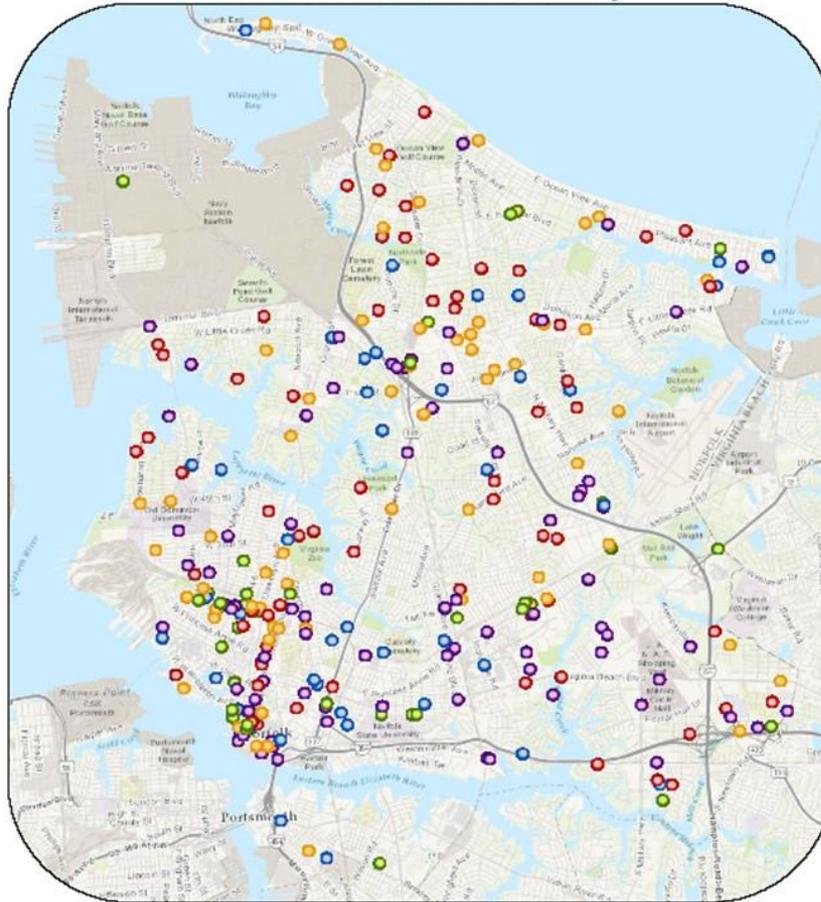


# RESPONDING SAMPLE BY NAICS CODE

Type of Business	Frequency	% of Responding Sample
Toy & Hobby Stores	1	.3
Transportation and Warehousing	10	2.5
Utilities	2	.5
Warehousing & Storage	1	.3
Wholesale Sector	3	.8
Wholesale Trade	9	2.3
Wireless Telecommunications Services	1	.3
Total	400	100.0



THE CITY OF  
**NORFOLK**  
Business Broadband Survey



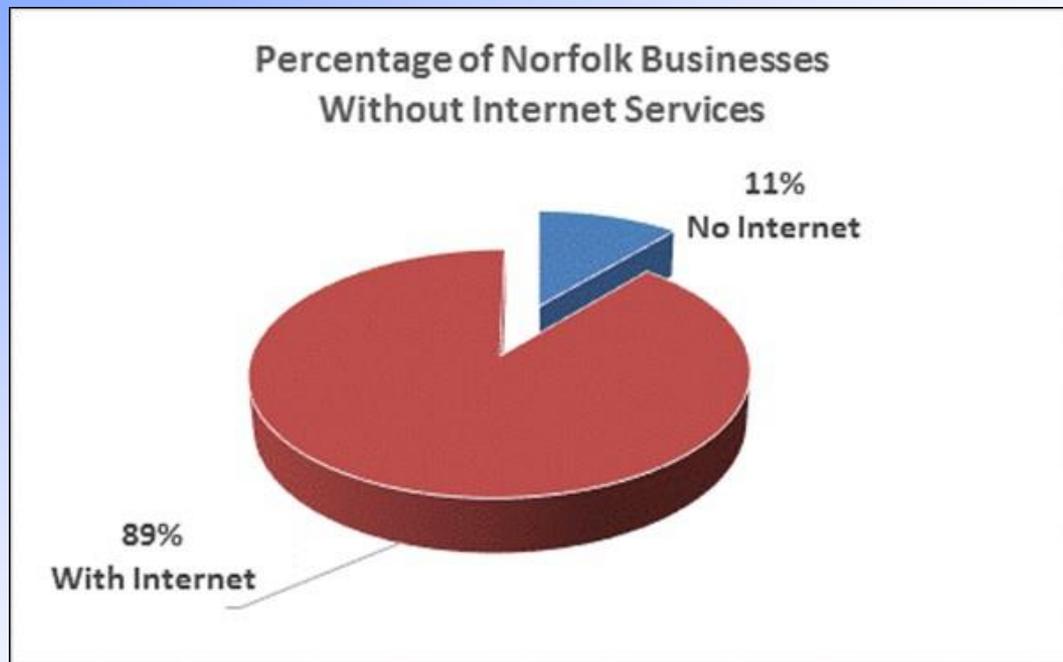
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**What is Your Business Annual Sales Volume?**

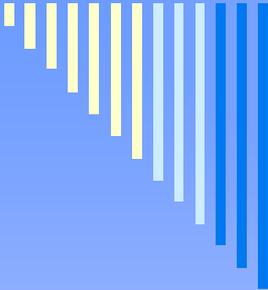
- Less than \$50,000
- \$50,001 - \$100,000
- \$100,001 - \$200,000
- \$200,001 - \$500,000
- Greater than \$500,000



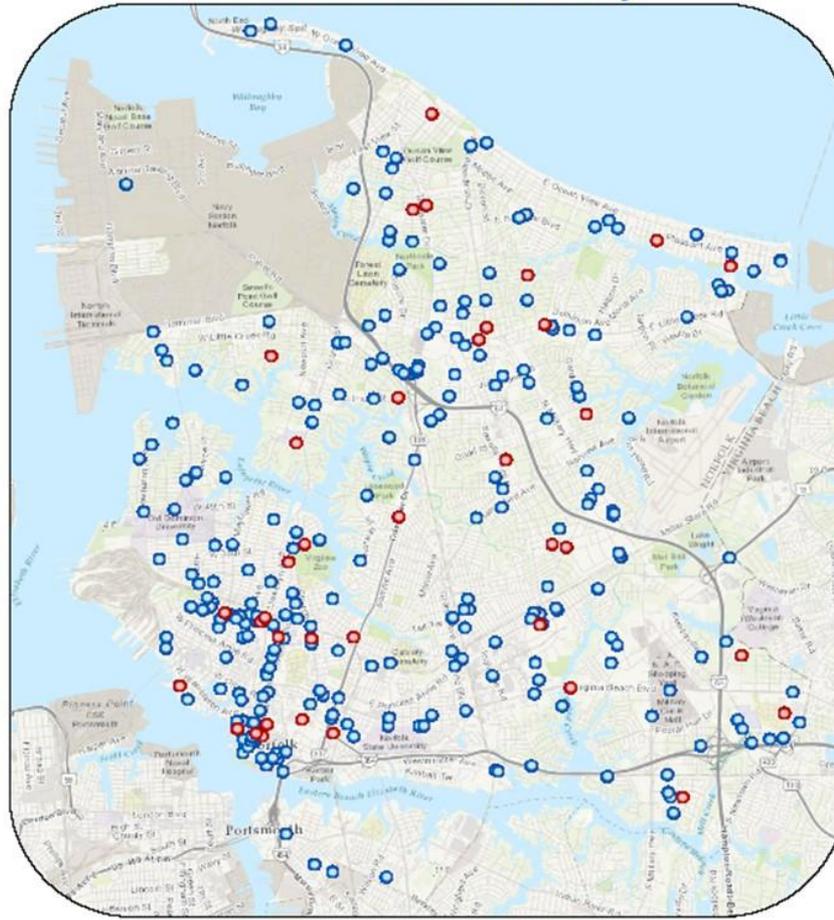
# BUSINESS WITHOUT INTERNET ACCESS



- Of the responding sample, 11% of businesses did not subscribe to the Internet. When considering those by type of business, several were food service and restaurant locations (pizza, bakery, chicken), auto repair, and retail shops (salons, barber shops).



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Business Broadband Survey



**Do You Have Internet Service?**  
● Yes  
● No

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# BUSINESSES WITHOUT INTERNET ACCESS

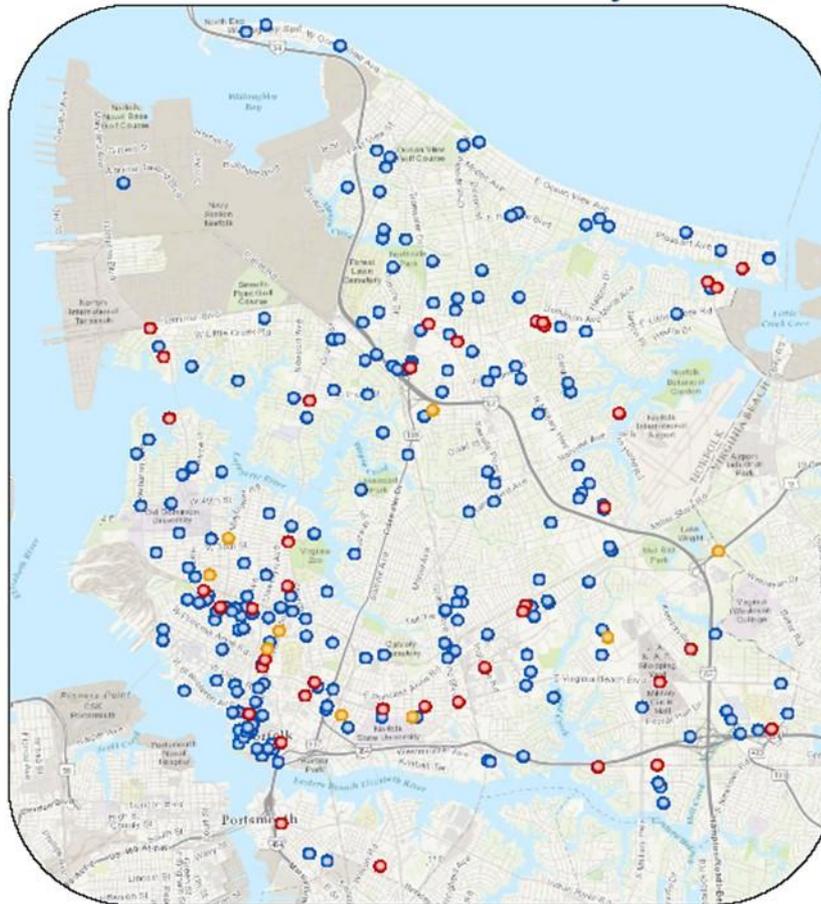
□ Why do you not have Internet service at your business? (N=45)

## First Response

- |  |     |
|--|-----|
| ■ Internet service isn't available                   | 7%  |
| ■ I'm not comfortable using the internet             | 4%  |
| ■ My business doesn't need internet service          | 38% |
| ■ I don't know how to use the internet               | 4%  |
| ■ Another company supports my internet service needs | 16% |
| ■ Internet is too expensive                          | 4%  |
| ■ Other (N=12)                                       | 27% |

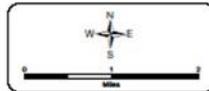


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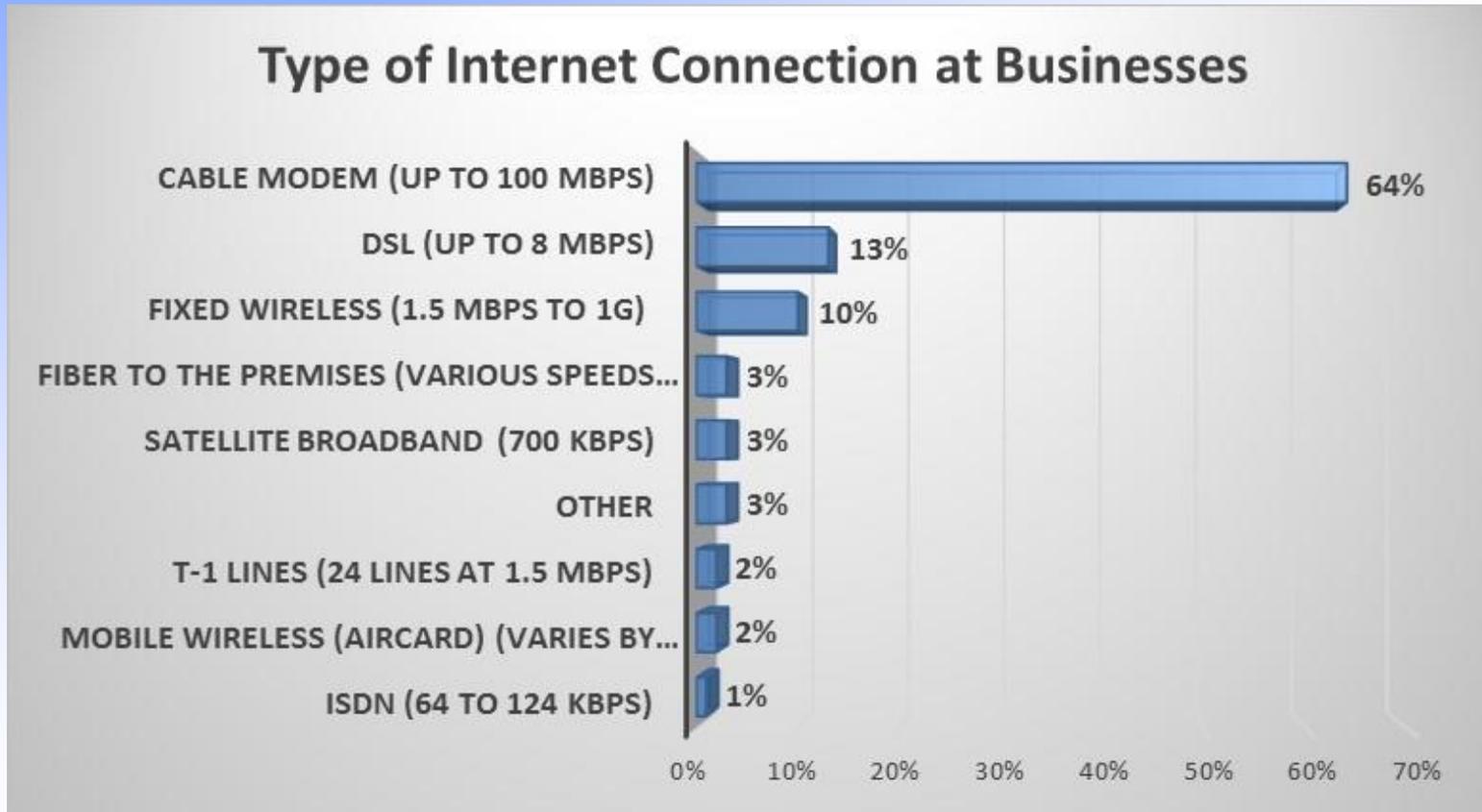


**Who is Your Internet Service Provider?**  
● Cox (79%) ● Other (7%)  
● Verizon (14%)

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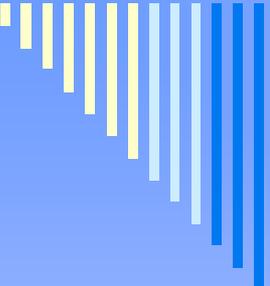


# TYPE OF INTERNET CONNECTION AT BUSINESSES



# RESPONDENTS WHO COULD NAME THEIR TYPE OF INTERNET CONNECTION, SPEED AND MONTHLY COST

Type of Internet Connection	N=132/37%	% Responding Yes	What is the speed?	How much do you pay each month? (range and median)
Dial-up Line Connection	1	100%	23 Mbps*	Don't Know
Satellite Broadband	3	27%	4-100 Mbps	Range: \$60-\$205 Mean: \$107.25 Median: \$82
ISDN	1	25%	64 Kbps	Don't Know
Fiber to Premises	7	64%	3-100 Mbps	Range: \$100-\$1000 Mean: \$504 Median: \$600
DSL connection	10	21%	8 Mbps-3G*	Range: \$30-\$713 Mean: \$537.66 Median: \$105
Fixed Wireless	17	44%	4 MBps-1G	Range: \$19-7995 Mean: \$614.13 Median: \$115
Cable Modem	81	35%	5 Mbps-5G*	Range: \$0-\$2000 Mean: \$84 Median: \$84
Mobile Wireless	4	57%	4 Mbps-4G LTE	Range: \$120-2500 Mean: \$975 Median: \$305
T-1	4	57%	1 Mbps-20 Mbps*	Range: \$0-\$1112 Mean: \$520.67 Median: \$450
Other	4	36%	20 Mbps-1G	Range: \$68-\$350 Mean: \$143.25 Median: \$77.50



# RESPONDENTS' CONTRACTS BY SERVICE PROVIDER AND AVERAGE LENGTH

- The length of broadband service contracts was reported between 1 and 10 years. The average broadband contract was 2.22 years and the most common response was 2.0 years. Verizon customers reported slightly shorter contract lengths (1.97 years) than Cox subscribers, 2.21 years. Other providers' (T-Mobile, AT&T, XO Communications) terms were the longest at 2.88 years.

Broadband Provider	% of Respondents with Current Contract	Average Length of Contract
Verizon	65%	1.97
Cox	54%	2.21
Other	50%	2.88



# SATISFACTION WITH BROADBAND CHARACTERISTICS AMONG NORFOLK BUSINESSES

Service Issue	Very Satisfied	Satisfied	Dissatisfied	Very Dissatisfied	Don't Know/Not Applicable
Cost of broadband/internet/network service	7%	49%	21%	7%	17%
Speed of the on-line connection	23%	58%	13%	5%	1%
Billing practices of your provider	16%	61%	7%	3%	12%
Reliable access to the Internet	31%	56%	10%	3%	1%
Ease of use	31%	62%	5%	1%	1%
Customer Service/Technical Service Representative's knowledge when you call for service	23%	52%	9%	5%	12%
Service/Installation technician's ability	24%	50%	5%	5%	15%

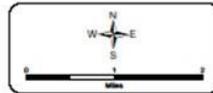


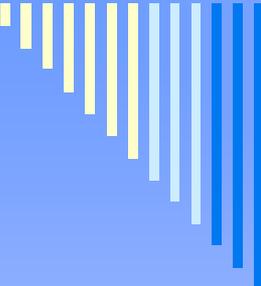
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**Speed of the Online Connection?**  
● Dissatisfied (13%)  
● Very Dissatisfied (5%)

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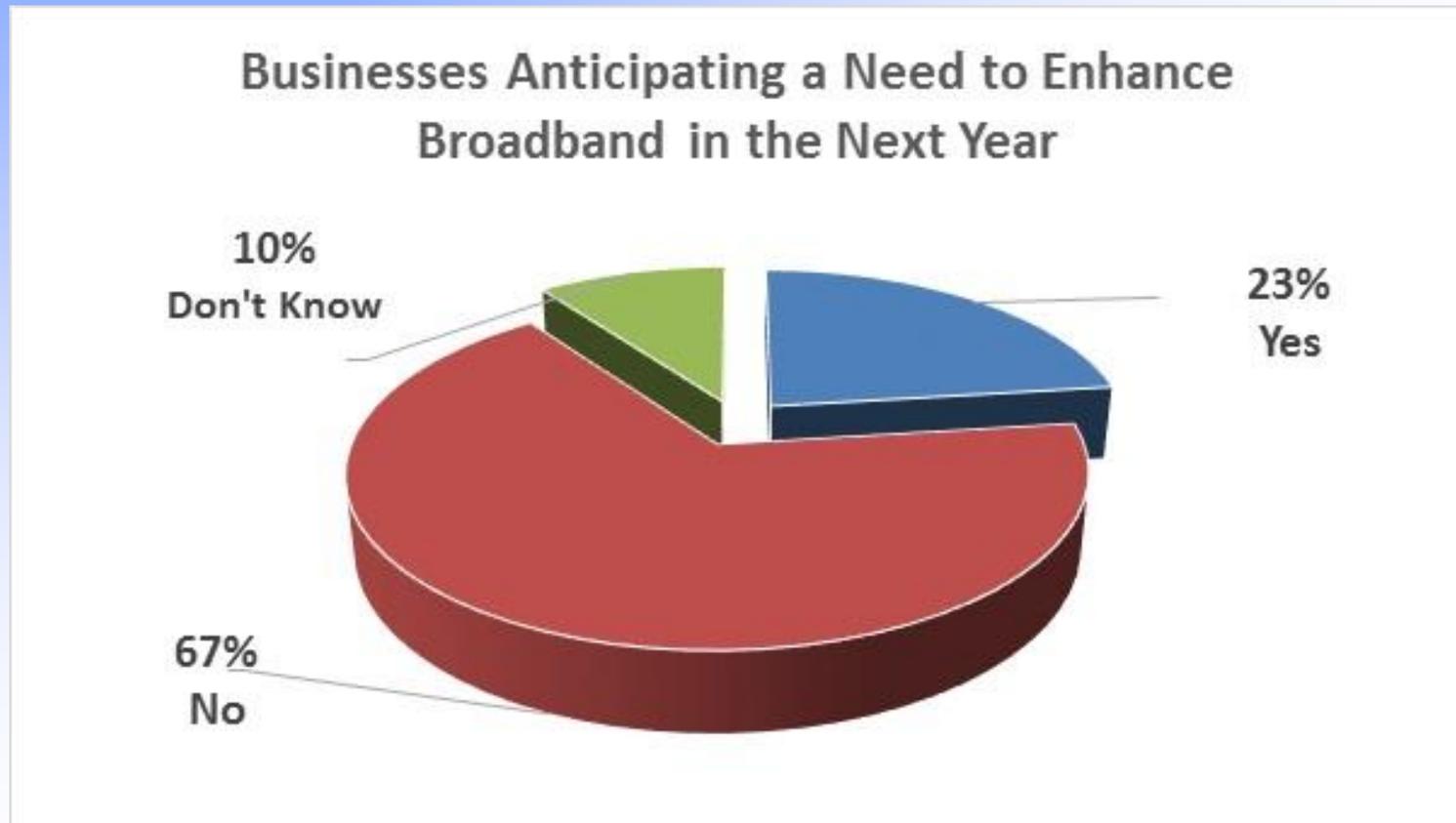


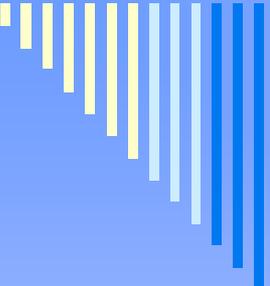


# BUSINESS APPLICATIONS DRIVING THE NEED FOR BROADBAND CAPACITY IN NORFOLK

Application	First Mention (N=355)	Second Mention (N=346)	Third Mention (N=334)
Email	95%	1%	.3%
Videoconferencing	1%	30%	1%
File Sharing/Transfer	1%	33%	25%
Internet telephone	1%	8%	15%
Retail Transactions	.3%	15%	20%
Website Application	1%	5%	23%
Business to business function	1%	3%	4%
Online Education	--	2%	2%
Banking	.3%	2%	4%
Monitoring Functions (Security, Energy)	--	--	1%
Research	1%	1%	4%
Telecommuting	--	--	.3%
Appointments/Scheduling	--	--	1%

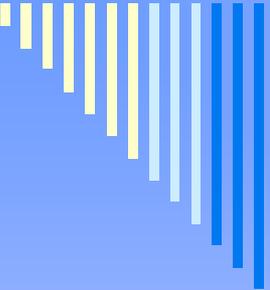
# PERCENTAGE OF BUSINESSES ANTICIPATING A NEED TO ENHANCE BROADBAND ACCESS IN THE NEXT YEAR





## TOP CATEGORIES OF BUSINESSES REPORTING ADDITIONAL BROADBAND ENHANCEMENTS NEEDED IN THE NEXT YEAR

1. Other Services (except Public Administration) 12%
2. Professional/Scientific/and Technical services 12%
3. Administrative/Support/Waste Management/and Remediation Services 10%
4. Retail Trade 6%
5. Health Care and Social Assistance 5%



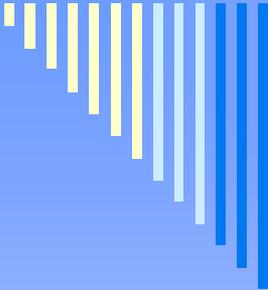
## TIMETABLE FOR ENHANCEMENT OF CURRENT HIGH-SPEED INTERNET ACCESS BY THOSE NOT EXPANDING IN THE NEXT YEAR

- |    |                                 |     |
|----|---------------------------------|-----|
| 1. | One to two years                | 30% |
| 2. | Three to five years             | 25% |
| 3. | More than five years            | 3%  |
| 4. | Depends on business need        | 4%  |
| 5. | Depends on change in technology | 3%  |
| 6. | Other                           | 1%  |
| 7. | Don't Know                      | 33% |

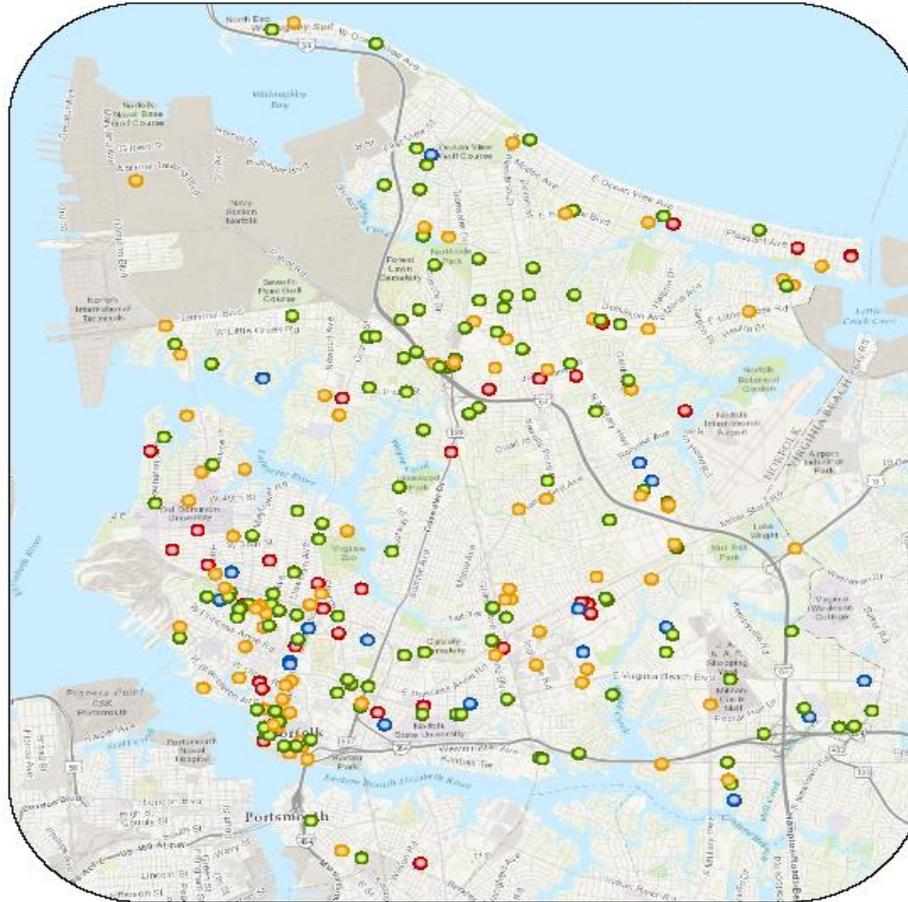


# HOW COMPETITIVE IS THE NORFOLK BROADBAND PROVIDER MARKETPLACE?

- |    |  |     |
|----|--|-----|
| 1. | Competitive, several options   | 10% |
| 2. | Somewhat Competitive, a handful of options                                 | 15% |
| 3. | Only Slightly Competitive, two providers                                   | 30% |
| 4. | Not Competitive at All, only one provider option                           | 41% |
| 5. | There is not a broadband option available that is suitable for my business | 3%  |



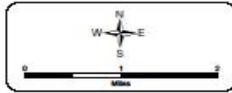
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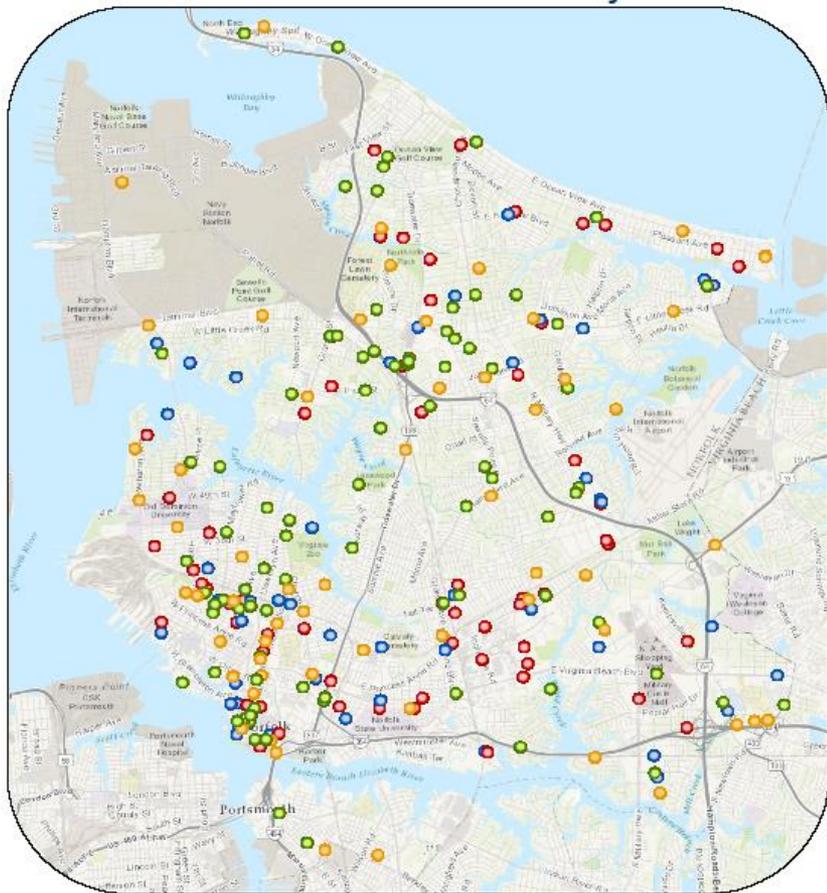
**How Would you Describe the Availability of Multiple, Competing Broadband Options?**

- Competitive (10%)
- Slightly Competitive (30%)
- Somewhat Competitive (15%)
- Not Competitive (41%)





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Business Broadband Survey

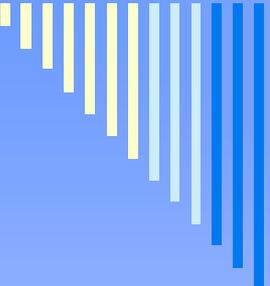


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Date: March 2017

**How Confident are You Negotiating a Contract with a Broadband Service Provider?**

Very Confident (23%)	Somewhat Confident (23%)
Confident (26%)	Not Confident (28%)





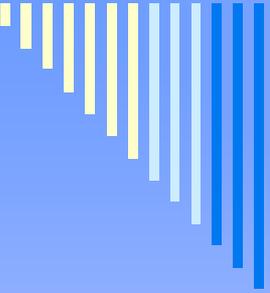
# IMPORTANCE OF A ROBUST BROADBAND/HIGH-SPEED INTERNET ENVIRONMENT

- How important is a robust broadband Internet connection to the day-to-day operations of your business?
  - Very Important 80%
  - Important 10%
  - Somewhat Important 6%
  - Not at All Important 3%



# IMPORTANCE OF A ROBUST BROADBAND/HIGH-SPEED INTERNET ENVIRONMENT

- Would it be beneficial to you if the broadband/high speed Internet environment in Norfolk was enhanced for your clients or customers?
  - YES 74%
  - NO 18%
  - Don't Know 8%



# OTHER KEY FINDINGS

- Size of Business makes a great difference in how broadband is experienced in Norfolk.
- Availability of necessary broadband is most critical to organizations engaged in construction, manufacturing, retail, supply chain, information services, real estate, education and healthcare.
- Those businesses with greater sales volume see robust broadband as critical to their day-to-day operations.



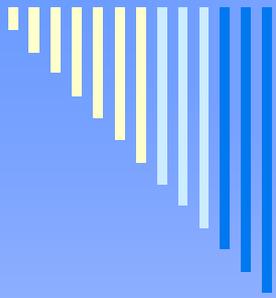
# SUMMARY OF OPEN ENDED COMMENTS MADE BY BUSINESSES AT THE CLOSE OF THE SURVEY (N=126)

- |     |   |     |
|-----|---|-----|
| 1.  | Need more options/competition in the City | 49% |
| 2.  | Wish had Verizon FiOS                     | 12% |
| 3.  | Other                                     | 7%  |
| 4.  | Newest/fastest technology not available   | 6%  |
| 5.  | Should be available everywhere            | 6%  |
| 6.  | Too expensive                             | 5%  |
| 7.  | Want Google Fiber                         | 4%  |
| 8.  | Happy with Broadband access               | 3%  |
| 9.  | Unhappy with Cox                          | 3%  |
| 10. | Want Hot Spots in the City                | 2%  |
| 11. | Don't Know                                | 2%  |



# ACTIVITIES FOR CONNECTNORFOLK TO CONSIDER

- ❑ Helping develop education and training related to Broadband, especially for small businesses.
- ❑ Serving as an independent clearinghouse for Broadband provider and application information for all Norfolk businesses.
- ❑ Developing ideas for aggregating demand.
- ❑ Continuing to help spur competition in the Norfolk broadband marketplace.



**Thank you for participating today!**

## **EXHIBIT C-1**

# **GOVERNMENT AGENCY COMMUNICATIONS NETWORKING QUESTIONNAIRE**



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*St. Paul Office:* 1597 Race Street, St. Paul, MN 55102 P/ (651) **340-5300** F/ (651) 340-5820

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# **NORFOLK DEPARTMENTAL BROADBAND QUESTIONNAIRE MARK- UP AND RESULTS COMPILATION**

**By**

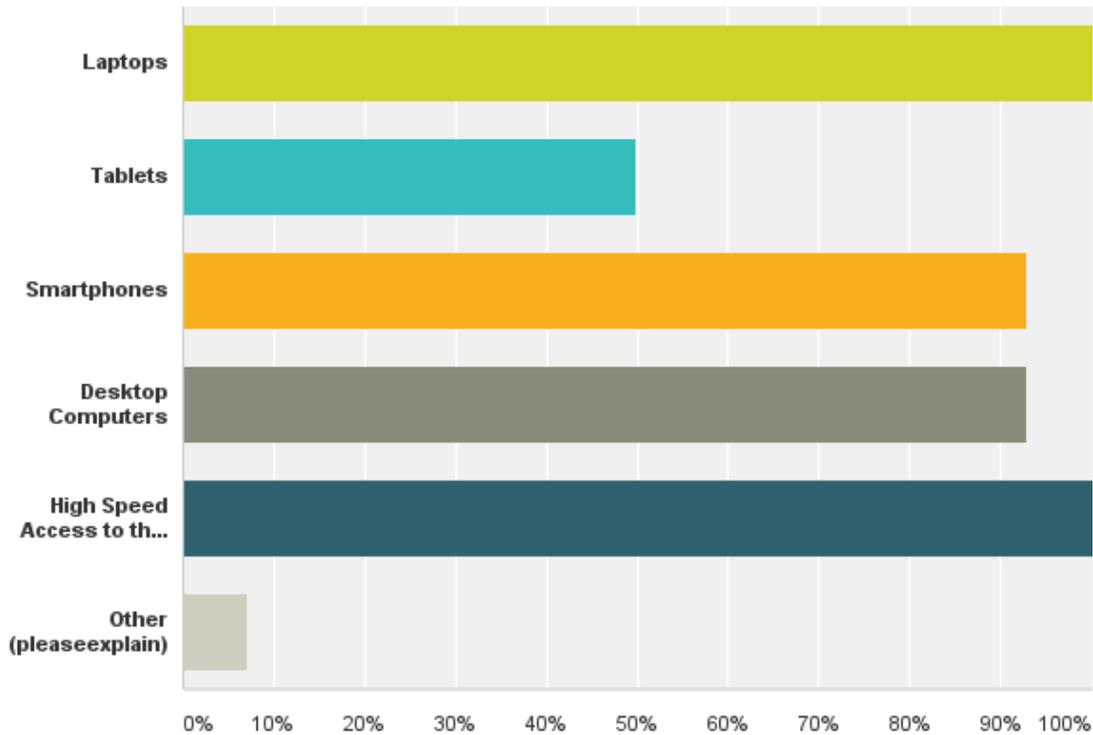
**CBG Communications, Inc.**

**Thomas G. Robinson, President**

**October, 2016**

## PART I: ADMINISTRATIVE OPERATIONS

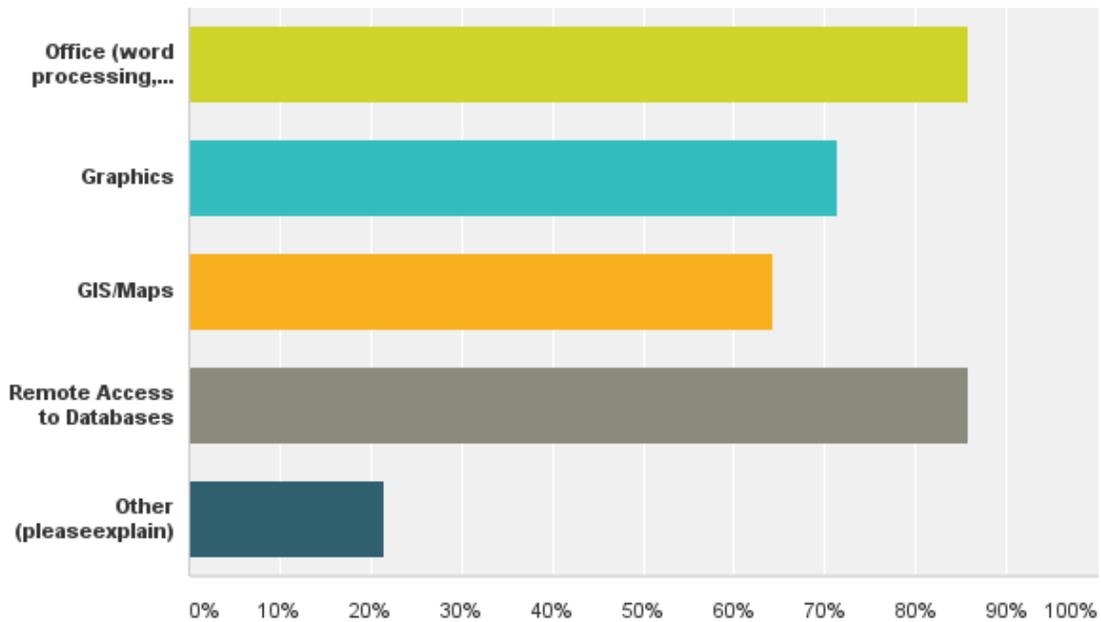
What types of broadband communications technologies and applications do you rely on for your department’s administrative operations and to help you provide necessary support services to staff? (Check all that apply) – Technologies



Answer Choices	Responses
Laptops	100.00% 14
Tablets	50.00% 7
Smartphones	92.86% 13
Desktop Computers	92.86% 13
High Speed Access to the Internet	100.00% 14
Other (please explain)	7.14% 1
<b>Total Respondents: 14</b>	

**Other:** Scanners and Plotters for GIS-Maps

**What types of broadband communications technologies and applications do you rely on for your department’s administrative operations and to help you provide necessary support services to staff? (Check all that apply) – Applications**



Answer Choices	Responses
Office (word processing, spreadsheets, etc.)	85.71% 12
Graphics	71.43% 10
GIS/Maps	64.29% 9
Remote Access to Databases	85.71% 12
Other (please explain)	21.43% 3
<b>Total Respondents: 14</b>	

**Other:** CC&B, DMV, Simplicity (SCADA), Crystal Reports, NorthStar, Hansen, AFMS, Budget Software, Dropbox and other file sharing applications

Open Ended Responses – Please explain why you rely on these technologies/applications.

**Budget and Strategic Planning**

Laptops: Laptops are utilized by analysts for general office work and can then be detached from a docking station and taken home to work remotely.

Smartphones: Budget Office staff uses both city and personnel smartphones to communication with team members and other city staff through email and voice.

Desktop Computers: Utilized for general office work

High speed Access to the internet: Utilized for research, email communication, etc. on a daily basis

MS Office: The full MS Office suite is utilized on a daily basis by Budget Office staffers with an emphasis on heavy excel use. The office also utilizes MS Visio for flow charting and organizational charts.

Remote Access: Budget Analysts use the remote app and remote desktop connection to connect to city database when working from outside the office. This is often a crucial tool when deadlines approach or workload is heavy.

### **Finance**

Laptops: Mobility increased convenience, and wireless access

Smartphones: Mobile Access

High Speed Access to the Internet: Performance, Value and Reliability for Cloud Base Software products

Office (word processing, spreadsheets, etc.): Incredibly simple application for daily tasks

### **Police**

Use of mobile laptop and assigned city cell phone > email, used for work when not at my work station, to include high speed internet support when applicable

### **Fire-Rescue**

Technologies – Our administrative staff is stationary as well as mobile at any given time.

Applications – Office for day to day operations. Graphics for training and PIO applications. GIS/Maps for emergency operations. Remote Access for mobility and troubleshooting access.

### **Norfolk Community Services Board**

Laptops – Critical for the mobile deployment of our behavioral health services, use of our Electronic Health Record (EHR), and other databases (HMISS) in the following areas: Case management (Intellectually disabled, child and adolescent, mental health, substance abuse), Program for assertive community treatment (PACT), Homeless outreach, Prevention (community health initiatives), Community integration (State hospital discharging), Jail

diversion, Crisis intervention team (CIT), Emergency services (TDO, ECO, Video Magistrate), Infant and Toddler Connection (ITCN)

Tablets – Similar to laptops, we are pushing our EHR vendor to streamline our mobile deployment to smaller and lighter form factors

Smartphones – Contact with consumers of CSB services, supervisory communication, email, and potential mobile app usage

Desktop Computers – Critical for the administrative staff and our office based clinical services and use of our Electronic Health Record (EHR) and methadone dispensing software and equipment in the following areas: Integrated Care Clinic (ICARE) psychiatric and medical care, Intake and assessment services, 24hr inpatient Crisis Stabilization Unit (CSU), Opioid Treatment Program, Group and individual outpatient therapy (child and adolescent, mental health, substance abuse), Clinic and site to site telemedicine

High Speed Access to the Internet – Critical 20mb circuits at all CSB sites for 24-hour access to our (Hosted, or cloud-based) Electronic Health Record via remote desktop. Segregated business internet connections are also needed for all CSB sites to conduct secure telemedicine. Coordinating care for CSB consumers requires looking up insurances, disability status, transportation, etc.

Outlook – Email, scheduling, encrypted emailing, and archive communication

Word – All forms of business documents at the state and local level

Excel – Critical for data extracts and business analytics in our Electronic Health Record, productivity reporting, call logs, bed census tracking, etc.

PowerPoint – All forms of presentations at the state and local level

Access – Critical for transmitting and receiving state reporting, data extracts, and analysis from Virginia Department of Behavioral Health and Developmental Services (DBHDS). We also maintain an incident management database as an agency compliance requirement.

Graphics – Creating agency media for use on norfolk.gov (CivicPlus) and individualized media across the varied CSB programs and services

GIS/Maps – Mapping and updating served public within Norfolk for use in: Shelter placement and transportation planning during emergencies, CSB service design and analysis

Remote Access to databases – We manage many reporting requirements and business maintenance through the following remote sites: Internal Norfolk resources (metastorm, PeopleSoft, AFMS, performance budgeting, etc.), Office of Inspector General (US Dept. of Health and Human Services), All insurers provider portals (Medicaid, Medicare, Magellan, Anthem, etc.), VITA (Virginia Information Technologies Agency) , DELTA /IDOLS /CHRIS (DBHDS

reporting), WaMS (Virginia Waiver Management System , CIOX Health (secure transmission of record requests), Methasoft (methadone dosing database software), Dr First (drug prescription portal) , Labcorp (lab results portal), Mediscribes (medical transcription portal)

### **Cultural Facilities, Arts, and Entertainment**

We rely on these technologies to perform our jobs, and we are a geographically dispersed department.

### **Human Resources**

Human Resources relies on several internet-based technologies to provide services including PeopleSoft, NLLC Learning Management System (LMS), and NeoGov for processing applications. Desktop computers and Office products are used by all employees. Laptops are used on occasion. Graphics are used by various divisions for different products.

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**What communications technology or application don't you have access to at your department that you need for administrative operations? For example, "Wi-Fi isn't available, so we don't have the potable/Mobile Access that is needed."**

### **Budget and Strategic Planning**

A solution like MS Sharepoint would be useful for when multiple analysts are working on the same document or to closely track version control

### **Finance**

Mobility by converting Desktop PC Replacing older Desktop PC

### **Planning**

Laserfiche Scanners

### **Norfolk Community Services Board**

We do not have 20mb broadband circuits at all CSB sites (have at 2 sites, need at 2 sites)

We do not have segregated business internet connections for secure telemedicine at all CSB sites (have at 1 site, need at 2 sites)

We do not have CON-G, WAP coverage at all CSB sites (have at 2 sites, need at 2 sites)

### **Human Services**

DHS is spread out in several locations throughout the city. The WDC, Detention Center and 741 locations are equipped with surveillance cameras, but the video is only reviewable at the same actual location of the camera. The ability to review video over the internet from multiple locations, or at least a central location, would improve efficiency when surveillance reviews are required.

### **Recreation, Parks and Open Space**

Wi-Fi is the number one request from our patrons of items currently not offered in recreation facilities. This is especially true at larger facilities including the Norfolk Fitness and Wellness Center, Lambert's Point, Norview and Titustown. Patrons would like to have access to Wi-Fi while working out, waiting for their children to complete lessons, prior to the start of classes and in some instances as part of a class. Other uses of Wi-Fi in recreation facilities include: support meeting rentals and special events by outside groups, Support summer camp activities that incorporate on-line activities, Support homework help programs that are facilities by outside organizations The expectation that the city provide Wi-Fi by our patrons is based on Wi-Fi availability at comparable facilities both in the public sector as well as private facilities, especially private fitness facilities.

**Police**

Wireless offload of videos from in-car camera systems and to support future technology needs and trends.

**Cultural Facilities, Arts and Entertainment**

We need better Wi-Fi and cellular coverage in many of our facilities (Slover Library Basement, Scope Administrative Offices). We also need a hard line internet connection at various points in Town Point Park to operate our ticketing system for events. For the future, many of our art exhibits should have internet or Wi-Fi connection to enhance the art & make it more interactive.

**Human Resources**

Human Resources would like to increase the use of mobile devices for training and for enhanced service by analysts meeting with client departments. Wi-Fi will support such use

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**Please explain why this technology or application is necessary for your administrative operations.**

**Budget and Strategic Planning**

A solution like MS Sharepoint would be useful for when multiple analysts are working on the same document or to closely track version control

**Finance**

Working remotely. Improving daily tasks with more efficient Desktop PC

**Utilities**

Access to NorthStar remotely is necessary in order for techs to have real time access in the field and to be able to update customers' records in real time. Access would eliminate manual work orders providing more efficient and effective customer service. Use of personal devices in work setting would aid in streamlining access (i.e. work emails can be sent directly to personal device for those employees who do not have a City cell phone or City smart phone).

**Planning**

We need this scanner (at least one) so we can scan our older files and clear up cabinet and drawer space. We are running out physical space in the office. This would decrease costs and make it easier to search for older documents (also for FOIA requests).

### **General Services**

Most of our operations require Subject Matter Experts to consult directly with customers away from computer workstations. As such, the time required to return to workstations to input data makes the customer service process less efficient and effective.

### **Norfolk Community Services Board**

Critical for the volume of staff at CSB accessing our Electronic Health Record (EHR) and the connected maintenance of the laptops for our mobile staff

Critical for the need to share psychiatric services in a cost effective and efficient manner through telemedicine. This methodology also serves the critical timing issues of providing services and meeting public safety requirements (TDO, ECO, crisis intervention)

### **Human Services**

Security events happen frequently in Human Services. We work with delicate situations such as the removal of a child from a home. Angry and upset parents are common visitors to our locations. Additionally, we provide supplemental food and income benefits to tens of thousands. Not all who apply are eligible and not all who are eligible are satisfied with their level of benefit. Security footage is reviewed often. It would be a big help to be able to do it from a central location.

### **Cultural Facilities, Arts and Entertainment**

Because our department/work environment depends on technology to remain competitive in the marketplace.

### **Human Resources**

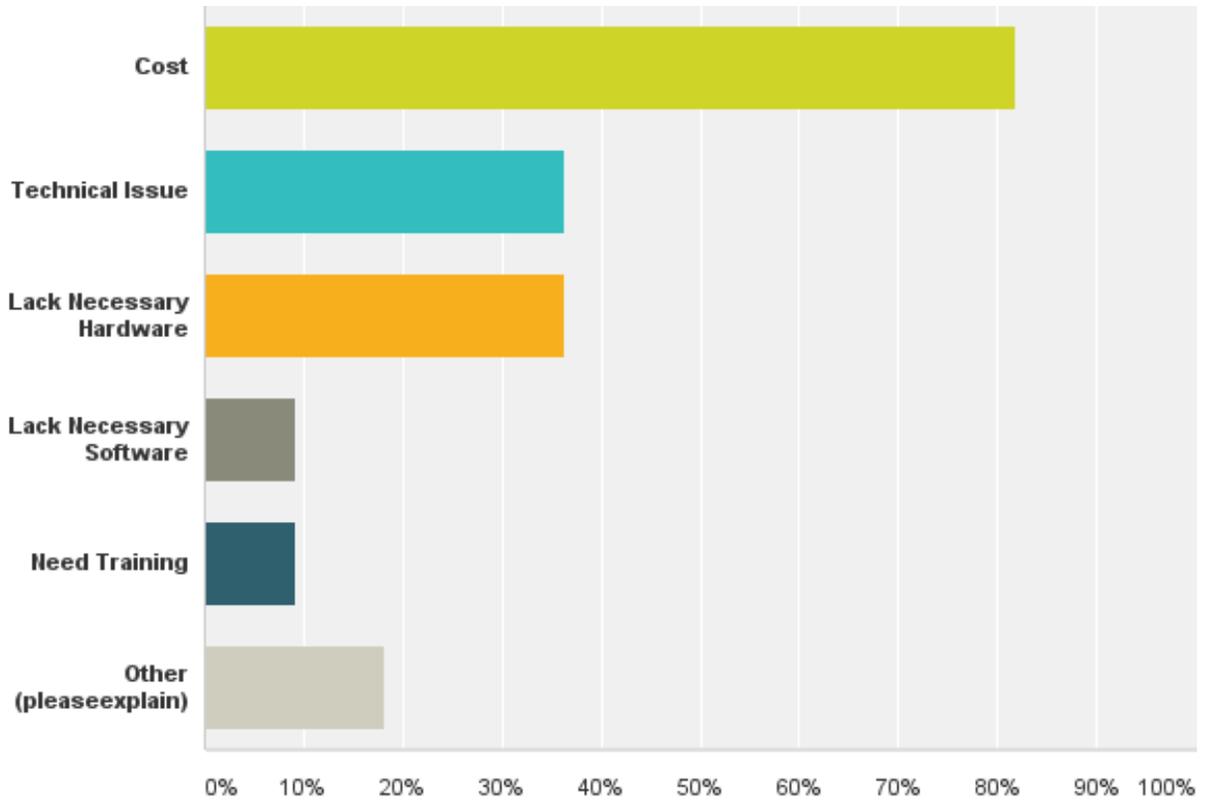
Enhanced customer service.

### **Recreation, Parks and Open Space**

The Addition of Wi-Fi as stated above will enhance administrative operations in Recreation services since it supports the goals of our facilities and enhances programs and services to the public.

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What barriers have kept you from accessing those technologies or applications? (Check all that apply)



Answer Choices	Responses
Cost	81.82% 9
Technical Issue	36.36% 4
Lack Necessary Hardware	36.36% 4
Lack Necessary Software	9.09% 1
Need Training	9.09% 1
Other (please explain)	18.18% 2
<b>Total Respondents: 11</b>	

**Other:**

The Budget office has, to my knowledge, never requested Sharepoint. It is not a product that is used citywide.

Current city policies do not support the operations of a Wi-Fi network at recreation centers.

**For all that you checked above, please explain how these factors have been barriers.**

### **Budget and Strategic Planning**

The Budget office has, to my knowledge, never requested Sharepoint. It is not a product that is used citywide.

### **Finance**

Technology and automation are essential to reducing costs and increasing quality outcomes. Standardizing Technology requirement City Wide.

### **Utilities**

Costs = budgetary concerns

Other = Prevents use of mobile application related to NorthStar.

### **Planning**

We have requested these scanners through the budget process in the past.

### **General Services**

External access to Wi-Fi is needed in our work units.

### **Norfolk Community Services Board**

CSB funding is a complex mixture of state, local, and grant funding. It can also be initiative based (Electronic Health Records, Medicaid expansion, affordable care, state budgets, etc.) Sustainable technology funding is and will continue to be a challenge.

### **Human Services**

Due to video bandwidth limitations, we are not able to stream security video on the city network.

### **Cultural Facilities, Arts, and Entertainment**

We need better Wi-Fi and cellular coverage in many of our facilities (Slover Library Basement, Scope Administrative Offices). We also need a hard line internet connection at various points in Town Point Park to operate our ticketing system for events. For the future, many of our art exhibits should have internet or Wi-Fi connection to enhance the art & make it more interactive. We rely on these technologies to perform our jobs, and we are a geographically dispersed department.

### **Recreation, Parks and Open Space**

There is no identified funds to support a Wi-Fi network. RPOS will have to work inside its existing budget to repurpose existing funds to make this happen.

Technical issues related to filtering content will need to be addressed before operating a Wi-Fi network. RPOS will have to work inside a city framework with other departments lead by CommTech to make this happen.

Time is the greatest hurdle regarding instituting a new policy for Wi-Fi. City policies must receive approval by the city manager. Not sure of where this item falls in terms of citywide priorities.

**Police**

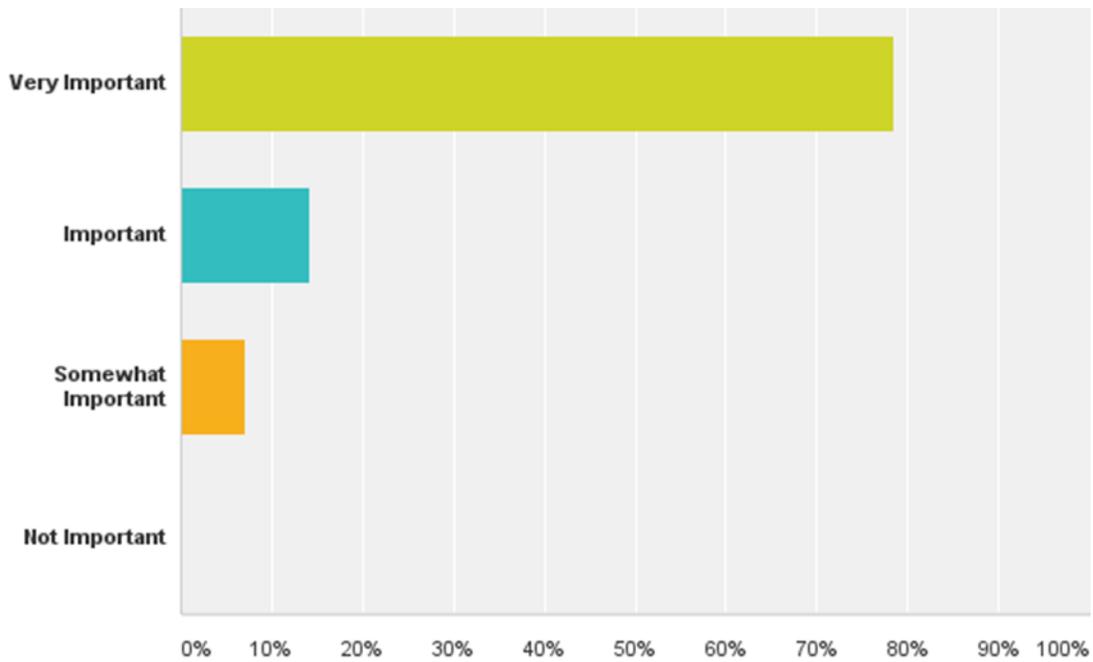
In-car camera / tablets in car replacement. Body worn cameras. Planned obsolesce of technology.

**Human Resources**

Cost is the primary consideration for providing greater use of mobile devices to staff members.

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**How important is access to portable and mobile technologies for administrative operations?**



Answer Choices	Responses
Very Important	78.57% 11
Important	14.29% 2
Somewhat Important	7.14% 1
Not Important	0.00% 0
<b>Total</b>	<b>14</b>

Please explain the level of importance above.

**Budget and Strategic Planning**

Smart phones and laptops are extremely important to the operations of the Budget Office especially during times when deadlines are approaching or when workload is heavy. The ability to work remotely, communicate with staff in the evenings and on the weekends, and have questions answered quickly is extremely important. The Budget Office is supported by a ComTech employee who is based in Colorado so the ability for this employee to work remotely is crucial to the job.

## **Finance**

Technological advances: Remote Access increase user productivity with a stable and secure Remote Application Environment, play a crucial role in improving productivity.

Reduce costs by simplifying technology and giving employees more flexibility in how they collaborate. (I.E Instant messenger (LYNC)).

BYOD -You can Work securely from anywhere, on any device with just an internet connection.

## **Utilities**

Access to portable/mobile technology improves our administrative operations and customer service.

## **Planning**

Our field staff need access to mobile devices when conducting their inspections. They do have phones and tablets currently.

Building Safety and Zoning Inspectors utilize mobile technologies to fulfill their job duties out in the field.

## **General Services**

Mobile or portable access is needed to deliver the best service to our customers.

## **Norfolk Community Services Board**

The mobile use of our Electronic Health Record is critical to service delivery.

## **Human Services**

Portable and mobile technology is always import in terms of keeping up with business communication throughout the day when admin staff are away from the office. They are absolutely essential to supporting staff when emergency shelters are activated.

## **Cultural Facilities, Arts, and Entertainment**

We need better Wi-Fi and cellular coverage in many of our facilities (Slover Library Basement, Scope Administrative Offices). We also need a hard line internet connection at various points in Town Point Park to operate our ticketing system for events. For the future, many of our art exhibits should have internet or Wi-Fi connection to enhance the art & make it more interactive. We rely on these technologies to perform our jobs, and we are a geographically dispersed department.

## **Recreation, Parks and Open Space**

Using portable technologies, allows our administrative staff to be efficient while being mobile.

**Police**

Keep us connected while on the go.

Public Safety and Officer safety. Efficiency, accuracy and timeliness of services.

**Human Resources**

Greater use of mobile devices would allow for more efficient service, providing analysts the ability to access information and data at their fingertips during meetings with client departments.

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**What are the emerging new technologies and applications that you anticipate will be critical to your administrative operations in the future and why will these be critical?**

**Budget and Strategic Planning**

Unsure

**Finance**

Cloud-based Technology are countless, security will be a major concern. Mobility Application Protocol and Application integration.

Enterprise Mobile Application Services allow the workforce to overcome mobility challenges and capitalize on benefits.

**Police**

Mobile router (hotspot). Wi-Fi hotspots on city buildings. Wireless uploads of BWC and ICC videos. Bluetooth activations of BWC cameras.

Vendors of many of the technologies being researched for use by the Norfolk Police are abandoning hardware dependent resources in favor Wi-Fi enabled capabilities. For example, several in-car camera systems under review rely heavily on wireless routers to handle the video ingestion process. Transitioning to wireless capability will allow the department and TSU to utilize the emerging technologies.

Efficient and timely upload of BWC and ICC videos. Keeping tablets and laptops current with software and antivirus patches and updates.

**Utilities**

New Asset Management/Work Order Management Software (Hansen replacement). HRSD new billing app (coming out in near future – aid in costumer credit card payment). Automated Meter Reading

The above technologies and applications will aid in providing a more efficient operation. They will also provide easier access for customers to view their water bill/accounts.

**Planning**

Continued use of cloud storage for our boards and commissions.

Cloud/digital file management greatly cuts down on paper usage, and costs and increases efficiency and organization.

Basic Gov that was just introduced to the Planning department in Spring 2016 to replace Naviline and Hanson permitting modules. Also would like to see interactive group

polling/surveys on site at community and civic league meetings as well as on the Planning Department's website.

Basic Gov is still a new component and will more than likely require upgrades to maintain services. Also interactive surveys would be useful to collect as much data as possible from the community at large when working on large City-wide planning projects.

### **General Services**

Use of mobile applications.

Many software companies offer a mobile add-on to aid business process. We will need these apps to achieve optimal performance of the software system.

### **Fire-Rescue**

Cloud Reporting.

Reporting EMS and Fire incidents to the State.

### **Norfolk Community Services Board**

1. Wireless signature capture (via Bluetooth or tablet screen)
  - a. It will change a big issue in the complexity of capturing signatures in the community
2. Porting traditional applications to the newer form factors (tablets, iPad, mobile apps, metro UI)
  - a. Without the change, applications do not present well on newer tablets and don't support alternative input (pen, gesture, touch, etc.)
3. Better computer connectivity through wireless data networks (Verizon 4g)

### **Human Services**

Business analytics, big data, open source software and cloud based solutions are all areas that one day may be critical to Human Services operations.

Human Services caseload is inversely proportional to economic prosperity. When the economy is booming, fewer individuals are in need of assistance. When the economy slows, Human Services casework picks up. At the same time, there is an ever growing call for tightening of resources, so it is critical for emerging technologies to help make up the difference in supply and demand.

### **Cultural Facilities, Arts and Entertainment**

We need the ability to accept grants and public art submissions online, and we need to build a mobile box office platform to meet industry standards.

To stay competitive and to meet industry standards.

### **Recreation, Parks and Open Space**

Web based RecTrac application

New application provides new features and customer service improvements.

### **Human Resources**

Advances in training technology make streaming video a consistent training methodology that should be available to users. While we have the technology to offer through our current system, we need a system that provides the bandwidth to avoid stopping and starting. We are also exploring the use of video-based technology for onboarding and benefits communications. Skype is used for remote interviews.

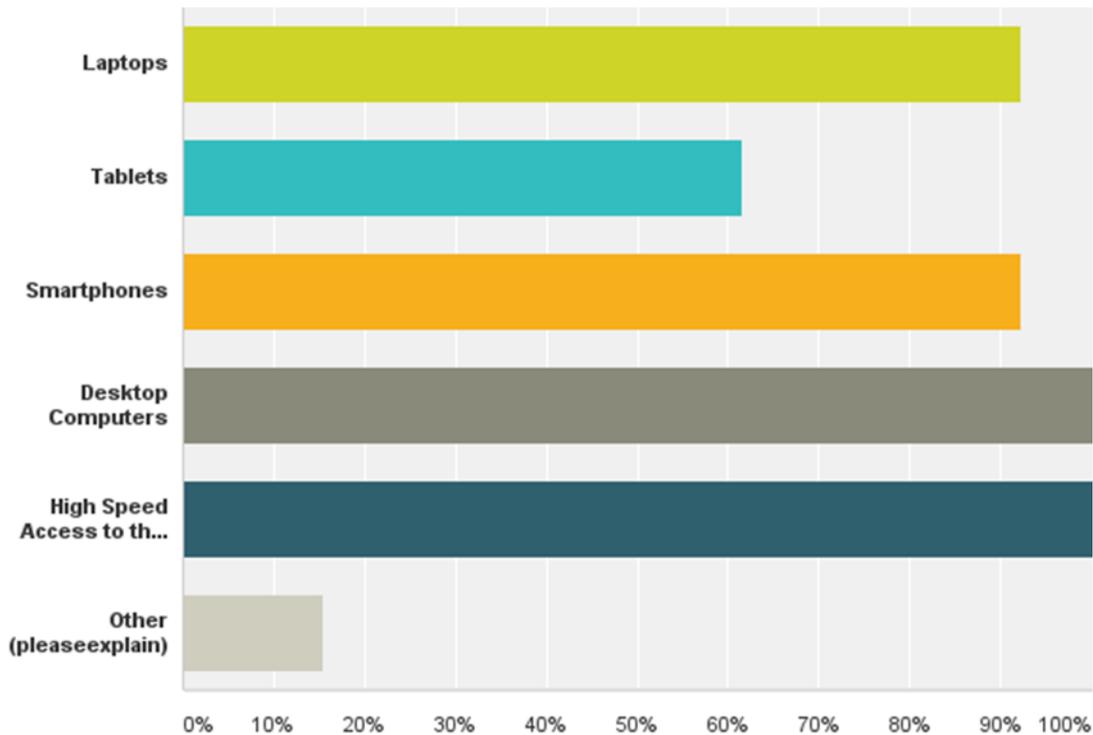
Although not critical, these technologies are consistent with trends in industry.

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**PART II: SERVICES TO THE PUBLIC**

**What broadband communications technologies and applications are integrated into your department in order to successfully deliver services to the public? (Check all that apply) – Technologies**

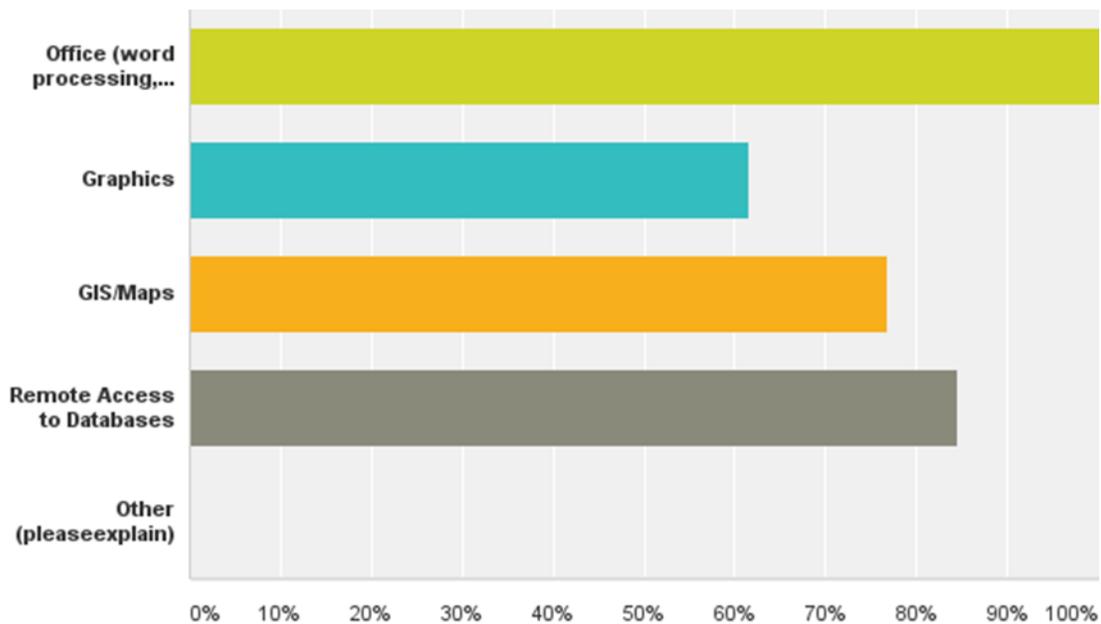
Answer Choices	Responses	
Laptops	92.31%	12
Tablets	61.54%	8
Smartphones	92.31%	12
Desktop Computers	100.00%	13
High Speed Access to the Internet	100.00%	13
Other (pleaseexplain)	15.38%	2
<b>Total Respondents: 13</b>		



**Other:** Scanners, QR Code Technology and Augmented Reality

What broadband communications technologies and applications are integrated into your department in order to successfully deliver services to the public? (Check all that apply) –

Answer Choices	Responses
Office (word processing, spreadsheets, etc.)	100.00% 13
Graphics	61.54% 8
GIS/Maps	76.92% 10
Remote Access to Databases	84.62% 11
Other (please explain)	0.00% 0
<b>Total Respondents: 13</b>	



**Applications**

For all that you checked above, please explain why you rely on these technologies and applications to deliver services to the public.

**Budget and Strategic Planning**

The Annual Budget Document is produced for public review and comment. All of the technologies and applications above are crucial to the successful production of that document.

**Finance**

Laptops: Mobility increased convenience, and wireless access.

Tablets: Mobility increased convenience, and wireless access for quiet rooms where we meet with visitors.

Smartphones: Mobile Access

High Speed Access to the Internet: Performance, Value and Reliability for Cloud Base Software products

Office (word processing, spreadsheets, etc.): Incredibly simple application for daily tasks

### **Police**

Rapid and efficient access to websites and data. Ability to maintain a high level of transparency.

### **Utilities**

Support water and sewer efforts to provide services to customers/citizens. Aid in receiving and processing customers' water accounts remittance and payments.

### **Planning**

City planning utilizes desk computer, mobile devices and GIS technologies to perform daily duties. All are essential technologies for our operations; we need them to deliver the best services to the public via clear communications and efficient dissemination of important information.

Laptops, Tablets, Smartphones assist with providing zoning and environmental data to the public while out in the field. Also used to record and document zoning infractions.

Scanners provide maps to the public

Desktop computers used for PowerPoint graphics and presentations at meetings

### **General Services**

These technologies are used to perform field work to citizens and internal city departments.

### **Fire-Rescue**

Technologies are needed because our services are mobile throughout the City of Norfolk.

Applications are used for locating and reporting incidents.

### **Norfolk Community Services Board**

Same as previously completed in administrative section.

### **Human Services**

Laptops and Smartphones are essential equipment for our Family Services Staff. Smartphones are used to required casework photographs and audio recordings of client interviews. In addition, they provide network accessibility to when used as 'hotspots'. This enables Family Services Staff to access critical case information from state systems, while the workers are in the field or on call.

**Cultural Facilities, Arts and Entertainment**

The public has come to expect these services as a daily part of their lives. We need to meet and consistently maintain industry standards.

**Recreation, Parks and Open Space**

These technologies allow our department to stay connected with the public and ability to respond to their needs and requests.

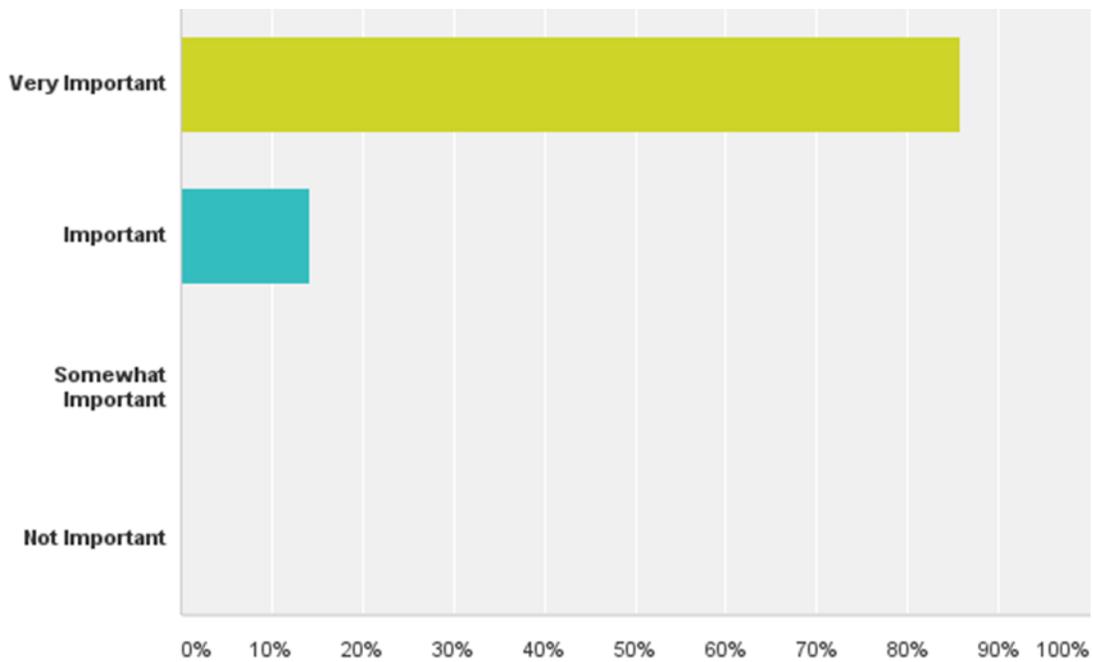
**Human Resources**

Human Resources uses the internet to provide access to job postings and process applications. Interested candidates use NeoGov (through GovernmentJobs.com) for such purposes.

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**How important is it to have access to portable and mobile technologies for service delivery purposes?**

Answer Choices	Responses	
Very Important	85.71%	12
Important	14.29%	2
Somewhat Important	0.00%	0
Not Important	0.00%	0
<b>Total</b>		<b>14</b>



**Please explain the level of importance above.**

**Budget and Strategic Planning**

Same as above. Mobile and portable technologies are crucial to the production of the Budget Document.

**Finance**

Remote Access increase user productivity. A stable and secure Remote Application Environment, play a crucial role in improving productivity.

Reduce costs by simplifying technology and giving employees more flexibility in how they collaborate. (i.e. Instant messenger (LYNC)).

BYOD -You can Work securely from anywhere, on any device with just an internet connection.

**Police**

Ensures better and more efficient customer service.

**Utilities**

Access to portable/mobile technology allows us to provide improved services at lower costs.

**Planning**

Field Operations - inspectors need for communication and efficient input of data in field.

Building Safety and Zoning Enforcement officers must have daily access to portable and mobile technologies in order to complete their inspections and to provide customer service while out in the field

**General Services**

Portable access is very important in order to deliver exceptional customer service

**Fire-Rescue**

Fire-Rescue services are performed throughout the City of Norfolk.

**Norfolk Community Services Board**

The mobile use of our Electronic Health Record is critical to service delivery.

**Human Services**

A significant amount of Family Services work takes place in the field. Portable, mobile technology enables the Family Services worker with much more information in real time. The difference between having this information readily available and having to make a decision without it, cannot be overstated. Better, more timely information can help assure better outcomes for our most vulnerable citizens. Today, we utilize smartphones well enough, but there is room for significant improvement in the use of mobile technology.

**Cultural Facilities, Arts and Entertainment**

The public has come to expect these services as a daily part of their lives. We need to meet and consistently maintain industry standards.

**Recreation, Parks and Open Space**

Having access to mobile technologies, would allow our landscaping and forestry crews to be more productive.

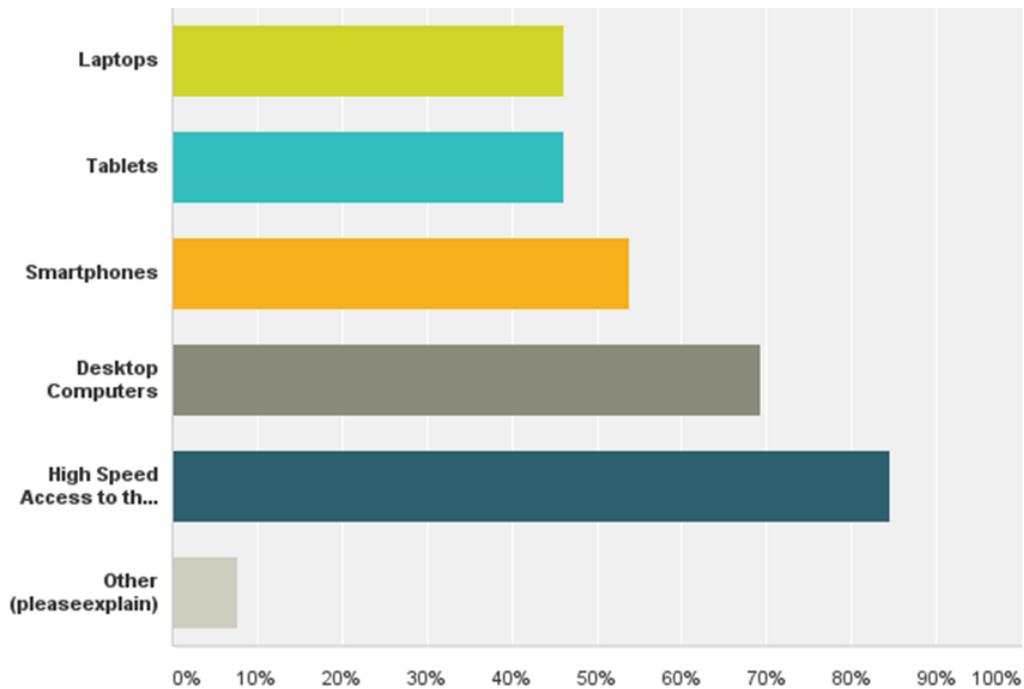
**Human Resources**

This is important for job candidates using mobile devices to apply for or check the status of their applications.

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**What are the broadband communications technologies and applications needed by Norfolk residents and businesses that help further your department’s ability to provide necessary services? (Check all that apply) – Technologies**

Answer Choices	Responses
Laptops	46.15% 6
Tablets	46.15% 6
Smartphones	53.85% 7
Desktop Computers	69.23% 9
High Speed Access to the Internet	84.62% 11
Other (please explain)	7.69% 1
<b>Total Respondents: 13</b>	

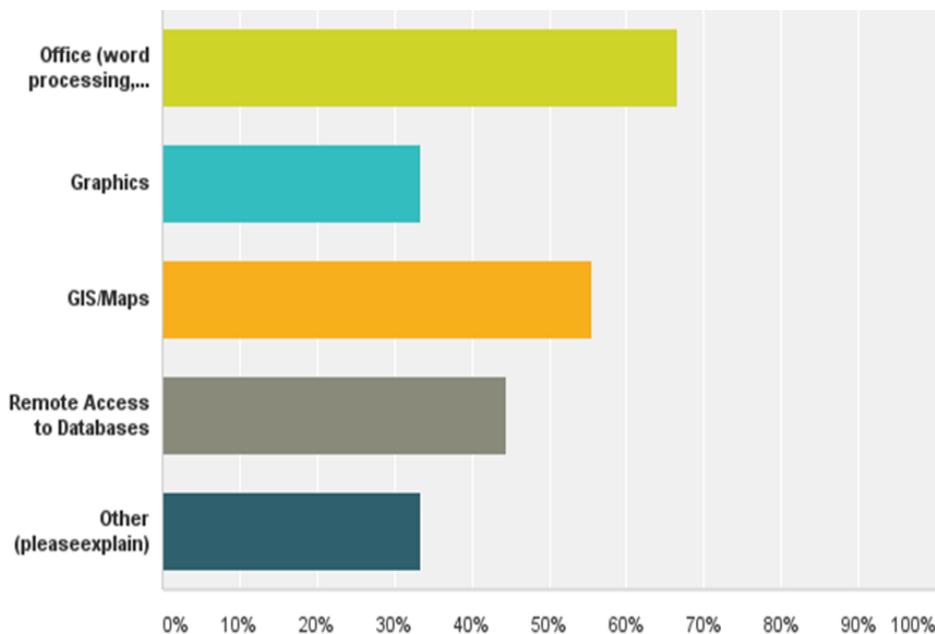


**Other:** Due to healthcare standards and privacy, we would begin to make kiosks available in our waiting areas to allow consumers secure access to their health record. This will require specialized hardware and software

**What are the broadband communications technologies and applications needed by Norfolk residents and businesses that help further your department’s ability to provide necessary services? (Check all that apply) – Applications**

Answer Choices	Responses
Office (word processing, spreadsheets, etc.)	66.67% 6
Graphics	33.33% 3
GIS/Maps	55.56% 5
Remote Access to Databases	44.44% 4
Other (please explain)	33.33% 3
<b>Total Respondents: 9</b>	

**Other:** Emails & Norfolk citizens can apply for public assistance using the Commonwealth’s ‘CommonHelp’ web application. Expanding the availability of high speed internet access would enable more citizens to apply without having to come to one of the Human Services offices. This could reduce their wait time for benefits and free more time for eligibility staff to spend more time on cases that are not a good fit for the Common Help application.



**For all that you checked above, how do they help?**

**Budget and Strategic Planning**

Any technology that would allow residents and businesses to electronically review the information published online by the Budget Office will further the department's ability to provide services.

**Finance**

Provides more transparent information to data. Allows access to future automation of processes and real time access to information between Finance and the City Treasurer's office.

**Police**

Ease of access to city services for its citizens.

**Utilities**

Broadband is an efficient means to provide information to/from our customers/citizens vs. mailings. Could circulate Project Bulletins and billing information via emails. Additionally, broadband access does not restrict customers to hours of operation to access their accounts or submit inquiries about an issue or project; have 24/7 access.

**Planning**

Residents simply need access to the internet and a computer with email in order to best communicate and interact with us in the most efficient way possible.

All Planning projects are created and shared online

Access to Norfolk Air for property information within the City

Access to building permit data

Access to site plan reviews and planning applications

Access for forms and applications for departmental processes in Planning, Building Safety and Development Services Center

**General Services**

The applications and technologies checked above helps to increase the department's percentile of satisfied customers.

**Fire-Rescue**

Ability to call 911.

Locate trained CPR providers during an emergency.

**Norfolk Community Services Board**

This will help enable our consumers to further take part in their health and treatment

**Human Services**

Norfolk citizens can apply for public assistance using the Commonwealth’s ‘CommonHelp’ web application. Expanding the availability of high speed internet access would enable more citizens to apply without having to come to one of the Human Services offices. This could reduce their wait time for benefits and free more time for eligibility staff to spend more time on cases that are not a good fit for the CommonHelp application.

Human Services connects many citizens with services provided by our community partners. The process of paying for these services involves a complicated process of including service contracts, purchase orders, verifications and invoices. The vast majority of these processes are paper based. Connecting with community partners through secure information technology could reduce costs and errors, thereby improving the potential outcomes for our citizens.

**Cultural Facilities, Arts and Entertainment**

So we can communicate with our patrons to upsell experiences/services, ticket sales, convenience, efficiency.

**Recreation, Parks and Open Space**

Having public computer labs in most of our Community Centers, enables our department to provide computer and internet access, to residents that may not have these tools available to them.

**Human Resources**

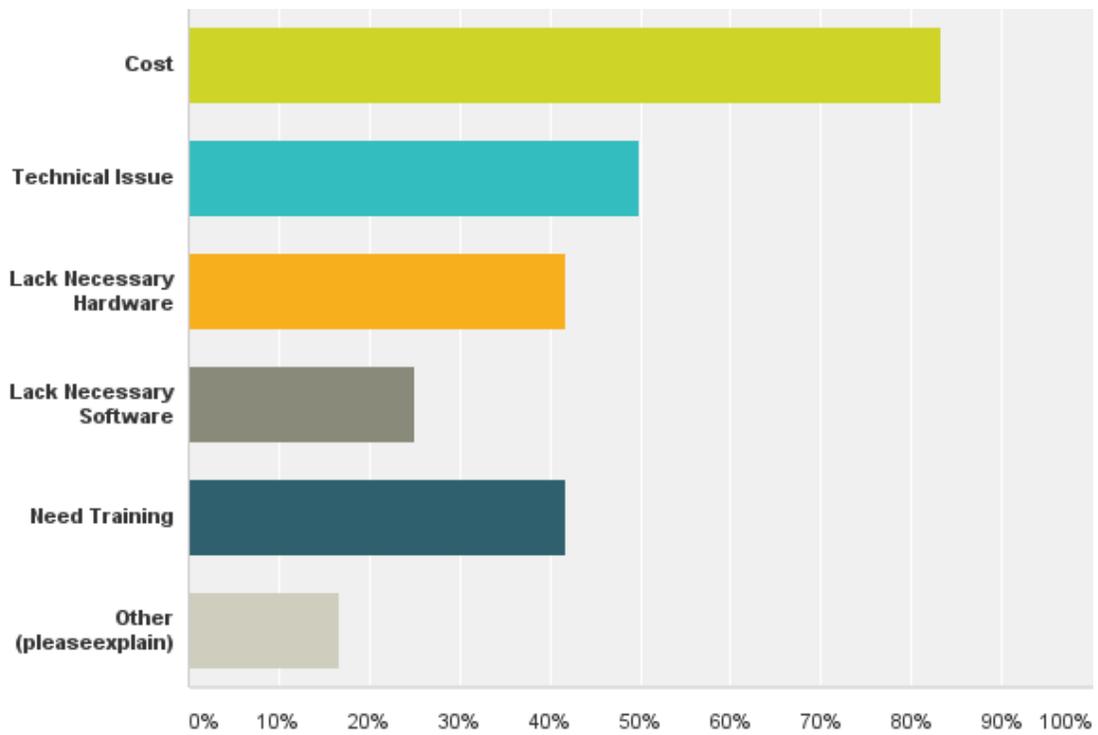
This is important for job candidates using mobile devices to apply for or check the status of their applications.

**What are the barriers to residents and businesses accessing those technologies and applications?**

<b>Answer Choices</b>		<b>Responses</b>	
	Cost	83.33%	10
	Technical Issue	50.00%	6
	Lack Necessary Hardware	41.67%	5
	Lack Necessary Software	25.00%	3
	Need Training	41.67%	5
City	Other (please explain)	16.67%	2 Inc.
<b>Total Respondents: 12</b>			

**Other:** Not applicable for most HR functions. Some job candidates do not have access to a home computer, but they can access in Human Resources or at the Public Libraries.

---



**For all that you checked above, please explain how these factors have been barriers.**

**Budget and Strategic Planning**

The assumption would be cost though anecdotally we believe most residents have the technology required to access published documents online.

**Finance**

Lack of communication and resources to better integrate systems.

**Police**

Compatibility of citizen's platforms with city services (esp. non-Windows users). Lack of knowledge of available services and technologies.

**Utilities**

Due to varying degrees of computer literacy/knowledge and economic situations of our citizens, could be seen as barriers to residents/businesses accessing technologies/applications.

**Planning**

Sometimes residents do not have computers or internet access. It is important to accommodate these individuals as well.

More budgeting strategies needed for technical issues and training for new programs such as Basic Gov.

**General Services**

Expensive installation cost can make it difficult for the department to offer the necessary technologies to residents and business partners.

**Fire-Rescue**

Not all residents can afford smartphones.

**Norfolk Community Services Board**

Health care information exchanging is one of the primary problems facing EHR vendors. Healthcare systems that interoperate seamlessly are not common yet. We are tracking what our vendor is doing on this front so that eventually we can begin to provide a patient portal to our consumers

**Human Services**

For many of our citizens, high speed internet is simply a luxury they cannot afford.

Affordable procurement and payment systems for Human Services are not readily available. Adding the complexity of including electronic access by community partners is a goal which further restricts our options.

**Cultural Facilities, Arts and Entertainment**

If patrons cannot afford technology, hardware, software, etc., we cannot reach them.

**Recreation, Parks and Open Space**

We try our best to ensure that the needs of our residents and businesses are met.

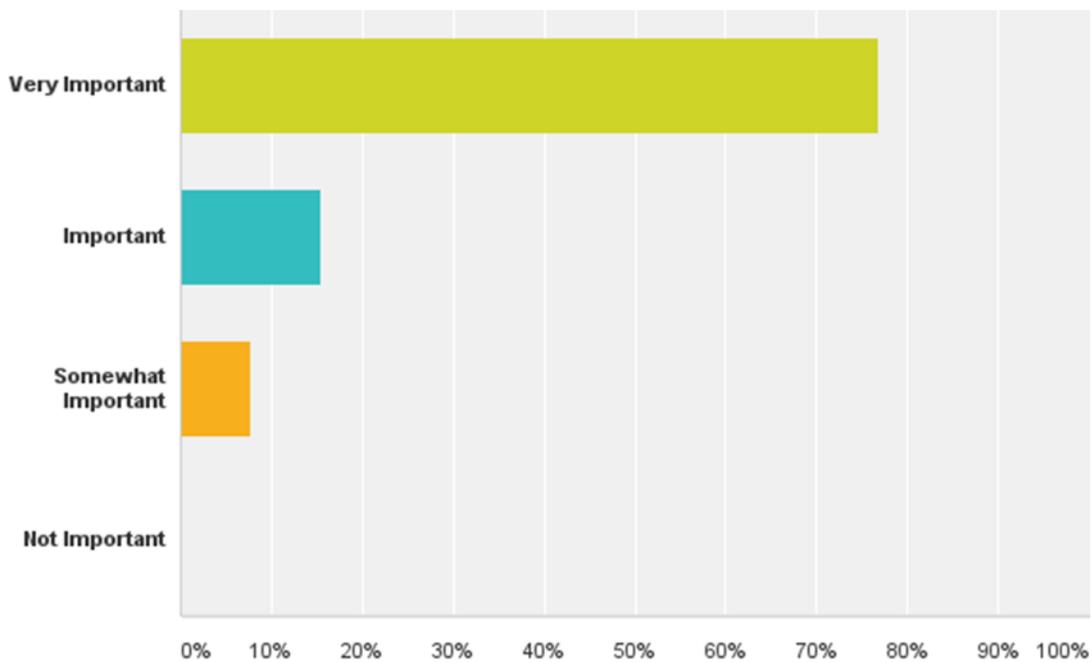
**Human Resources**

Not applicable for most HR functions. Some job candidates do not have access to a home computer, but they can access in Human Resources or at the Public Libraries.

---

**How important is the universal availability of these technologies and applications to your department and City residents in the future?**

Answer Choices	Responses
Very Important	76.92% 10
Important	15.38% 2
Somewhat Important	7.69% 1
Not Important	0.00% 0
<b>Total</b>	<b>13</b>



**Please explain the level of importance above.**

**Budget and Strategic Planning**

As more and more information and communication occurs online availability of the tools needed to publish and view online information will be very important.

**Finance**

Desire to increase the ability to process payments on line.

### **Police**

Ease of use and seamless integration. Transparency of services. Community relations and engagement.

### **Utilities**

The universal availability of these technologies/applications would be very important as they should be the primary line of communication with customers. The function would enhance the ability to communicate with citizens. May also help keep rates down.

### **Planning**

It is not impossible to communicate with residents who do not have computer or internet access, but it reduces costs through mailings/postage we can communicate digitally.

New Basic Gov system will be used to track all Planning applications and permits status. Majority of Planning projects are created, stored and shared online.

### **General Services**

Business process relies on technology and will do so more in the future.

### **Fire-Rescue**

Allows all residents access to emergency aid.

### **Norfolk Community Services Board**

Creating patient portals and providing a kiosk pc to allow access to health records is a natural progression and puts tools in the hands of our citizens.

### **Human Services**

The use of information technology expands as fast as it evolves. This concept is not likely to change going forward. In order for Human Services to keep up with its mission, the availability of the network and systems such as those mentioned above, must become a reality. It will cost much more in Human capital and potential loss of benefits for our citizens if we do not strive to make this technology ideas reality.

### **Cultural Facilities, Arts and Entertainment**

The public has come to expect these services as a daily part of their lives. We need to meet and consistently maintain industry standards.

### **Recreation, Parks and Open Space**

We would like to continue to rely on the best available technology, to provide service to our customers.

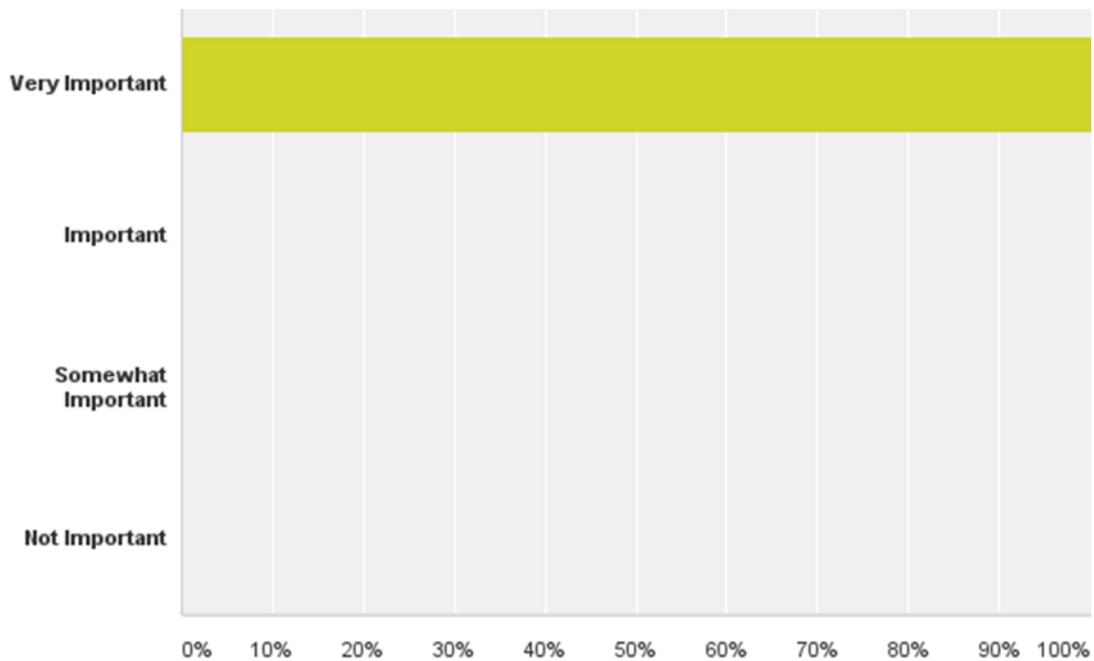
**Human Resources**

Not applicable for most HR functions. Some job candidates do not have access to a home computer, but they can access in Human Resources or at the Public Libraries.

---

**How important is the use of broadband communications technology for employee, workforce and economic development purposes?**

Answer Choices	Responses	
Very Important	100.00%	14
Important	0.00%	0
Somewhat Important	0.00%	0
Not Important	0.00%	0
<b>Total</b>		<b>14</b>



**Please explain the level of importance above.**

**Budget and Strategic Planning**

Broadband communication will be critical in the future for employee, workforce, and economic development. The ability to access work, training etc. from remote locations will be key in the future.

**Finance**

Remote Access increase user productivity. A stable and secure Remote Application Environment, play a crucial role in improving productivity, communication and access to data.

### **Police**

To provide timely support services to the department.

### **Utilities**

The use of broadband communications technology would be very important to employees, workforce and economic development purposes because it improve efficiencies in customer service.

### **Planning**

The city can operate more efficiently and quickly if broadband communications technology is utilized.

Data needs quick and easy access for employees and customers throughout the City.

### **General Services**

Broadband communication is important as the trend to connect remotely is more necessary.

### **Fire-Rescue**

Allows everyone access at any location.

### **Norfolk Community Services Board**

The advances of these technologies will inevitably foster a well-informed, nimble workforce. Norfolk will stay a premiere tech city.

### **Human Services**

Sir Francis Bacon first penned the phrase, 'Knowledge is Power'. Today, the availability of broadband communications is equal to the availability of knowledge. The future of the City will in no small way be determined by how well we provide information technology.

### **Cultural Facilities, Arts and Entertainment**

The public has come to expect these services as a daily part of their lives. We need to meet and consistently maintain industry standards.

### **Recreation, Parks and Open Space**

Having reliable broadband communications is critical to our department's operations.

### **Human Resources**

Broadband communications technology is critical to recruit and retain high performing employees and to compete with other public and private employers for high performers.

---

**What are the emerging/new communications technologies and applications that you anticipate will be critical to your ability to deliver services in the future?**

**Budget and Strategic Planning**

Unsure

**Finance**

Use of eVA for procurement Automation of accounts payable and e-invoicing

**Police**

Enhanced Bluetooth. 5G Cellular Data. CAD 9.4 and WebRMS. Remote activation and access to BWC and ICC.

**Utilities**

Integration of technology (use of personal devices at work) GIS – Software is constantly changing how business can be done. IVR (Interactive Voice Response) – Customers can perform routine business without speaking to a live person.

**Planning**

N/A

Laserfiche scanner to store department documents such as site plans, staff reports, applications etc. Need for online real-time surveys and polling to share ideas

**General Services**

Skype - the ability to video conference from your desktop.

**Fire-Rescue**

Higher speed broadbands.

**Norfolk Community Services Board**

Wireless signature capture (via Bluetooth or tablet screen)

Porting traditional applications to the newer form factors (tablets, iPad, mobile apps, metro UI)

Better computer connectivity through wireless data networks (Verizon 4g)

**Human Services**

Business analytics, big data, open source software and cloud based solutions are all areas that one day may be critical to Human Services operations.

Norfolk citizens can apply for public assistance using the Commonwealth's 'CommonHelp' web application. Expanding the availability of high speed internet access would enable more citizens to apply without having to come to one of the Human Services offices. This could reduce their wait time for benefits and free more time for eligibility staff to spend more time on cases that are not a good fit for the CommonHelp application.

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**Cultural Facilities, Arts and Entertainment**

Augmented reality mobile platforms (i.e. Pokemon), commerce platforms, crowd sourcing, interactive experiences, etc.

**Recreation, Parks and Open Space**

GIS enabled service request application that would allow customers to submit service tickets

**Human Resources**

On-demand video-based tutorials for department services and learning and development.

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**How will you need to integrate them into your operations?**

**Budget and Strategic Planning**

**Finance**

Interface to AFMS

**Police**

**Utilities**

Coordination with IT

Educating customer base on available technologies

**Planning**

N/A

Currently many of our site plans, staff reports and applications are stored either on the Planning K drive or on paper in file cabinets. Information is not always readily available for staff or public use. Online surveys and polling will be used at community meetings, civic leagues and informal gatherings to promote collaboration between staff and interested parties.

**General Services**

All computers will need skype to conduct business with internal and external customers

**Fire-Rescue**

**Norfolk Community Services Board**

We will need a phased approach with time for staff to adapt and settle.

**Human Services**

**Cultural Facilities, Arts and Entertainment**

Creation of an APP (application), exhibits, QR Codes, text sourcing

**Recreation, Parks and Open Space**

Having mobile technologies landscape crews will drastically reduce response time and would increase productivity

**Human Resources**

Human Resources would implement for specific functions using a pilot approach to assess success before using for additional services.

## **PART III: THE CITY'S CURRENT NETWORK**

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**Tell us about your experience using the City's Network, considering such issues as network reliability, speed, capacity and ease of use:**

### **Budget and Strategic Planning**

Outside of very rare service outages we have experienced solid reliability and sufficient speed and capacity for the Budget Office's requirements.

### **Finance**

Increase network reliability by prioritizing bulk internet traffic

Blocking internet sites has somewhat increase network reliability

### **Police**

Good so far

Poor speed and capacity at peak hours. Insufficient capacity in general.

### **Utilities**

Our department's experience has been good – system/access is rarely down.

### **Planning**

No issues

Financial system AFMS will frequently get "hung up" when trying to save data, the information will be aborted and the user will have to sign back in to begin again.

Overall the City's Network rarely goes down, performs at adequate speed although the department K drive is almost always near capacity and has to be frequently scanned for items to delete.

### **General Services**

The City's network speed has been very reliable; however, the ability to live stream is not available and present an ongoing challenge.

### **Fire-Rescue**

No issues at this time.

### **Norfolk Community Services Board**

The telephone switches in 2 of our locations (Tidewater Drive & Virginia Beach Blvd) are antiquated but are cost prohibitive to replace.

The city experiences a significant slowdown at lunch time every work day. This interacts negatively with our 150 to 200 staff accessing our Electronic Health Record (cloud hosted) through remote desktop. I believe that this slowdown occurs because all traffic has to be filtered and passed through the firewall (one door) and as such more traffic at lunch slows everyone. This has caused freezing of our EHR and other business applications. As an engineer I understand that there is not an effective way to isolate and prioritize traffic. An upgraded firewall or caching server may help but traffic will fill up as much bandwidth capacity as you throw at it, to a point. Other than that the network is reliable and with the tools the City has given me (What's up gold) I can effectively troubleshoot our hosted services against Norfolk net versus Verizon MiFi connectivity.

**Human Services**

In general, the City's Network is a secure and reliable utility. You notice it, when it doesn't work or things come to a crawl. Like the water or electricity, it is expected to be there 100% of the time you need it. City of Norfolk Comm-IT should take pride in the quality of the service they provide NDHS.

**Cultural Facilities, Arts and Entertainment**

Very difficult to use, archaic platform, confusing layout, not user friendly, lacks a search capability, slow speed, integration of links is slow, need more storage on the shared drive.

**Recreation, Parks and Open Space**

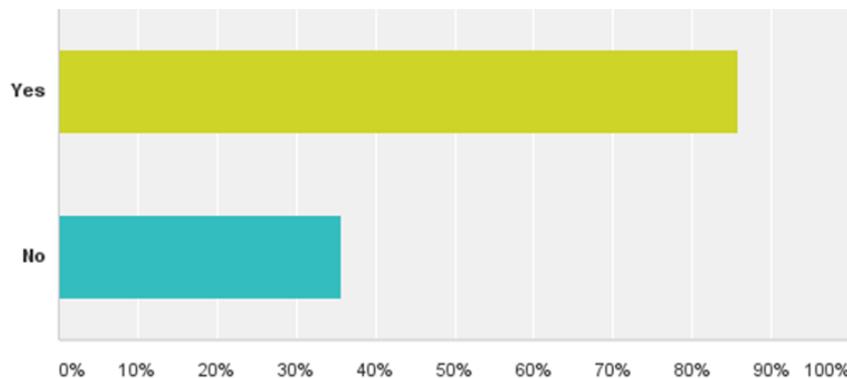
Generally, we are pleased with the Network, however, we would like to see the City offer public access Wi-Fi in our Community Centers.

**Human Resources**

Overall experience has been good, with the exception of running out of space on network drives.

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**Have the City's current information technology support and processes met your department's needs? If yes, how? If no, why not and what needs to change?**



Answer Choices	Responses	
Yes	85.71%	12
No	35.71%	5
<b>Total Respondents: 14</b>		

**Budget and Strategic Planning**

Yes, Support services have typically been responsive and have resolved issues in a timely manner.

**Finance**

No, more software collaboration purchases and provide detail listing of software availability which was previously purchased.

**Police**

Yes, meets minimum needs. Expect increasing demands on services in the future.

**Utilities**

Yes and no.

Yes, current needs are being met. Help Desk staff are responsive and attempt to resolve issues that arise.

For future needs, no. Procurement processes delay delivery of computer equipment (once a computer has been received, IT staff still has to wait for other hardware/software, then prepare the device and install at location. Could be simplified if one contractor used for ordering all computers/software/hardware needs). Additionally, Remote Access to applications not currently being provided.

**Planning**

Yes, Support technicians have been knowledgeable and helpful.

Yes, Software and hardware needs are almost always provided promptly when requested. However, more IT Liaison training would be beneficial to the department.

**General Services**

Yes, the City’s technology support team is as always helpful with finding solutions to technology needs.

**Fire-Rescue**

Yes, our IT department has great support staff and has answered the needs of our department.

### **Norfolk Community Services Board**

Yes, by seeking a partnership with us to plan out any of our technology issues and initiatives. By gathering all of the needed subject matter expertise to find a solution that follows best practices, policy, and is effective for staff to deploy and maintain.

### **Human Services**

Yes and no.

Yes - Human Services is supported by both its own information technology unit and the City's information technology department. This split support has worked out well as we have our own dedicated team of programmers and desktop support analysts. At the same time, we are able to leverage the City's resources in Networking and Telecommunication. We also greatly benefit from the use of the City's Laserfiche application, which would be cost prohibitive if were to purchase it exclusively.

No - Remote Access to state and local systems, while improved from just a few years ago, still needs to be enhanced. For instance, the NDHS Family Services Division must use a state provided VPN connection to access their case management system OASIS. While this is a workable solution, it would be cleaner if we could utilize a robust Remote Access solution from the City.

### **Cultural Facilities, Arts and Entertainment**

No, it seems (more often than not) that one has to escalate to the executive level to get something completed.

### **Recreation, Parks and Open Space**

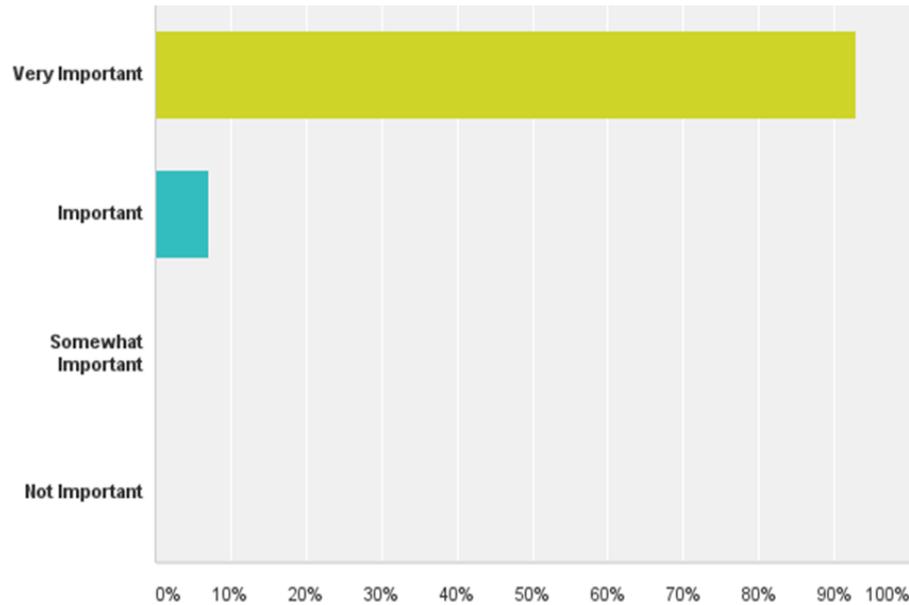
Yes, we are pleased with speed and reliability of City's network, but we want to see it evolve in the future to incorporate the latest technologies to keep up with public's demand.

### **Human Resources**

Yes and no.

For the most part, yes. As technology changes, it seems that our department takes on more responsibility for implementation and user support of technology. Examples are the LMS and PeopleSoft Enhancements (Absence Management, ePerformance). It would be helpful to better delineate the expected technical support that can be provided by the help desk once a technology is implemented. We need improved support to better define department resource requirements for new technologies.

**How important is the City’s Network to the government services that you provide?**



Answer Choices	Responses
Very Important	92.86% 13
Important	7.14% 1
Somewhat Important	0.00% 0
Not Important	0.00% 0
<b>Total</b>	<b>14</b>

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**Please explain the level of importance above.**

**Budget and Strategic Planning**

Nearly every aspect of the work done in the Budget Office requires access to the city’s network

**Finance**

Critical to our daily business needs. Product knowledge and understanding the customer's needs.

**Police**

Information flow faster

Providing timely and efficient support and services to the citizens.

### **Utilities**

The City's network is very important to the government services our department provides because without it, our services (such as Billing, managing water pressure and preventing sewer backups) could be impacted.

### **Planning**

We use it to look up properly information and for research

Most Planning functions in all of the divisions require a computer and internet/intranet access. Network services are crucial for builders and residents for permitting, applications processes

### **General Services**

We are an internal service providers who relies on the city's network to conduct day-to-day business.

### **Fire-Rescue**

For Fire-Rescue it can be life changing.

### **Norfolk Community Services Board**

It is critical to charting, documenting, reporting, and receiving reimbursement for every service we provide to the 6K consumers we serve

### **Human Services**

Without the City's network, the Department of Human Services would be crippled in its ability to deliver services to the citizens of Norfolk. While the Virginia Department of Social Services could provide network services for the majority of Human Services, non-VDSS missions such as tax relief and other local initiatives could not be supported.

### **Cultural Facilities, Arts and Entertainment**

It is mission critical.

### **Recreation, Parks and Open Space**

### **Human Resources**

We use the network on a daily basis for a variety of functions. It is critical to operations. Laserfiche and Metastorm are two applications that are frequently used on the network.

**Who are the community, business and government partners that you connect with over the network frequently? (Please provide the organization names. If no partners, please write "None")**

### **Budget and Strategic Planning**

Typically, communication with the community and other partners is not a major aspect of the Budget Office's work however, on occasion we communicate with other local governments (VA Beach, Chesapeake, Newport News, Portsmouth, Hampton, Suffolk) and outside agencies that the city provides funding to.

### **Finance**

AFMS Financial, Engagement, Secure32.

### **Police**

Hexagon/Intergraph, Trittech/Omega, Lexis Nexis, CI Technologies, Visual Computer Solutions, CWA, City Attorney, Civic League Partners, Various federal and state agencies, Community Services Board.

### **Utilities**

Civic Leagues Norfolk Citizens DMV (Department of Motor Vehicles) State HRSD (Hampton Roads Sanitation District) Harris Computer Systems HRPDC (Hampton Roads Planning District Commission) VDH (Virginia Department of Health) DEQ (Department of Environmental Quality) DCLS (Virginia Division of Consolidated Laboratory Services) AWWA (American Water Works Association) Wholesale customer's Other localities VOSH (Virginia Occupational Safety) Various departments within the City

### **Planning**

City Civic Leagues Norfolk Wetlands Board Colleagues within the City Board of Zoning Appeals Engineers/Developers for Site Plans Sand, Beach and Dune Committee Residents City Planning Commission Board Vendors Architectural Review Board City Manager's office, City Clerks and the Mayor's offices

### **General Services**

None

### **Fire-Rescue**

Norfolk Police, Federal, State and local agencies.

### **Norfolk Community Services Board**

State Hospitals, other Community Service Boards, DBHDS, community health providers,  
Department of Human Services

**Human Services**

Human Services interacts with 100's of community partners to serve the citizens of Norfolk. Within the city, system interaction with Norfolk Public Schools and the Community Services Board are minimal, but are sources for great potential gains from improved information technology.

**Cultural Facilities, Arts and Entertainment**

Too many to list. Our department has a global reach.

**Recreation, Parks and Open Space**

None

**Human Resources**

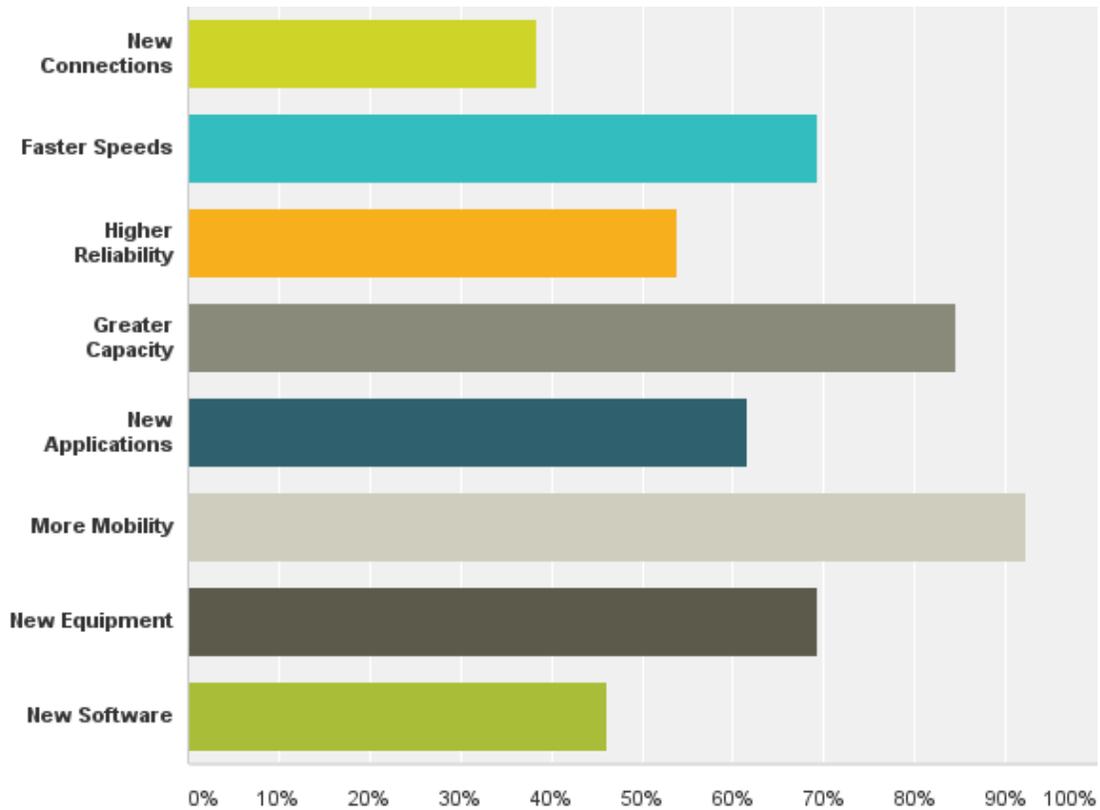
We currently share data with our Benefits providers. They provide us with data so that we can reconcile the information. We also work with a consulting agency to review our healthcare data.

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### Part IV: The City's Future Network

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When you think of the use of broadband communications technologies and applications, and the City's Network, what improvements over the next two to three years do you anticipate needing?



Answer Choices	Responses	
New Connections	38.46%	5
Faster Speeds	69.23%	9
Higher Reliability	53.85%	7
Greater Capacity	84.62%	11
New Applications	61.54%	8
More Mobility	92.31%	12
New Equipment	69.23%	9
New Software	46.15%	6
<b>Total Respondents: 13</b>		

**Comments:**

**Budget and Strategic Planning:** Of primary concern would be faster speeds, higher reliability, and more mobility.

**Planning:** Expand storage space for our departments k:drive. We are frequently near capacity due to the # of maps, images, and files we need to store digitally.

**Planning:** More mobility - we need to be able to present information to the public in a variety of settings (community centers/schools/malls). Other: the department is tasked with developing new ways to interact on social media, such as real time polling w/iPhones, iPads, etc., to reach additional City consumers/residents.

Human Services is in great need for a replacement of its Purchase of Services suite of applications. This is anticipated to be a major cost for the department. Human Services has been increasing our use of mobile technology with each passing year. This trend should continue as staff become accustomed to the availability of information in the field and business processes are adapted to take advantage of it.

**What additional community, business and government partners do you envision you will need to connect with over the network? (Please list, if no additional partners, just put "None")**

**Budget and Strategic Planning**

None

**Finance**

None

**Police**

EVERYONE!

**Utilities**

The ability to provide targeted messages to citizens who may be impacted by a project/emergency work.

**Planning**

None

See above "other" comment re public outreach: the department is seeking additional ways to get more people involved in community meetings such as online meetings/real time polling, etc.

**General Services**

My require software systems to integrate with state agencies.

**Fire-Rescue**

None

**Norfolk Community Services Board**

Federal partners related to Affordable Care

**Human Services**

Human Services interacts with numerous community partners to serve the citizens of Norfolk. To date, we have barely scratched the surface in terms of utilizing technology to enhance the results of services provided by our partners. Integrating systems where possible with our partners could lead to significant improvement in communications and operation efficiency.

**Cultural Facilities, Arts and Entertainment**

Too many to list. Our department has a global reach.

**Recreation, Parks and Open Space**

None

**Human Resources**

None

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**Now think further out, what is the ideal broadband communications technology and application environment for your department and the public you serve in ten years?**

**Budget and Strategic Planning**

Speed, Capacity, and portability

**Utilities**

AMI – Automated Meter Infrastructure

GIS – Geographic Information System Live Chat

VTC – Video Telephone Conferencing

**Planning**

Augmenting what we currently have.

Complete a database system for all permits and applications that all employees can access from any device for both employees and the public. Employees should not be tied to a desk to access/share information.

**General Services**

Mobile applications and video conferencing.

**Fire-Rescue**

All citizens have the ability to contact emergency services.

**Norfolk Community Services Board**

Robust connectivity of our mobile users to the Electronic Health Record.

**Cultural Facilities, Arts and Entertainment**

We will have to maintain industry standard (whatever the technology of the time is).

**Recreation, Parks and Open Space**

Ideally we would like to see, high speed internet access in all of our Community Centers and Cemeteries, and public Wi-Fi access in our Recreation centers and parks.

**Human Resources**

Human Resources must have a communications environment that supports privacy of confidential information, but also provides seamless service to internal and external customers.

**What would be some of the key issues that would need to be kept in mind?**

**Budget and Strategic Planning**

Unsure

**Finance**

Instant Messenger integration

Integrating Mobile Data Management Technology

**Police**

System and data security. High speed, secure data transmissions.

**Utilities**

Cost, Security, Training

**Planning**

Multiple user access and security measures

**General Services**

The ability to conduct business remotely will be requested more often.

**Fire-Rescue**

Greater capacity.

**Norfolk Community Services Board**

Current wireless solution (Verizon 4G LTE) versus building based wireless access (Cox or I-Net) and how to merge into a Metropolitan Area Network if possible

**Cultural Facilities, Arts and Entertainment**

Costs

**Recreation, Parks and Open Space**

Security and Cost

**Human Resources**

Integrated systems, mechanisms to increase the speed of implementation of new technology.

**What constraints do you see that will need to be overcome in order to reach your goals and meet your needs?**

**Budget and Strategic Planning**

The current process has been effective for the Budget Office

**Police**

Embedded, institutionalized mentalities in upper management.

**Utilities**

Cost, Security, Training

**Planning**

Budget, staff training and willingness to change current practices and processes.

**General Services**

External Wi-Fi – the ability to connect to the city’s network without a city device.

**Fire-Rescue**

Cost and service.

**Norfolk Community Services Board**

Current wireless solution (Verizon 4G LTE) versus building based wireless access (Cox or I-Net) and how to merge into a Metropolitan Area Network if possible

**Cultural Facilities, Arts and Entertainment**

Costs

**Recreation, Parks and Open Space**

Policy and infrastructure

**Human Resources**

Either greater support from ComIT or an increase in internal HR technology expertise to support the research, implementation, and ongoing support of new systems. When new technologies are deployed we need to better define the resource requirements needed to support new systems. Part of this is a more clear delineation of roles and responsibilities.

**Going forward, what is the best way for your department to communicate its IT-related needs to Communications and Technology?**

**Budget and Strategic Planning**

**Finance**

Ongoing Technology improvement occurring more frequently.

**Police**

Timely response to inquiries. Proper progressing and resolution of work requests.

**Utilities**

Regular meetings

User group meetings (various levels of users)

**Planning**

Phone, email, online service requests

The current process is adequate, the helpdesk is competent and friendly; however, we could use faster installations when needed.

**General Services**

Web portal helpdesk

**Fire-Rescue**

Inter-departmental meetings

**Norfolk Community Services Board**

The current system of Altiris ticketing, customer service meetings, security liaison meetings, email, and phone calls covers all bases. I don't think we lose any of those avenues

**Human Services**

Human Services maintains its own Information Technology unit who work hand in hand with the Department of Communications and Information Technology. This partnership works well for Human Services and should be continued.

**Cultural Facilities, Arts and Entertainment**

Departments should have a single point of contact and a periodic requirements review.

**Recreation, Parks and Open Space**

We would like to continue to communicate with ComTech via monthly meetings.

**Human Resources**

It would be helpful to have periodic strategic discussions to consider emerging technologies, current City priorities, and expected level of service now and in the future with our current internet applications.

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**Please describe below anything else that you would like to say about broadband communications technologies, the I-Net, or the City's Network in general, and their relationship to your department.**

**Police**

Poor performance and limited capacity of the network in all aspects of operation in its current configuration.

**Planning**

No additional comments. Thank you

**Norfolk Community Services Board**

The staff at Communications and Technology are an incredibly effective team from Network & Security, Service & Support, Asset Management, to Phones & Telecom. They are always willing and able to support the varied and complex needs of the Community Service Board. Since becoming a city department in 2012, we have conducted 4 major program moves, done 2 major location buildouts, upgraded our broadband, launched telemedicine and maintained a constant tempo of difficult computer maintenance and support. The depth of knowledge and troubleshooting tenacity has consistently been impressive. My thanks and sincere appreciation.

**Human Services**

Human Services maintains its own Information Technology unit who work hand in hand with the Department of Communications and Information Technology. This partnership works well for Human Services and should be continued.

**Cultural Facilities, Arts and Entertainment**

In order to remain competitive, we will consistently need state of the art technology as it is made available.