Magellan ADVISORS

www.magellan-advisors.com

October 2018

Final

City of Palm Coast
FiberNet Broadband Business Plan

Table of Contents

Table of Figures

Table of Tables

1 Executive Summary

1.1 Cities are Getting Smart and Going Digital

The future of cities is as much in bits and bytes— smart systems and software applications—as it is physical infrastructure. All digital technology depends on bandwidth and connectivity—the ability to move information quickly and flexibly from and to most anywhere. Indeed, digital technology has become the key to effectively managing and using traditional systems even as it has opened new possibilities for business, commerce, education, healthcare, governance, public safety, and recreation.

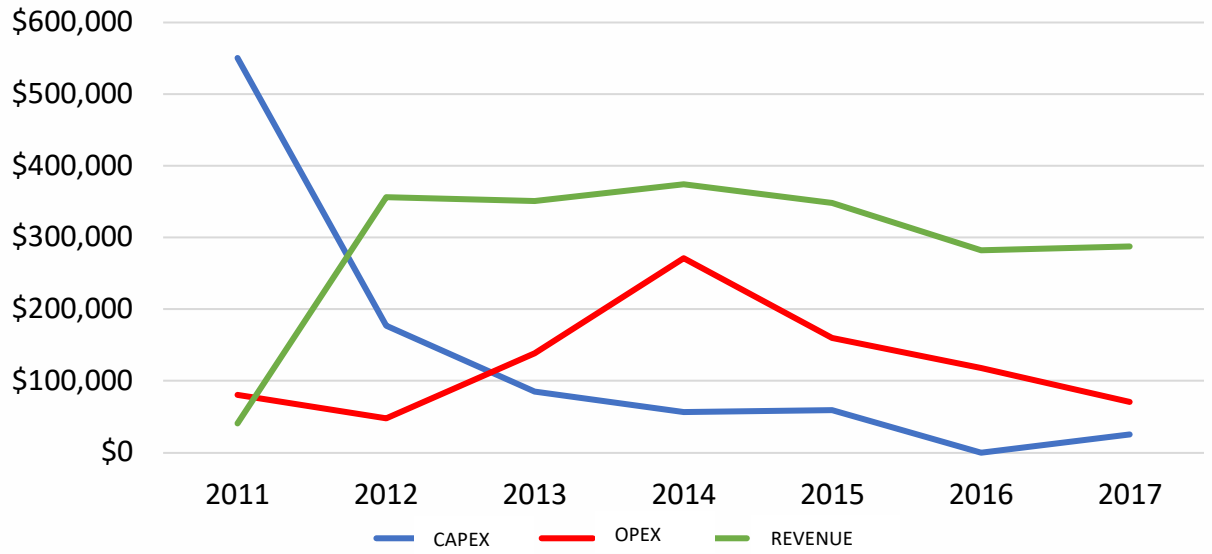
Traditionally, cities have relied on for-profit private companies to provide all their broadband needs, which comes with recurring costs, limited flexibility, and, too often, inadequate services. Cities are increasingly recognizing that broadband is another utility, just like water, sewer, gas and power. In some ways, broadband is becoming even more critical as our traditional utility systems require it to operate economically and reliably. At the same time, citizens and visitors demand better connectivity and more bandwidth. Many cities are acting on these realities by directly investing in public infrastructure to meet internal municipal requirements and make sure their businesses, institutions, and residents are well served with broadband.

1.2 FiberNet: A Great Investment Yesterday and for Tomorrow

The City of Palm Coast recognized this issue in early 2004, and commissioned the construction of Palm Coast FiberNet, a high-speed fiber-optic backbone to connect all City sites and facilities. As of today, in 2018, FiberNet's assets include nearly 60 route miles of conduit, and 54 miles of high-count fiber cable. FiberNet includes two facilities for interconnecting with other networks, the City's data center, and high-speed connections to the regional top-tier internet access point in Jacksonville, FL. As of this analysis, FiberNet had a total of 124 connections, most of which are at public facilities, including schools and traffic signal cabinets.

Palm Coast FiberNet is saving the City of Palm Coast over $310,000 per year as of 2018, and it has been doing so for nearly 10 years. Additionally, FiberNet generates excess revenue of more than $100,000 annually after covering all its costs, including those generated by meeting the City's internal operational requirements. FiberNet currently has a positive net impact on the City of at least $410,000 annually, based on net income, and internal savings realized. During this time, it has also provided fast, highly reliable, reasonably priced connections for several local businesses and community anchors. All of this has occurred with essentially no additional investment in expanding or promoting FiberNet.

Figure 1: Overview of capital and operating expenses compared to revenue for FiberNet



Today, FiberNet is solid information infrastructure for Palm Coast. The core issue for this plan is how to leverage that infrastructure for smart, sustainable growth.

1.2.1 Achieving the Palm Coast Vision

During the Broadband Business Planning process, a clear vision for Palm Coast became clear: Extensive economic development, particularly in high-value, low-impact sectors (media and software, for example), building on massive real estate investment (as many as 20,000 residential units in the next decade), leading to rapid population growth, while maintaining the natural, open, and uncongested community character. Clearly, this is an ambitious vision that can only be achieved on top of ultra-fast and reliable network infrastructure.

Palm Coast is replete with well educated, forward-thinking residents who are using technology to improve and transform how they live, work and play. Current broadband services and infrastructure are, according to the results of the Palm Coast Tech Assessment, inadequate for their purposes. As the City grows, it will attract more connected citizens and visitors. At the same time, the vast array of devices that permeates life in Palm Coast and elsewhere is only going to increase. All these changes are causing people's expectations of local governments to change, and driving demand for better connectivity. People use digital technology to interact with each other more easily, faster, and more flexibly.

The implication is simple: Palm Coast must methodically invest in technology if it hopes to attract investment and fully serve those who live, work, and visit there. Delivery of government services will rely on broadband to operate better, cheaper, and faster. New technologies will enable local governments, public safety, and utilities to be even more efficient, effective, and resilient, and will require ever more bandwidth and connectivity. The City's internal bandwidth and connectivity needs could grow exponentially as the local economy and population grow.

1.3 Investing for Growth

Palm Coast is ideally positioned to attract dynamic, high-paying technology jobs, if it has advanced world-class network services. Private companies are unlikely to make the necessary investment because this is an emerging market and they have other interests and priorities. If Palm Coast is going to prosper and avoid being eclipsed by nearby metros, it will have to be a technology leader, which means making smart investments that attract additional investment. The challenge is to balance technology investments with other fiscal needs in an era of tight budgets. Many cities are responding to this challenge via partnerships that enable innovation within their communities. Palm Coast began charting a course in this direction in 2004/2005, starting its journey in earnest a decade ago, and had the foresight to make strategic, incremental investments in its infrastructure every year since. It is well-positioned to reap further benefits from FiberNet and other technology assets.

1.3.1 FiberNet 2.0

The City of Palm Coast commissioned this Municipal Broadband Business Plan—which we have dubbed FiberNet 2.0—to map out a strategic route forward, and to guide FiberNet's evolution as a platform for innovation in Palm Coast. This Business Plan provides details about the existing broadband market, provider offerings, needs of the City, its community anchors, and the greater community, through a directed Tech Assessment. Further, the Business Plan outlines strategies whereby Palm Coast can expand FiberNet to further meet the community's connectivity needs, including that of Palm Coast's end users, through a potential Public-Private Partnership (P3) strategy.

A P3 strategy will allow the City to focus its efforts on the expansion and maintenance of the physical infrastructure, while its P3 partner focuses on lighting and operating the network for the benefit of the community. The partner would have to meet specific requirements for providing connectivity to the City enterprise, supporting future Smart City initiatives, and offering fiber-based next-generation telecommunications services across the community. Magellan Advisors has helped over 400 cities across the US with broadband planning, deployment, and funding. We pride ourselves on not just delivering a report, but a report filled with actionable insights that the City can practically implement to address its bandwidth and connectivity needs. No two cities are alike, so our recommendations are tailored to the specific needs and opportunities of Palm Coast and FiberNet.

Our recommendations to the City of Palm Coast include:

A. Address key gaps in the FiberNet infrastructure.
B. Ensure that FiberNet expansion is integrated into all relevant capital projects, particularly in Public Works and Utility, and that it is pre-planned into all greenfield[1] development opportunities.

[1] Greenfield development implicates development of undeveloped property, and negates contending with previous buildings or infrastructure.

C. Actively engage local technology leaders to guide and promote FiberNet's development, particularly in support of Palm Coast Smart City initiatives.
D. Seek a private partner to provision, operate, and maintain FiberNet, and to provide a class of next-generation retail broadband services.
E. Develop a Smart City strategy and program.

1.4 FiberNet 2.0 Feasibility

Magellan methodically assessed the current and future broadband needs of Palm Coast. We used a combination of internal and external stakeholder interviews, online Technology Assessment, and a community focus group for businesses, organizations, and area professionals/entrepreneurs. We also assessed the capabilities allocated to FiberNet and its financial performance. The goal of these assessments was to determine how current broadband services meet community needs, what role the City might play in leading, as well as meeting, broadband benchmarks. The assessment provides information about how and where FiberNet might be expanded to address those needs.

1.4.1 Internal needs and opportunities

Internal interviews were conducted with representatives from IT, Public Works, Community Development, Finance, Utilities, the City Manager's office, Sheriff, Fire, Economic Development, and other anchors and stakeholders. Each organization provided crucial feedback on their current and future connectivity needs. Short-term internal City requirements were for enhancing operations, more applications and data (bandwidth), and more pervasive wireless connectivity (FiberNet has already met most of the City's needs for wired connections). Prospective future Smart City initiatives will increase these requirements. The City of Palm Coast will likely find it economical to deploy hundreds if not thousands of sensors and servos in the future to monitor and control its systems, provide services, and respond to emergencies. All of these will need connections for sending and receiving data. Town Center could be developed to be aware and smart, which will also require wireless (as well as additional wired) connectivity.

Of course, the overall goal is to be a place people want to visit, live in, and bring their businesses. This will require superior network services. Input from internal and external stakeholders also suggest that the City will need to generate much more digital content, including translating data from its systems into meaningful information for people. The simple reality is that the City of Palm Coast simply doesn't have the capabilities for all of this. While it has many able employees, they are focused on other priorities. The goal requires the City to cultivate a range of partnerships, particularly to deliver network services to the community.

1.4.2 Broadband demand and supply

Magellan assembled an assessment of current broadband availability in Palm Coast though online research, discussions with current providers, and with the results of input provided by the Tech Assessment, focus groups, and stakeholder interviews. This assessment of the market paints a snapshot of current providers' solutions, including costs, speeds, and product availability for the different classes of users in the Palm Coast market, including business, residential, and enterprise services.

While the Palm Coast area has extensive infrastructure passing through it, the business participants that took part in the Tech Assessment were less than satisfied with their internet services, particularly its performance and price. This is not surprising because the services consistently delivered much lower speeds than contracted. On average respondents spent $239 a month on internet access, and 54% expected their spending to increase. Over half of the businesses that participated in the Tech Assessment said they were highly likely to change their physical locations for better connectivity.

1.4.3 FiberNet SWOT

Our assessment of FiberNet's strengths, weaknesses, opportunities, and threats revealed a few critical gaps in the network and only enough staff capabilities for basic network operations. FiberNet has substantial assets but the current network architecture does not use those assets efficiently, driving up costs and limiting the number of sites the network can serve. Changing to a more sophisticated architecture (Gigabit Passive Optical Network, or GPON) would greatly reduce the per connection costs to FiberNet.

FiberNet infrastructure is located adjacent to numerous commercial sites where the network has no current users. Many businesses are on-net, while more are near-net, and could be connected at marginal costs. Several major developments—Town Center being the more prominent but not the largest—are planned, and could be conditioned to include fiber-optic infrastructure. This would allow FiberNet to expand rapidly and economically. With these developments there will also be vertical opportunities to offer value-added services, such as content and security.

Table 1: FiberNet SWOT

	Have/Positive	Need/Negative
	Opportunities	**Threats**
External/Future	Strong regional economy, including projected demand for real estate Global destination and transit area Low cost of living, high quality of place State emphasis on job creation "Fringe" opportunities, craft and niche markets Less need for physical labor Increasing economic gains from technology	Supply of intellectual, social and technical abilities, educated and skilled persons Relatively low wages Urban sprawl and "bedroom community" syndrome State-level services and support, particularly for planning, development, and social issues Attitudes toward institutions Cyber-security: bots, breaches, hackers, viruses, etc.
	Strengths	**Weaknesses**
Internal/Current	Abundant network infrastructure Revenue positive with minimal effort Numerous greenfield developments Local "Smart City" type initiatives	Physical bottlenecks and gaps in the network Operational capabilities Investment in FiberNet, FiberNet subsidizing IT for other departments

Overall, FiberNet had strong financial performance. FiberNet revenue has declined in recent years, which has directly impacted total revenue for the Information Technology enterprise fund. On the other hand, capital investment in the network rapidly declined from 2011 to 2013, and has been declining slowly since with a small jump in 2014 when core networking equipment was replaced. FiberNet operations has followed a similar pattern: While overall IT staff increased and shifted to higher-skill positions, staff capacity dedicated to FiberNet decreased. Regardless, FiberNet has consistently generated excess revenue, which has been used to subsidize overall City IT costs.

The overall conclusion is that it is quite feasible to expand FiberNet's market and physical reach, and that, if done in a methodical manner, it will not only be financially viable but will provide funds for other purposes. This will require substantial increases in capital and operating expenses, particularly customer care, operations, and sales. It is not clear, given FiberNet's history, that the City of Palm Coast itself is positioned to consistently grow FiberNet and serve network customers. Several key functions—sales, specifically—are outside the City's core competencies and have essentially no capacity.

1.4.4 Roadmap

Magellan Advisors recommends a crawl, walk, run action plan for FiberNet 2.0. The City of Palm Coast should plan to invest in closing key bottlenecks and gaps in the network infrastructure, and in connecting on-net but unserved businesses. Generally, this approach should follow the City's overall business development, focusing first on areas with high density of businesses. Network growth should then follow real estate development and population growth.
In conjunction with network development, we recommend the City explore Smart City opportunities, evaluate options and technologies, and deploy the network to enable the most impactful and economical solutions. More broadly, Palm Coast should undertake a learning process to ascertain how FiberNet can be a platform for entrepreneurs and innovation. This will most certainly involve expanding wireless infrastructure, as well as extending City services virtually—into software applications and data. We recommend pursuing this path in an open manner, from engaging local citizens to conducting design events for technology leaders from across the globe.

First and foremost, the City of Palm Coast should seek a private partner to help with these objectives. Essentially, the City should become both lead customer and facility owner for a network services company to grow, maintain, and operate FiberNet. At the same time, the City should establish robust and inclusive governance for FiberNet, and clear benchmarks and metrics for FiberNet performance. The private partner should be asked to provide full capabilities—adequate, dedicated staff—to these goals and directly invest in customer connections, while the City focuses its investments on core infrastructure and Smart City solutions.

1.5 Recommended Action Items and Next Steps

1. The City should reach consensus on the approach outlined in this Plan; the City has concluded that while it sees value in ownership and expansion of FiberNet, that it desires a new plan and approach to managing the assets, serving community organizations, and in spurring innovation throughout the community.
    a. The City should immediately begin to seek a potential private partner who could function as a FiberNet Network Operator and FTTP Services Provider.
    b. The City should not expend capital to expand FiberNet until a P3 Partner has been selected, and an expansion plan/approach has been agreed to with said Partner.
    c. The City should push to structure an agreement based upon a revenue share on gross revenues generated over FiberNet assets.
    d. The City should push aid to construction costs, or connection fees to subscribers, or allow the P3 Partner to assume drop/connection costs. While City ownership of the drops should be of interest to the City, it could structure a buy back over time from the Partner.
    e. The City should be open to innovative P3 approaches. Many interested firms will have different investment requirements, differing risk profiles, operational expertise or experience. The City should be open to innovation and should adjust its Business

Plan and vision for a P3, to find the best solution that meets the City's long-term goals.

f. The City should brand the P3, as "P3 Partner, powered by Palm Coast FiberNet," and should share in the branding and marketing efforts, while supporting the partner's sales efforts. With a P3 partnership, the City will not grow its revenues unless/until the Partner does – the City should be incentivized and must assist in driving use.

g. The City should agree on business development and operations plans for the partnership, in close coordination with Town Center master developer selection process. Town Center should be targeted as an Innovation District focused as a potential pilot project.

2. As an Infrastructure Owner, the City will continue to manage OSP infrastructure, managing the design, construction, and fiber O&M on FiberNet's passive assets.
    a. The City has recently awarded contracts with Danella Construction and PCS Fiber for Fiber Construction and OSP O&M services – nothing further is required here.
    b. The City must invest in and manage a Fiber Management System, capable of integrating with ESRI GIS, and tracking of OSP assets, including fiber strand and splice details. The City should issue an RFP for this software and professional services.
        i. While the City's primary focus should be on developing a P3 as previously documented, it should continue to make its assets available strategically to the greater market.
    c. The City has excess conduit available along backbone routes and it should make this available to industry at a competitive cost.
    d. Allocate resources to and assign ownership of network facilities—buildings/cabinets, conduit, fiber, poles, etc.—deployment and maintenance. Determine final operational structure, and location of FiberNet within the City organization.
3. FiberNet needs oversight and regular checkup on strategic direction. A FiberNet Task Force or Governance committee with a cross membership from FACT and Innovation teams, should be charged with execution and governance—to ensure recommendations are agreed on and implemented.
    a. Engage external stakeholders, particularly entrepreneur, innovation, and tech people, on the task force.
4. The City should work to strategically address bottlenecks, gaps, etc., and stage the network for prospective partners.
5. Explore smart city applications, focusing on feasibility, to generate comprehensive and detailed City requirements. The City should identify key smart city applications and initiatives which can advance the City Council and community's goals.
6. Utilize FiberNet as a platform for innovation and to further entrepreneurship and workforce goals.
7. Develop a vision and design for Town Center that includes next generation technologies for energy, fitness, information, mobility, production, recreation, etc.

8. Host solution events focused on key network applications/smart city opportunities in conjunction with partners.
    a. Actively involve and promote to target customers.
    b. Use "solutions events" to show what's possible and a visioning process to focus possibilities on what's important and needed.
9. Track activities, milestones, and outcomes, share and celebrate them, too. Create and report on FiberNet performance metrics.

2 FiberNet and the Palm Coast Broadband Market

FiberNet is a City of Palm Coast asset used for internal operational purposes as well as to generate revenue and support business growth and economic development initiatives. It provides high-capacity connectivity and data communications, including internet access, for private users, Flagler County Schools, and the City. The value of FiberNet—as with any network—lies in the applications and functions it supports. This section examines FiberNet's business environment, including the City of Palm Coast's current and potential requirements based on current plans and visions, and emerging trends.

2.1 City of Palm Coast Goals and Priorities

The City of Palm Coast vision includes a multigenerational community with a diverse, sustainable economic base, supporting innovation and high-quality lifestyle. The City's purpose is to provide exceptional amenities, infrastructure, and services, while protecting the environment, enhancing the area's aesthetic beauty, and conserving natural resources. Many of the City's 2018 budget priorities directly benefit from, contribute to, or depend on FiberNet, and FiberNet plays a key role in all of the City's goals, including supporting day-to-day operations of every City department.

Economic development depends on connectivity, and this is especially true for the City of Palm Coast because of its greenfield opportunity to foster innovation-based economic development areas like Town Center, linked—economically, physically and virtually—with the entire community. Recent planning activities called for developing attractions, holding events, and establishing an innovation hub, coordinated with an experienced, visionary developer for Town Center; each of which will require, and will be greatly enhanced through, robust connectivity. The City's expansion goals require connectivity, too, and FiberNet expansion can be done most economically in conjunction with other infrastructure development. Financial goals show the City is in a strong position, and FiberNet contributes to that. Modest investments, particularly with a private partner, leverages the City's financial position to provide value-added services. This should increase FiberNet's revenue, which can then be reinvested in additional infrastructure, services, or innovation activities.

FiberNet supports the City's environmental, livability, and quality of place goals, but also enables innovative new opportunities such as smart lighting along trails that users can turn on or off or community-wide electric scooter sharing. The same is true for workforce: FiberNet

could be used to profoundly improve the community talent pool along with City employee skills and performance. Digital connectivity makes it possible for everyone to get better education and training, manage performance, and personally develop. Of course, this relates directly back to the economic development strategy for Palm Coast.

Attracting new talent, building-up the local workforce, and strengthening City employee skills are complementary activities that rely on readily available access to others and their knowledge. A technology event focused on community mobility could be integrated with analysis and simulation of emergency response, as well as community-oriented education about how tech can help people get around and stay healthy.

Clearly, FiberNet will continue to be a critical asset for City of Palm Coast to achieve its goals. For FiberNet to be viable it also needs to address local market opportunities. The general characteristics of Palm Coast's economy and population are key considerations if FiberNet is to grow and meet community needs. Detailed analysis of current broadband demand, supply, and the factors driving both are critical to a good plan for FiberNet. This information may also inform the City's development and operational plans.

2.2 Community demographics and economics

Palm Coast's population grew 14% from 2010 to 2016, to 81,000.[2] The median age was 47.6 years in 2016 and trending higher. The City had substantially more persons 65 years and older (20% of population) than the state of Florida (19%) or the United States overall (14%). This demographic grew 5.7% annually, which was nearly double the rate for the country. Population projections indicate that the City's population will double to nearly 160,000 by 2040.[3]
More housing units were owner-occupied in Palm Coast than across Florida and the U.S., and both the median value of homes and home-owner costs were lower. Meanwhile, the rental costs were higher and the rental vacancy rate (2.3) is much lower than the state (8.5) or nation (6.2). Vacancy rates are a ratio of unoccupied/unused units to total available. Therefore, a vacancy rate of 2.3 means that during the period in question 2.3% of the total units were vacant. A vacancy rate of less than 4 to 6 indicates a lack of supply. Healthy vacancy rates are typically considered to be between 6 and 8. Homeowner and rental vacancy rates fell faster, and owner-occupied units increased in Palm Coast while decreasing overall elsewhere. The local population is older and more likely to be living in their own homes, and data suggest these factors are increasing.

Relatively more of the local population had retirement and Social Security income than elsewhere in the state and nation. Median household income for Palm Coast ($49,207) was between that of Florida ($48,900) and the U.S. ($55,322) in 2016. While Palm Coast mean

[2] Source: *American FactFinder*, U.S. Census Bureau, https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml. Data come from the American Community Survey except where noted.
[3] Source: 2017 Annual Report Growth and Development Trends in the City of Palm Coast, City of Palm Coast Community Development Department, page 5.

household income was higher ($59,910) than the median, it was only 86% of the state and 77% of the nation. These statistics suggest that most Palm Coast households earned less than the mean, and less than similar households elsewhere. In 2016, the City had 20% to 30% more households earning between $25,000 and $75,000 per year than the state and nation. Table 2 shows that Palm Coasts workforce, compared to the state and nation, lacked higher-level educational credentials. College undergraduate, graduate, and professional school enrollment were substantially lower than the state and nation, too.

Table 2. Educational achievement of populations 25-years old and older compared

EDUCATIONAL ACHIEVEMENT	PALM COAST	FLORIDA	U.S.
Less than 9th grade	2.7%	5%	6%
9th to 12th grade, no diploma	6.2%	8%	7%
High school graduate or GED	34.0%	29%	28%
High school graduate or higher	91.1%	87%	87%
Some college, no degree	26.2%	21%	21%
Associate's degree	9.3%	10%	8%
Bachelor's degree	14.1%	18%	19%
Graduate or professional degree	7.5%	10%	12%
Bachelor's degree or higher	21.6%	28%	30%

Palm Coast had more jobs in retail (21% more than Florida and 40% more than the U.S.), arts, entertainment, and recreation, and accommodation and food services, and education services than other industry sectors. Arts, entertainment, and recreation, and accommodation and food services companies grew the fastest (11% annually), followed by transportation (5.7%), retail (4.2%), agriculture (3.9%) and wholesale (3.1%). Public administration contracted fastest (-4.3%), followed by construction, manufacturing, and management, professional and technical services, which all reduced employment about 1% per year between 2010 and 2016.

There were just over 1,000 establishments in Palm Coast in 2012.[4] The City had relatively more real estate and rental and leasing establishments (98), administrative and support and waste management and remediation service establishments (106), transportation and warehousing establishments (39), and health care and social assistance establishments (156) than other economic sectors. Utilities, mining, and manufacturing establishments, which are relatively scarce in Palm Coast, tend to have the greatest economic impact on communities. Of Palm Coast's sectors with relatively more establishments, healthcare and social services have the greatest economic impact.

[4] These data come from U.S. Census Bureau Economy-Wide Key Statistics, for which 2012 is the latest year. More recent data sets do not have city-level economic data.

2.3 Development plans and opportunities

Five hundred and seventy-one residential units and nearly a quarter-million square feet of non-residential space were built in 2017. That level of development is likely to continue for the foreseeable future. At the end of 2017, the City contained 16,586 vacant platted lots.[5] Over 20,000 residential units and nearly a million square feet of commercial and office space are planned for major developments by 2031. The City of Palm Coast *Prosperity 2021* plan identifies nine business districts:

- Airport Area Business District
- Downtown District
- Hargrove Business District
- Matanzas Business District
- Old Kings Business District
- Parkway East Business District
- Parkway West Business District
- Pine Lakes Business Parks
- Roberts Road Business District

And, there are major developments (DRI, developments of regional impact) within the City of Palm Coast (see Table 3).

The Area SR 100 Corridor Community Redevelopment Agency (SR100 CRA) encompasses 2,946-acres generally located east of Belle Terre Parkway and north of SR100 centerline, south of Royal Palms Parkway and 0.75-miles east of Interstate 95. It was established in 2004 and is scheduled to sunset in 2034. Over a twenty-year timeframe, the 2004 Community Redevelopment Area plan projected the SR100 CRA would generate over $181 million in Tax Increment Finance (TIF) revenues. The tax increment funding—$1,714,118 as of FY2016-2017—is to be used solely for purposes of the City of Palm Coast CRA Plan. The City of Palm Coast Community Redevelopment Agency, which is governed by the Mayor and City Council members, has a debt-service of $944,357, including outstanding loans.

Two Developments of Regional Impact (DRI) are within the CRA boundaries: the Town Center DRI and SR 100 DRI. A DRI is "any development which, because of its character, magnitude, or location, would have a substantial effect upon the health, safety or welfare of citizens of more than one county."[6] There are five DRIs in Palm Coast, summarized in Table 3, and multiple smaller developments, including along Colbert Lane on the east.

[6] Section 380.06(1), Florida Statutes.

Table 3. Developments of Regional Impact in Palm Coast

	TOWN CENTER	SR 100	PALM COAST	NEOGA LAKE	OLD BRICK TOWNSHIP
Build out year			2034	2030	2031
Residential units	2,500	2,400	3,600	7,000	5,000
Office	1.4M SF	30K SF			
Commercial	1.6M SF	50K SF	2.48M SF	2.49M SF	1.15M SF
Institutional	625K SF				
Movie Theater	2,400 seats				
Lodging rooms	480 rooms	150 rooms			
Assisted Living	240 beds				
Common Area	714 acres				

**Neoga Lake and Old Brick Township do not have any immediate prospects for development and were not used in the plan, however, these two opportunities should be planned for in the future.

2.4 Broadband infrastructure, providers, and services

The City of Palm Coast is nominally served with broadband, which is currently defined by the Federal Communications Commission as 25 Mbps (megabits per second) downstream and 3 Mbps upstream throughput to the internet. Regardless, substantial portions of the City, especially to the northwest, have no broadband services, as illustrated in Figure 2. . On the other hand, Figure 3 shows only one provider offering 100+ Mbps service to a small portion the City.

Figure 2: The number of broadband providers by Census block

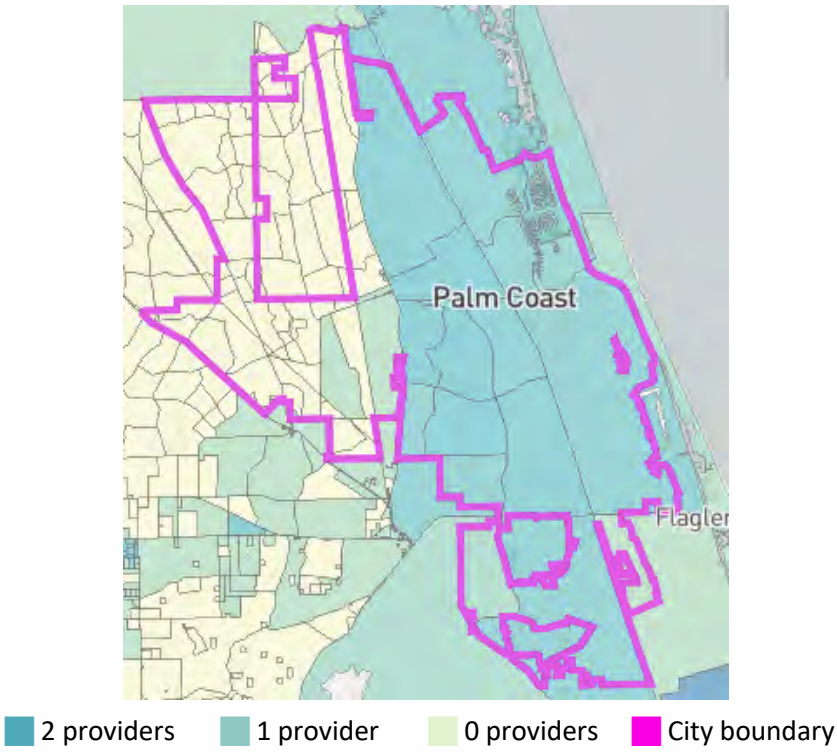
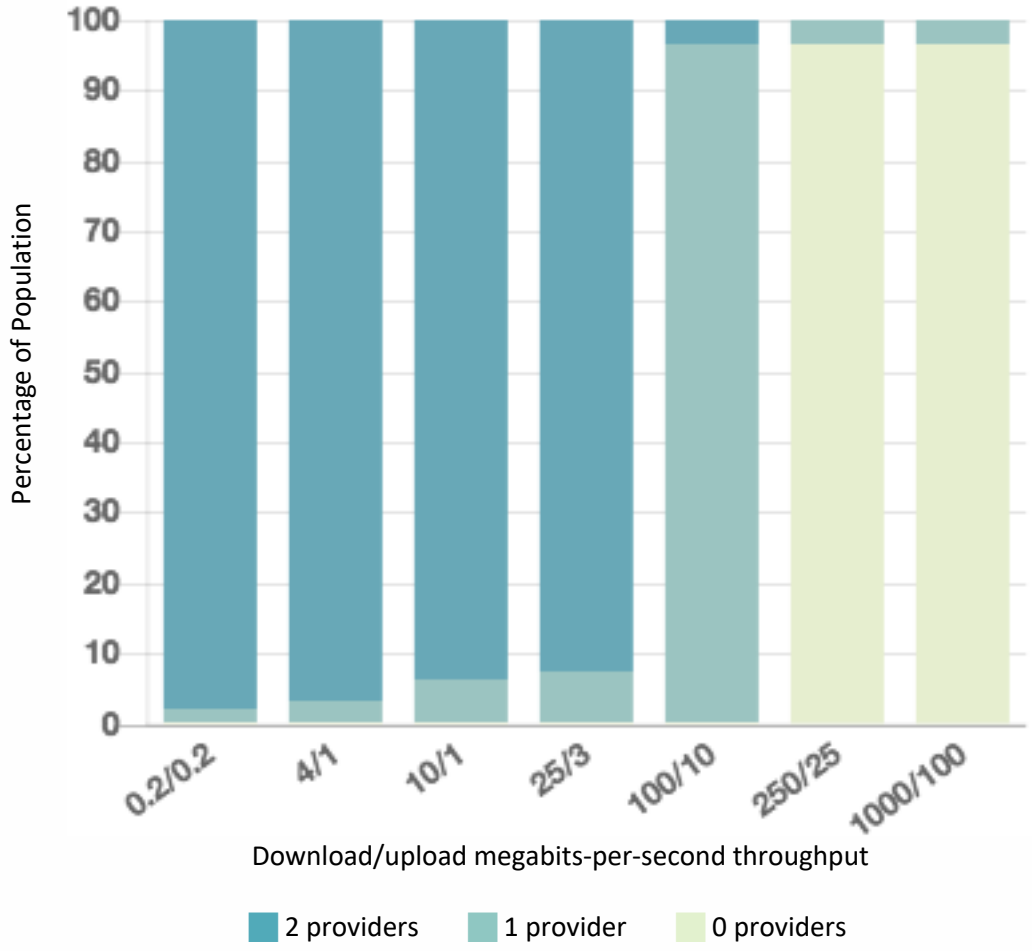


Figure 3: The number of broadband providers by throughput



Broadband providers' advertised rates, summarized in, run from about $60 to over $100 per Mbps per month. Note that FiberNet partners, Datacom and Palm Coast Internet (PCI), do not advertise rates.

Table 4. Advertised costs and speeds of internet services in the Palm Coast area

AT&T MARKET ANALYSIS			
RESIDENTIAL	**PACKAGE**	**SPEED**	**PRICE**
19 Flarestone Ct 32137	Internet Basic	Up to 5 Mbps	$40/m
	Internet 100	Up to 100 Mbps	$50/m
	9 bundles	Ranging from 5 Mbps-100Mbps	$55/m - $140/m
12 Flamingo Ct 32137	Internet 5	Up to 5 Mbps	$40/m
	Internet 100	Up to 100 Mbps	$50/m
	Internet 300	Up to 300 Mbps	$70/m
	Internet 1000	Up to 1000 Mbps	$90/m
	9 bundles	Ranging from 100 Mbps-1000 Mbps	$65-$125/m
BUSINESS	**PACKAGE**	**SPEED**	**PRICE**
1 Yacht Club Dr 32137	Internet 25	25 Mbps	$40/m
	Internet 50	50 Mbps	$50/m
	Internet 75	75 Mbps	$60/m
11 Market Ave 32164	Internet 18	18 Mbps	$40/m
11 Poppy Place 32164	Internet 18	18 Mbps	$40/m
9 Old Kings Rd N 32137	Internet Basic 3	3 Mbps	$40/m

SPECTRUM MARKET ANALYSIS

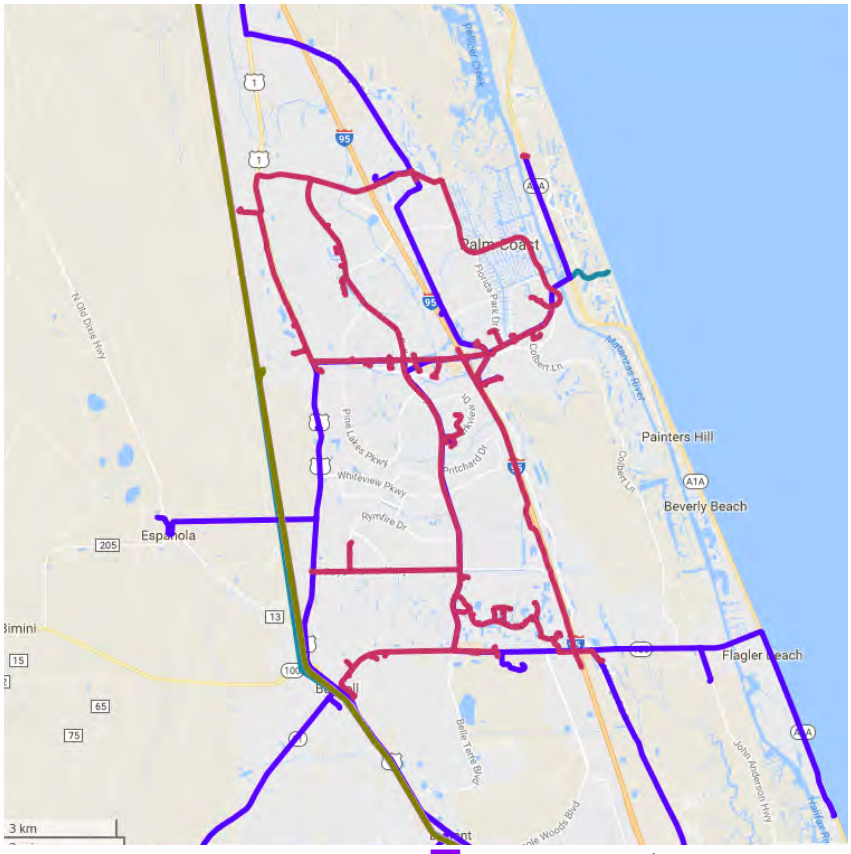
RESIDENTIAL	PACKAGE	SPEED	PRICE
339 Wellington Drive 32164	Basic Internet	Speeds starting at 100 Mbps	44.99
	Triple Play Gold	100 Mbps 200 channels, phone	$129.97
	Triple Play Silver	100 Mbps, 175 channels, phone	$109.97
	Triple Play Select	100 Mbps, 125 channels, phone	$89.97
	Not advertised - selection at checkout	400 Mbps	add $25/m
	Not advertised - selection at checkout	940 Mbps	add $60/m
BUSINESS	**PACKAGE**	**SPEED**	**PRICE**
1 Yacht Club Dr 32137	Basic	100 Mbps	$44.99
	Ultra Internet Up to a Gig - call for details	300 Mbps	$59.99
11 Market Ave 32164	Basic	100 Mbps	$44.99
	Ultra Internet Up to a Gig - call for details	300 Mbps	$59.99

2.4.1 Data Centers, Long-Haul Fiber, and Metro Networks

In addition to broadband services, numerous companies own and operate fiber-optic routes through or near Palm Coast. Figure 6.

Figure 4 shows local fiber-optic cable routes by network owner, and Figure 5 shows long-haul fiber routes at local and regional scales. There are twenty-six data centers in northeast Florida, although none are in Palm Coast. An overview map of regional data centers is included in Figure 6.

Figure 4: Palm Coast area metro/middle-mile network fiber routes[7]



[7] Fiber maps are created using Fiber Locator subscription tool. www.fiberlocator.com

Figure 5: Northeast Florida long-haul fiber routes, region (left) and Palm Coast area (right)

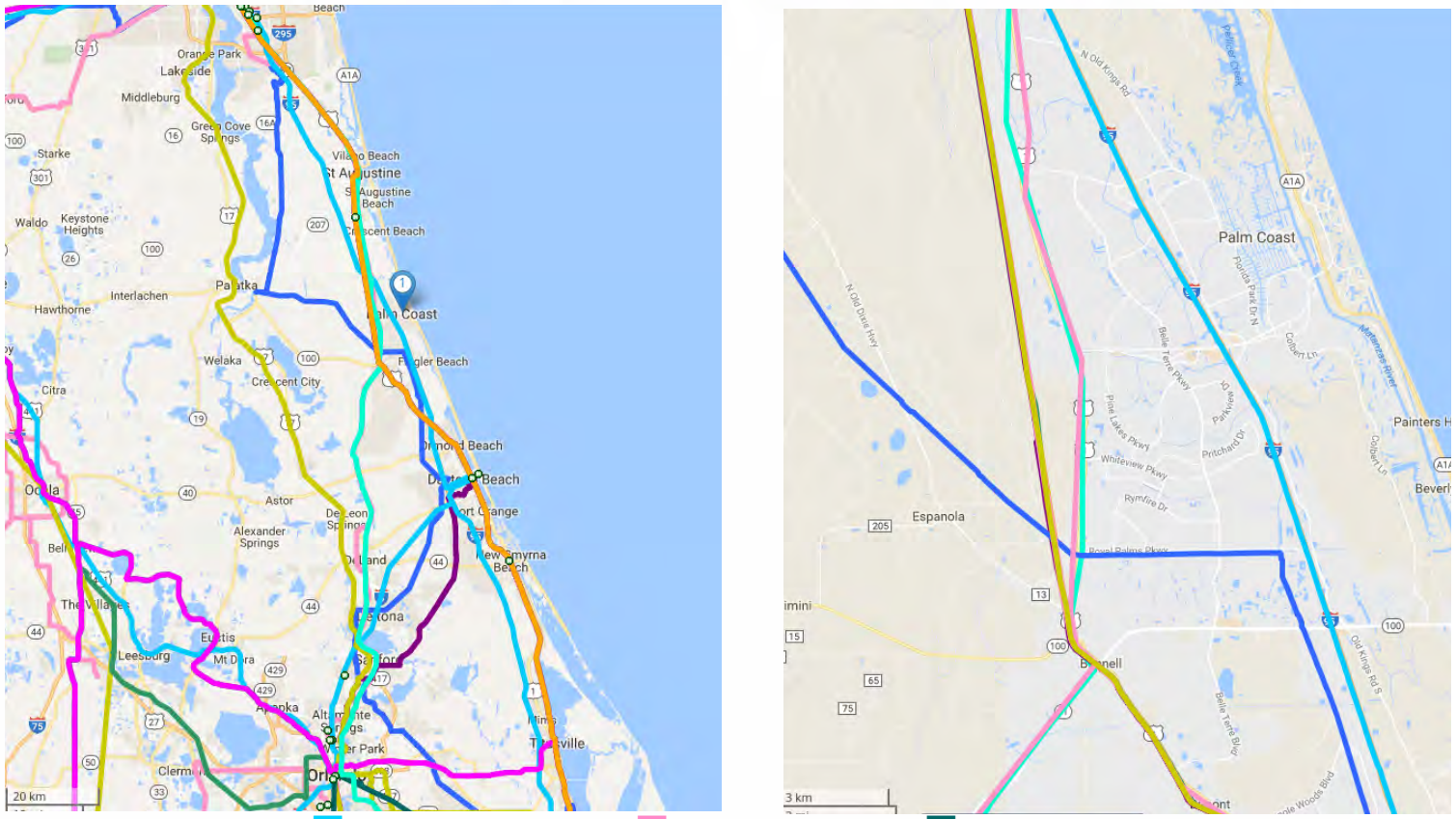
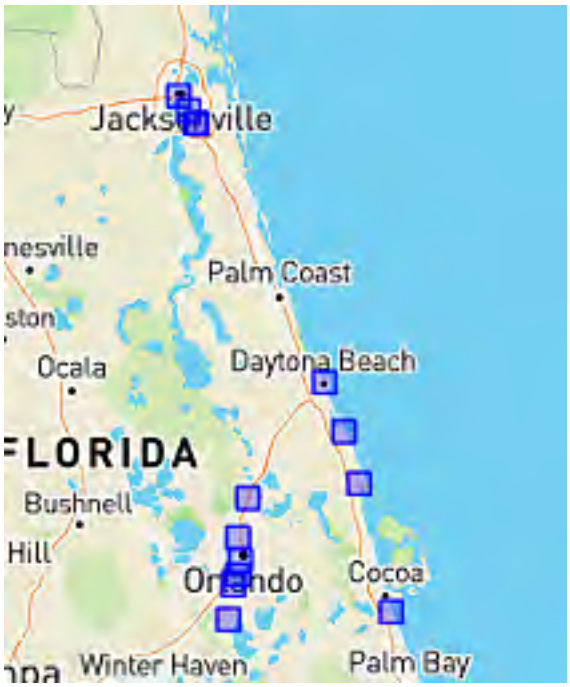


Figure 6: Data centers in northeastern Florida



The data centers in Figure 6 include but are not limited to the following:

- **Level3 (Now CenturyLink)** - 608 W Adams St, Jacksonville, FL 32204, USA and 111 N Segrave St, Daytona Beach, FL 32114: Level3, now owned by CenturyLink, operates carrier neutral data centers globally.
- **Cologix Florida** - 4800 Spring Park Rd, Jacksonville, FL 32207: Cologix operates the two leading network neutral Northern Florida data centers in Jacksonville. JAX 1 at 421 West Church Street in Jacksonville's central business district is home to Northeast Florida's largest concentration of Internet and telecommunications companies. Cologix also owns and operates the JAX2 facility at 4800 Spring Park Road, which houses the leading enterprise-grade Jacksonville data center and disaster recovery facility. Jacksonville is a significant hub in the Southeast due to two separate submarine cable systems enabling direct fiber access to Central and South America as well as the Caribbean. Leveraging Jacksonville colocation data centers as a network node allows customers to create an express route to South America without traversing through Miami, which reduces costs, latency and risk.
- **Jacksonville Data Center VIII** - 4905 Belfort Rd, Jacksonville, FL 32256: The Jacksonville Data Center is a carrier neutral data center catering to carriers such as Comcast, CenturyLink, and Peak10.
- **Cogent** - 8324 Baymeadows Way, Jacksonville, FL 32256: Cogent owns and operates 52 data centers in North America and Europe. Services provided in Cogent Data Centers include rack space, power, helping hands, state-of-the-art environmental controls and,

of course, full connectivity services (Dedicated Internet Access, IP Transit and Ethernet Point-to-Point). Cogent Data Centers also host Cogent's Utility Computing servers.

2.5 The Palm Coast Technology Assessment Results

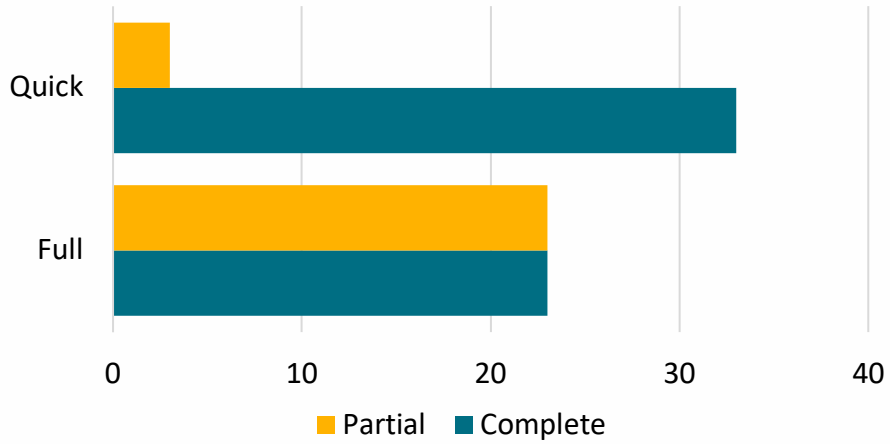
The Palm Coast Tech Assessment was conducted via a systematic online survey of local businesses and other organizations. The purpose was to understand how they are using technology today and what they need for tomorrow. It assessed both demand for and supply of commercial broadband services in the Palm Coast market, and gathered information about how and why organizations spend on technology. This information suggests where FiberNet might find opportunities to fill unmet needs and support economic growth.

A random sample of 1,000 companies was chosen from a list of all Palm Coast businesses. Letters from the City of Palm Coast, requesting participation, were sent. This was repeated a second time, not including those organizations that had already responded. Two dozen non-respondents were contacted by phone, none of whom indicated they did not participate because they felt the topic was irrelevant, however simply lacked time or interest. Finally, the survey was promoted openly via local partners and social media. While response rates were not high enough for statistically valid conclusions, the assessment results provide useful insight into needs and priorities of local organizations, particularly in key sectors.

2.5.1 Responses and participants

There were two different versions of the Tech Assessment—a Full version and an abbreviated Quick version. A total of 82 organizations participated in the Tech Assessment, over half of whom opted for the Full assessment. Overall, two-thirds of the responses were complete. Only 23 of the Full Assessments (28% of all responses) were completed, while over 90% of Quick assessments (35) were completed. See Figure 7.

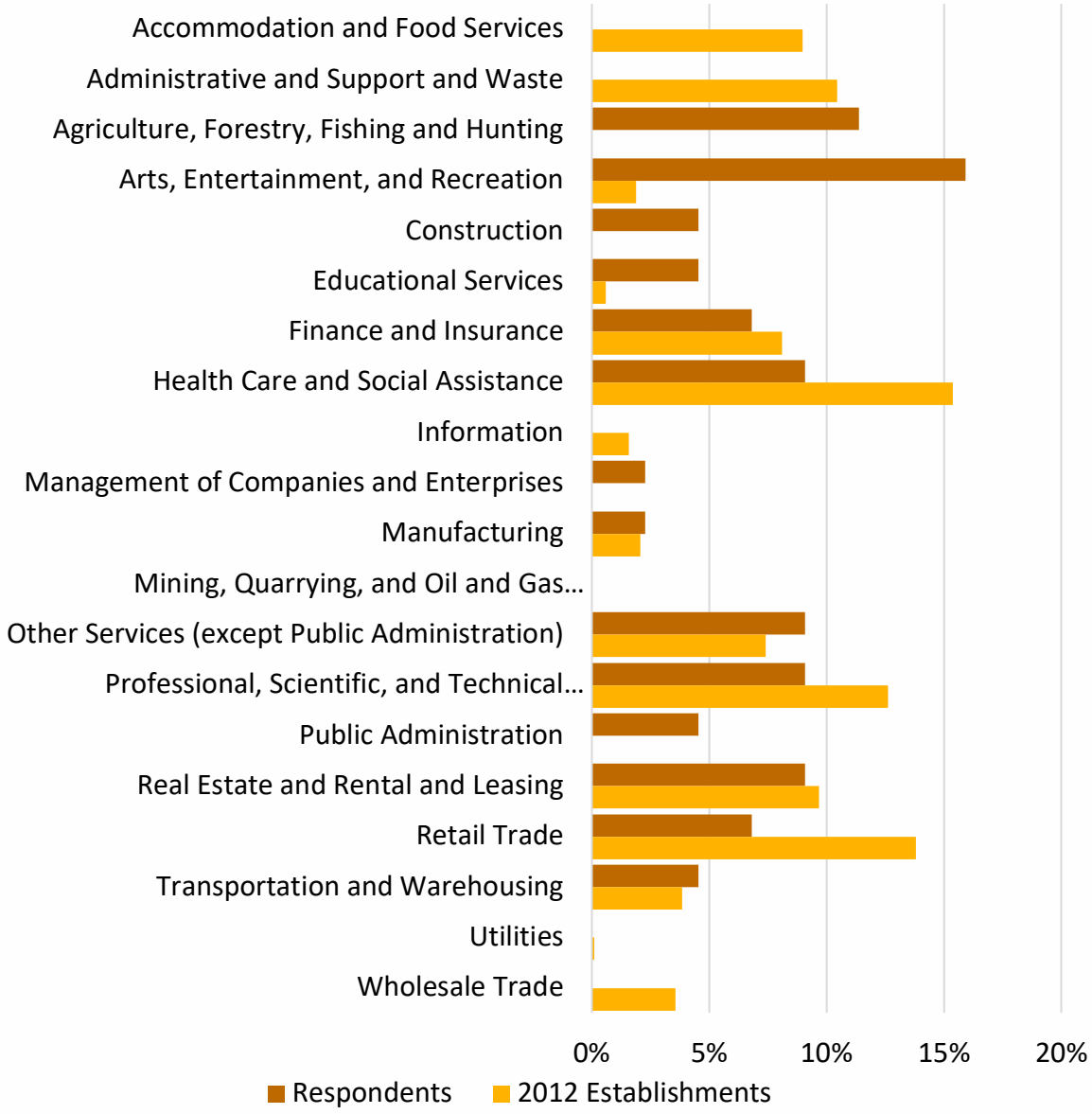
Figure 7: Tech Assessment participation by type and extent



For key sectors, participation in the Tech Assessment were on par with their presence in the local economy, in terms of the percentage of establishments in each sector.[8] Agriculture, arts, entertainment and recreation, and education organizations participated at a higher rate than they appear in the local economy. Finance and insurance, manufacturing, other services, real estate and leasing, and transportation and logistics were comparable. Organizations in health care and social assistance, retail trade, and professional, technical, and scientific services participated less than might be expected given their number of establishments. The Census Bureau did not count Construction or Public Administration establishments. No accommodation and food services, administrative, support, and waste services, information, and wholesale trade organizations participated in the Tech Assessment.

[8] Source: U.S. Census Bureau, *Community FactFinder*, https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml

Figure 8: Tech Assessment participants compared to 2012 establishments



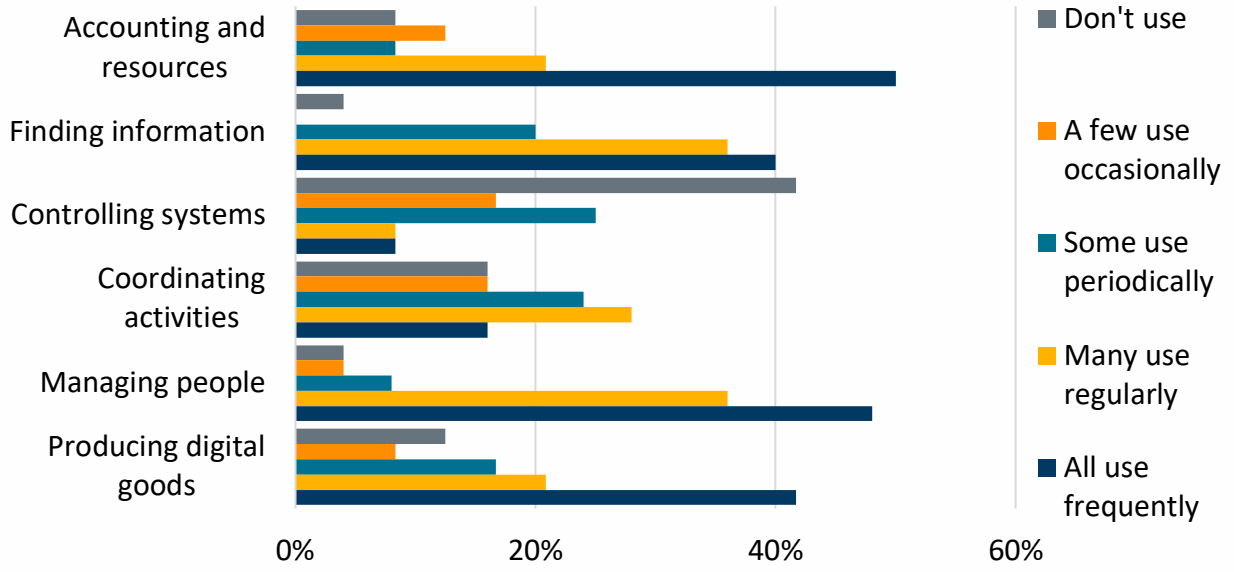
Participants represent 48 locations and 336 employees in Palm Coast and have over 500 locations and nearly 8,500 employees total. While most had only 1 employee, respondents' average size was 7.2 employees. The largest respondent employs 5,000 people. Three-quarters of the participating organizations were headquartered in the community. Most non-local headquarters were elsewhere in Florida, but participants' headquarters were widely distributed across the country.

2.5.2 Technology assets and use

Desktop computers—making up almost half of all digital devices—are still the norm for Palm Coast organizations, a large proportion of which are more powerful workstations. A fifth of all devices were laptops. Handhelds and tablets, making up 13% of devices each, are not far behind. Servers, particularly larger ones, were rare among participants.

The most common uses for digital technology were identifying and tracking people, finding and managing information, and accounting for money and tracking things (see Figure 9). Automation was the least common use, with nearly three-fifths of respondents either never or rarely using digital technology for controlling and monitoring machines/systems. While two thirds of respondents regularly create digital products, and frequent, intense technology use was indicated about 30% across all applications, about 12% of Palm Coast organizations use digital technology very little.

Figure 9: The frequency of uses of digital technology



2.5.3 Spending

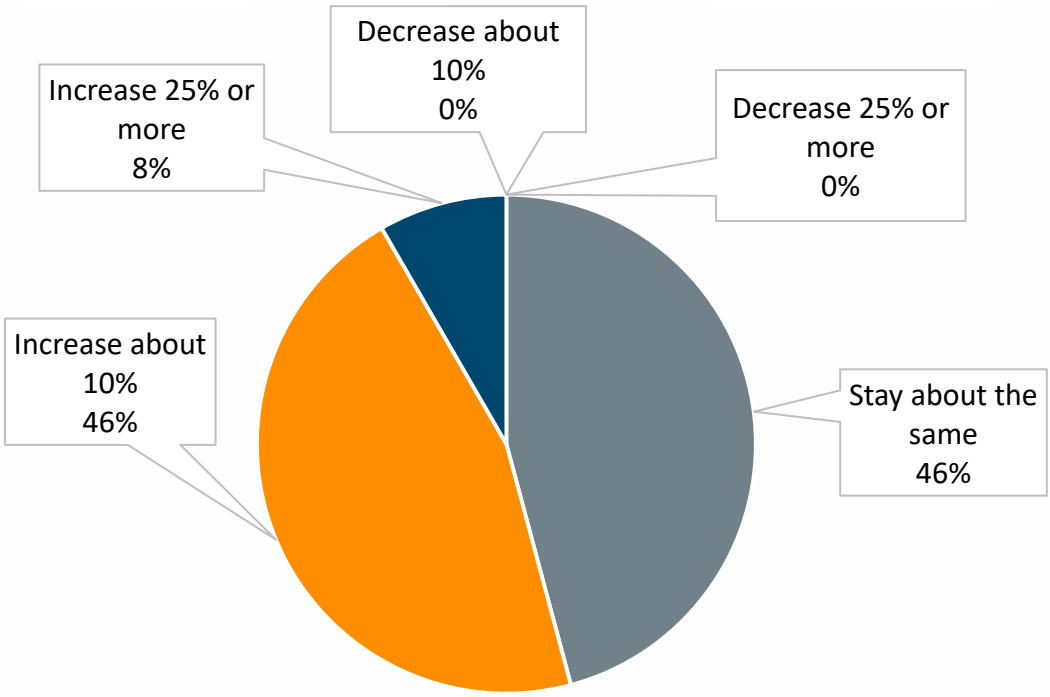
Internet access is only one component of overall technology spending, but it is inter-related with other expenses. The organizations participating in the Tech Assessment spend approximately $50,000 per month on technology. Cloud services and hosting is the largest—but relatively uncommon—overall expense, followed by telecom services, which was the most common expense. Hardware, maintenance, and software were also major expenses reported by about half of respondents. Internet access accounted for about one-tenth of organizations' spending. Only three participants noted monthly spending on training, averaging $1,250 per month, which was about 3% of expenditures for all.

Table 5. Tech Assessment participants' spending on technology

TECHNOLOGY EXPENSE	COUNT	TOTAL	AVERAGE
Cloud, hosting, online file storage	9	$11,737	$1,304
Hardware lease	2	$260	$130
Hardware purchase	12	$6,370	$531
Internet access	23	$5,490	$239
Maintenance and operations	10	$6,260	$626
Software licenses	14	$6,112	$437
Software-as-a-service subscriptions	7	$2,686	$384
Telecom services (cell/mobile, voice, WAN, etc.)	21	$7,575	$361
Training and user support	3	$1,250	$417
Video content, streaming media, television	9	$911	$101
Teleconferencing and web conferencing	3	$145	$48

While almost half of organizations expect no change in technology spending, as illustrated in Figure 10, a similar percentage foresaw increasing it by 10%. Eight percent expected their tech spending to increase by 25% or more, and none indicated it would decrease.

Figure 10: Participants' anticipated changes in technology spending



2.5.4 Connectivity

All participating organizations had internet, although 4.2% (of 48), only had access via cellphone, dial-up, satellite, or other low-speed connection. The most common internet connection was cable modem, provided by Spectrum, which has well over half of the market. A fifth of connections were fixed wireless, but these appear to be backup or internal connections rather than primary internet access (all participants with fixed wireless had other broadband connections). DSL and fiber-optic, both provided by AT&T (PCI also provides fiber-optic connections via Palm Coast FiberNet), each account for about one sixth of connections. AT&T has a third of the local broadband market.

Figure 11: Broadband providers identified by Tech Assessment participants

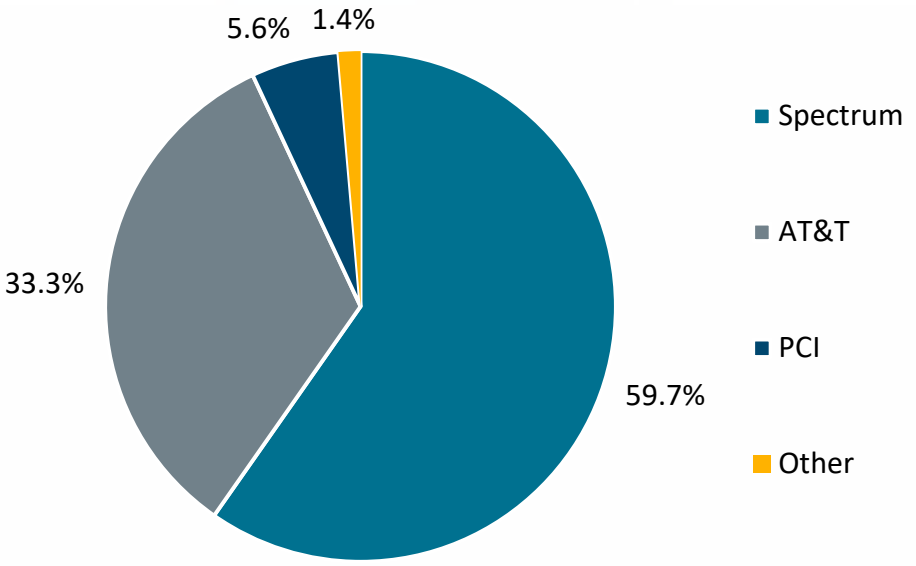
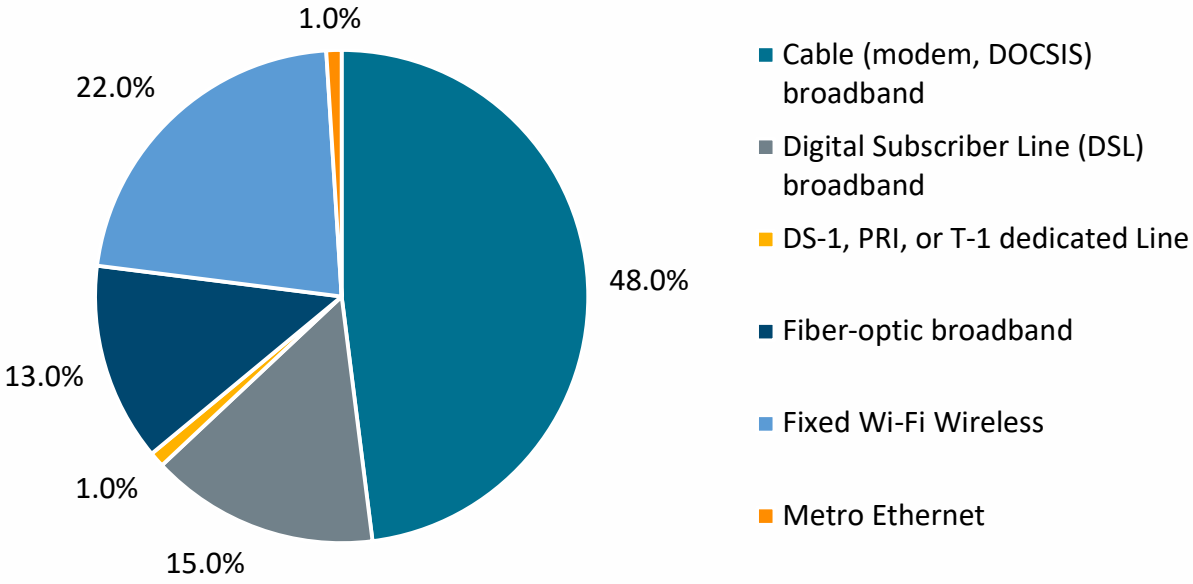


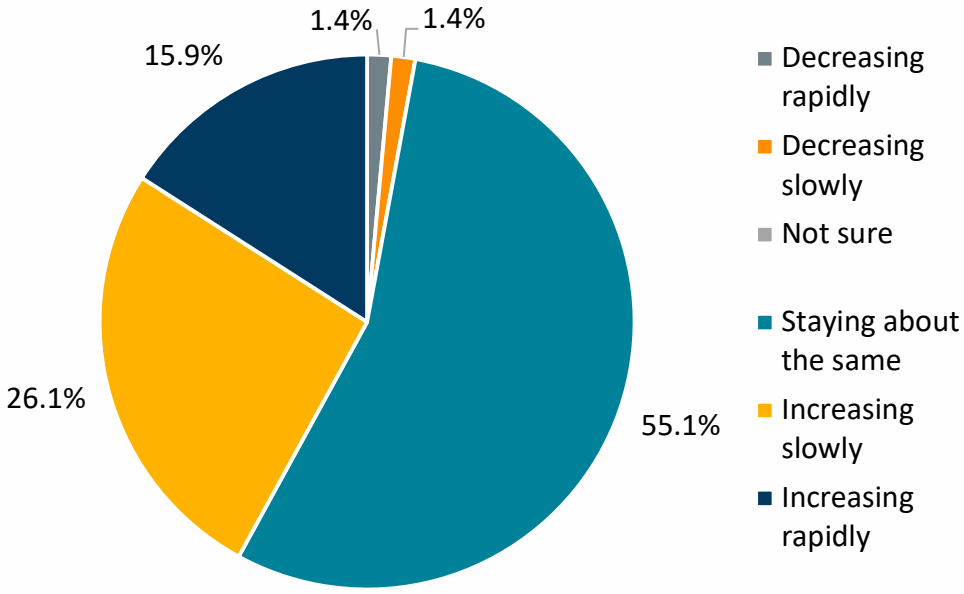
Figure 12: Connection types (n = 105)



WiFi is the most common form of connectivity—over half of participants reported using it internally and a quarter offered public WiFi connections. Of course, this is just for hyper-local access/connections, and requires some form of internet service. Over half of participants also use cellular data connections—e.g., MyFi mobile hotspots—for internet access. While more than half of participants expected their connectivity needs to stay about the same, over a

quarter expected needs to increase, and about a sixth or participating organizations expected them to grow rapidly. About 3% foresaw decreasing connectivity requirements.

Figure 13: Expected changes in connectivity requirements



The maximum contracted speed (for fiber-optic broadband) was 1 Gbps (1,000 Mbps), the most common contracted speed was 100 Mbps download and 10 Mbps upload (100/10), and the average was 157/85. In contrast, the actual speeds were 27/17 on average, and the maximum speeds were 108/241.[9] Statistics suggest the speeds experienced by most Tech Assessment participants is around 15/4, which doesn't technically count as broadband speeds!

[9] The maximum tested upload speed was for a fiber-optic connection, for which the download speed was 94 Mbps.

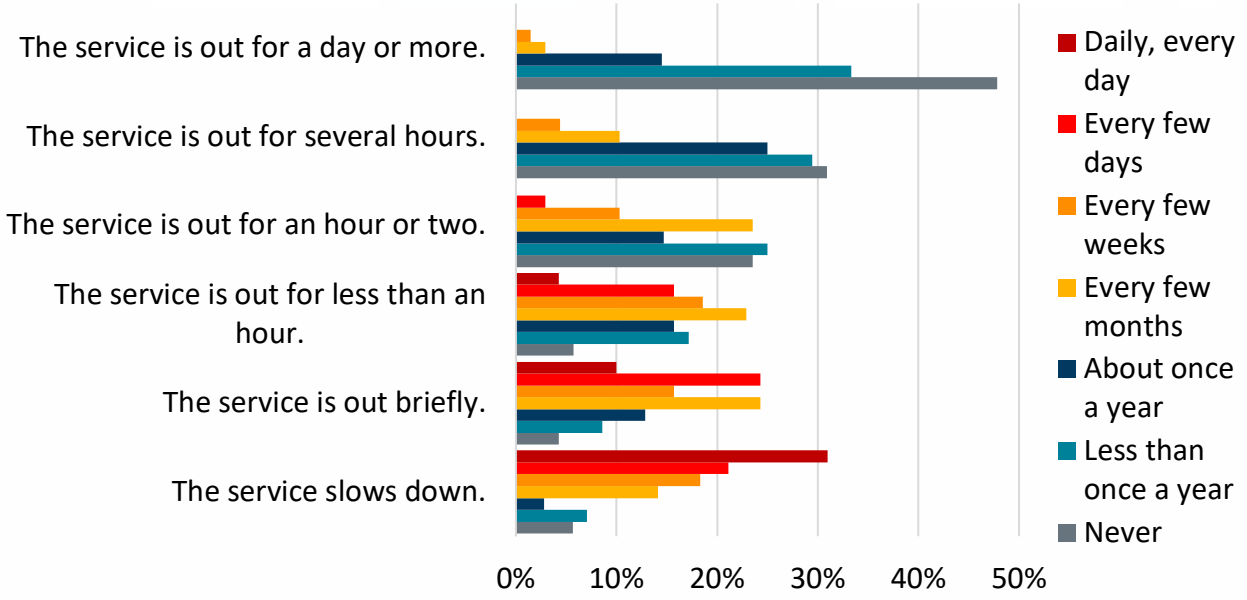
Table 6. Average tested internet access speeds (Mbps) and costs

PROVIDER	DOWNLOAD	UPLOAD	MONTHLY RECURRING COSTS TOTAL	MONTHLY RECURRING COSTS PER MBPS
AT&T	25.6	33.0	$47.92	$0.82
PCI	35.8	43.9	$381.50	$4.79
Spectrum	28.2	7.3	$104.04	$2.93
Other	5.1	1.5	n/a	n/a
CONNECTION TYPE				
Cable	22.6	5.7	$112.50	$3.98
DSL	18.2	7.6	$103.21	$4.01
Dedicated Line	21.9	5.8	$37.50	$1.35
Fiber-optic	49.7	74.0	$281.00	$2.27
Fixed Wireless	19.6	7.6	$64.29	$2.36

2.5.5 Performance

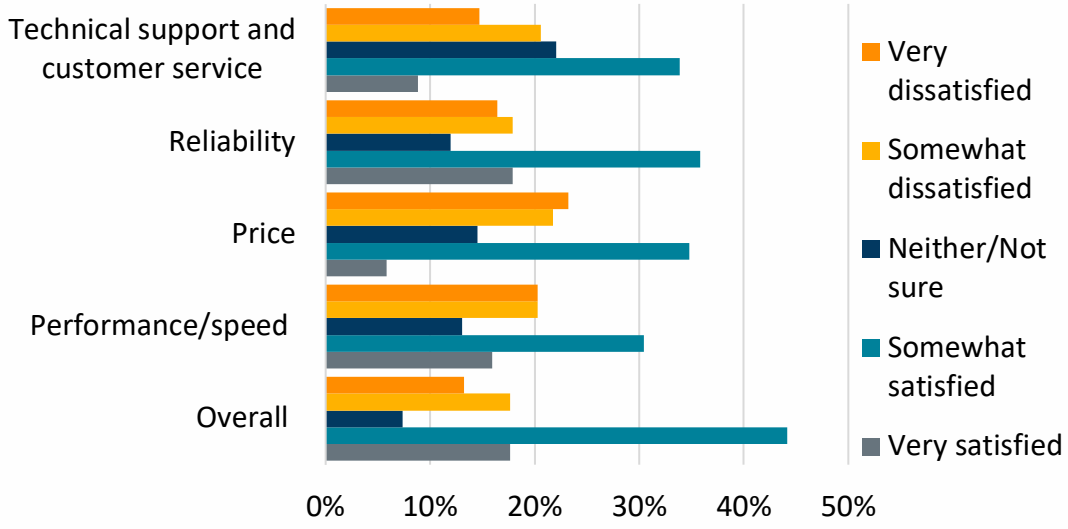
Average upload and download speeds for various providers and connection types are compared in Table 6. Fiber-optic services had the fastest speed, but not nearly where they should be based on contracted speeds. Faster average upload speeds for fiber-optics suggests providers are oversubscribed for their downstream capacity (i.e., there is not enough backhaul capacity to meet the needs of consumers.) AT&T's relatively fast speeds are because the average includes both their DSL and fiber-optic connections. On average, DSL is substantially slower than fiber-optic. The price per Mbps per month is rather high for both cable and fiber-optic, relative to other markets.

Figure 14: Internet access performance



As illustrated in Figure 14, about a third of respondents experience daily slowing in internet access. Seventy percent of respondents experienced slowed speeds on a regular basis, while 15% rarely do. About two-fifths have regular service outages, and the same portion rarely have substantial outages. Multi-hour outages regularly occurred for 4% of participants.

Figure 15: Participants' satisfaction with internet services



Regardless, a larger percentage of respondents were very or somewhat satisfied with their internet services than very or somewhat dissatisfied. Performance and price were the major areas of dissatisfaction, and overall about a fifth of organizations appear to be unhappy with their current internet service.

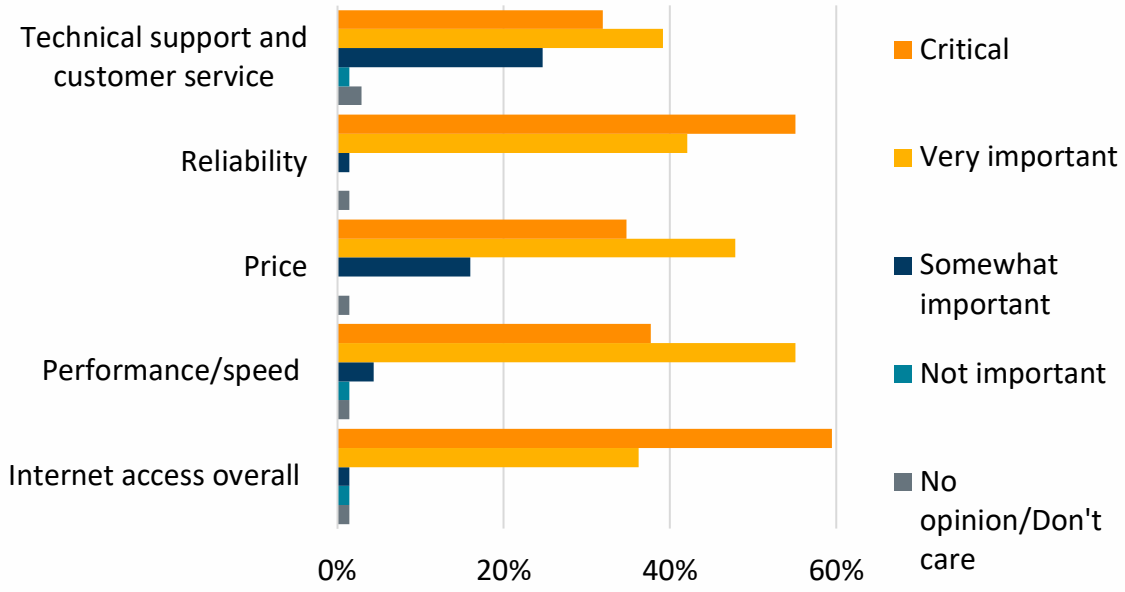
2.5.6 Costs

Palm Coast organizations spend an average of $114 per month on internet services, although most pay substantially less (the median monthly cost is only $75), and some pay as much as $500. PCI customers reported the highest monthly costs for internet access. Participants with AT&T internet access, paid about $0.82 per month for a Mbps of throughput (downstream + upstream), whereas Spectrum customers paid about $3.00, and PCI customers about $4.80.

2.5.7 Importance

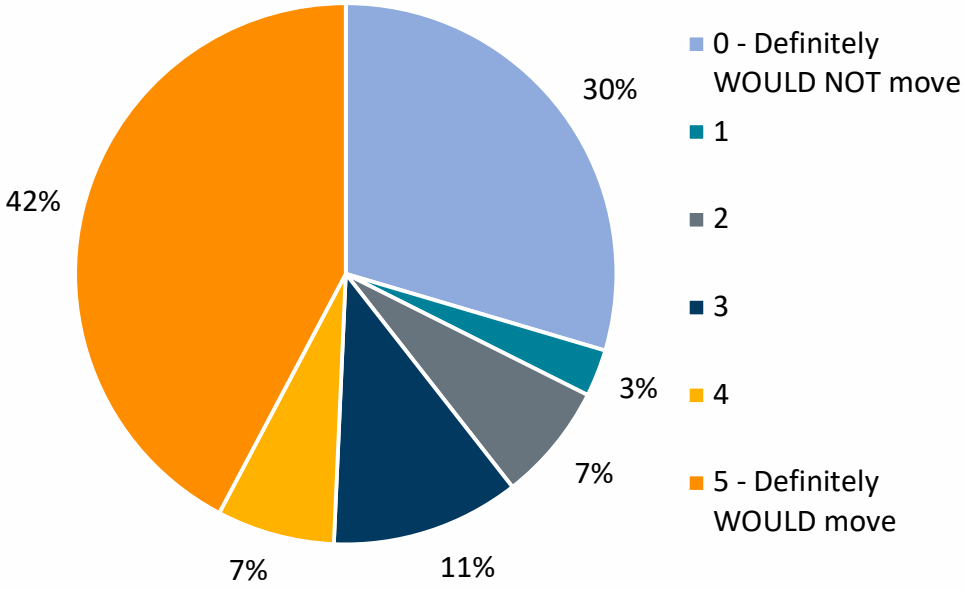
Palm Coast organizations highly value internet access overall, based on Tech Assessment results, and are especially concerned about reliability: 97% of respondents rated it as critical or very important. See Figure 16. Performance was generally seen as somewhat more important than price, with 93% and 83% giving these high importance ratings. Support was not rated as highly as other characteristics, with a quarter of participants rating it as somewhat important.

Figure 16: Importance of internet access and service characteristics



Emphasizing the importance of internet to their businesses, effectively half of participants indicated they would definitely or very likely move their companies to another building or commercial development for better broadband. About a third were very unlikely to move for broadband. A fifth of Palm Coast could go either way, based on Tech Assessment results.

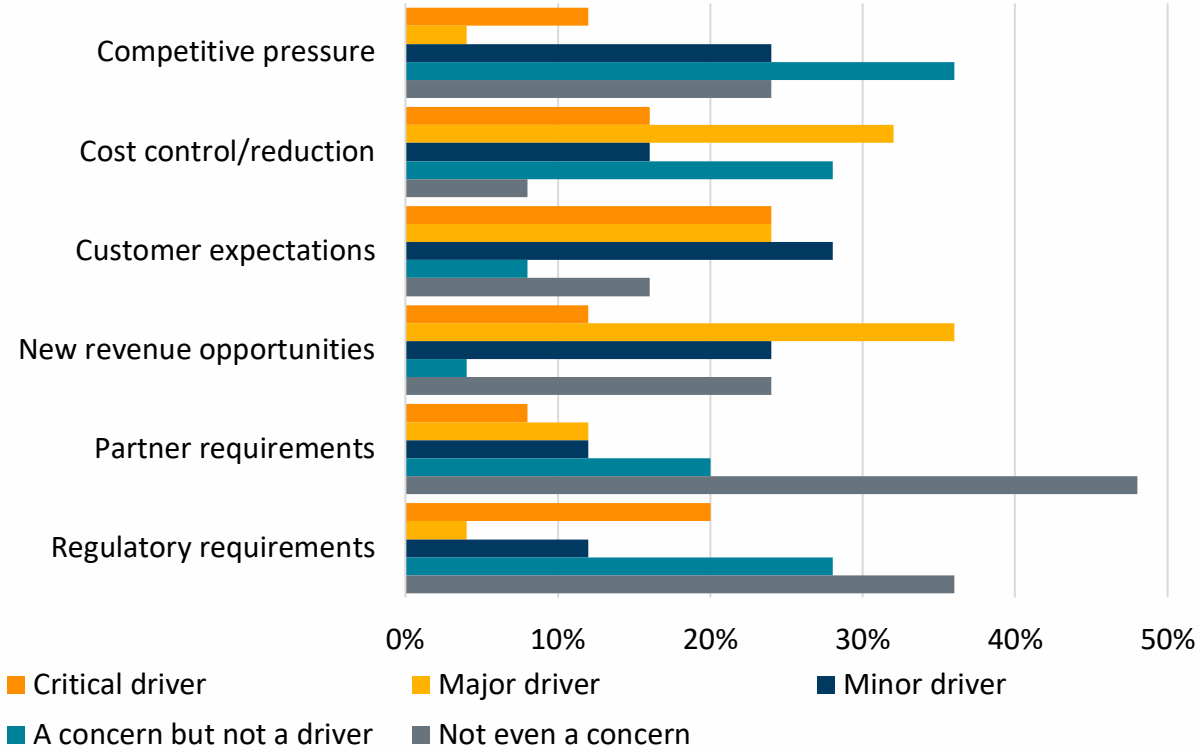
Figure 17: Percentages of participants likely to move or not for better broadband



2.5.8 Drivers, barriers, and challenges

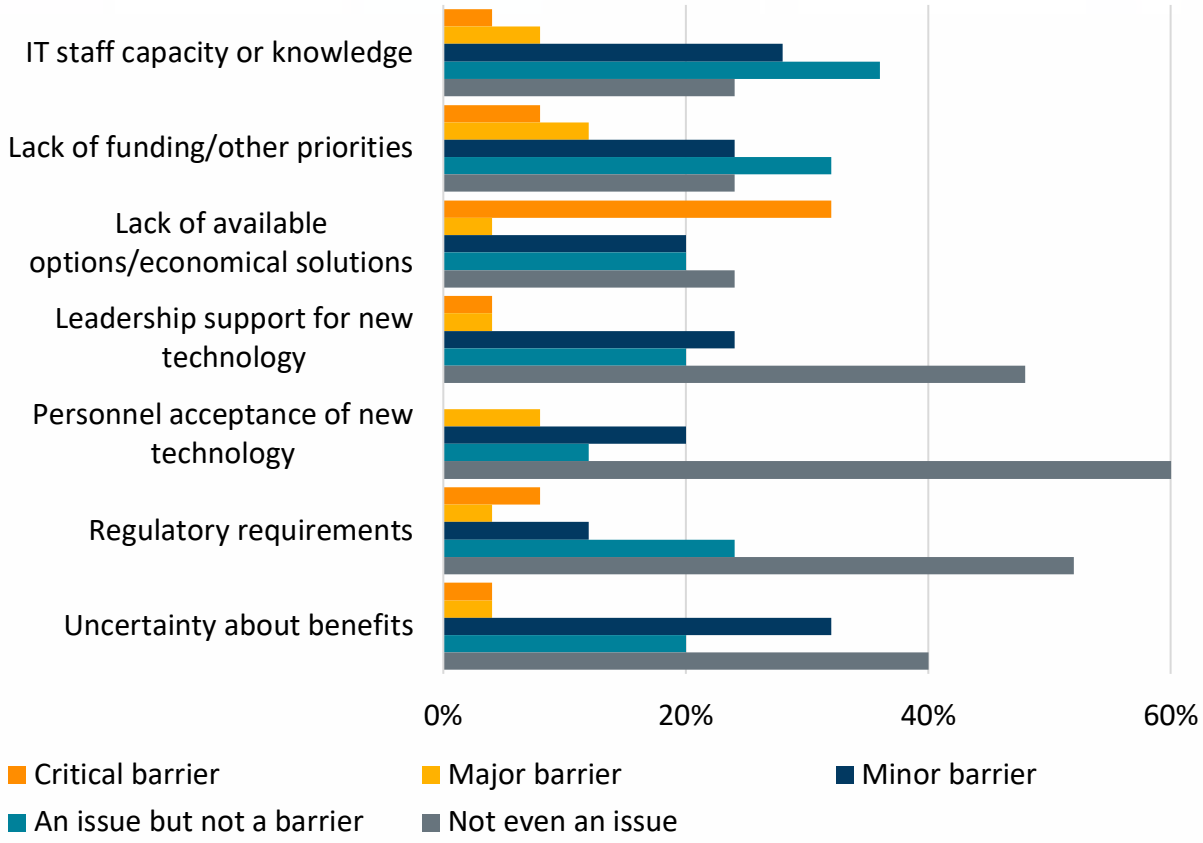
The key drivers of technology spending for Tech Assessment participants were customer expectations, new revenue opportunities, and cost reductions. See Figure 18. About half of companies indicated these as critical or very important drivers. In contrast, about two-thirds saw partner requirements, regulatory requirements, and competitive pressure as non-drivers. On the other hand, a fifth of respondents indicated regulatory requirements to be a *critical* driver.

Figure 18: Drivers of IT spending



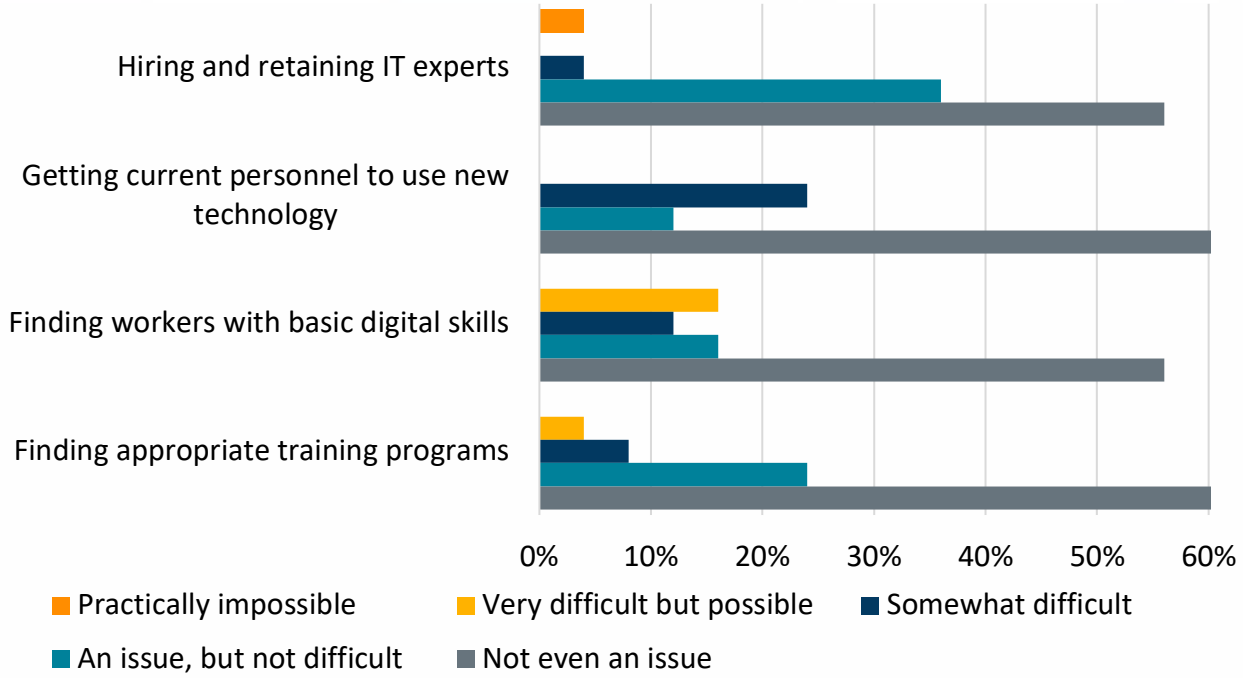
Palm Coast organizations face reasonably small barriers to technology investment, as illustrated in Figure 19. A third of participants indicated that the biggest barrier is lack of solutions. Lack of funding for technology or other priorities presented major barriers for about a fifth of organizations. Personnel acceptance of, leadership support for, and regulations were *not* barriers to technology investment for about three-quarters of participants. Uncertainty about benefits, IT staff expertise, lack of funding, and leadership support were minor barriers for a third to a quarter of participants.

Figure 19: Barriers to IT spending



The biggest technology challenge for Palm Coast organizations seems to be finding workers with basic skills. Hiring capable IT professionals and finding appropriate training were clearly challenges for some. Generally, though, there are no issues with getting personnel to use technology, and most companies have no problem hiring qualified IT staff.

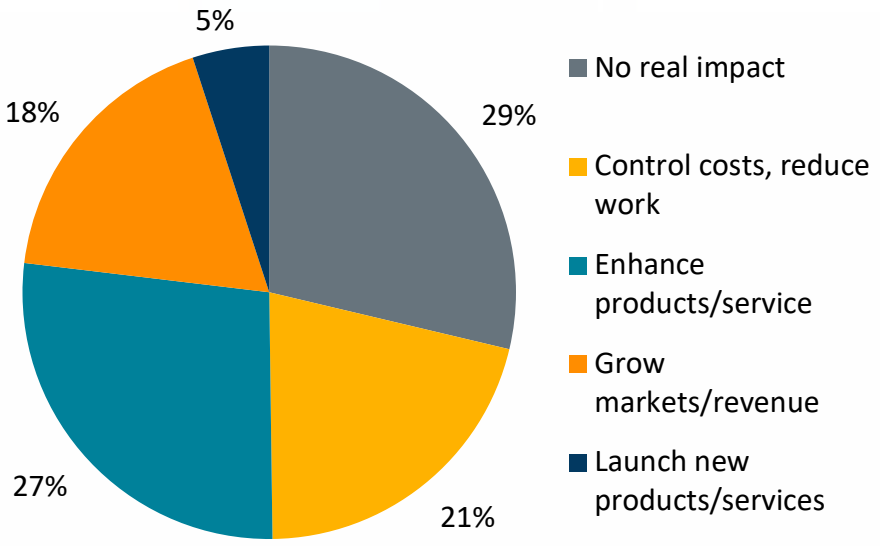
Figure 20: Technology-related workforce issues



2.5.9 Impacts

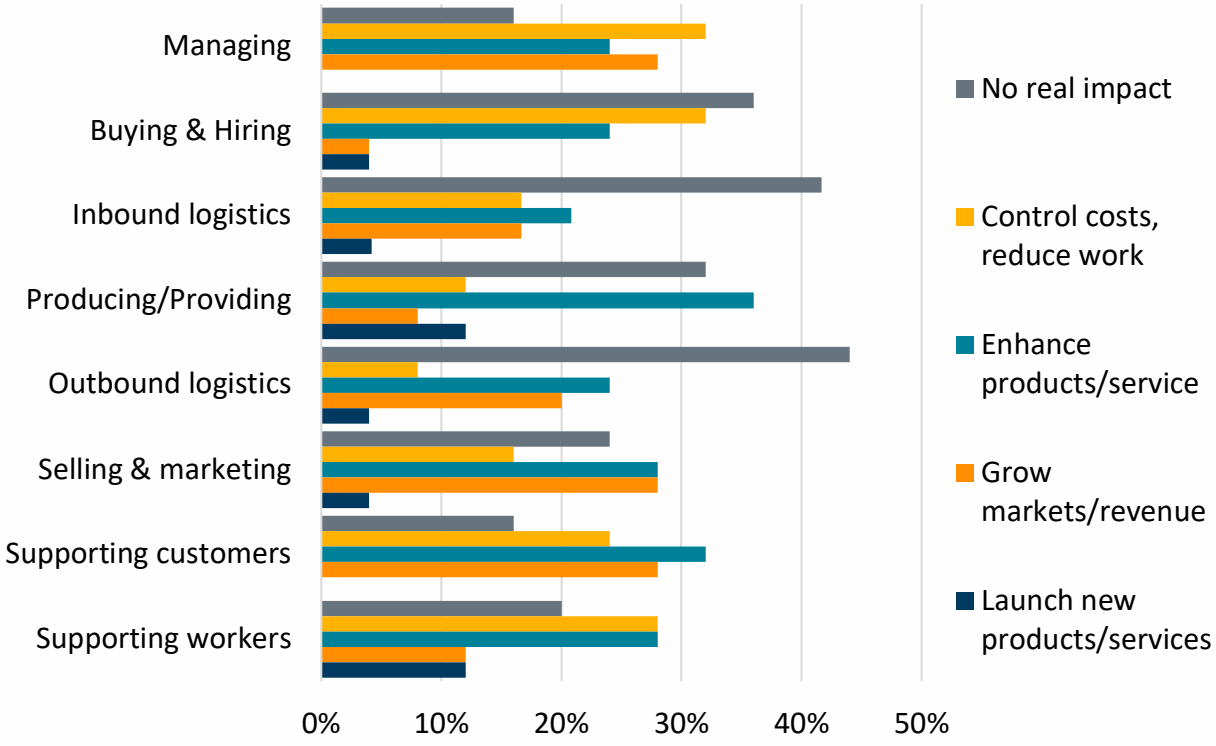
Impacts of technology spending and use may be the biggest issue for competitiveness and economic growth, and this appears particularly true for Palm Coast. As shown in Figure 21, effectively a third of organizations find no real impact from technology. About a quarter have been able to enhance their products or services with technology, and about a fifth each have been able to control costs and grow revenues. Five percent have used it to launch new products or services.

Figure 21: Impacts of technology spending and use



A deeper analysis, illustrated in Figure 22, shows the biggest impacts to be in customer support, marketing, and sales by enhancing products/services and growing revenue. Note that this comports with the heavy utilization for identifying and tracking customers, etc., discussed above, in Technology assets and use. Production and internal worker support were the largest sources of new technology-based products or services. Almost half of organizations realize no benefits for inbound and outbound logistics. Cost control has been an impact, especially in administration, buying, and hiring.

Figure 22: Impacts of technology investment by business function



2.5.10 Summary and conclusions

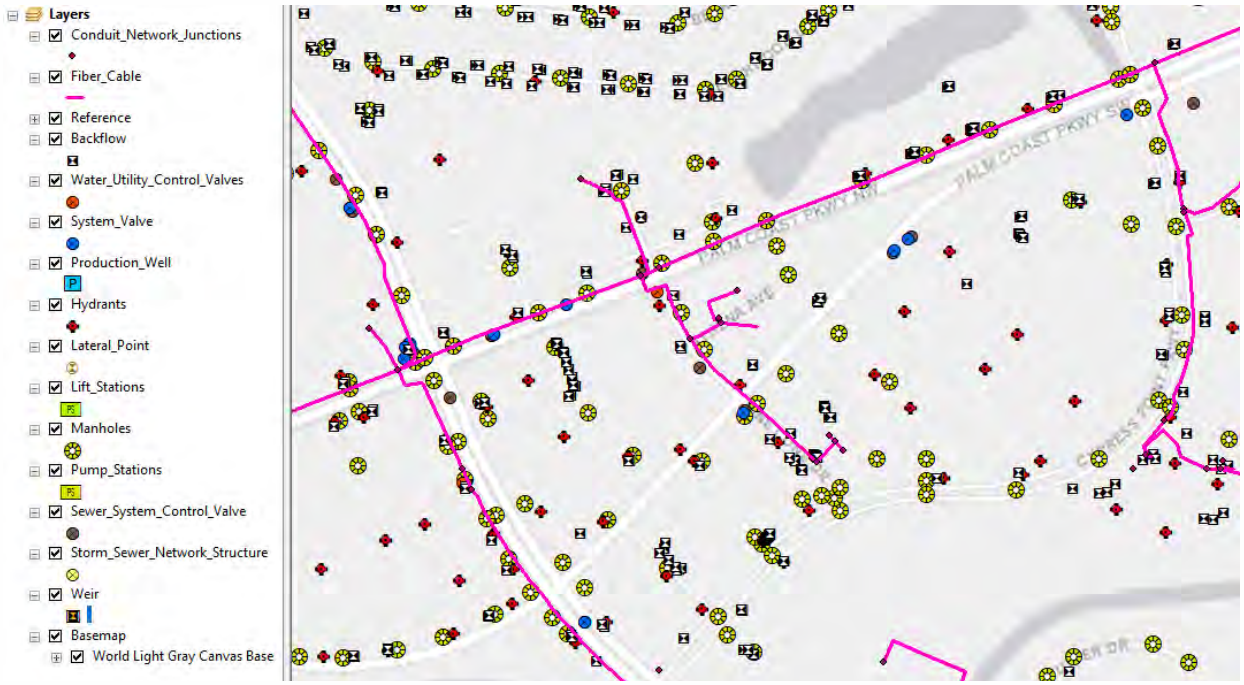
Available solutions and utilization are twin issues for technology in Palm Coast. Some of this relates to limited technology capabilities, particularly basic digital skills in the workforce, but lackluster services from broadband providers is clearly an issue. Broadband offerings are limited, they do not come close to meeting their commitments, and they have significant reliability issues. While barriers and challenges to technology use faced by Palm Coast organizations seem to be minimal, their impacts and levels of utilization are also low. Cost control has been a major impact area, but with relatively low levels of automation.

Internet and telecom services are clearly important to and a major expense for Palm Coast organizations. Customer expectations and new revenue opportunities are driving this spending, and if companies can't get what they need in Palm Coast, many are willing to look elsewhere. Possibly more importantly, Palm Coast companies may be at a competitive disadvantage due to low levels of utilization coupled with lackluster solutions. Additional education and support may be necessary for them to effectively get and use technology.

2.6 Palm Coast Smart City Opportunities

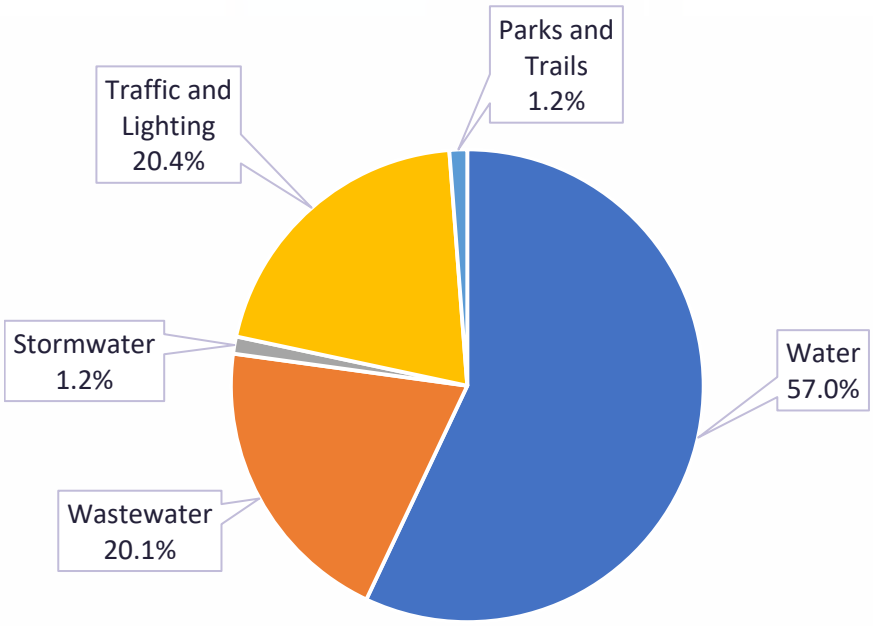
Smart City initiatives deploy digital technology to control public assets, generate data, and make municipal services—and citizens' lives—better. The results can be huge bottom-line gains from reducing energy consumption, manual labor, component failures, vandalism, and other costs. Smart Cities can also generate additional benefits and revenue by enhancing current services or offering new services. Online and self-serve rentals, data brokering, and advanced connectivity are a few examples. Needless to say, these opportunities involve substantial investments in hardware, and require workforce up-skilling. They can also have big connectivity requirements.

Figure 23: Potential locations for sensors and other devices in one area of Palm Coast



The City of Palm Coast has numerous Smart City opportunities with current infrastructure and services. Figure 23 illustrates the prospective locations of sensors and servos for monitoring and controlling City systems in just one small area. These add up quickly: There are some 33,000 devices to connect based on current facilities, the majority of which are in the Utility department. Traffic and lighting applications and wastewater applications each represent about a fifth of prospective connections. Parks and trails and stormwater have relatively small percentages, but these will likely increase with climate change, population growth, and other trends.

Figure 24: Percentage of Smart City connection possibilities by department



The financial implications of Smart Cities are staggering. If the City of Palm Coast were to connect only half of its prospective devices via third party network service providers (e.g., cellular telephone companies), it would face around $5.5 million in annual recurring charges. The twenty-year cumulative savings from using the City's own infrastructure, particularly FiberNet, could reach over $100 million.

Table 7: Potential connection costs and savings from Smart City applications in Palm Coast

	TOTAL DEVICES	POTENTIAL CONNECTION UPTAKE			
		10%	25%	35%	50%
Water	19,052	1,905	4,763	6,668	9,526
Wastewater	6,732	673	1,683	2,356	3,366
Storm water	392	39	98	137	196
Traffic and Lighting	6,829	683	1,707	2,390	3,414
Parks and Trails	406	41	101	142	203
Total Connections:	**33,411**	3,341	6,446	11,694	16,706

	TOTAL DEVICES	POTENTIAL CONNECTION UPTAKE			
		10%	25%	35%	50%
3rd Party Connection Cost @$35 per month	$800,184	$2,000,460	$2,800,644	$4,000,920	
	$282,744	$706,860	$989,604	$1,413,720	
	$16,464	$41,160	$57,624	$82,320	
	$286,818	$717,045	$1,003,863	$1,434,090	
	$17,052	$42,630	$59,682	$85,260	
Total Annual Savings	**$1,099,392**	**$2,748,480**	**$3,847,872**	**$5,496,960**	
20-Year Savings	$21,987,840	$54,969,600	$76,957,440	$109,939,200	

2.6.1 Smart City examples

Cities and municipalities across the nation are capitalizing on fiber broadband networks to implement smart devices for a myriad of purposes, from citizens aging in place through economic development to traffic management. Some Smart City applications have monetary benefits or cost savings for the cities while others are are off balance sheet or soft benefits.

Economic Development - LUS Fiber: Lafayette, LA

LUS Fiber has been operating for over a decade, however the organization went through arduous legal battles with telcoms to get there. While not an application or device, fiber networks assist cities in recruiting and retaining businesses and in creating jobs for its citizens. LUS Fiber is a classic case of "build it and they will come." NuComm International was searching for a location for a headquarters, including 1,000 jobs and chose Lafayette because of the "the network and the entrepreneurial spirit it represented." Additionally, a film effects company, Pixel Magic, relocated its operations to Lafayette after filming nearby – bringing 100-200 jobs with them. People have begun to move to Lafayette and sometimes even back to Lafayette, in part due to knowing they would have affordable high-speed internet. Many of these people have started small businesses, and in some cases grown them to medium or larger businesses, further enhancing the Lafayette economy. In 2011, Lafayette was ranked the 6th fastest growing economy in the nation.

Makers Spaces – Ting Makerspace: Westminster, MD

In select cities where Ting has deployed fiber internet networks, the company has also opened makerspaces. The organization feels that the creation of makerspaces is important to the local economy. They define a makerspace as "a physical embodiment of everything great about the Internet, like seeking out new ideas, sharing with a community and acquiring knowledge."[10] At

[10] https://www.tingmakerspace.com/ accessed August 13, 2018.

the Ting Makerspace, people can take classes or simply use the tools they offer. Classes are typically offered on use of the various tools and what can be created with them (i.e. Intro to capturing shapes with the 3D scanner or Laser cut a keychain). Tools such as 3D printers, laser scanners, CNC Routers, Dremel tools, and smoldering irons allow participants to be creative and innovative. While some people simply use makerspaces to have fun, many use makerspaces as a stepping stone to creating innovative small businesses. These places can be important catalysts for small business economic growth within a community, allowing people to gather, collaborate and innovate.

Innovation Districts – Canton, OH

In 2016, Ohio passed an Innovation District Law[11], allowing cities and municipalities to create Downtown Redevelopment Districts which may permit tax abatements of up to 70 percent of increased assessment in conjunction with payments in lieu of taxes. These funds can then be used to fund loans or grants for technology businesses. Innovation districts must have high-speed internet, capable of speeds up to 100 gigabits download. The City of Canton is capitalizing on this new law and redeveloping a 12-block area of their city to create an innovation district. Canton City Council voted in the fall of 2017 to develop an 11-member board of directors to assist in steering and managing the development process. Technology companies have been reaching out to the city to inquire about the innovation district and a number of companies have toured buildings. The mayor, a city council member, a Stark County commissioner, a representative from Agile Networks or the Hall of Fame technology incubator, among other local stakeholders will be on the board. The city hopes that "creating that ecosystem will hopefully lead them to finding the next Uber or the next Google or the next high-growth technology company."

The Hall of Fame Technology Incubator, the district's anchor, is under construction and will be complete in the fall of 2018. Things are moving along in Canton. Startup Stark is one of the first organizations to settle in the innovation district and they are anticipating more tech organizations opening in the future, the founders are hoping to replicate Silicon Valley in Canton. Startup Stark is in the process of becoming a non-profit and envision helping start-ups get running, while creating a database of tech-related "people, places, and things." They are hoping that more tech companies will move into their building so they can create a collaborative hive mind. "Startup Stark, which is in the innovation district, and Agile founders described an ideal 'ecosystem' for technology startups as one with amenities for living and working within walking distance."[12]

[11] https://ssti.org/blog/ohio-passes-innovation-district-law accessed August 13, 2018.
[12] http://www.cantonrep.com/news/20180811/startup-stark-encourages-tech-community accessed August 13, 2018.

Recruiting Professionals/Tech – Tullahoma, TN

Tullahoma's LighTUBe, owned and operated by the Tullahoma Utilities Board, has been serving customers in Tennessee since 2009. In 2011, J2 Software Solutions, which specializes in providing high-tech solutions to law enforcement agencies to handle dispatching, records management and other functions decided to move its headquarters to Tullahoma, and the major driver was LighTUBe's high-speed fiber-optic network. J2 employs a staff of approximately 35, has an annual revenue of over $3 million, and is located in a 6,000 square foot building in Tullahoma.

Stormwater – Chicago, IL

City Digital[13], a smart city incubator in Chicago, launched a pilot project in the north end of Chicago in 2016. The project is aimed at solving a typical urban issue, rainwater. Rainwater causes a myriad of issues for urban, suburban, rural, and waterfront locations such as Palm Coast. Not only can rainwater cause flooding, but it can cause erosion, increased pollutants, among other issues. While gray infrastructure (ie. pipes, sewers) previously served the needs of most municipalities in the past, as climates have changed, so have storm systems which are now more intense, frequent, and localized. Many are turning to green infrastructure to help solve these issues, along with technology to monitor and maintain the infrastructure.
City Digital's project in Chicago is called the Smart Green Infrastructure Monitoring Project (SGIM) and includes permeably paved roads with sensors installed under the road to monitor precipitation amounts, humidity levels, soil moisture measurements, air pressure levels, and chemical absorption rates. The program has continued to expand and now has five locations across Chicago, allowing UI Labs to analyze historical and real-time data to provide site-specific recommendations. This data will also be published on the city's data portal allowing others to utilize the data. Now, with SGIM, City Digital and Chicago hope to have a program in place to monitor green and gray infrastructure. UI Labs and City Digital also are on the lookout for other cities that would like to partner and replicate these systems to derive additional insights about stormwater issues and solutions.

Aging in Place – Beacon Hill, Boston, Massachusetts

In 2014, the Milken Institute conducted a study[14] on best big and small cities for aging in place. The small cities included: Iowa City, Iowa; Manhattan, Kansas; Ames, Iowa, Columbia, Missouri; Sioux Falls, South Dakota; Ann Arbor, Michigan, Ithaca, New York; Lawerence, Kansas; Logan, Utah; and Fairbanks, Alaska. Surprisingly, none of the cities in the rankings were located in warmer climates, typical of Florida, California, or Arizona, states that are well-known retirement

---

[13] Data-Smart City Solutions. (2017) *How Smart Cities Track Rainfall.* https://datasmart.ash.harvard.edu/news/article/how-a-smart-city-tackles-rainfall-956 Accessed on August 15, 2018

[14] Eisenberg, R. (March, 2014). The Milken Institute's Best Big and Small Cities for Successful Aging. *Forbes.* https://www.forbes.com/sites/nextavenue/2017/03/14/the-milken-institutes-best-big-and-small-cities-for-successful-aging/#62f0b8b07fef Accessed on August 15, 2018.

states. Walkability, transit and mobility, healthcare, affordable housing and community engagement were general themes that emerged.

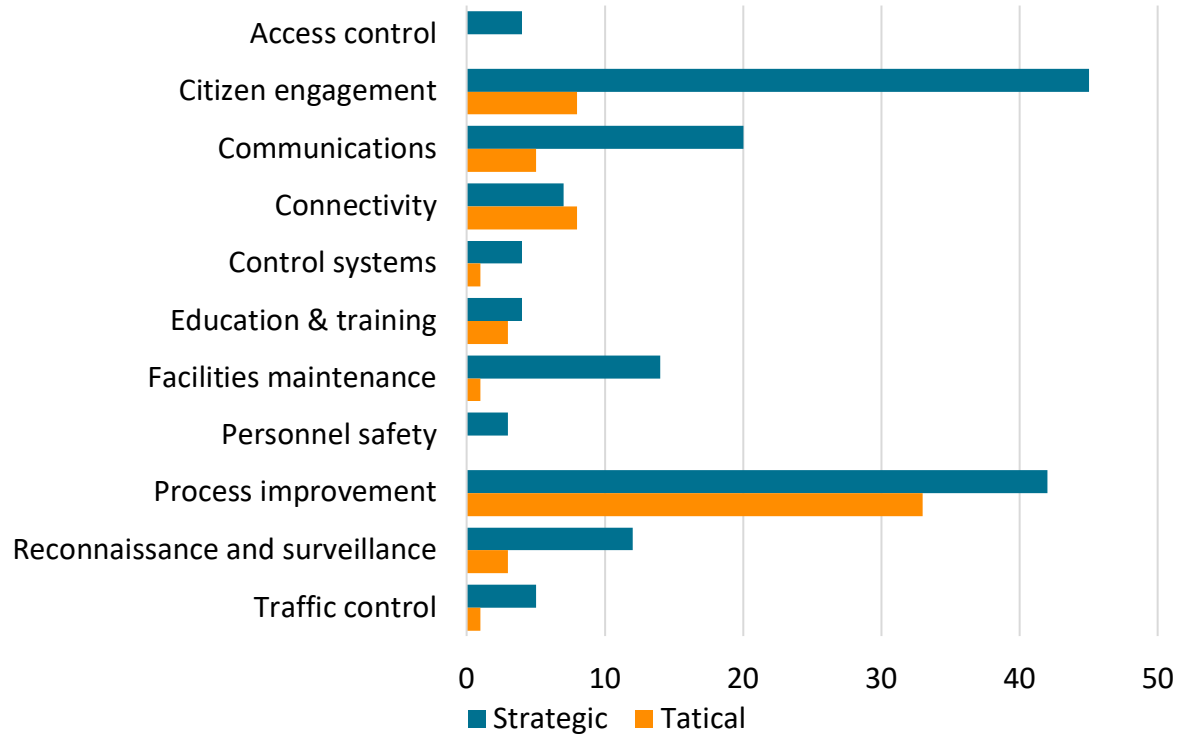
In Beacon Hill, Massachusetts a group of older people gather weekly for political discussions over breakfast. This get together, along with other outings to plays, museums and other cities is offered through a non-profit member organization called the "village." Members pay a couple hundred dollars per year to cover overhead for services ranging from grocery shopping, appointments, and to social activities. The World Health Organizations has established a network of cities, "The Global Network for Age-friendly Cities and Communities," with member cities that pledge to devise policies and initiatives to make their cities more livable for the eldery, helping them to age in place. Over 500 cities across the globe are members, and share best practices and lessons learned. Some of those projects and initiatives include: redesigning green spaces, trainings on public transportation and pushing for more housing stock with universal design principles. Smart homes come into play here, with applications or sensors to alert family members of issues within the home and applications for telehealth or telemedicine. Beacon Hill is continuously searching for more innovative ways to assist their residents to age gracefully, within their homes and neighborhoods.

2.6.2 Opportunities identified by staff and stakeholders

Magellan Advisors engaged both internal and external City of Palm Coast stakeholders to identify Smart City opportunities. We initially interviewed departmental leaders about current technology initiatives and needs. These can be seen as near-term, "tactical" precursors for Smart City initiatives. Then we conducted brief internal and external workshops. The internal workshop was followed-up with internal information gathering about longer-term, "strategic" initiatives. Information was gathered directly from participants during the external workshop. Magellan Advisors also observed activities involving City-owned assets.

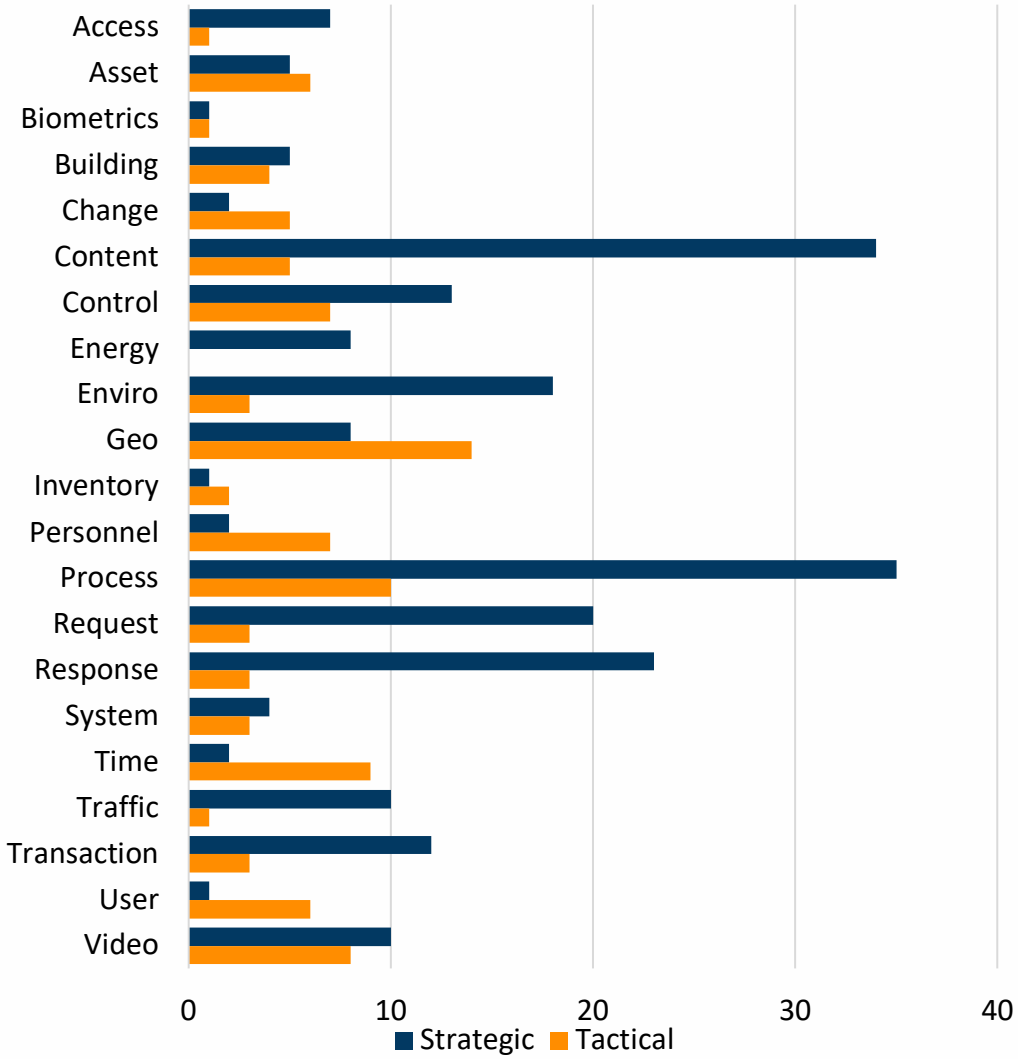
Initiatives, needs, and opportunities were coded for the type(s) of data and infrastructure they require, their general function, and general purpose. Figure 25 shows that the strategic discussions after the Smart City workshop generated more ideas addressing more functions, and that strategic initiatives would be more focused on citizen engagement, communications, facilities maintenance, and reconnaissance and surveillance than tactical initiatives. There was greater overlap between departments' inputs on strategic initiatives. The only function that was mentioned fewer times in strategic ideas than tactical ideas was connectivity.

Figure 25: Functions addressed by tech initiatives



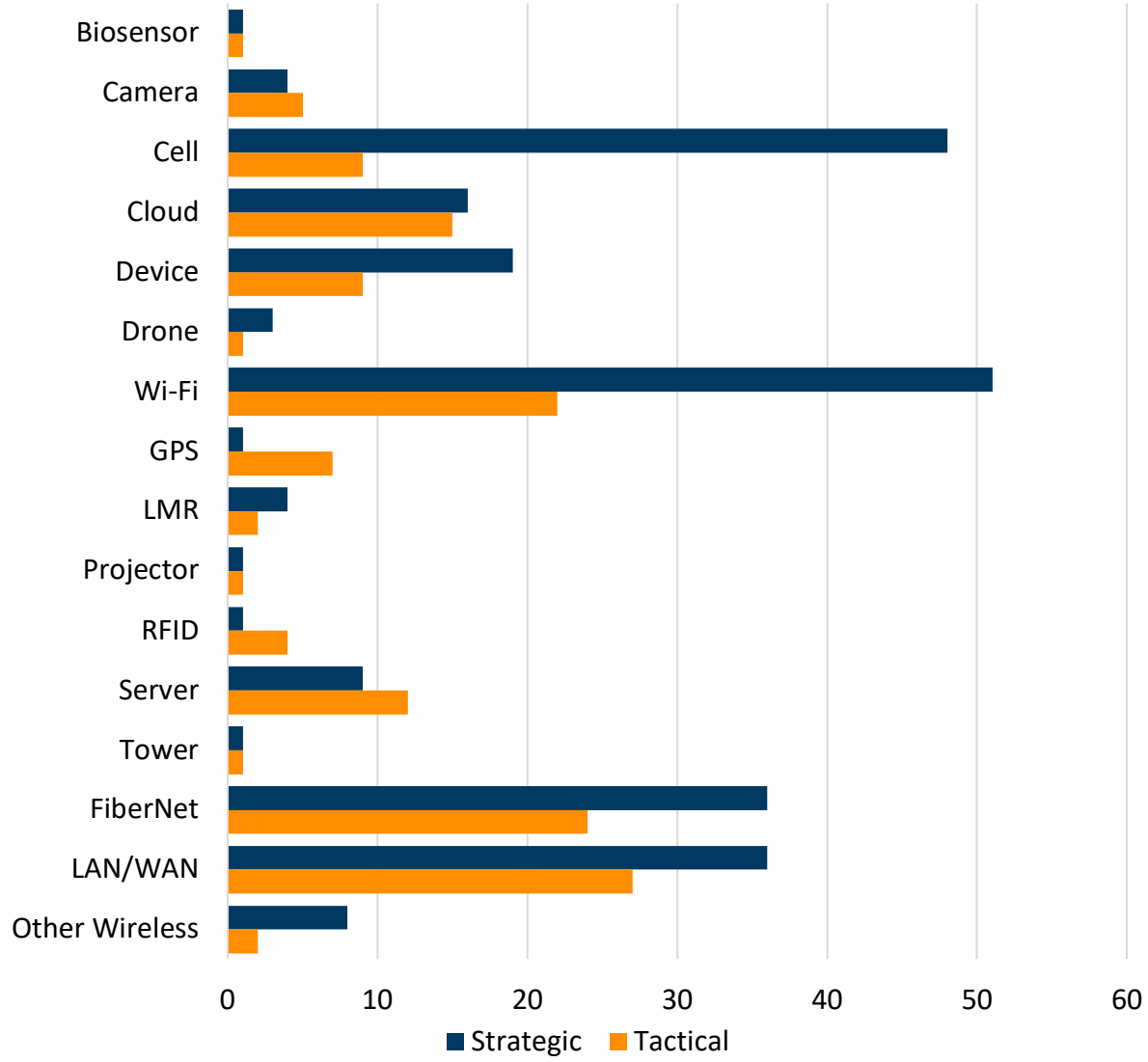
The data requirements for short-term, tactical initiatives, illustrated in Figure 26, are greatest for information about location (geo), process, time, video, personnel, assets, change, and content. Strategic initiatives have overall much greater data needs, particularly for data about processes and produced informational content. Tactical initiatives required more data on internal resources. Information about requests for local government services—emergency incidents, inspections, Open Records, etc.—and responses to those requests, energy, environment, transactions, and traffic were notably higher for strategic initiatives.

Figure 26: Types of data required by City of Palm Coast initiatives



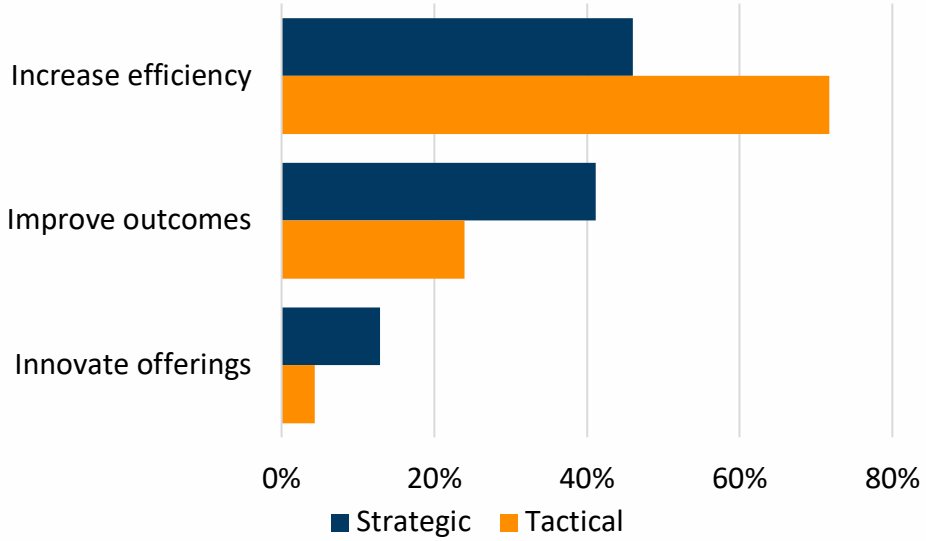
The infrastructure requirements for strategic and tactical initiatives are compared in Figure 27. Overall, the major increases are for network infrastructure, especially for cellular and/or WiFi and other wireless. Eight of the tactical issues involve cellular and/or WiFi, compared to 47 strategic initiatives. Server, GPS, RFID, and camera infrastructure will be required in tactical initiatives more so than for strategic initiatives. Eleven of the tactical initiatives require cloud and/or server infrastructure, which drops to eight for strategic initiatives.

Figure 27: Infrastructure requirements for initiatives



These findings suggest Palm Coast will become ever more network-centric, and will be especially more reliant on wireless connectivity, in spite of the fact that connectivity as a function was *less* of a focus in strategic initiatives. The City will need to generate more informational content along with more data about conditions in the City and about municipal operations. Tactical initiatives are largely intended to increase efficiency and reduce costs. Strategic initiatives were generally more focused on directly improving outcomes for citizens and offering potentially valuable new services.

Figure 28: General purpose or intended impact of initiatives



2.6.3 Smart City issues

Magellan Advisors conducted a site survey of Palm Coast to establish the locations of businesses and commercial areas, city facilities and infrastructure, and residential areas, focusing on Smart City opportunities. We also conducted a public Smart City workshop. Information gathered during this process pointed to several Smart City issues for Palm Coast.

5G small cell and WiFi Wireless

The City of Palm Coast has a clear strategy for traditional cellular, having designated City-owned sites for cell towers and out-sourced the marketing of these sites to Diamond Communications. Emerging wireless technology provide more capacity and faster connections with many more, smaller antennas. 5G (5th generation) cellular and WiFi are prime examples. Other wireless technologies such as Bluetooth, Dedicated Short Range Communications (DSRC), LPWA (low-power wide-area, including LoRa, SigFox, and others), LTE-M (long-term evolution, category M1), Wi-SUN (wireless smart utility network), ZigBee, and Z-Wave also involve placing antenna and/or other devices in the environment. Wireless connectivity requirements of Smart City opportunities should be analyzed and built into the planning process. As discussed above, these requirements are likely to increase substantially, as are the needs of the general public. Therefore, wireless may be a key area for cost avoidance and new revenue for the City. Further, WiFi is a multi-purpose Smart City tool, which can not only provide wireless access to Near-Net or Off-Net Smart City components, but it can be used as an amenity, providing both free public access, as well as high-speed connectivity for the City's mobile workforce.

Traffic monitoring for emergency response and public safety

There are numerous requirements for first responders and public safety to assess traffic flow and incidents. Intelligent control of signals can speed response times. Personnel can assess and prepare for responses in-transit or proactively. Advanced video analysis can identify persons or vehicles wanted by law enforcement. Information can be pushed to citizens and visitors for commuting, tips, and way-finding. Standards organization, including the American Association of State Highway and Transportation Officials, ASTM International, U.S. Department of Transportation, and Federal Communications Commission, have addressed traffic data. There are numerous vendors offering products and services for monitoring traffic and related activities.

Possibly the most mature of Smart City technologies, there are a plethora of intelligent traffic solutions for Palm Coast to consider. The ideal process would involve assessing current systems, including County and State, and thinking deeply and critically about goals. Citizen engagement is critical, and the key to that is meaningful information. The City should aggregate data on emergency and related service requests and responses, including timing and related traffic incidents, and share that data with citizens. The City should also establish a task force or working group, including representative citizens, to address this issue. Key roles would be to scan for solutions, promote the data to citizens, and get citizen feedback on both.

Water and wastewater management and quality monitoring

Potable water and ground water are major concerns for the City of Palm Coast. Systems for managing water—acquiring, dispersing, moving, reusing, and testing it—must be controlled and monitored to meet demand and deal with environmental issues (e.g., major weather incidents). Water systems are following in the steps of electric systems, evolving systems control and data acquisition into Smart Water Grids. A wide range of sensors for the characteristics, including the presence of water are available but must be integrated into systems that inform personnel and automatically adjust processes. Water resources can be secured while reducing energy use. Data about water resources and systems can be pushed to citizens and made available for third-party value-added applications.

The two sides of this issue are internal operations, particularly avoiding or mitigating problems, and external citizen activities. Citizens may be part of the solution as well as a solution driver. The City must provide timely, accurate, and actionable information to citizens so they can act accordingly. This could involve flooding or leaking sprinklers or any other number of related issues. New technologies are emerging to allow real-time in-line water quality testing. The City could avoid substantial risk by deploying sensors to proactively monitor manholes, PEP tanks, and water lines. It would also have to collect and analyze data in the process. Citizens might benefit from this analysis. On the other hand, the City might ask citizens to deploy technologies related to water use and waste water collection. This could be more effective as well as economical, but would require even more data sharing and connectivity.

Building and grounds maintenance

Maintenance of buildings and grounds can be expensive undertakings that are evident to citizens and visitors. From mopping and mowing to taking out the trash, it takes a lot of work to keep a city looking good! Systems for these purposes, including predictive maintenance, condition assessment, and even robotic devices, have evolved substantially in recent years, and they have become better integrated with similar systems (for appliances and vehicles, for example). There are numerous technological components involved, including various types of sensors, programmable controllers, and special-purpose robots. They are on the cusp of being economical, mass market technologies. That said, while building and grounds monitoring technology is reasonably mature, automation of actual maintenance is still evolving technology. The City of Palm Coast should study the potential impact of automation on building and grounds maintenance. While this may be a longer-term effort, it could have major budgetary and operational benefits for the City. Key questions involve the level of spending on maintenance as well as technological development and requirements. The City can capitalize on current connectivity, GIS, monitoring, and surveillance, but they will almost surely need to be enhanced. New infrastructure such as beacons and sensors may be required or useful. Sensor-based technologies used for smart garbage can and smart irrigation initiatives can assist cities in maximizing efficiencies and minimizing costs associated with these city responsibilities. Bigbelly[15] waste management systems, deployed in New York and Philadelphia, have sensors installed in trash cans to alert city staff that the bins are full and ready to be emptied, saving staff time, gas, and costs. Libelium[16] irrigation systems, deployed in Barcelona, involve deployment of sensors in the soil, allowing remote monitoring of moisture and control of irrigation systems to facilitate management of the water network. These sensor technologies assist cities in streamlining operations, beautifying public spaces, and reducing carbon footprints.

Mobility between neighborhoods and business districts

Mobility is a common Smart City challenge and was voiced as a concern by City leadership and City Council members during stakeholder interviews and meetings. Palm Coast does not have many of the mobility issues of dense urban areas, but its citizens do face challenges of sprawling suburban areas. An automobile is necessary to move around Palm Coast, to go to shop, work, or even recreate. Palm Coast needs intelligent means to move people from their homes through business districts to recreational areas. There are multiple potential solutions to this issue, including driverless (such as EasyMile[17], deployed in Gainesville, Florida May 2018) and on-demand (such as Shotl[18], deployed in Battle Creek, Michigan March 2018) shuttles. These solutions benefit from the availability and support of particular services or standards such as 5G, Dedicated Short-Range Communications (DSRC), and WiFi. While Gainesville and

[15] http://info.bigbelly.com/case-study/city-of-philadelphia?hsCtaTracking=529e1123-9a56-4fe5-a5b5-fba2c7c983d2%7C6cff5cdd-9206-433c-a617-2ed8cfc4f677
[16] http://www.libelium.com/saving-water-with-smart-irrigation-system-in-barcelona/
[17] http://www.easymile.com/ez10-driverless-shuttle-turning-heads-in-gainesville-florida/
[18] https://shotl.com/news/shotl-lauches-in-the-united-states

Battle Creek's mobility issues are drastically different from those of Palm Coast, this does not mean that Palm Coast could not locate a partner to customize a solution to serve their citizens' neighborhood mobility challenges.

There are numerous current and rapidly emerging solutions to mobility problems, and some involve little or no public investment. The City of Palm Coast should assess the cost and maturity of the solutions, and look for what is on the horizon. The critical consideration is the infrastructure they might require, particularly for wireless connectivity. As connectivity becomes more pervasive, antenna sites are becoming both more abundant and smaller. This allows for faster but also more consistent and flexible connections, which is what autonomous and on-demand vehicles require.

Mobility is primarily a citizen, rather than municipal, issue, so citizen engagement is critical to a solution. The City needs meaningful information about the trips citizens make—and those they don't make—to recreate, shop, work, etc., and whether people would use a "solution." The former requires data-gathering, which can be a fraught activity. There are also many new, less challenging ways to get this information. Assessing willingness-to-use, in contrast, requires an actual test, which would necessarily involve a private company and/or university. Therefore, the City should research citizens' local travel habits with an eye toward hosting one or more pilot projects.

Open data

A standard practice of Smart Cities is providing data openly to the general public. Of course, this means that (a) processes must be digitized to generate the data and (b) systems must be capable of serving up data using accepted standards. When deployed properly, Open Data can greatly reduce cities' operating costs, particularly for information systems. Related functions and systems can directly support layered, value-added services and even generate new revenue for the City. As a bolt-on solution to legacy systems, Open Data can be a huge challenge. The city's primary software vendor, Tyler Technologies (publisher of Munis enterprise resource planning software) has a citizen transparency service. They also just acquired Socrata, a leader in Open Data solutions/platforms. Whether it makes sense to stay with a proprietary solution or go to fully open systems depends on the City's strategic orientation. The City should consider how these options fit with its goals related to attracting talent and being a technology leader. Open Data can be a powerful tool to incentivizing development of technology and data startups.

Smart building/home platform

The City of Palm Coast City Hall received Silver level LEED certification for environmentally friendly features, supporting the City's strong commitment to strong environmental practices and programs. A number of the design points of City Hall included smart building applications such as controllability of lighting systems and indoor air delivery monitoring. Smart buildings/homes take these applications a few steps further.

Smart Buildings/Homes are simply facilities with controls, network access, and sensors integrated into them. Sub-systems, such as appliances, entrances (doors and windows), and HVAC, have similar functionality and integrate seamlessly (at least in concept) with the building operating system. The overall purposes are convenience, energy efficiency, and safety/security, but the systems also extend to entertainment, fitness, food preparation, pet care, and wide range of other domestic functions. A general purpose of a platform is to allow entrepreneurs and existing companies to develop new applications that provide additional functions. Deployment of these systems and development of such a platform can be facilitated by the City, which can also directly benefit from the technologies for City facilities. ANSI/BICSI has been the leader, along with the Environmental Protection Agency (EPA) and National Institutes for Standards and Technology (NIST), in establishing standards for Smart Buildings. IEEE has established numerous standards on building automation, controls, and sensors.

These technologies are mature and have clear operational value for the City. The City should conduct an internal assessment of standards knowledge and use among key departments. "What are we doing about this, what standards are we using, and who knows about it?" should be the guiding questions. The City should also initiate a dialog with local builders, developers, and property managers to assess knowledge and use in the community. At the same time, look at what is happening in the industry: Who are the major players? What are the most used products? Where are the emerging technologies? Again, community stakeholders in related business and industry should be actively involved in strategy to acquire solutions from—and possibly attract—smart building/smart home companies.

Palm Coast does have one home builder interested in and currently developing design plans for a model smart home in Palm Coast. Magellan Advisors had the opportunity to discuss developments with Sun Coast Realty during the Smart City workshop and a follow-up telephone discussion. As aging in place is a major factor for many citizens in Palm Coast, smart home technology coupled with telehealth and telemedicine applications could drastically benefit the aging population in Palm Coast. Sun Coast Realty could engage with the City and public safety to develop policy around keeping citizens safe through monitoring and response.

Aging in place and lifestyle support

Many Palm Coast residents are seniors. Retiring Baby Boomers are likely to find Palm Coast as a great place to live out their lives. Increasingly, people need in-home assistance and support either to avoid moving into an institution or having to pay for more intensive services. These are major focal areas for Smart Cities around the world. Healthcare robotics and telehealth applications are especially relevant, along with monitoring systems that are basically an extension of Smart Building systems mentioned below. From wearable sensors to telemedicine to sensors and other systems in the home, many of these technologies operate in private realms but could greatly benefit from public infrastructure and services. Data acquisition, analysis, and security are critical governance issues for any applications involving persons.

Standards include Health Information Protection and Privacy Act (HIPPA) requirements, as well as numerous ways to establish connections and securely share data.

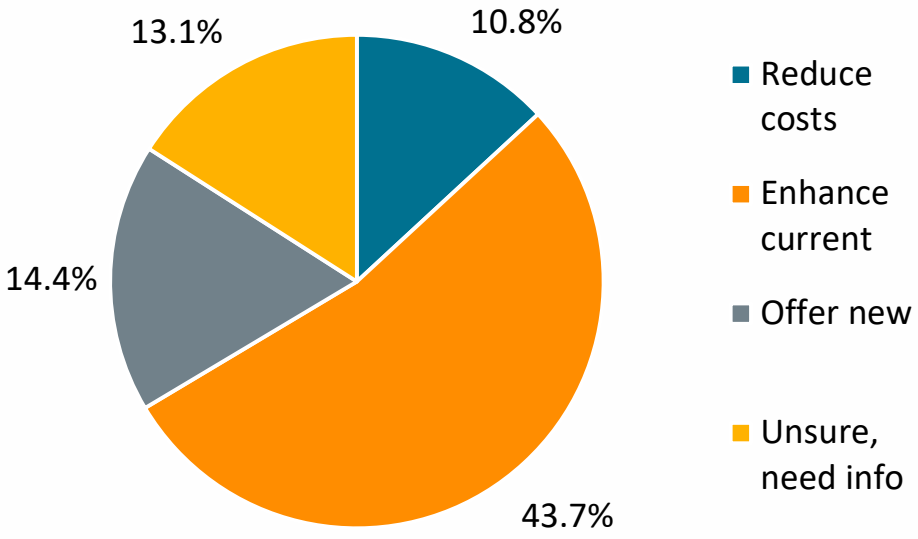
There is a reasonably long history of devices to support aging in place. (The "I've fallen and I can't get up" commercials first aired in 1989.) The emerging generation of solutions are much more complex and powerful technology. The City's role may be helping citizens make sense of the options, as well as providing supporting infrastructure and services. There are two sides to this: Understanding emerging technologies, their costs and benefits, and understanding citizens' habits, interests, and values. One practically requires the other: The best way to understand citizens is to engage them in examining the technologies. For example, the City might organize a trip to Louisville, KY for local business and civic leaders, and regular citizens, to see the technology first hand. According to Forbes Magazine[19], Louisville is becoming the Aging in Place capital, with a cluster of businesses focusing on technologies services this distinct sector. Or, it may host demonstration or research projects by companies, think tanks, and universities. In each case, the City's role is organizer, facilitator, and data platform.

2.6.4 Public technology priorities

The Palm Coast Tech Assessment also covered priorities for public technology initiatives (see Section 2.5 on page 25 for complete results). Participants were asked whether local government should focus on cost control, service enhancements, new services, or do nothing. They could also indicate that they need more information. No respondents (out of 54) indicated the government should "Do Nothing" on any of the topics. The majority of responses, as illustrated in Figure 29. While a fifth felt initiatives should reduce costs, more were for offering new services. About the same percentage indicated a need for more information.

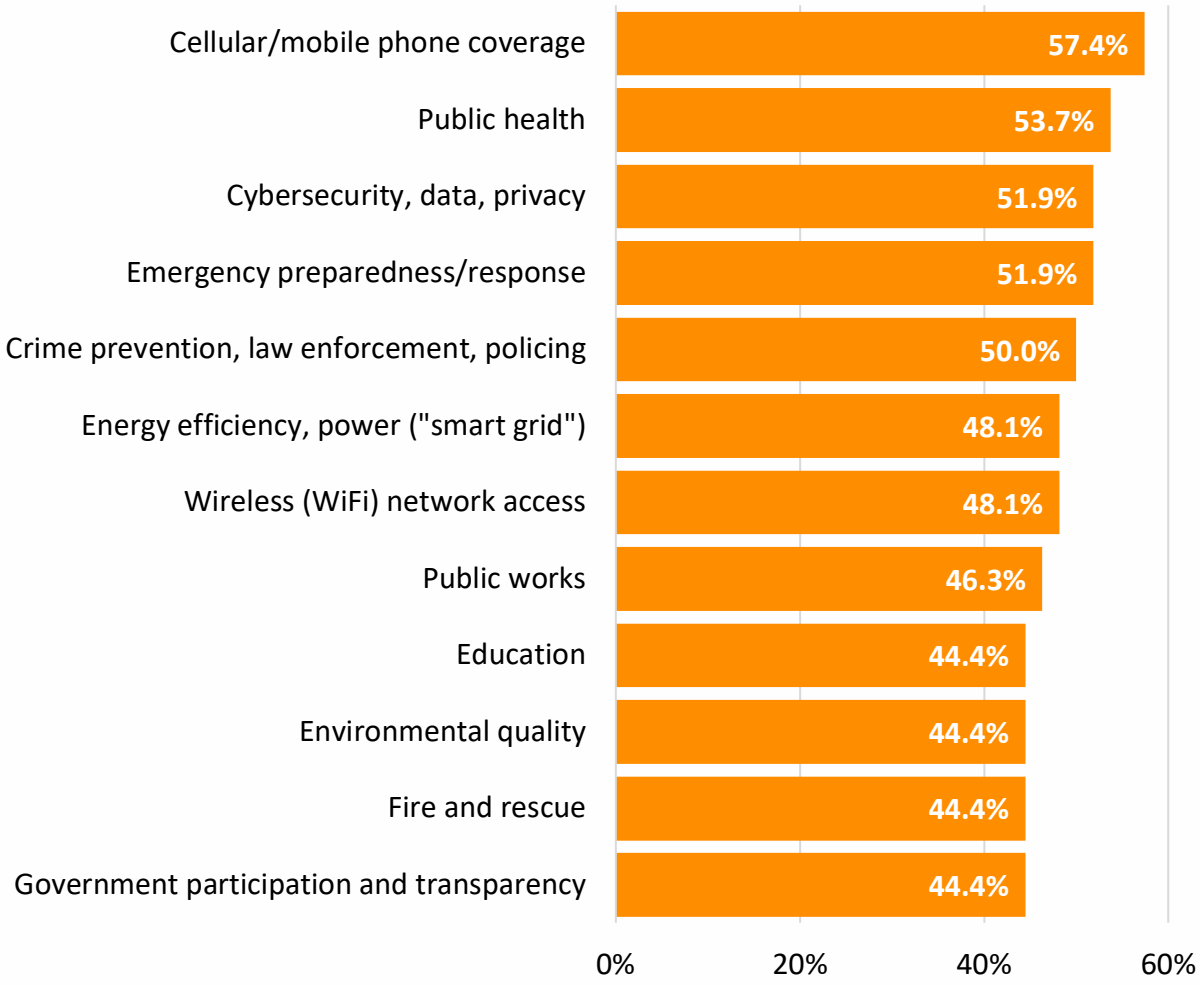
[19] Farrell, Chris. (January, 2018). Why Louisville is Becoming America's Aging Capital. *Forbes Magazine.* Accessed https://www.forbes.com/sites/nextavenue/2018/01/08/why-louisville-is-becoming-americas-aging-capital/#6ffae740315d. August 15, 2018.

Figure 29: General priorities across topics



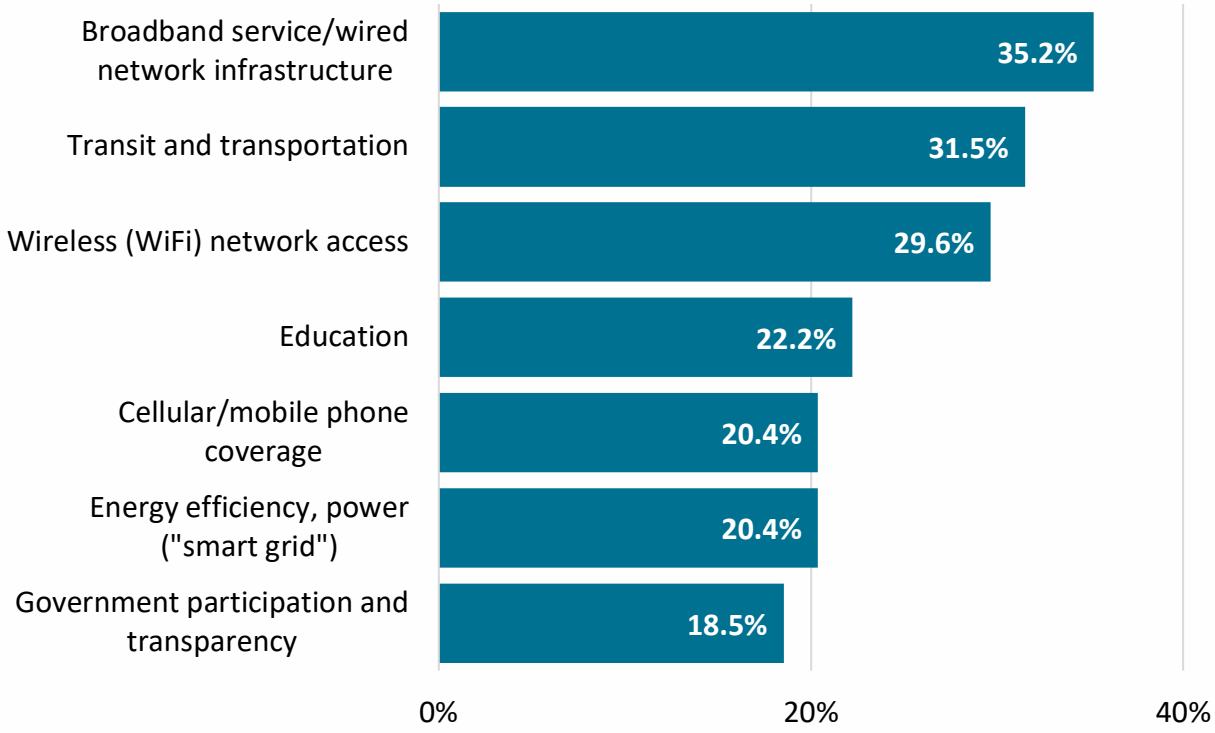
The next three figures show the items that received the most ratings of "enhance current," "offer new," and "need more information." Clearly, along with basic communications, local business people want enhancements to safety and security, illustrated in Figure 30. The City must secure its own systems, and it is possible to extend some protections to citizens. Technology can also directly enhance public health, emergency preparedness, and crime prevention, as discussed in detail above. Quality of place, workforce, and civic participation are also private leaders' priorities for tech-based enhancement.

Figure 30: Top areas for enhancement



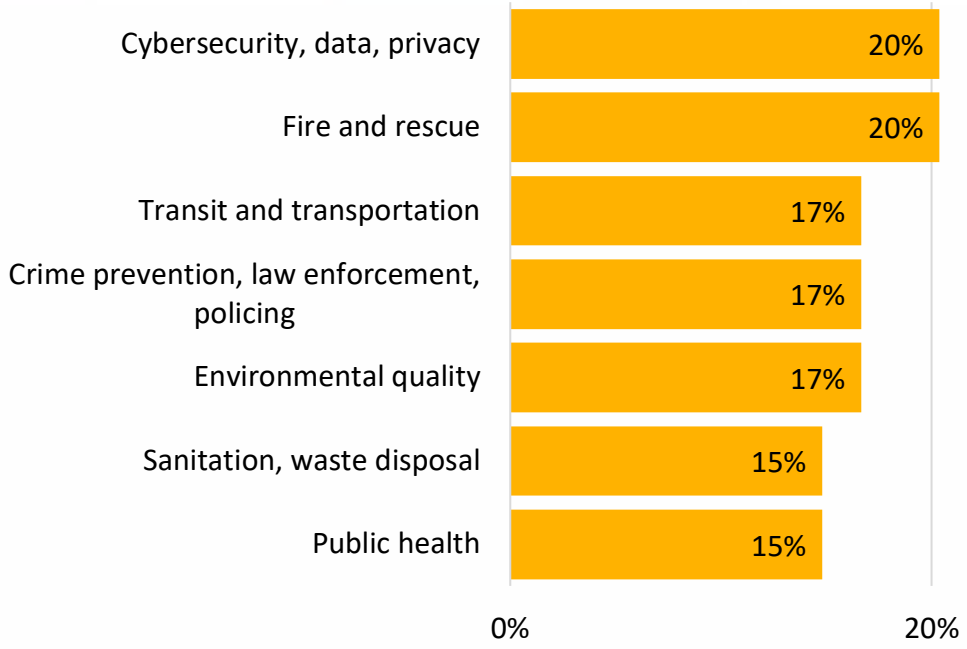
Advanced connectivity, wired and wireless, were top priorities for new offerings, along with transit and transportation, as shown in Figure 31. These results comport with other findings, particularly from City Council Members and the public Smart City workshop, that mobility is a major issue for citizens. Of course, the City of Palm Coast is already providing some of this—FiberNet, specifically—so these results suggest lack of awareness of and latent demand for faster connectivity. The prominence of cellular and Wi-Fi suggests citizens what more flexible connectivity, too.

Figure 31: Areas for new services



Finally, safety and security were top among topics about which Tech Assessment respondents wanted more information. New, online security was just as uncertain as old-school safety. These are very different domains, yet could use similar channels to inform citizens. Equal proportions of respondents wanted more information about crime, environment and transportation, which can all come from integrated monitoring infrastructure.

Figure 32: Topics about which participants needed more information



2.6.5 Technology conclusions and recommendations

The City of Palm Coast is facing major technological changes. At very least, the City will need to make major upgrades to its current information systems, particularly its enterprise resource planning (ERP) software. Advanced metering infrastructure, asset, and inventory management are just a few planned technology enhancements. Ideally, these systems should be inter-operable, if not integrated, for maximum value and minimal risk exposure. They should also be designed and deployed to accommodate Smart City applications, as should the City's physical facilities and operations.

Current departmental leaders are aware of Smart City possibilities, and that awareness is likely to grow as several key positions and people transition. Business leaders may be even more aware than current city leaders. The issues they're dealing with and their priorities for public technology show that they've had to get smart to survive and prosper in tough times. Collaboration between business and city leaders could be a powerful tactic for driving technology investments and impacts. If nothing else, it would help align City operations with community drivers while breaking down internal silos.

The City will need to change its priorities and even some basic functions. Whether responding to FOIA requests, fixing infrastructure so it never breaks, moving people around the community without congestion, or creating a downtown from the ground up, digital technology plays a critical role in a changing Palm Coast. Change management and innovation will need to be built into process if they are to be true priorities.

For all of the opportunities identified above, the City needs to both acquire and manage data and engage citizens, which actually go hand-in-hand. The Smart City assessment suggests the City will need to provide more information about its process, particularly regarding requests for services and responses. Environment and security are also key areas where citizens want information for which the City can gather data. All of this data will need to be processed into meaningful content, so the City will need to adapt its processes and reorient its workforce toward content production and publishing.

Many local organizations have already made these changes, and are almost desperate for technology resources. Being smart also involves scanning for new technology opportunities and threats for the community. This is, in effect, an entirely new municipal function that has direct economic impact. By methodically searching for new technologies and trends, the City positions itself and its citizens for greater success. At the very least, the City's role is to provide useful public information for citizens to be safe. Similar information can enable community members to use fewer limited resources, like police and water, while making greater use of abundant ones, like parks and trails.

Innovative economic development strategies are possible as the City of Palm Coast focuses on data and engagement, and as it develops new environmental scanning capabilities. Some or most are unforeseeable and will emerge over time with work. In the near-term, a key opportunity is to organize or host events that attract key demographics: relatively young, well-educated (or experienced and skilled), tech-savvy, diverse, and creative.

A related opportunity is to identify major players in industries and institutions focused on the topics touched on above, and engage them in a discussion about their needs and opportunities. Palm Coast represents their market, and a great place to invest. Note that these two opportunities are highly complementary, so the City of Palm Coast should also invite the corporations to participate in or sponsor the events, which would help attract targeted persons. Longer-term opportunities depend on both infrastructure and organizational capabilities. The City of Palm Coast must invest in both if it hopes to attract high-paying jobs and highly-skilled workers and grow sustainably. The City should choose a model and priorities for growing FiberNet, and should consider what else it can do to foster wireless connectivity. In the process, the City should develop and hire staff (or a partner) capable of operating FiberNet, and aggressively pursue FiberNet business opportunities.

FiberNet activities should feed directly into Palm Coast's new Smart City functions and roles. FiberNet technical operations should dovetail with the City's data acquisition, management, and sharing function. FiberNet marketing and sales should directly do citizen engagement, and should facilitate this function for IT and other departments. Both aspects of FiberNet should lead collaborative environmental scanning with other departments and community stakeholders. And, FiberNet excess revenue and functionality should be used to support innovative economic development activities.

The practical conclusion is that there is clear demand for FiberNet services—with the City and out in the business community. The most critical demands are currently among local businesses, and Fibernet is well-positioned to meet those needs. The City will have increasing—in amount and criticality—connectivity needs, especially as it deploys Smart City technologies. In the process, the City could leverage its other technology investments to enhance and expand FiberNet's services. By acting as an anchor tenant, the City can give a partner substantial, profitable business with little or no direct costs. High-density, mixed use development of Town Center—with leading edge, Smart technologies built-in—would also create an ideal market for FiberNet growth. All of this makes a strong business case for FiberNet, and will make it attractive to prospective partners.

2.7 FiberNet SWOT

Strengths are simply what you have, and weaknesses are what you need. Weaknesses are largely dependent on the situation. Strengths also varies depending on external demands, expectations, and needs. In other words, what you have and need are relative things. It is useful to examine the opportunities and threats first because it provides context to evaluate strengths and weaknesses.

Table 8. SWOT analysis from *Proseperity 2021* report

Strengths	*Weaknesses*
• Quality of Life • Available Workforce • Quality Schools • Affordable Housing • Geography and Climate • Transportation Network • City FiberNet • Utilities • Public/Private Partnerships • Cultural Diversity	• Availability of Industrial Land and Space • Higher Cost Industrial Land and Space • Funding for Economic Development • Lack of Specialized Workforce • Permitting Time Constraints • Economic Base/Diversity • Public Awareness (Region, Nation, Global)
Opportunities	*Threats*
• Available Land • Refocus on Industrial/Commercial • Medical Sector • Green Sector • GREAT Outdoors (Ecotourism, Sports, Active Lifestyle) • Retirees • Florida East Coast Railroad • Foreign Investment • Foreign Trade Zones • Regional and National • Marketing/Branding	• National and Global Economic Conditions • State and National Policies • Private Sector Financing • Local Budgetary Constraints • Public Awareness (Region, Nation, Global) • Water Supply

In 2011, the SWOT depicted in Table 8 was created for the *Prosperity 2021* plan. It is nearly a decade old, and more general than FiberNet's SWOT, yet many of the items are still relevant. A recent internal City of Palm Coast analysis had similar results, but found perceptions about and promotion of Palm Coast as a location for business investment and young persons to be a weakness. Recommendations from that process were to build attractions, host events, and establish an innovation hub as part of comprehensive Town Center development.

Many of the threats are actually from local sources such as political friction, lack of alignment, collaboration, and vision, and poor business climate. Whether perceived or real, the larger issue with these "threats" is they don't include possible negative ramifications of global, national, and regional trends. For example, how might the move toward more contingent, contract workforce impact the area's economic prospects? While this is beyond the scope of this project, it is important to consider these issues, so they are briefly summarized as relevant to FiberNet.

2.7.1 Opportunities and Threats for FiberNet

Opportunities and threats are situations or things outside one's control (or potential, in the future) that could impact one's mission or purpose. Opportunities potentially enable or support, while threats might interfere, impede, or hinder. Develop and pursue opportunities based on their potential value. Avoid threats and mitigate their potential impacts by preparing for them. Specific applications of these general rules depend on one's goals and objectives, and opportunities and threats one expects to face in the environment. It is advisable to continually scan the environment, set indicators for action, and test assumptions and conclusions. The following is a general assessment of apparent, "big picture" opportunities and threats. Some detail is or will be in other parts of the FiberNet business plan, as noted below.

Economy

The overall economy is growing at a reasonably strong rate, with very low unemployment and low inflation. Energy, finance, distribution, logistics, personal care, recreation, and tech sectors are all strong, especially those that are building components for others' systems. Demand for consumer goods and services is generally strong. Wages remain relatively flat, along with overall spending by businesses, particularly manufacturing. Real estate has recovered well, with strong development of single and multi-family units, although high-end housing and retail space has not followed suite. Generally, investors are not being aggressive. One reason for this is that memories of the Great Recession are still fresh, and memories of the bursting tech bubble of 2001 are not stale. While there is a strong tendency toward deregulation and free markets, enabled by tech and promoted by industries such as finance and medicine, there is also trepidation about major changes or investments.

Northeast Florida is a tourist destination and transportation hub. Jacksonville to the north is a major seaport, rail hub, and aviation center, with a relatively many firms and jobs in business and professional services. Education is a major sector, particularly with Gainesville and the University of Florida in the region. To the south of Palm Coast, Orlando is global leader in leisure and hospitality, and has strong business and professional services sectors, but its strongest recent growth has been in manufacturing. Other regional communities along the beach, particularly Daytona Beach are major destinations for motorsports and related visitors. Across the region talent attraction and development has become a major objective for economic development due to demand for highly capable workers. Generally, the State of Florida has grown employment faster than any eastern, midwestern, or southern state. A detailed analysis of local demographics and economics is included in Section 1. Local trends

generally mirror national and state trends, although the area has somewhat lower educational achievement, fewer rental units, and more constrained household income. This suggests fewer economic opportunities and less upward mobility for young professionals. Employment statistics for the area support this conclusion.

Geography/environment

Palm Coast's geographic location is ideal for tourism and trade but does face seasonal environmental challenges. Not only is the area exposed to hurricanes and other ocean-driven weather, rising sea levels mean the area may be impacted by high tides and relatively minor storms. Weather patterns are expected to be more extreme, meaning potential impacts from any given event are higher. Given the City's location, population and traffic growth are likely to impact the area. Green spaces and natural areas currently balance well with development. Palm Coast could be negatively impacted by urban sprawl outside its boundaries, especially if growth moves west into traditionally agricultural areas. Accessibility and walkability along with shelter from the elements are critical components of the built environment that can mitigate these threats.

Government/regulation

The State of Florida has a very liberal open records law, which means anyone can ask for any information without providing any information, and such requests must be met expeditiously with minimal requirements on the requester. Constitutional entities within the state government deal with conservation, criminal justice, education, and special populations, specifically seniors and veterans. Other constitutional entities are local—counties, municipalities, sheriffs, etc.—and other state functions are carried out by statutory entities under the executive branch, except for the Public Service Commission, which is under the legislator.

Executive agencies include the Florida Citrus Commission and lottery, along with the typical array of agencies. The State Agency for Technology, although under the Department of Management Services, has a separate budget and is not subject to the department. The Department of Environmental Protection has supervisory authority over local water management districts, although they each have an individual governing board. Local school districts are independent of the State Department of Education. Community, economic, and workforce development at the state level are all under the state Department of Economic Opportunity.

The current administration places major emphasis on job creation. Governmental efficiency and public safety are other major state executive branch focus areas. The state has made substantial expenditures on environmental conservation and natural disaster preparation, response, and recovery, and continues to invest in education. All of this is being done while the state is cutting taxes. The net effect is likely to be reductions in state services—particularly

health and human services—and in regulatory oversight. State law effectively prohibits cities from participating in competitive markets, specifically broadband.

There appear to be few regional governance entities in Florida. The state has ten planning regions, all coordinated and supported by the statewide Florida Regional Councils Association, whose roles are more supportive than governing. The Planning Councils are multi-purpose entities comprised of local governments. Two-thirds of board members for each council are local elected officials, and one-third of board members are appointed by the governor. Palm Coast is on the south end of the Northeast Florida planning area, and practically carved out of the north end of the East Central Florida area. While each Planning Council serves a set of core functions—economic development, emergency response, and land use planning support—how they operate and the services they provide vary greatly between councils. The bulk of the Councils' funds (60%) come from federal grants. Local funds cover about 35% of the Councils' budgets. The state provides only about 5% via contracts, and no general state funds are appropriated to the Councils.

There are also regional Community Action agencies and Councils on Aging across the state. Northeast Florida Community Action Agency administers HUD programs in the area—Community Service Block Grants, Low-Income Energy Assistance Program, and Weatherization Assistance Program. Most public seniors' services are provided by the cities and counties, or by the Florida Department of Elder Services' Division of Statewide Community-Based Services, via eleven Area Agencies on Aging. ElderSource serves and the Area Agency on Aging of Northeast Florida, but is almost entirely a coordinating role.

Society

American society is becoming more demographically and socially diverse, and is trending older particularly among persons of Asian and European descent. The culture has become less formal and more inclusive of fringe activities and groups. While traditional recreational pursuits and social institutions have seen participation erode, numerous new micro movements have gained steam. From local foods and craft beers to custom cars and mini homes, small-scale endeavors have become hugely popular in recent years. At the same time, people are more skeptical toward traditional mass institutions such as higher education, journalism, and political parties. The ascendant new mass institutions are gaming and social media. People are generally seeking more curated experiences, often as a combination of educational, recreational, and social activities.

Technology

Artificial intelligence, automation, and big data represent a major technology trend toward greater digitization of processes and things. Most anything can now be intelligent. At the same time collaborative technologies, multi-player gaming, and social media represent another technological mega trend toward increased connectivity and information access along with social fragmentation. Thanks to technology, we are less longer burdened by physical work or

limited by place. This means people can focus on creative interests and others who share those interests.

As more activities become digitized, and more value is transacted online, more cybercrime and information breaches are inevitable. Technology is essentially creating whole new areas of the economy, which must be monitored and secured, albeit in totally different ways. Digital technology is useful for monitoring things and controlling access to them. By the same mechanism, if security is breached, negative impacts can multiply. Ultimately, cybersecurity failures can undermine trust in institutions, markets, and polling places, threatening the very foundations of free-market liberal democracy. The huge increase in spending on cybersecurity and its integration at the highest strategic level of corporations and governments is no surprise. The arms race will inevitably continue as new risks emerge from artificial intelligence (AI), social media, and other tech trends.

A critical element of technology as an opportunity or threat is the capabilities required to use it. As organizations digitize to increase efficiency and speed operations, workers must upgrade their skills and move into higher-value positions. There is a substantial portion of society that is left out of the workforce—and most of the economy—due to lack of access and education. It is practically impossible to succeed today without solid technology skills and understanding. On one level, detailed technical knowledge is required for advanced roles. This knowledge base is constantly changing. On another level, general knowledge of the practical and strategic implications of technology is required of effectively everyone. It can be particularly important—and difficult—for key decision-makers and top officials to have these insights. Technology can change rapidly, but certain basic realities remain: Constantly learn or be left behind.
The other key trend in technology is connectivity. The rate at which digital, IP-based connectivity has spread is unprecedented. As more areas get connectivity, the trend to increase network capacity and throughput will accelerate. Consumers are demanding more options for connectivity, with new devices and services that deliver any form of information, anywhere, anytime. Where old local telephone systems were monopolies, today's markets and technology allow numerous entities to provide network services. For connectivity, the bottom line is determined by the density of subscribers/users within a geographic area. Areas with strong growth in high-income occupations and residences are attractive to network service providers, especially if the cost of entry can be kept low.

Summary

Generally, FiberNet has abundant external opportunities, which align with internal City of Palm Coast requirements and with Smart City opportunities, discussed on page 38 and elsewhere in this document (see cross-reference). Generally, the opportunity is to use design-oriented development events as a means to draw diverse, tech-savvy, young persons to Palm Coast, then to implement what they design. Bureaucratic inflexibility may be a barrier to this opportunity, and to associated opportunities from regional growth and technological innovation. Top-down, exclusive approaches probably won't work. Open, inclusive approaches are better.

Part of this is due to economic and geographic location between two of the state's large metropolitan areas. Palm Coast could too easily be swallowed by the region as a bedroom community to Jacksonville and Orlando. FiberNet gives the City a competitive toehold, especially in the areas of business and professional services, education, and healthcare. It can be a point of engagement, where people feel they can really make a difference, literally differentiating the community from a horde of competitors.

The key general objective for the region appears to be attracting and developing highly capable workers, particularly people relatively early in their careers. As a literal greenfield, Palm Coast can create a space tailored to this demographic. Consumers increasingly seek experience and expect to be engaged in a product or service. The opportunity is to host a collaborative design and development process, and the parallel threat is to be ignored by young independent professionals.

FiberNet itself is a design topic, as well as a key component in an overall design, and can be a means for understanding other opportunities and threat. People value that which they have a hand in designing, and that which gives them understanding. FiberNet can be a platform for both of these outcomes. The overall opportunity is for Palm Coast and FiberNet to provide a blank canvas for investors in key areas—business and professional services, education, healthcare, real estate, and technology—while guiding how and where they invest to align with local priorities and values. The best way to do this is via a broad-based, collaborative, and inclusive process rather than via traditional expert-driven, official-oriented programs.

2.7.2 Strengths and Weaknesses of FiberNet

FiberNet consists of 54 miles of fiber-optic cable, buried in 60 miles of conduit, including two spare conduits alongside the one occupied by the current FiberNet backbone cable, with 110 splice cases. It has two core carrier-class switches, one in each of two co-location facilities, and various types of Customer Premise Equipment, including media converters, and small-form Ethernet switches. FiberNet connects to the internet at Jax NAP via a 1 Gbps circuit from JoyTel (swapped for local fiber), backed up by 30 Mbps direct internet access via Spectrum Business. The City also has two other 1 Gbps circuits from JoyTel, one for disaster recovery and one interconnection with other providers.

The network currently connects 120 locations, including 45 private businesses, or about 6% of the economic base, including several cell sites. The network has grown by an average of 10 connections per year since 2006. FiberNet's primary customers are network service providers, along with other wholesale customers—the local school system and the City, itself. Several City assets and facilities—notably Water Treatment Plant 2—are not on the network, and FiberNet is terminated adjacent to (or even in) multiple business locations that are not connected to the network.

2.8 FiberNet description and issues

The City of Palm Coast FiberNet consists of 53.9 fiber-optic sheath-miles, 60 route-miles of conduit, and 110 splice cases. It has a combination of two interconnected rings to the north and a tree-and-branch architecture, with a ring around City Hall, to the south. Major road corridors were meant to be backbone routes, which required three (3) 1.25-inch conduits in the public right-of-way, and a 288-strand fiber-optic cable in one of those conduits, leaving two additional pathways. Laterals from the backbone were specified as one (1) 2-inch conduit and appropriate strand-count cable for the area or connected facility.

FiberNet incorporated two co-location facilities, or interconnection points, one on Palm Coast Parkway (west bound) at Belle Terre Parkway, directly in front of Utility WTP1, and a second on Central Ave, at Central Park in Town Center, just south of City Hall. Connections on the Palm Coast network are divided between co-location facility (Co-lo) 1 and Co-lo 2, which are centrally located in the clusters of customer locations. All customers were served with dedicated fiber pairs that home-run from their premises to one of the co-lo facilities.

As of this analysis, FiberNet had a total of 124 connections, most of which are at public facilities or traffic signal cabinets, as listed in Table 9. The City of Palm Coast budgeted $2.5 million in seed money over 5 years (2006 – 2010 @ $500,000 annually). Further, FiberNet cost the City approximately $200,000 per year from 2013 to 2017, and generated an average of $631,151. FiberNet has generated an average of 7.7% of the City of Palm Coast's Information Technology Fund expenses, while contributing an average of 12.7% of annual revenue, not including revenue from other City departments for communications services (to public facilities and traffic signal cabinets listed in Table 9.

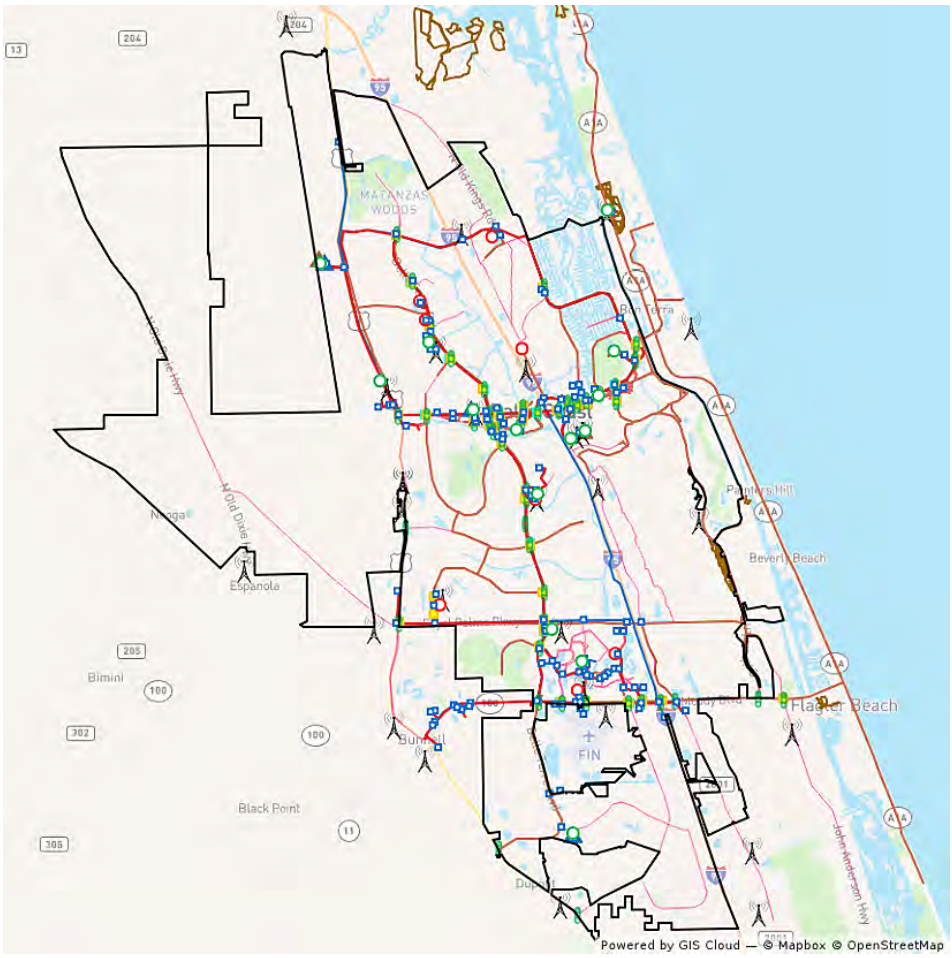
Table 9. FiberNet connection count by type

CONNECTION TYPE	COUNT
AVAILABLE-UNUSED	5
PRIVATE CUSTOMER	45
PUBLIC FACILITY	16
TRAFFIC SIGNAL CABINET	44
TOTAL	**120**

FiberNet was designed to first connect public facilities, selected strategic routes that would connect commercial and industrial areas at the same time - residential areas were never planned. Commercial, industrial, or institutional locations were provided with a lateral, and major building entries had a splice enclosure and vault. From a purely geographic perspective, the network infrastructure has current gaps on FL SR 100, far north (near A1A and I-95) and south (along Seminole Woods Rd.), along Colbert Rd., and in the northwest quadrant of the City (along Old Dixie Hwy and between it and Hwy A1A).

Figure 33 shows the fiber-optic cables (red lines) and junction points (blue squares) are located in proximity to City facilities (green circles), schools (red circles), traffic signals (orange squares and green rectangles), and utility plants (triangles). Other than in the far north and south ends of the City (black line), the fiber is adjacent to most cellular telephone tower sites. Diagrams in Figure 34 and Figure 35 show more detail for strand counts (circles) and the location of splice cases (hexagons). The clusters of connections (and customers) are along Palm Coast Parkway, to the east and west of the freeway, and along FL SR 100, with the airport to the south and downtown to the north.

Figure 33: Map of the City of Palm Coast FiberNet



There were multiple public and secure Wi-Fi access points connected to FiberNet, particularly in parks and public buildings. The City of Palm Coast was connecting traffic signals, which will involve fiber to dozens of intersections, as the time this report was being produced. The water plants, wastewater plants, and utility administrative buildings were connected but other utility infrastructure have RF-based communications rather than fiber. (As discussed above, the utility

plant networks were being moved to a physically separate network with no connection to the internet.)

The splice case at the northwest corner of Belle Terre Parkway and Palm Coast Parkway, near Co-lo 1 has limited capacity. It does not have enough slack in the enclosure and the splice case will not reach a splice trailer so any splicing will have to be done on the ground. There are effectively no available strands in the cable from the splice case to the co-lo. The 288-strand backbone cable at Palm Harbor Parkway and Forest Grove Drive, to north and on the other side of the highway, was relocated for road work. Only 48 strands were spliced to complete the ring back to Co-lo 1. The other strands were left unspliced (not connected.)

The cable along FL SR 100 (E. Moody Blvd.) between Belle Terre and Bulldog Drive is 24-strand in traffic control conduit, and has only a few spare fibers remaining in the sheath. This section should be part of a 288-strand backbone cable, buried in conduit, that continues to and along Town Center Blvd, completing a “downtown” ring. The accessibility and security of Co-lo 2 may be an issue, and may be best moved into City Hall. City Hall is currently connected by 24-strand lateral cable from the backbone.

Figure 34: Diagram of FiberNet facilities near Co-lo 1

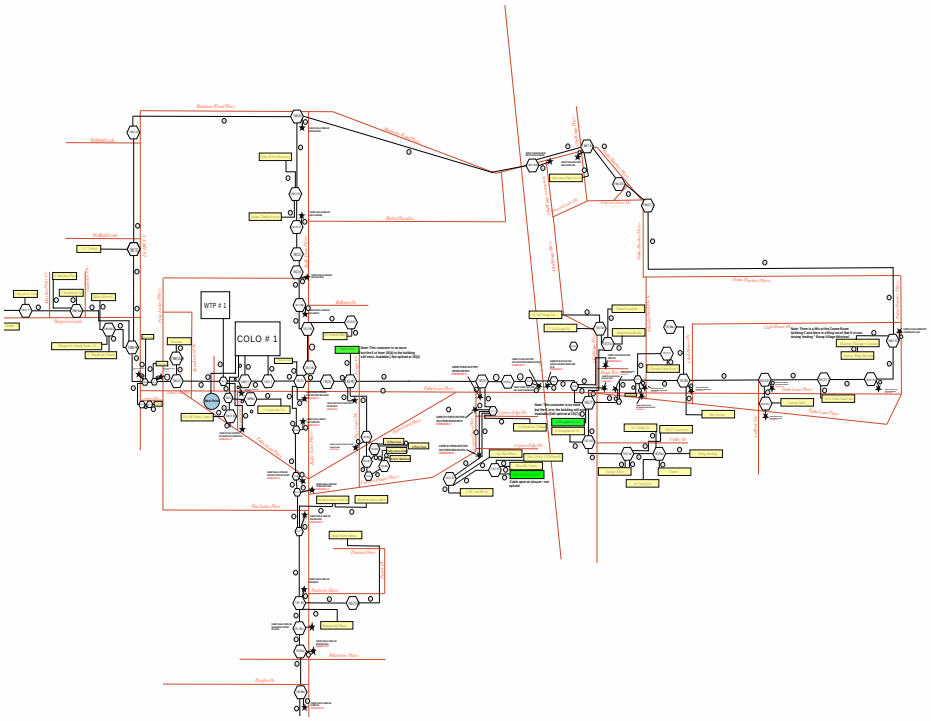
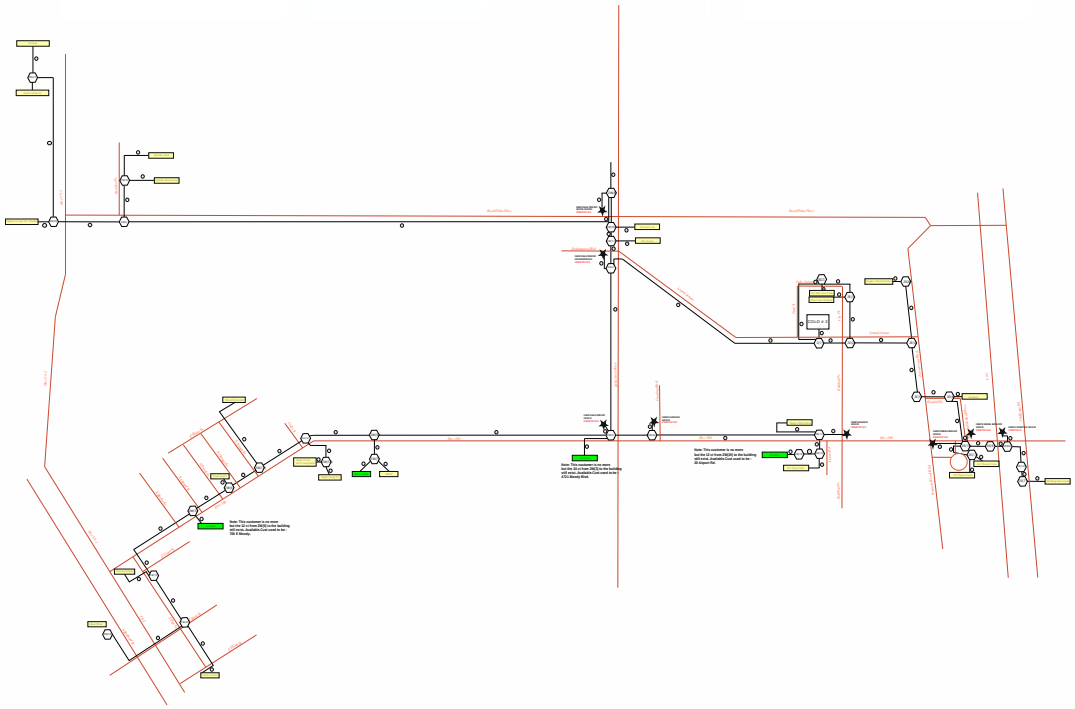


Figure 35: Diagram of FiberNet facilities near Co-lo 2



Network Operations[20]

The public FiberNet and the City's enterprise network were physically separated: They used separate strands within each fiber cable. The co-location facilities in the City (Co-lo 1 and Co-lo 2), were used by the City's enterprise wide-area network (WAN) and FiberNet to interconnect various providers and sites. The City had two internet service providers but was not load-balancing between them. A single network management system (WhatsUp Gold) was used for both networks because there are only a couple of routers on FiberNet. The City network ended up as a quasi-ring. City Hall was not on the ring, but it does not go through Co-lo 2, it homeruns to the City's current data center. It uses only 4 fibers into Co-lo 2, and is connected into the ring to Co-lo 1. The City plans to move its current data center to City Hall, but the project is on hold until a backup generator gets installed.

The cost of getting connected to FiberNet has been a concern, along with the amount of time it takes to respond to requests for service and the related issue of staff capacity. There was some belief that a different pricing model—one that covers the full cost of customer connections—might address these issues. The FiberNet business model has been to sell wholesale connections to providers who then sell retail Internet services to commercial (not residential) customers. The business approach has been reactive: planning connections only started after

[20] Most information for this sub-section came directly from City of Palm Coast IT Director Steve Viscardi as part of discussion about internal needs and plans.

customer request, and each drop had to be costed out and approved before deployment occurs. Every customer connection has been deployed as a homerun connection, with a dedicated pair of fibers to each customer from their assigned Co-lo. There has been no dedicated FiberNet network management resources, in fact, only four resources are currently in the IT Operations Division.

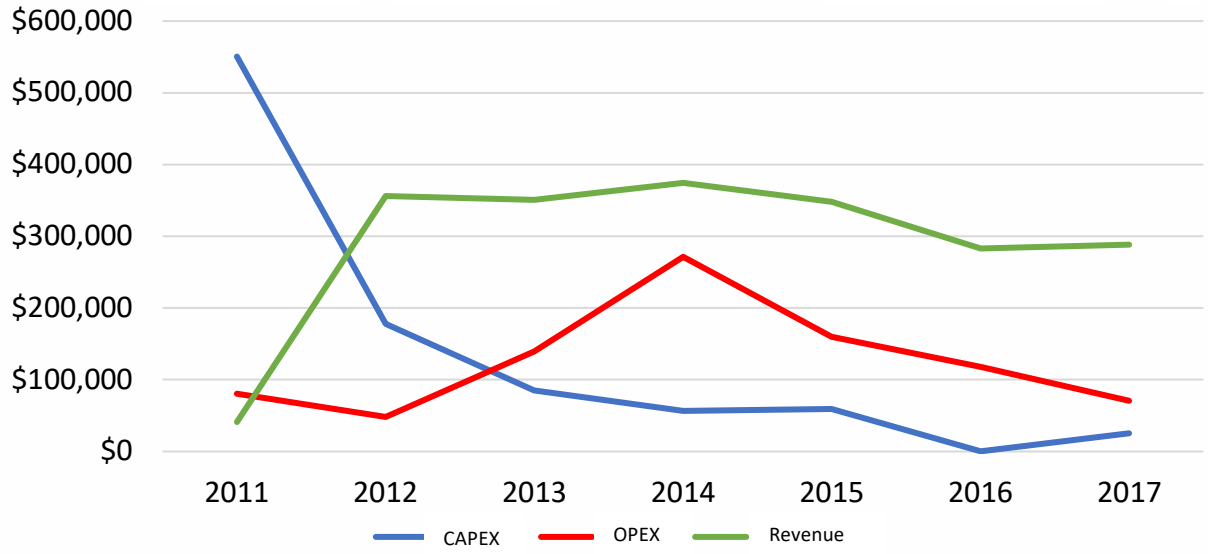
Market conditions for FiberNet have been unclear. Do many small businesses really need gigabit Internet services? There may be plenty of supply from AT&T and Spectrum, and AT&T said they would deploy fiber anywhere they had Uverse. Uniti Fiber has deployed throughout the community to reach most cell towers. Many of the local providers struggle to run their operation and manage billing, including payments due to FiberNet. The school system recently put in all their own equipment, including network units and transceivers. Most FiberNet issues seemed to be with customers getting connected to the network, but beyond that the network has required little operational support; it "practically ran itself." It has been unclear how the IT Department might help with customer issues other than offer consulting service to help people get the right network equipment.

FiberNet financial performance

FiberNet generated almost $300,000 of revenue per year, and averaged 12.7% of IT revenue (between 2013-2017). This translates to just over $5,500 of revenue per customer annually. The network has an average of $3,300 of expenses, including the costs of all public connections, per private customer. In contrast, FiberNet has only four customers, including Flagler County Schools. The three private customers generate less than $2,000 of revenue per month. Since the initial deployment in 2011-2012, overall expenses averaged $223,911 per year, or 8.8% of IT expenses. Sixty percent of these were operating expenses, with around $45,000 per year going to capital expenses. As illustrated in Figure 36, FiberNet capital expenditures have consistently declined and operating expenditures have declined since a peak in 2014. Note that revenue has been reasonably static since 2012.

FiberNet allows the City to save in approximately $310,000 in telecom costs per year. This estimate is based on the cost of a 1 Gbps connection from Spectrum for 20 sites at $1,295 per month over a 12-month period. This equates to a savings of over $3 million since 2008.

Figure 36: Overview of capital and operating expenses compared to revenue for FiberNet



The expense and revenue trends suggest that FiberNet's revenue growth has directly driven by capital investment while sustained revenue has been dependent on operating expenses. The 2012 leap in revenue occurred immediately following the peak in investment in 2011, and has been steady since. This suggests that further capital expense will be necessary to grow revenue. Revenue declined somewhat with operating expenses since 2014. It appears revenue cannot be maintained without on-going investment in operations. This analysis comports with basic business and economic principles.

Table 10. Summary expenses and revenue related to FiberNet

	OVER 5 YEARS
TOTAL EXPENSES	$15,359,662
FIBERNET EXPENSES	7.7%
OTHER IT EXPENSES	92.3%
TOTAL REVENUE	$12,988,851
FIBER REVENUE	12.7%
CELL TOWER REVENUE	10.9%
INTERNAL REVENUE	75.0%

On average over the last five years, the IT department has 10.8 full-time equivalent employees (not counting part-time/temporary). Based on Figure 38 and

Table 13, the general trend appears to have been increasing analyst and support resources, paralleled by a reduction in management and production roles. Both higher- and lower-level jobs were reduced while mid-level jobs expanded only a fraction, equivalent to one full-time pay-grade 12 position. Workforce expense and staffing numbers are translated into baselines for FiberNet fiscal and workforce capacity, summarized in Figure 40.

Figure 37: IT revenue 2013 to 2017, including all cell tower rental and FiberNet services

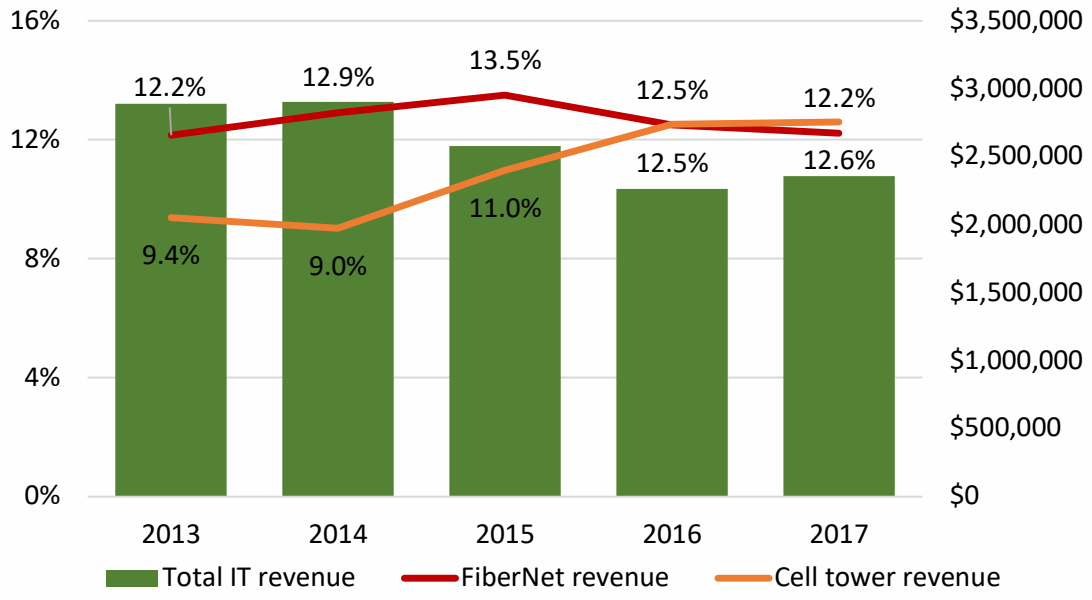
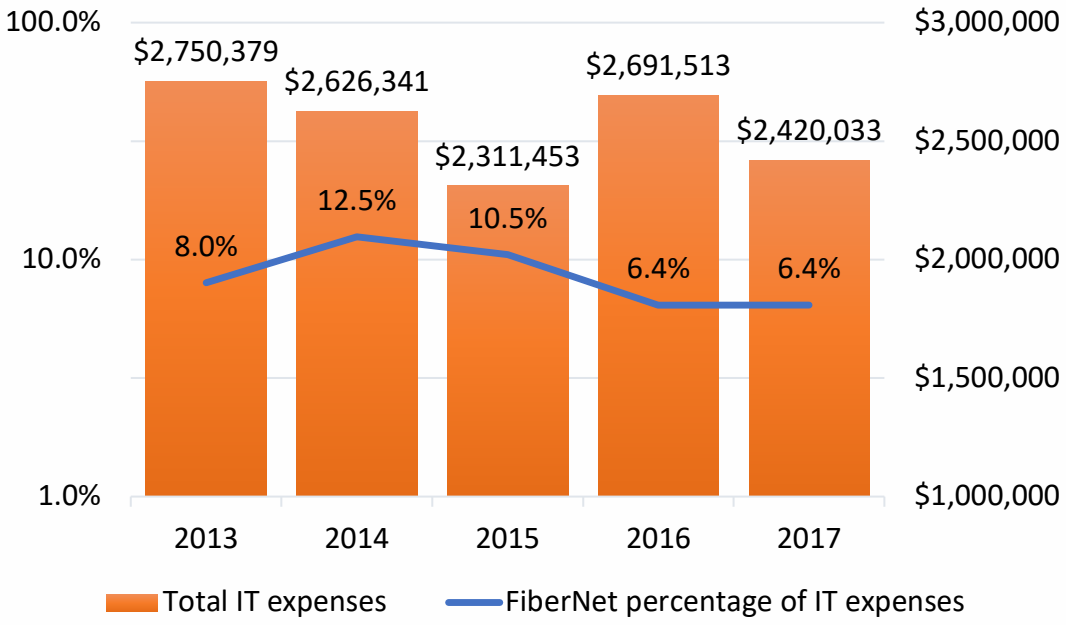


Figure 38: Total IT expenses, 2013-2017, including FiberNet



The majority of FiberNet's expenses, $89,268.61 on average, were workforce-related and for machinery and heavy equipment. Operating expenses over the last five years, minus benefits, salaries, etc., totaled $101,553.

Table 11. FiberNet cost structure 2013-2017

EXPENSE	5-YEAR AVERAGE
PERSONNEL SERVICES, INCLUDING BENEFITS AND CONTRACTORS	55.3%
ELECTRICITY	2.0%
REPAIR AND MAINTENANCE SERVICES	5.8%
ADVERTISING AND PROMOTION	0.1%
OPERATING SUPPLIES AND EQUIPMENT UNDER $5K	1.1%
MACHINERY AND EQUIPMENT OVER $5K	35.6%

Changes in IT expenditures suggest that workforce (personnel services), operating costs, and capital outlays are being reset to historical levels and to meet increasing demand for capabilities.

Table 12. IT workforce structure and change by title, 2013 -2018

CLASSIFICATION TITLE	CURRENT FTE	CURRENT FTE	PERCENT OF AVERAGE FTE 2013-2017	AVERAGE ANNUAL CHANGE 2013-2018
Application Analyst	3	23.1%	13.5%	2.6%
GIS Specialist	3	23.1%	19.2%	0.6%
Information Technology Director	1	7.7%	9.6%	-0.5%
Operations Manager	0	0.0%	5.8%	-2.0%
Senior Application Analyst	1	7.7%	9.6%	-0.5%
Senior Staff Assistant	0	0.0%	5.8%	-2.0%
Support Assistant	1	7.7%	3.8%	1.5%
Senior Support Analyst	0	0.0%	5.8%	-2.0%
Support Specialist	0	0.0%	5.8%	-2.0%
System Administrator	1	7.7%	9.6%	-0.5%
Tech Support Administrator	1	7.7%	3.8%	1.5%
Tech Support Analyst	2	15.4%	7.7%	3.1%
Total Full-time	**13**			**5.6%**

Table 13. Workforce structure by pay grade

PAY GRADE	AVERAGE FTE 2013-2018	PERCENT OF AVERAGE FTE	PERCENT OF CURRENT FTE (13)	DIFFERENCE AVERAGE AND CURRENT
22	1.00	9%	8%	-1%
18	1.50	13%	8%	-6%
17	1.00	9%	8%	-1%
16	0.67	6%	8%	2%
15	1.67	15%	23%	8%
14	1.00	9%	15%	6%
13	2.67	24%	23%	-1%
11	0.67	6%	0%	-6%
9	0.50	4%	8%	3%
8	0.50	4%	0%	-4%
	11.17			

The simple fact is that the City of Palm Coast does not have the capacity to operate FiberNet, and it is not clear it has the ability. The IT department has neither a network manager or a telecommunications technician. FiberNet personnel must be able manage customers and promote the network as well as operate it. There may be capabilities in other departments, outside of IT, but those are not assigned to FiberNet under the present arrangement. The City of Palm Coast is operating FiberNet as an enterprise network, but is not prepared to operate it as a carrier's carrier.

The provider customers—Datacom and Palm Coast Internet (PCI)—also have limited capabilities. Datacom is staffed part time by its owner who has a full-time job. PCI has a few staff, including the owner whose primary business is food services, but no dedicated sales and marketing personnel. PCI's technical staff also does PC repair and similar jobs. And, the company is in arrears with the City, so appears to have limited fiscal capacity. Basically, FiberNet's customers are barely performing as internet service providers, which is not saying much given the notoriously low service levels for the industry.

Table 14. City of Palm Coast FiberNet financial baselines based on annual averages, 2013-2018

EXPENSE OR REVENUE		AMOUNT
TOTAL OPERATING EXPENSES		$137,119
WORKFORCE EXPENSES	$116,818	
OPERATIONS & MAINTENANCE EXPENSES	$20,301	
CAPITAL EXPENSES		$86,782
TOTAL ANNUAL EXPENSES		$223,901
ANNUAL REVENUE		$328,886
EXCESS REVENUE		$104,985

FiberNet is clearly profitable, as shown in Table 14, even though revenues have been declining over recent years, as shown in Figure 37.

Excess revenue is not being reinvested in FiberNet, but is used to buy down the cost of IT services for City departments. It has the bones of an Open Access network but not back office systems, operations, and capable providers.

FiberNet needs a fund to pay for access lines (connections), so those costs don't have to be fully imputed to customers before they can connect, and it needs marketing and sales capabilities. FiberNet also requires customer service, finance, and operational capabilities, which could conceptually be provided by other City departments, but there are no policies or procedures in place to tap those resources. Even billing appears to be minimally handled by the City, based on the difficulty getting and lack of detail in customer invoices provided through this assessment.

2.8.1 Summary

FiberNet is a vital community asset, which has connected City and school sites for nearly a decade, driving down the cost of connectivity for both agencies. It has abundant opportunities due to the national and regional economy, social and demographic trends, and evolving technology, as summarized in Table 15. The threats are relatively low-impact or long-term. The two-critical threat—weak workforce supply and impending urban sprawl—can be proactively addressed together by local development. The key is activities and assets in Palm Coast to tap the opportunities while working to mitigate potential threats where possible.

Table 15. FiberNet SWOT anaylsis

	Have/Positive	Need/Negative
	Opportunities	**Threats**
External/Future	Strong regional economy, including projected demand for real estate Global destination and transit area Low cost of living, high quality of place State emphasis on job creation Fringe opportunities, craft and niche markets Less need for physical labor Increasing economic gains from technology	Supply of intellectual, social and technical abilities, educated and skilled persons Relatively low wages Urban sprawl and "bedroom community" syndrome State-level services and support, particularly for planning, development, and social issues Attitudes toward institutions Cyber-security: bots, breaches, hackers, viruses, etc.
	Strengths	**Weaknesses**
Internal/Current	Abundant network infrastructure Revenue positive with minimal effort Numerous greenfield developments Local Smart City type initiatives	Physical bottlenecks and gaps in the network Operational capabilities Investment in FiberNet, FiberNet subsidizing IT for other departments

FiberNet is a strength, in and of itself, and its position in Palm Coast is viewed as an even greater strength. It is currently generating excess revenue, has numerous low-hanging fruit business opportunities, and can be extended into new developments. City IT projects and citizen-facing Smart City initiatives also represent a strength for FiberNet, particularly to the extent that the result in new assets or demand for FiberNet. FiberNet's weaknesses can be addressed internally, via redirecting excess revenue, and through development of a P3 (public-private partnership) to support expansion and operations of the network. More importantly, the City of Palm Coast can use FiberNet to tap regional, national, and even global opportunities, while mitigating critical threats. Under-skilled workforce, urban sprawl, and cyber-security are very different threats but FiberNet could be a part of the solution to addressing all three as discussed above under "Palm Coast Smart City Opportunities."

3 FiberNet Design Issues and Options

The extent, placement, and specifications of network infrastructure depends on the City's goals, needs, and priorities. Section two detailed issues and opportunities for FiberNet, including its assets and capabilities. This section describes options for addressing infrastructure and service issues, and the implications for the City's strategy and FiberNet's potential. Bottlenecks and gaps limit the network's capacity and reach, respectively, and impede core uses for the City. Extending the network to Near-Net sites, deploying additional backbone along the way, increases the network's customer base and its reliability. The network architecture must evolve to more efficiently use the infrastructure, which means deploying technologies such as gigabit passive optical network (GPON) equipment and setting up back-end systems to manage operations. This section considers each of these options in decreasing detail: Bottlenecks and gaps are specifically addressed but GPON and FTTH, even more so, get general discussion and estimates.

3.1 Bottlenecks and gaps

There are three major issues with FiberNet's current infrastructure:

1. Main splice case at Belle Terre and Palm Coast Parkway - Cost Estimate: $50,000

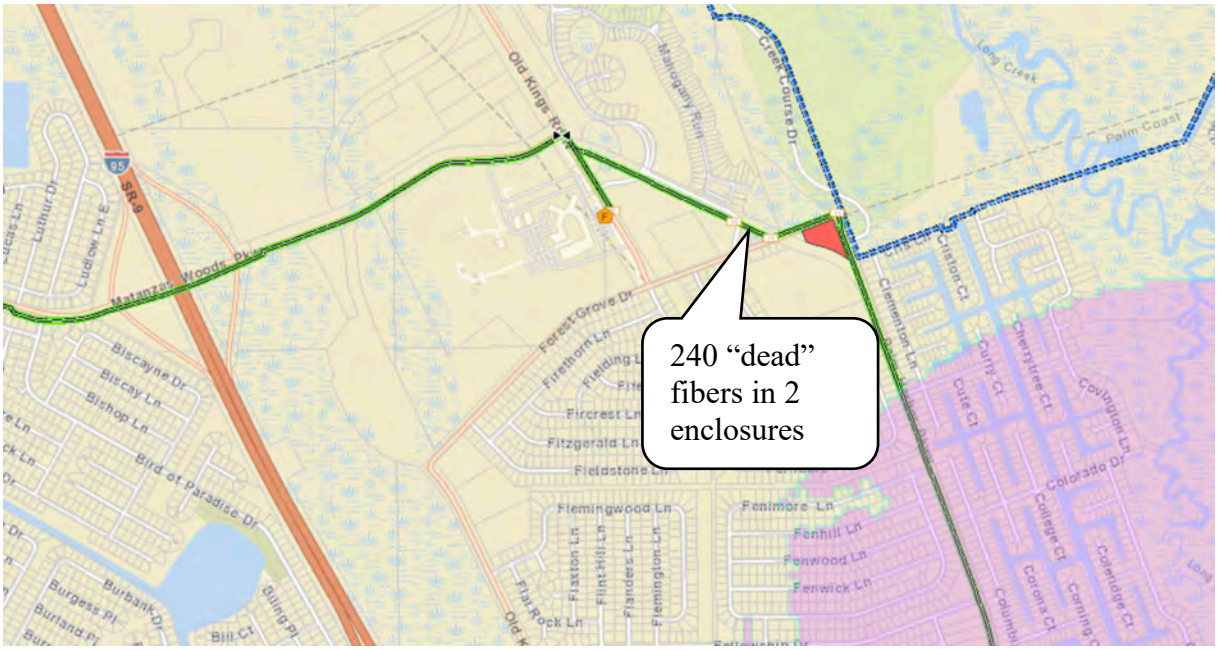
FiberNet has dual co-location "hearts," which are referred to a co-lo 1 and co-lo 2. A main splice case near co-lo 1, shown in Figure 39 at the corner of Belle Terre Parkway and Palm Coast Parkway has no available cable slack. Nothing else can be connected by splicing into the cable simply because it isn't long enough. Slack from this case had to be moved east a few years ago for an emergency restoration at Lupi Court. The bottleneck is especially severe because fiber comes into this case from four directions, interconnecting the northern and southern halves of FiberNet's infrastructure. It would cost approximately $50,000 to pull new 288-strand cable from this case to the nearest vaults in all directions to replenish slack.

Figure 39: Bottleneck at Belle Terre Blvd and Palm Coast Parkway

2. "Dead" backbone strands on Forest Grove - Cost Estimate: $15,000

The northern portion of FiberNet consists of east and west rings. In the northeastern portion of network, near the intersection of Palm Harbor Parkway with Forest Grove Drive, 240 backbone fibers were left "dead" (not spliced together) to save money on a previous restoration. Illustrated in Figure 39. This bottleneck greatly reduces network capacity in some of the densest and rapidly growing parts of the City. It limits redundant routes along FiberNet's northeastern ring. The fibers need to be spliced in two handhole enclosures on Forest Grove Drive between Old Kings Road and Palm Harbor Parkway (see Figure 40), which will cost approximately $15,000. This issue may also accommodate, and be resolved by, extending the backbone in this area.

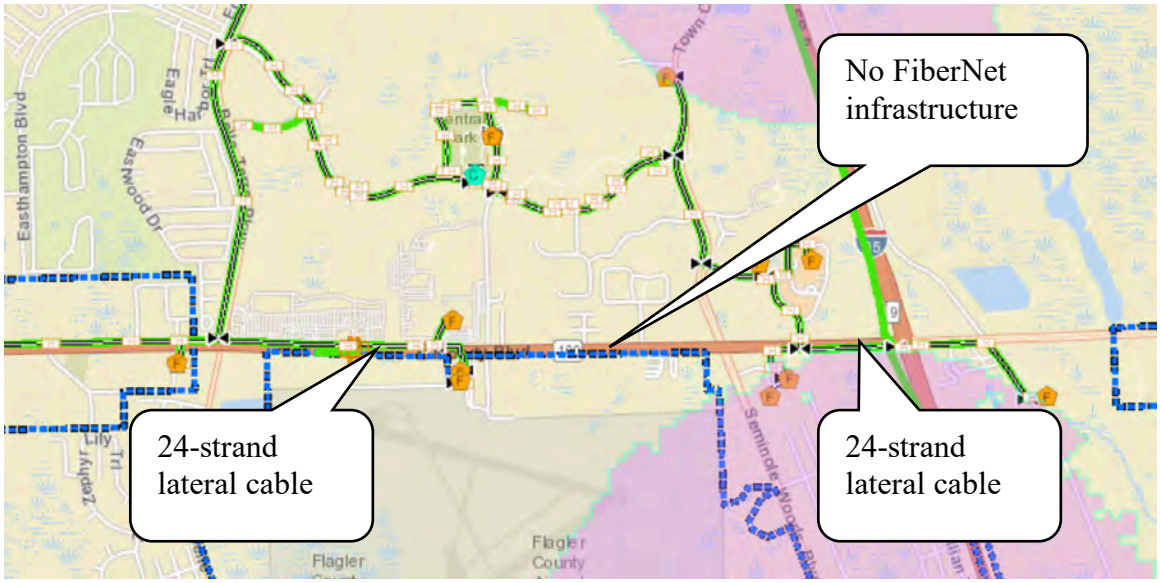
Figure 40: Fiber bottleneck at Forest Grove Drive between Palm Coast Parkway and Old Kings Road



3. Backbone gap on SR 100 adjacent to the airport and Town Center- Cost Estimate: $94,000

SR 100 is currently the southern edge of FiberNet. The City has a 24-strand fiber optic cable running east along SR 100 from Belle Terre Parkway in traffic signal system conduit to feed Flagler High School and customers along Airport Blvd. Another 24-strand fiber runs southeast from City Hall past Florida Hospital, east along 100, under I-95 to Old Kings Elementary School. The result is a gap in a ring, shown in Figure 41, that includes City Hall, co-lo 1, major customers, and most of the Town Center DRI area. All of these areas are currently on isolated network legs and would benefit from redundant routes. A backbone fiber along SR 100 would provide access to additional customers, increase overall capacity and reliability, and allow for extension east to Colbert Road. In 2017 the estimated cost to close this ring with new conduit and 288-strand fiber was approximately $94,000.

Figure 41: Gap along SR 100 between Belle Terre Parkway and Seminole Woods/Town Center



Beyond these major bottlenecks and gaps, there are four areas of the city that have no FiberNet infrastructure. Two parallel gaps in FiberNet exist along US 1/State Street and Old Kings Road between SR 100 and Palm Coast Parkway. These routes would increase redundancy and put more customer and cell tower sites on FiberNet. Depending on business goals and issues, these should be considered top priority for network expansion.

For mid-term prospects, the biggest gap in FiberNet may be the area south of the airport. It features two open economic development areas, a major residential development, numerous business and industry locations, and several approved or current cell tower sites. The eastern end of SR 100 and Colbert Lane provide a route for the network to connect several new developments and get closer to Flagler Beach and other tourism assets. It would be a major expansion but could have great value in the future.

The largest overall gaps are in the northwest portion of the City, in the Neoga Lakes and Old Brick Township areas. There is no FiberNet infrastructure in the northern part of Palm Coast adjacent to I-95, either. These areas would require extensive new backbone infrastructure and are likely long-term expansions more than three to five years in the future, likely tracking future development opportunities.

3.2 Issues with Current Business Models and Providers

The current FiberNet business model adopted in 2010 was wholesale Open-Access, and direct Government Services transport (think interlocal with schools), and has included the lease and trade for dark fiber. The business model has evolved out of necessity and opportunity, however, the previously adopted structure of providing lit Open-Access circuits has been fraught with management and business-related issues. These issues include CAPEX funding requirements, lack of risk taking by the partnering providers, and general ROI of expansion investments. While Open-Access was the intended business model of FiberNet, and it is still conceptually deployed today, the City must have partnering providers who can assist the City in growing the market and expanding the network – today's partners do neither.

Through development of this new Business Plan, FiberNet 2.0 should focus the City's attention on expanding FiberNet through a sound business case and investment roadmap, providing a high-speed fiber offering to support businesses, community anchors, and to support greater municipal connectivity, including Smart City. The City's focus towards its next business model should provide a revenue structure that supports FiberNet's expansion, passive operational requirements, and most importantly, the long-term sustainability of the network. The model should identify a partner(s) who would undertake an aggressive marketing and sales campaign to expand FiberNet's availability throughout the network's service area, and one that would provision and manage services, as a network operator on behalf of the City. Further, the City wants a partner(s) who is willing to share risk and can possibly bring capital investment to bear on the partnership.

3.3 Issues with Current Network Architecture

The current FiberNet business model and architecture was developed and deployed as an Active Ethernet (AE) service offering only. GPON, or Gigabit Passive Optical Network, technology was really in its infancy 10-years ago and was not an ideal technology for Palm Coast at the time. That has led to the use of most of the fiber strands in many of the backbone segments. Active Ethernet as deployed today requires two (2) fibers for every customer – home run back to a Colo. This aggregates to two fibers for each customer/connection in the backbone segments. Today, BiDi (bidirectional) fiber-optic transceivers are available for AE, requiring only a single (1) fiber strand, providing 50% better utilization over today's method. Further, GPON technology can aggregate 32, 64, and even 128 customer connections on a single (1) backbone fiber strand given proper placement of passive optical splitters.

These technologies would allow the City to recapture fiber strands, allowing for a better long-term fiber utilization plan. The City could potentially forego having to upgrade existing fiber backbone segments, opting for better utilization foremost, saving further fiber expansion until its truly required. The City should look to include GPON services, and the supporting technologies into the next FiberNet equipment refresh.

3.4 Evolving FiberNet's Architecture

"Architecture" refers to a network's structure, to the components that make it up, interconnections between those components, how it operates, including its capacity for customers and data traffic, and what functions it delivers. It is an important consideration as the City of Palm Coasts decides if and where to invest more in FiberNet. Network architecture constrains or enables business models. Some architectures are much more flexible and scalable than others. FiberNet's architecture is currently a combination of physical ring and logical dual-star, in which every user is directly connected via dedicated backbone fiber strands to one of two co-location facilities. This is not an economical, flexible architecture. The City of Palm Coast should consider alternative approaches that can be scaled and managed more effectively.

3.4.1 Transition to GPON

Gigabit Passive Optical Networking (GPON) is the modern standard for advanced FTTP networks. GPON allows a single backbone strand to serve numerous customers with gigabit connections, while enabling the service provider to offer tiered services. Each Optical Line Terminator (OLT) port in a central site (co-location facility) is passively split—literally light through a prism—to connect to either 32 or 64 Optical Network Terminals (ONTs) at subscribers' premises. New PON technology will soon serve 128 customers via a single 10 Gbps OLT port.

GPON could be a vast improvement over FiberNet's current homerun architecture. Currently, each customer connection requires a pair of fiber strands in the backbone between one of FiberNet's co-los and the customer's premises. Therefore, some routes are limited to 144 or fewer customers/connections in that whole portion of the network, while other portions of the fiber are stranded, unused, and in some cases "dead." GPON is better because it can serve more customers at less cost without abandoning network assets.

FiberNet would continue to utilize Active Ethernet (AE) in a multi-ring topology, as it does today, however AE would be reserved for City sites, schools, and other community anchors/organizations who require dedicated, guaranteed capacity. FiberNet should consider introducing a GPON offering targeted to the small and medium size business (SMB) market in conjunction with AE. The GPON/AE architecture allows for a broad array of services at very high speeds with maximum reliability. A GPON/AE service offering would put FiberNet ahead of local incumbent ISPs, especially if its offerings include an entry-level fiber-based service priced competitively with "best-effort" legacy services which are still prevalent throughout the Palm Coast market.

Many network component manufacturers offer FTTH/FTTP technologies that support both Active Ethernet and GPON within a single chassis solution. Companies such as Adtran, Alcatel, Calix, Cisco, and others provide solutions today that incorporate a platform of various service offerings. An Active Ethernet/GPON services platform allows a provider to easily deliver an entry level broadband offering such as GPON, with a simple straightforward option to migrate

users to a dedicated, Active Ethernet offering with superior guarantees. Systems such as these are great for today's service providers because multiple solutions are incased in the same box, limiting the total amount of hardware required to support the services.

A critical issue is whether there is pent up demand for fiber-based telecommunications services throughout the Palm Coast market. FiberNet has an opportunity to deploy a FTTP fiber distribution technology in key business areas and corridors focusing on the development of Broadband Deployment Zones within the FiberNet service area. Business districts, land use areas, and/or utility district could serve this purpose, based on strategic objectives and operational structure. For current purposes, a business district is used to assess commercial opportunities and utility districts are used to analyze FTTP opportunities.

A feeder/distribution network is required to make an area eligible for GPON services. Several districts in Palm Coast would benefit from next generation broadband services, based on the type, amount, and density of businesses that are contained within these zones. Buildout of broadband infrastructure in zones would equip them with the physical fiber-optic network capable of providing nearly unlimited bandwidth to businesses, including 1 Gbps and 10 Gbps connectivity. The City has much of the network in place to build out key business corridors and industrial and business parks.

In addition, the service areas that have been chosen for initial buildout do not preclude any additional business areas or residential areas from being included in the overall plan. These additional areas should be vetted against their potential return on investment or benefit to the region. The proposed buildout, and its supporting network components, could allow FiberNet to scale to support a region wide expansion when the timing is right.

4 FiberNet 2.0 Roadmap and Action Plan

Through interviews and discussions with community leaders, City management, and departments, we understand that FiberNet has provided significant value to the City over the last 13 years, and that continued City ownership and strategic expansion is paramount to the long-term sustainability of the network. Although the City feels strongly about its expansion, and its place in providing high-speed connectivity throughout the community, it must be expanded strategically and opportunistically.

The City of Palm Coast has the opportunity to expand FiberNet using an incremental build-out approach, focusing targeted investments at those Business/Organizations, Community Anchors, and Smart City related infrastructure and initiatives using a Palm Coast adopted Business district deployment approach. As previously documented, Palm Coast manages its City through defined districts (listed below), defined by clear boundaries – these districts are used for the structured analysis of the potential broadband zones.

The buildout analysis is intended and structured to allow Palm Coast to take an incremental build approach, using a crawl – walk – run concept. The City has been investing in, and building their fiber network since 2005, while FiberNet has formally been operational since 2010, this has afforded the City the opportunity to build an extensive network with many existing network access points – otherwise known as fiber interconnects. As we begin the analysis around buildout, Magellan recommends a strategy that targets On-Net customers first, those that are essentially on the network, and require limited fiber build, if any. The City would then make targeted investments to focus on those that are Near-Net, where some buildout is required, limited to 750 ft. Finally, the City would target buildout of an entire Zone, based upon the numbers of potential connections (customers and smart city), and the potential ROI (revenues, CAPEX, OPEX). This approach allows us to target areas with the greatest need, as defined through potential municipal connections including Smart City, and customer revenue potential.

Each District has a developed Profile Sheet which is meant to inform our collective teams about the fundamental opportunities within the districts. The following broadband planning attributes have been defined district by district:

- Existing FiberNet and Technology Assets
- Potential Municipal Connections (cost deferral)
    - City sites and facilities
    - City infrastructure components (smart city connections)
- Potential Customers (revenue opportunity)
    - Businesses
        - On-Net
        - Near-Net
        - Total in District
    - Organizations
        - Not for Profits
        - Community Anchors
    - MDU/Condos and Units
    - Towers and Cellular
- CAPEX Costs to Buildout and ROI/Financial Metrics

4.1 Broadband Deployment Zones

To determine the geographic scope of the network, Magellan has identified key corridors and business areas that are prime for network buildout based on business density. FiberNet should build out into commercial areas first because costs are generally lower and revenues per subscriber are generally higher; resulting in a more feasible business case. These networks also generate positive economic development benefits in a short amount of time by enabling local businesses to access next-generation broadband at affordable rates. Magellan would suggest using a phased approach that first brings fiber-optic broadband to Palm Coast's business corridors and, if successful, expands into Palm Coast's residential neighborhoods, and future development opportunities.

Table 16: Palm Coast broadband zones overview

ZONE	BUSINESS DISTRICT(S) AND OTHER AREAS INCLUDED
Central	Downtown, including Town Center DRI, from US 1 to Old Kings Road
East	Old Kings and Parkway East, including north Colbert Lane and Grand Haven
North	Matanzas/Palm Coast Park area
Northwest	West Palm Coast, including Neoga Lakes and Old Brick Township
South	Airport, including economic development areas, Grand Landings, and southern Palm Coast
Southeast	Southeast Palm Coast, including SR 100 DRI, the east end of 100, Colbert Lane, Roberts Road, and Marina Del Palma
West	Hargrove, Parkway West, and Pine Lakes

West Broadband Zone

Hargrove Grade, Parkway West & Pine Lakes

Facilities/Sites

	Connected	Total
City Facilities	1	2
County Facilities	0	0
Fire Stations	1	1
Parks & Rec	1	2
Wastewater Plants	0	0
Water Plants	0	1

Customer Connections

	On-Net	Near-Net	Total
Businesses	106	416	522

	Connected	Total
Organizations/ Anchors	2	2

Smart City Connections

	On-Net	Near-Net	Total
Water	108	1,181	3,375
Wastewater	30	560	2,010
Stormwater	2	18	40
Traffic	69	159	160
Street Lighting	40	579	1,586
Wireless	8	8	8
Public Safety	-	-	-

Development Opportunities

None Identified

City Assets

Fiber Backbone – 70,793 feet

FiberNet Network Access Points - 74

Wireless Towers - 4

Wireless Master Plan Parcels - 2

Buildout Requirements

Total Connections: 3,038 existing routes
Total Connection Costs: $2,609,782

Revenues:
Business: $10,648,800
Smart City: $31,783,200

Total CAPEX $2,609,782

Total Connections 3,038

CAPEX to Revenue Ratio 8.2%

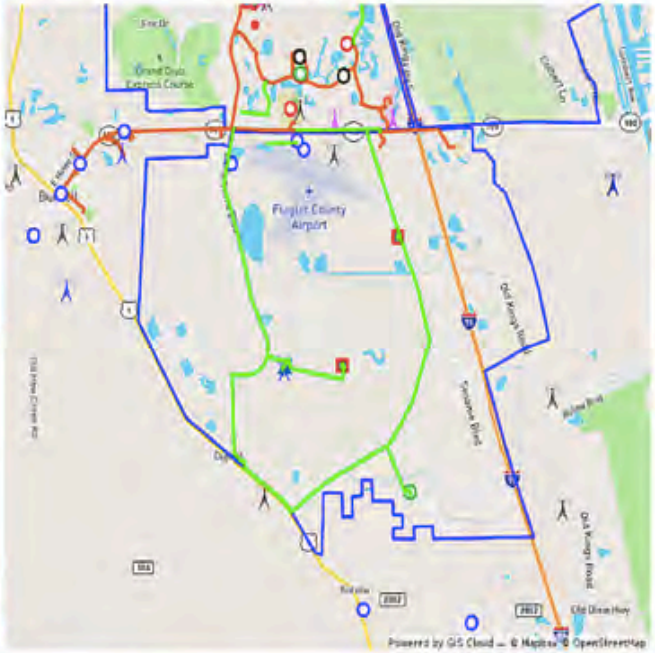
Total Revenue Potential 20-year $31,783,200

South Broadband Zone

EDA Airport 1 & 3

Facilities/Sites

	Connected	Total
City Facilities	0	0
County Facilities	1	4
Fire Stations	0	0
Parks & Rec	0	1
Wastewater Plants	0	0
Water Plants	0	1



Smart City Connections

	On-Net	Near-Net	Total
Water	21	122	2,682
Wastewater	5	68	633
Stormwater	1	5	36
Traffic	6	14	16
Street Lighting	6	8	523
Wireless	0	0	3
Public Safety	-	-	-

Customer Connections

	On-Net	Near-Net	Total
Businesses	3	30	33
	Connected		Total
Organizations/ Anchors	0		0

Development Opportunities

	Residential	Business
None Identified		

City Assets

Fiber Backbone – 7,965 feet

FiberNet Network Access Points - 22

Wireless Towers - 0

Wireless Master Plan Parcels - 8

Buildout Requirements

Total Connections: 250 existing routes
Total Connection Costs: $201,419
Revenues:
Business: $673,200
Smart City: $1,822,800

Total CAPEX	$201,419
Total Connections	250
CAPEX to Revenue Ratio	8.1%
Total Revenue Potential 20-year	$2,496,000

North Broadband Zone

Matanzas

Facilities/Sites

	Connected	Total
City Facilities	0	0
County Facilities	0	0
Fire Stations	2	2
Parks & Rec	1	1
Wastewater Plants	1	1
Water Plants	1	1

Customer Connections

	On-Net	Near-Net	Total
Businesses	0	0	0

	Connected	Total
Organizations/ Anchors	3	3

Smart City Connections

	On-Net	Near-Net	Total
Water	33	773	3,635
Wastewater	6	217	852
Stormwater	3	11	31
Traffic	26	54	54
Street Lighting	18	479	1,225
Wireless	5	5	5
Public Safety	-	-	-

Development Opportunities

	Residential	Business
Palm Coast Park	3,600	496

City Assets

Fiber Backbone – 67,090 feet

FiberNet Network Access Points - 26

Wireless Towers - 4

Wireless Master Plan Parcels - 6

Buildout Requirements

Total Connections: 1,546 existing routes
Total Connection Costs: $773,000

Revenues:
Business: $0
Smart City: $12,986,400

Total CAPEX
$773,000

Total Connections
1,546

CAPEX to Revenue Ratio
6%

Total Revenue Potential 20-year
$12,986,400

Central Broadband Zone

Downtown/Town Center

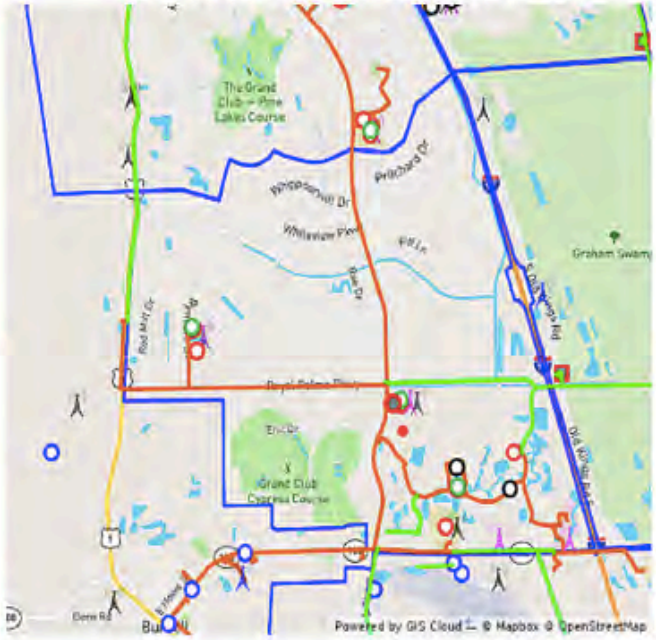
Facilities/Sites

	Connected	Total
City Facilities	0	2
County Facilities	0	0
Fire Stations	1	1
Parks & Rec	3	3
Wastewater Plants	0	0
Water Plants	0	0

Customer Connections

	On-Net	Near-Net	Total
Businesses	8	77	85

	Connected	Total
Organizations/ Anchors	0	1



Smart City Connections

	On-Net	Near-Net	Total
Water	54	995	4,922
Wastewater	28	224	910
Stormwater	3	16	195
Traffic	47	104	110
Street Lighting	129	624	1,906
Wireless	5	5	5
Public Safety	-	-	-

Development Opportunities

	Residential	Businesses
Town Center	2,500	600

City Assets

Fiber Backbone – 68,427 feet

FiberNet Network Access Points - 59

Wireless Towers - 4

Wireless Master Plan Parcels - 4

Buildout Requirements

Total Connections: 2,157 existing routes
Total Connection Costs: $1,274,787

Revenues:
Business: $1,734,000
Smart City: $68,577,600

Total CAPEX
$1,274,787

Total Connections
2,157

CAPEX to Revenue Ratio
6.7%

Total Revenue Potential 20-year
$19,138,800

East Broadband Zone

Old Kings & Parkway East

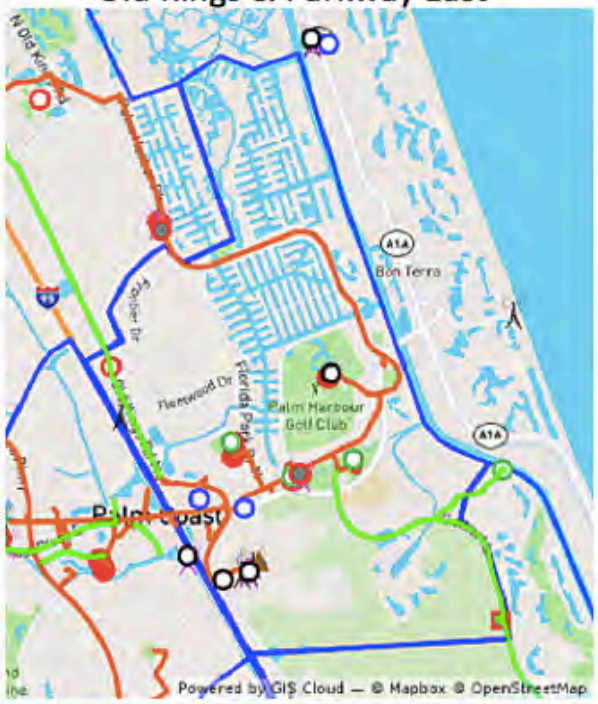
Facilities/Sites

	Connected	Total
City Facilities	3	3
County Facilities	0	2
Fire Stations	1	2
Parks & Rec	3	3
Wastewater Plants	1	1
Water Plants	0	0

Customer Connections

	On-Net	Near-Net	Total
Businesses	43	288	331
	0	0	1

	Connected	Total
Organizations/ Anchors	0	1



Smart City Connections

	On-Net	Near-Net	Total
Water	96	826	2,915
Wastewater	40	507	1,546
Stormwater	4	21	66
Traffic	24	64	68
Street Lighting	26	296	940
Wireless	13	13	13
Public Safety	-	-	-

Development Opportunities

	Residential	Business
None Identified		

City Assets

Fiber Backbone - 50,641 feet

Fiber Network Access Points - 40

Wireless Towers - 2

Wireless Master Plan Parcels - 2

Zone Summary

Total Connections: 2,125 existing routes
Total Connection Costs: $1,802,981

Revenues:
Business: $6,752,400
Smart City: $15,069,600

Total CAPEX
$1,802,981

Total Connections
2,125

CAPEX to Revenue Ratio
8.3%

Total Revenue Potential 20-Year
$21,822,000

Southeast Broadband Zone

Colbert Lane, Roberts Road, Marina Del Palma, SR 100

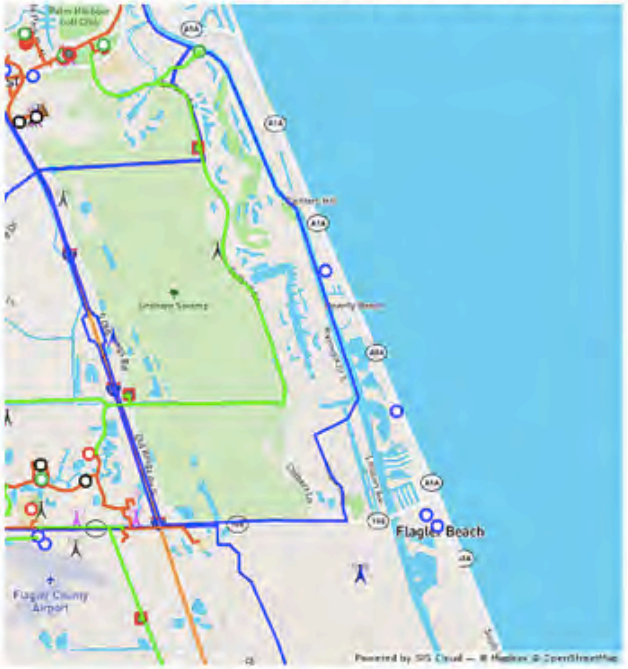
Facilities/Sites

	Connected	Total
City Facilities	0	0
County Facilities	0	0
Fire Stations	0	0
Parks & Rec	0	1
Wastewater Plants	0	0
Water Plants	0	0

Customer Connections

	On-Net	Near-Net	Total
Businesses	0	60	60

	Connected	Total
Organizations/ Anchors	0	0



Smart City Connections

	On-Net	Near-Net	Total
Water	6	6	1,523
Wastewater	2	7	781
Stormwater	0	1	24
Traffic	0	0	0
Street Lighting	3	5	602
Wireless	0	0	0
Public Safety	-	-	-

Development Opportunities

	Residential	Business
Colbert Lane & Roberts Road	1,500	40
Marina Del Palma	140	0
SR 100	2,400	16

City Assets

Fiber Backbone – 0 feet

FiberNet Network Access Points - 2

Wireless Towers - 0

Wireless Master Plan Parcels - 4

Buildout Requirements

Total Connections: 79 existing routes
Total Connection Costs: $189,440
Revenues:
Business: $1,224,000
Smart City: $159,600

Total CAPEX
$189,440

Total Connections
79

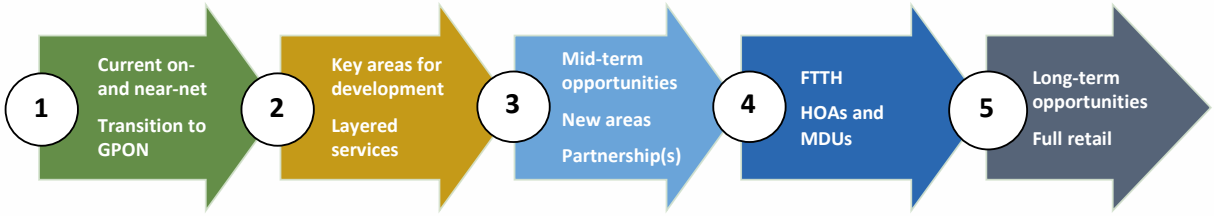
CAPEX to Revenue Ratio
13.7%

Total Revenue Potential 20-year
$1,383,600

4.2 Recommended Phasing Plan

The phasing plan presented is only one scenario that FiberNet could utilize. There are other options that FiberNet could consider based on the amount of funding available and how quickly it wants to accelerate broadband deployment, including accelerating additional zone buildouts, or extending backbone into new areas of the City. This phasing plan anticipates a Phase 1 project on one or two zones or sub-zones, which would serve as a "proof of concept" pilot. The zones or sub-zones for Phase 1 will be selected based on potential ROI, as projected from costs and customer densities. This process would validate the business case for fiber deployment and minimize FiberNet's financial risk for later expansion into the larger project.

Figure 42: General FiberNet infrastructure and services expansion process

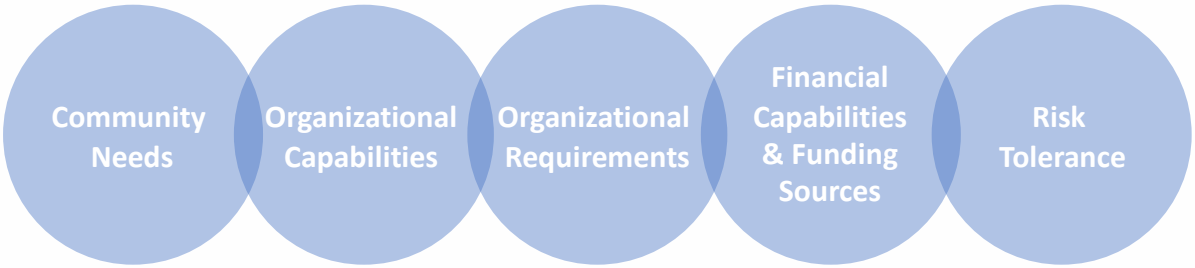


Developing a business case on the initial deployment areas allows FiberNet to determine the feasibility of investing in infrastructure. To do so on a citywide or service area basis would be a significant undertaking and at this state, there are too many variables to forecast an accurate deployment forecast. For the purpose of this report, a targeted business case was developed that could be used to acid test the feasibility of deploying within the areas identified. Lessons resulting from Phase 1 will be used to build a more refined and comprehensive business case for buildout past the pilot.

4.3 Business and operating models

The right broadband business model for a local government depends on its organizational capabilities and requirements and on local market factors. Financial resources are required for broadband, so fiscal capacity is a factor along with risk tolerance. All of these factors overlap, as illustrated in Figure 43. They must be in place and understood for a successful community broadband initiative.

Figure 43: Inputs to selecting the right broadband business model



Broadband business models fall on a continuum from low risk/low investment options to higher risk/higher investment, shown in Table 17. The City of Palm Coast can get rewards in the forms of lower costs, revenue generation, and overall community benefits, if it is willing to put in more financial investment, operational effort, and regulatory oversight. Moving up the continuum also involves greater local government participation in the delivery of broadband services.

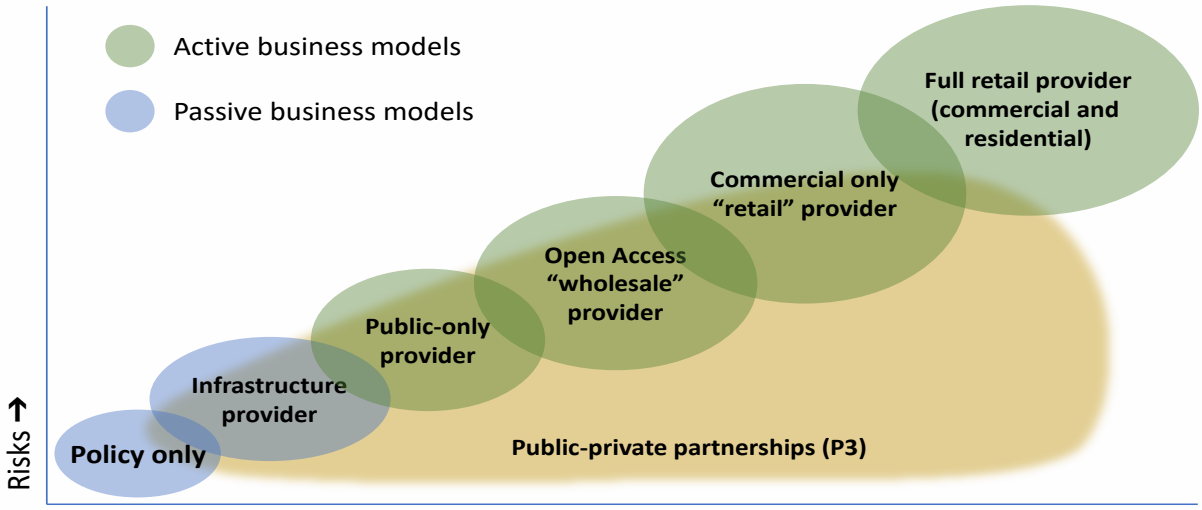
Table 17. Summary of broadband business models

BUSINESS MODEL	DESCRIPTION	EXAMPLES	SUMMARY
		Passive Models	
Policy only	City uses policy tools and standards to streamline construction and reduce the cost of building infrastructure.	• Santa Cruz County, CA • Knoxville, TN	Low risk/reward option to support incentives to accelerate broadband investment but no "quick wins" to improve services.
Infrastructure provider	City provides conduit and/or dark fiber to businesses, broadband providers, and other public organizations; City does not provide retail services.	• Santa Monica, CA • Palo Alto, CA • Lakeland, FL	Improves the cost and availability of fiber infrastructure to providers, businesses, and community organizations, not generally used for residential.

Partially Active Models			
Public-only service provider	City financed or shared financing with other public organizations. Dark fiber or data services to community organizations; sometimes retail services provided by the City to these organizations.	• Seminole County, FL • Leesburg, FL • Columbia County, GA	Improves the cost, access and collaboration among public organizations without forcing the City to compete with private broadband providers.
Open Access "wholesale" service provider	City financed and operated wholesale services only to retail broadband providers who deliver Internet, telephone, and other services.	• Danville, VA • Provo, UT	Enables more competition and choice but difficult to incentivize broadband providers to use municipal infrastructure.
Active Models			
Commercial-only "retail" service provider	City financed and operated fiber transport, Internet access, telephone, and data services to businesses.	• Fort Pierce, FL • Hudson, OH	Enables the City to directly improve services to businesses but requires the City to compete with broadband providers and operate the network.
Full retail (commercial and residential) service provider	City financed and operated fiber and sometimes cable services Internet and often television and telephone to residents and businesses.	• Bristol, VA • Morristown, TN • Ashland, OR	Enables the City to provide major improvements to residential services but requires significant investment and operational capabilities.

Public policy and infrastructure only options are passive business models: The local government does not operate a broadband network. The role of government increases along the continuum, from Public Services Provider through Open Access Provider to Retail Provider. With each of these business models, the government operates a publicly-owned broadband network. Public-private partnerships (P3) take many forms along the continuum. As Figure 44 suggests, P3's can apply to most broadband business models, reducing risks and strengthening rewards when structured correctly.

Figure 44: P3 Continuum



The continuum can be seen as a general path to community broadband goals. In many cases, a city will work through several models as its capabilities and infrastructure evolve. Some models contribute to others. Broadband-friendly policies, for example, are essentially costless means to spur broadband supply, and they lay the foundation for more active models. Other models conflict with each other: local government planning to implement a retail model probably shouldn't do public-private partnerships if it would lead to competition between the local government and one or more private partners.

Figure 44 illustrates an important point about broadband business models: The variability of risk and reward increase with the level of risk and reward. Careful planning and experienced leadership are critical for minimizing costs and maximizing benefits of broadband initiatives.

4.3.1 Policy-only

Local public policies influence how broadband services develop in a community. Permits, right of way restrictions, structural requirements, technical specifications, fees, franchises, and other local policy instruments impact the cost of constructing and maintaining broadband infrastructure. Policy-only is not really a business model, but it does affect the viability of other

business models. Municipalities that did not want to actively develop broadband have used policy to facilitate private development and spur better availability and costs for broadband.

Example: Santa Cruz County, CA

The Santa Cruz County board of supervisors in November 2013 approved an eight-month timeline to overhaul its broadband infrastructure plans and regulations. Specific areas of focus included permitting fee reductions and a proposed "dig once" ordinance that would make it easier to install new fiber-optic cables during other work on area roads or utilities lanes. "The County will continue a focus on broadband infrastructure throughout the county to enable businesses to function in the digital era, and students and households to have high quality access to information and communication.

The County will work with industry providers to develop a Broadband Master Plan to identify focus areas within the county that will be most suitable for gigabyte services, particularly as the Sunesys backbone line is constructed during 2014 and 2015. The County will work with service (last mile) providers to ensure that these focus areas are deemed a priority, in order to support streaming requirements, product development, job creation, and online selling capability."

4.3.2 Infrastructure provider

Municipalities can lease and/or sell physical infrastructure, such as conduit, dark fiber, poles, tower space, and property to broadband service providers to serve the community. The capital expenses to construct broadband infrastructure, particularly in highly developed urban environments with entrenched providers, can be a huge barrier to entry for new providers. Use of existing public infrastructure can be a cost-effective alternative to constructing private infrastructure. Utility and enterprise fund models fit well with the infrastructure model because they provide the capabilities to develop and manage broadband facilities, and offer them to broadband service providers using standardized rate structures.

Example: City of Palo Alto, CA

In 1996, Palo Alto built a 33-mile optical fiber ring routed within the city to enable better Internet connections. "Since then, we have been licensing use of this fiber to businesses. For the past decade, this activity has shown substantial positive cash flow and is currently making in excess of $2 million a year for the city. We now have that money in the bank earmarked for more fiber investments."

4.3.3 Public-only Provider

Municipal public-only broadband service providers use fiber-optic networks to interconnect multiple public organizations, often also providing wireless connectivity. Services are limited to community anchors within their jurisdiction, including local government agencies, school districts, higher education institutions, emergency services and law enforcement, utilities, and occasionally healthcare providers and non-profit social service agencies. The majority of these anchors require connectivity and often, the municipal network provides higher capacity at lower costs than these organizations are able to obtain commercially. Municipal and utility

networks across the country have been built to interconnect cities, counties, school districts, and utilities to one another at lower costs and with long-term growth capabilities that support these organizations' future needs and protect them from rising costs. In these cases, government service providers may be cities, counties, or consortia that build and maintain the network. The providers utilize inter-local agreements between public agencies to establish connectivity, rates, and the terms and conditions of service.

Example: Seminole County, FL

Seminole County owns and operates a 450-mile fiber-optic network that was installed over the past 20 years by the County's Public Works department primarily to serve the needs of transportation. Since that time, the network has grown to connect the majority of the county's facilities, five cities within Seminole County, Seminole Community College, Seminole County Schools, and other public network to a common fiber-optic backbone. The network has saved millions of dollars in taxpayer dollars across the county and has become a long-term asset that enables the county and the other connected organizations to meet their growing connectivity needs.

4.3.4 Open-access provider

Municipalities that adopt open-access generally own a substantial fiber-optic network in their communities. Open-access allows these municipalities to "light" the fiber and equip the network with the electronics necessary to establish a "transport service" or "circuit" to service providers interconnecting with the local network. Service providers are connected from a common interconnection point with the open-access network and have access to all customers connected to that network. Open-access refers to a network that is available for any qualified service providers to utilize in order to connect their customers. It allows municipalities to provide an aggregation of local customers on a single network that they are able to compete for and provide services. The concept of open-access is designed to enable competition among service providers across an open network that is owned by the municipality. The municipality retains neutrality and non-discriminatory practices with the providers who operate on the network. The municipality establishes a standard rate structure and terms of service for use by all participating service providers.

Example: City of Danville, VA

In 2004, Danville built the original network to serve government and municipal buildings, along with schools. Starting with a small start-up loan from city's electric fund, 10 years of incremental growth now has nDanville with revenues of $1.8 million in 2014, while contributing $300,000 towards the city's general fund.

A critical key to the network's early success was, and continues to be, the Mid-Atlantic Broadband Communities Corporation (MBC), which provides wholesale middle mile access to the Danville network. The nonprofit MBC covers 26 counties and 1700 route-miles and connects to nDanville to peering exchanges near Washington DC, Atlanta, and Charlotte. The partnership

allows nDanville to be sustainable, and allows MBC to reinvest excess earnings into regional economic development efforts.

The city does not directly provide services, but as an open access provider, sells middle-mile service to a local provider, Gamewood, which provides tiered broadband services to Danville customers. Danville also uses its fiber network to provide broadband access for its schools, which now generates E-Rate revenue to the tune of about $1 million annually. Incremental, low-risk strategic investments have paid off, and nDanville services are now expanding into residential areas. Network passes over 2,500 customers in a city of 26,000 homes, and this rate is increasing incrementally as well, as more revenue allows for quicker growth. Current take-rate was 20% during Year 1, and the goal was to add 5% per year after that. The city says that it is doing a good job of hitting those numbers.

Clearly, Danville is making the transition from the old to the new economy in the following ways.

- *Open-access network connecting schools, government, businesses, and homes*
- *Upgraded education services to gigabit speeds*
- *Financially sustainable, and contributing $300,000 annually to the city's general fund*
- *Enabled opportunities through fiber broadband services for local businesses*
- *Increased reliability, performance, and availability of fiber broadband across the city*
- *Reinvested system revenues leading to expansion of the network*

4.3.5 Commercial-only

Municipalities that provide end users services to business customers are considered retail service providers. Most commonly, municipalities provide voice and Internet services to local businesses. In many cases, a municipality may have built a fiber network for the purposes of connecting the city's primary sites that has been expanded to connect local businesses, in effort to support local economic development needs for recruitment and retention of businesses in the city. Municipalities that provide these services are responsible for managing customers at a retail level. They manage all operational functions necessary to connect customers to the network and providing Internet and voice services. Municipalities compete directly with service providers in the local business market, which requires the municipality to manage an effective sales and marketing function in order to gain sufficient market share to operate at a break-even or better.

Example: Fort Pierce Utilities Authority, FL

Primary FPUAnet services are Dedicated Internet Access, Fiber Bandwidth Connections, E-Rate IP Links, and Dark Fiber Links. FPUAnet services also include Wireless Broadband Internet and Wireless Bandwidth Connections, which extend FPUA's fiber through wireless communications. The FPUAnet Communications mission statement is "To help promote economic development

and meet the needs of our community with enhanced, reasonably priced communications alternatives."

It all began around 1994, when FPUA began to build a fiber-optic network to replace leased data links between its buildings in Fort Pierce. The new optical fiber system proved more reliable and cost effective and was built with sufficient capacity for external customers. In 2000, FPUA allocated separate fibers through which it began to offer Dark Fiber Links to other institutions. This soon expanded to include businesses and more service types.

4.3.6 Full retail: commercial and residential

Municipalities that provide end user services to businesses and residential customers are considered retail service providers. Most commonly, municipalities provide voice, television, and Internet services to their businesses and residents through a municipally owned public utility or enterprise fund of the city. As a retail service provider that serves businesses and residents, the municipality is responsible for a significant number of operational functions, including management of its retail voice, television and Internet offerings, network operations, billing, provisioning, network construction, installation, general operations, and maintenance. The municipality competes with service providers in the business and residential markets and must be effective in its sales and marketing program to gain sufficient market share to support the operation. Many municipalities that have implemented these services are electric utilities that serve small to midsize markets. Many of these markets are rural or underserved in areas that have not received significant investments by broadband service providers. Retail service providers must comply with state and federal statutes for any regulated telecommunications services. These organizations must also comply with state statutes concerning municipal and public utility broadband providers; a set of rules has been developed in most states that govern the financing, provision, and deployment of these enterprises.

Example: Bristol Virginia Utilities (BVU OptiNet)

BVU OptiNet is a nonprofit division of BVU, launched in 2001, that provides telecommunication services to approximately 11,500 customers in areas around Southwest Virginia. OptiNet is known for its pioneering work in the area of municipal broadband throughout the area. BVU is acknowledged as the first municipal utility in the United States to deploy an all-fiber network offering the triple play of video, voice, and data services. Offering digital cable, telephone service, and high-speed Internet from a remote-area utility provider makes BVU exceptional, even on a global level.

4.3.7 Public-private partnership

A broadband public-private partnership (P3) is a negotiated contract for a private company to offer broadband services in a given area in return for some special resources or rights from the public partner. In recent years, P3s have been increasingly implemented as more municipalities employ public broadband and utility infrastructure in conjunction with private broadband providers. P3s leverage public broadband assets, such as fiber, conduit, poles, facilities with private broadband provider assets, and expertise to increase the availability and access to

broadband services. Municipalities forgo the getting into the business of providing retail services and instead, make targeted investments in their broadband infrastructure, and make it available to private broadband providers with the goal of enhancing their communities. In this type of model, the municipality would be considered an Infrastructure Provider who maintains permanent ownership interest in the broadband infrastructure (e.g., conduit and perhaps dark fiber) that is funded by the municipality for a piece of the action, generally a negotiated revenue share paid by the provider.

Example: The City of Rancho Cucamonga, CA

In 2016, the city worked to develop a Fiber Master Plan. The city has consistently shown entrepreneurial spirit in past initiatives (starting electric utility, purchase of 16,000 street lights from California Edison), and now in the deployment of high-speed, next-generation broadband services. The plan identified ways for the City to expand their existing fiber network, its extensive traffic assets, and additional investment to create a backbone network throughout the City's primary business corridors, and economic development zones. The network will support additional use by internal departments, community anchors, partnerships with ISPs, and the support for Smart City initiatives. Rancho Cucamonga worked to develop and solicit an RFI for Public Private Partnerships, and developed a roadmap and action plan that recommended the City/Utility formalize its broadband utility as a division of Rancho Cucamonga Municipal Utilities (RCMU). Network Design and Engineering and full turnkey implementation services began in 2017, including all procurement, governance, network standup and testing, data center design, public policy, marketing and branding, and integration of all ISPs into the network platform. Network construction began in Q2 of 2018. Adoption of the Fiber Master Plan has led the City to budget $12 million to execute the plan over a 6-year period.

During 2018, Rancho Cucamonga forged an agreement with Inyo Networks for the delivery of internet services to the businesses and residents in Rancho Cucamonga. In return for use of the City's assets, Inyo networks will negotiate and provide a revenue share payment to the City based upon the total gross revenues across all service offerings that is similar in length to the agreed upon term.The agreement with Inyo includes:

- *Residential 1Gbps symmetrical BEST-EFFORT Internet*
- *Business 100 Mbps and 1Gbps symmetrical BEST-EFFORT Internet*
- *Business and Anchor 100 Mbps, 1Gbps and 10 Gbps symmetrical DEDICATED*
- *Internet with industry acceptable Service Level Agreements*
- *Voice Over IP telephone service (VOIP) – not subject to revenue share*
- *IPTV video service – not subject to revenue share*
- *Dark Fiber and Lit Transport*
- *Other TBD services*

Example: The Covenant of Rancho Santa Fe, CA

The Covenant of Rancho Santa Fe (RSF) was established in 1928 as a country residential community located in San Diego County, CA. Today it is one of the most exclusive, beautiful, and desired rural communities in the country. The community includes a world class golf course and over 1,800 homes with an average home price of approximately $3 million. Rancho Santa Fe is home to many famous people including movie stars, politicians, sports figures, and corporate executives/CEOs.

Several years ago, RSF requested an upgrade to its telecommunications facilities, specifically asking for a FTTH build. Incumbent providers agreed, however requested that RSF pay the capital required to build out the network, which was estimated at $20 million at the time. The RSF Board declined their offer, and instead undertook a FTTH Feasibility Study that outlined the options available to bring fiber-based service offerings to its community. RSF has decided to self-fund the buildout, maintaining long-term ownership of this very important community asset, and has embarked on the process to develop a Public Private Partnership.

RSF has identified numerous potential partners that would operate the network while providing its residents, businesses, and anchors with state-of-the-art fiber-based telecommunications services. RSF is currently negotiating the partnership with the selected partner and the network is due to be operational in 2017/2018.

4.4 Recommended Approach for Palm Coast FiberNet 2.0

Key to any successful expansion must include a decision on how to fund, operate, and maintain FiberNet going forward, under any scenario or option. To support this analysis, Magellan's financial models include full staffing and OPEX requirements for each model. How Palm Coast staffs these roles, through insourcing (FTEs), or outsourcing (P3 partner or contract operator) has yet to be determined, however this analysis will provide the City with potential options, and recommendations to support a successful expansion of FiberNet.

4.4.1 Funding

The City will have to look at strategic funding sources to manage the expansion of FiberNet. Its expansion will benefit the community's utilities, public safety, mobility, general city operations, as well as in providing potential revenue sources (customers, smart city cost deferral). It's arguable that some of these functions should help pay for expansion when its warranted – for instance, if traffic funds/or even grant funds could be used to expand a traffic network, this is directly a case for expansion of FiberNet assets using traffic dollars, at least proportionally. Conversely, if the City decides that FiberNet should be expanded to connect the Utility's AMI collector points, this expansion should be funded by the Utility. In the case of AMI, the Utility would be required to pay recurring monthly fees to third-party providers for connectivity, these funds could be capitalized, supporting the expansion of FiberNet further.

Funding for the commercial-like segments would have to be funded through some other mechanism such as municipal bonds or other internal loans. For locations such as Town Center,

otherwise known as the Downtown District, or other redevelopment projects, TIF, or CRA funding may be applicable to those areas' infrastructure investments. At first glance, Palm Coast does not qualify for many traditional broadband grants, or loan programs, however there are applicable funding programs that target Utilities, Healthcare, Low Income Housing, Economic Development, and Innovation related projects. As an example, Economic Development Association could be a potential source for an Innovation Grant to fund buildout and to spur potential innovation within the Downtown District. Successful, progressive cities take a holistic approach in aggregating funding to expand its network related buildout goals. You must cast a wide net when searching for available funding, while internalizing costs where appropriate. These municipalities are finding significant savings over the long term, when investments are strategic and well thought out. In addition, with appropriate planning and conditioning, communities are building vast inventories of fiber-optic networks at a significant cost savings over traditional construction methods.

Financial models in this Plan include 20-year municipal bond lending at a rate of 4.5%.

4.4.2 Operations

Paramount to any plan for expansion, is a sustainable operating model – specifically how the City will operate FiberNet, from a staffing and network operations perspective. Maintaining a lit FiberNet platform for municipal purposes, or in support of Smart City initiatives will require a level of operations and staffing, while use of the network for commercialized purposes will obviously require a much higher level of support to provide carrier class services, as defined by 99.999% uptime.

To be clear, as a fully functioning municipality, Palm Coast government will require a lit network platform to conduct City business, both site to site, and in empowering future Smart City. As previously documented, the City would spend $310,000 a year today, and going forward if FiberNet were not in place. And even if the City contracted with a third party for its connectivity, it would still have a level of network operations to manage, which would necessitate the need for staff, including a Network Engineer and/or Network Administrator. In short, the City of Palm Coast will always have to plan and manage network assets, the question is at what cost. The City decided a long time ago that FiberNet was a wise investment, and analysis provided in this document confirms this, however past operations have been troublesome.

Going forward, the City has the opportunity to decide how it should manage and staff FiberNet during this next 10-year planning cycle – FiberNet 2.0. Looking back at previous FiberNet operations experience, it does not appear as though adding internal staff specifically with the expertise to provide a carrier-class network solution was an option. FiberNet staffing/resourcing has been lean, and City leadership understands that telecommunications is not a core expertise of City government. As outlined in this Plan, an internalized function could require numerous functional operations' staff to manage an expanded FiberNet deployment.

This would mean increased head count within the IT Department, which is further outlined in more detail below.

Palm Coast also has the option to outsource or partner for a network operator who could manage their network, providing network provisioning, monitoring, customer services, billing, and other customary functions. This would be akin to an outsourced staffing service however, it would solicit a specific network operator and retail FTTP provider to deliver FibetNet's service. While this would absolve the City of managing operations, there could still be legal issues related to State of Florida municipal broadband barriers, if it appears as though the City is actually providing the services – as a City function.

The City has 3 options to consider for operating FiberNet, they are:

- Internalize – full staffing and internal operations model – FLORIDA STATE LAW ISSUES PROVIDING RETAIL "END-USER SERVICES"
- Contract – contract with a firm to operate the network – outsourced operation with City direction and guidance – "Palm Coast provided service" – FLORIDA STATE LAW ISSUES PROVIDING RETAIL "END-USER SERVICES"
- P3 – partnership with an exclusive Network Operator and Retail FTTH Provider

Internalizing the FiberNet operation will require the addition of FiberNet staff. While some roles can be shared between current IT staff, it's very questionable whether current staffing levels can provide any level of support at this time. A FiberNet Manager, Network Engineer, and supporting staff would be required, and are outlined within the financial models and staffing plans in upcoming sections. Alternatively, the City could contract with an external, third party to operate the network as an extension of the City of Palm Coast. A contracted operator would still be bound by the regulations and capabilities of the City of Palm Coast, as an outsourced operation, is simply an extension of the City's operation of a Broadband Utility. State of FL broadband laws would impact any services provided by Palm Coast, even through operation by a third-party contract operator.

A P3 (public-private partnership) could be structured much like the City's Wireless Master Plan with Diamond Communication, where the City could opt for a revenue share on gross revenues generated through the use of FiberNet's assets by its P3 partner. In recently developed broadband P3s, the private sector P3 partner leverages their operating experience, data center and supporting telecommunications assets and systems, and upstream content and national network interconnects to deliver a range of advanced IP services to community organizations (businesses and anchors), and in some cases residents. The P3 partner would provide a full range of telecommunications, entertainment, and supporting services, and would be required to light, and operate its network, as well as providing full local customer service and sales support. In some instances, communities have required the provisioning and management of municipal circuits for either site to site connectivity, or in support of smart city and WiFi initiatives.

Using a P3 arrangement, the City would invest in, and maintain passive OSP infrastructure, for the long-term benefit of the community, opting for a long-term lease agreement, IRU, or revenue share with the partner for consideration of use of the city's public assets. Revenue shares are usually a preferred payment approach by the public partner, as it provides a benefit to the City when the partnership is successful. The City has a vested interest in its partner doing well, and therefore must co-brand, co-market, and work to drive uptake of network services. Further, as the infrastructure owner, and not the operating partner, the City has the opportunity to focus on influencing beneficial public policy tools which could drive down the cost of any further network expansion. Proper planning and coordination between capital projects, or other ROW disturbances could save the City a tremendous amount of capital over traditional construction methods.

The City should also take a hard look at where FiberNet resides within the City enterprise. While FiberNet was constructed and has operated under IT since its inception, a change in direction or business model, may give way to a more ideal structure. And with a renewed focus on FiberNet expansion, FiberNet could benefit from being in a department with a keen eye toward development activities taking place throughout the community.

Magellan Advisors believes that FiberNet could be located organizationally, and managed internally by:

Information Technology – FiberNet should reside with IT if a portion of it will remain a lit network, and if it continues to directly support municipal connectivity and Smart City initiatives. A lit FiberNet network is managed no differently than the other Layer 2/Layer 3 network devices, and all lit services should be aggregated to the same network transport platform. IT could also manage all O&M and expansion projects, as they do today.

Or, FiberNet could reside in an Operating Department, such as:

Utility Department or Public Works – should FiberNet become a passive network, where network equipment is no longer supported internally, but pushed to an Outsourced Operator, or P3 Partner, the Utility or Public Works Department may be an ideal City department to manage, expand, and maintain all passive OSP infrastructure. Both Utility and Public Works have complementary operations as it relates to other City infrastructure, maintaining fleets of vehicles, underground equipment and contractors, and tasks such as underground utility locates. In addition, they work in the ROW, and have first-hand knowledge of the infrastructure and issues that exist.

4.4.3 Maintenance

The City of Palm Coast has maintained Fiber O&M, and network equipment maintenance contracts since the inception of FiberNet. It is experienced in managing its infrastructure, and related contracts/vendors. Under any scenario, capital expansion and fiber maintenance should remain with the City, to ensure the long-term viability and sustainability of the assets, as

well as public ownership. FiberNet OSP Maintenance costs will increase as the network expands incrementally, as O&M is usually budgeted at a cost of $1,500 per year per cable mile. The City should consider a Fiber Management System (FMS) to manage its fiber infrastructure going forward. An FMS would bolt on to the City's ESRI GIS platform and would give the City strand level management of the OSP. In development of this assessment, Magellan worked with Danella Construction to piece together their records for updated network diagrams, and splice matrices – IT did not readily have these available. It is highly recommended – and will be expected by any potential partners, for the City to maintain valid, up to date records down to the individual fiber strand level, including splice history.

Depending on the operating model, network equipment and software maintenance may change, with costs increasing or decreasing based on the City's role in operating any portion of the network.

4.4.4 Summary

City of Palm Coast has overwhelmingly confirmed the value of the City's network to its current municipal operation and continues to see great opportunity where FiberNet can support community technology-based initiatives. A community in the 21st century requires connectivity. The initial investment made into FiberNet has netted the City overall savings, as previously documented, and created new revenue streams from commercial use of the network. It will continue to allow the City to manage its long-term telecommunications costs well into the future, while providing a next generation connectivity platform to support the Palm Coast communities' continued evolution.

While FiberNet operates profitably, generating nearly $100k in annual free cash flow, the network has struggled to expand, and grow sustainable revenues. The issues identified through this assessment, appear to be focused in the following areas:

- **Current Business Model**
- **Current Service Provider Partners**
- **Current FiberNet Operating Model and Staffing**
- **Lack of Branding and Marketing**

Through development of this Business Plan, FiberNet 2.0 should focus the City's attention on expanding FiberNet through a sound business case and investment roadmap, providing a high-speed fiber offering to support businesses, community anchors, and to support greater municipal connectivity, including Smart City initiatives. Palm Coast must decide how to staff FiberNet under any business model, or deployment scenario, and must commit to funding the operational components identified in its role to ensure success.

While Open-Access was the intended business model of FiberNet, and it is a concept still used today, you must have partnering providers who can assist the City in growing the market and expanding the network – today's partners do neither. An exclusive broadband/FTTP P3 would absolve the City of many of its operational challenges and would keep the City out of the

competitive market place, focusing its responsibilities solely on expanding and maintaining this very important infrastructure.

FiberNet 2.0 should focus on providing next-generation connectivity throughout Palm Coast's corridors, Business Districts, and expanded focus areas. To do so, it can look toward internalizing and providing services directly, or through the use of a P3. Both are completely diverse business models, where one is internalized, and network services are provided by the City of Palm Coast, while the other is provided by an industry partner charged with expanding, lighting, operating, and managing FiberNet, providing retail services to customers under the partner's brand, and with their operations. Many municipalities will participate in branding, for example, RCMU Fiber (City of Rancho Cucamonga), and its partner Inyo Networks use, "Inyo Networks, powered by RCMU Fiber," as its brand and image.

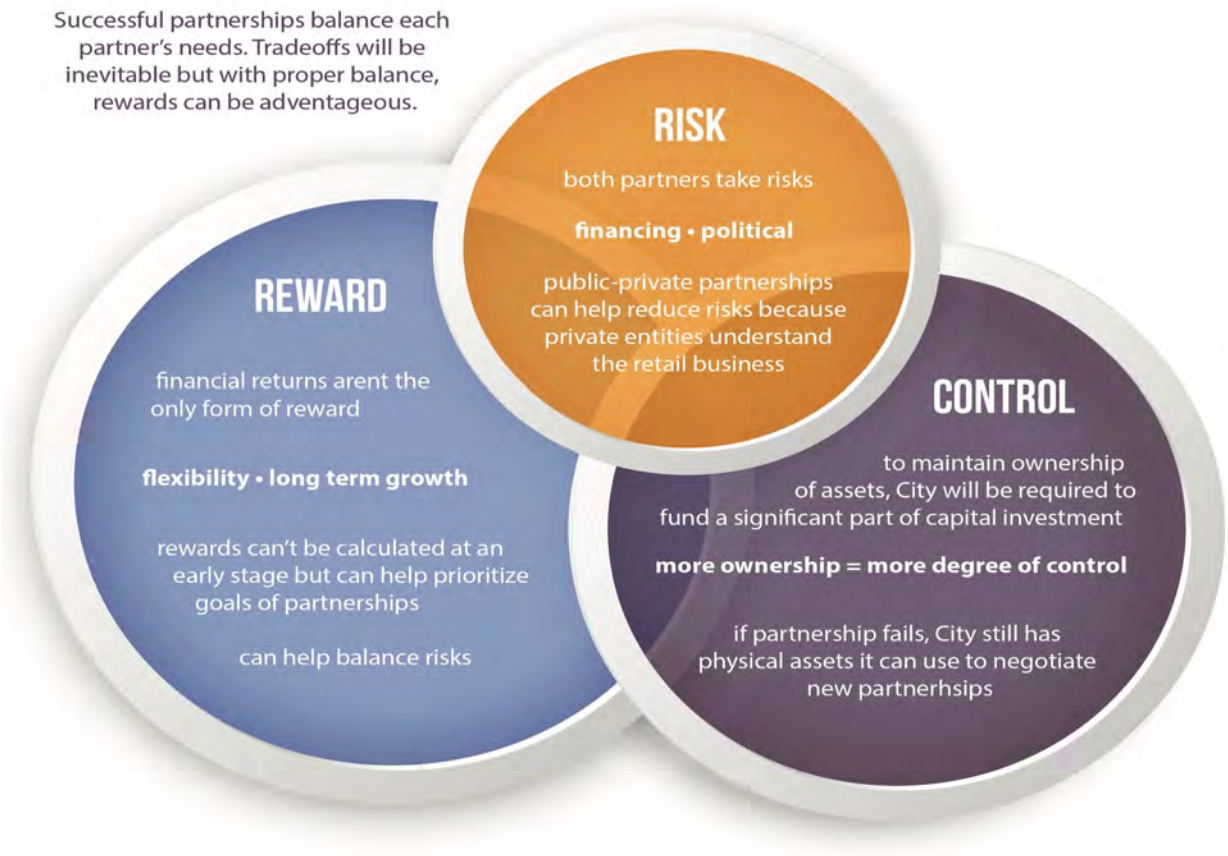
Table 18: Proposed Business Model Comparison

Full Retail Model	Infrastructure Provider – P3
City staffed, and operated	City invests in, and maintains infrastructure
Deploy network equipment, systems, and upstream services	Partner operates and provides services
REGULATORY BARRIERS EXIST	City receives revenue share or lease fee for use of public assets
	City and Partner co-brand, co-market, and drive use of assets

Table 19: Operating Model Comparison

Full Retail Model	Infrastructure Provider – P3
Internalize 5 roles (Mgr, Network Engineer, Sales/Marketing, Customer Support, OSP/GIS – staff grows as subscriber base grows)	Services would include Broadband only*
24x7 NOC, and After-Hours Support contracts	City maintains fiber construction and O&M contracts
Maintain Enterprise Fund and separate accounting	No further operational requirements

Figure 45: Broadband partnerships



P3's for Broadband Partnerships are a balancing act between how much RISK the City is willing to take, understanding their desired amounts of CONTROL, and expectations around REWARD or payoff. In short, the greater REWARD and CONTROL the City desires, the greater RISK they must assume. In many cases, P3 partners are willing to bring capital investments to the table, for long-term stable relationships, or for partial ownership/long-term interest in the developed assets. The City should be prepared to be open to innovative opportunities that could limit its operating requirements, while maximizing potential revenue and technology opportunities.

4.5 FiberNet 2.0 – Potential Connections Analysis

Through complex GIS analysis of the existing FiberNET routes, we analyzed various types of connections, by Broadband Zone (Business Districts). We looked for potential On-Net (within 150 ft. of existing interconnect point) Businesses, Near-Net (within 750 ft. of existing network assets) Businesses, and On-Net Smart City, Near-Net Smart City connections. We also reviewed those that were off-net, simply too far off the network assets to serve – those were removed from the model as Capital Expenditures to expand the backbone to serve those off-net as this cannot be justified at this time. However, the City could take another look at these areas should a strategic fiber build occur, i.e., building fiber to a new fire station or utility extension.

Figure 46: Example - Map of Potential Smart City Connections

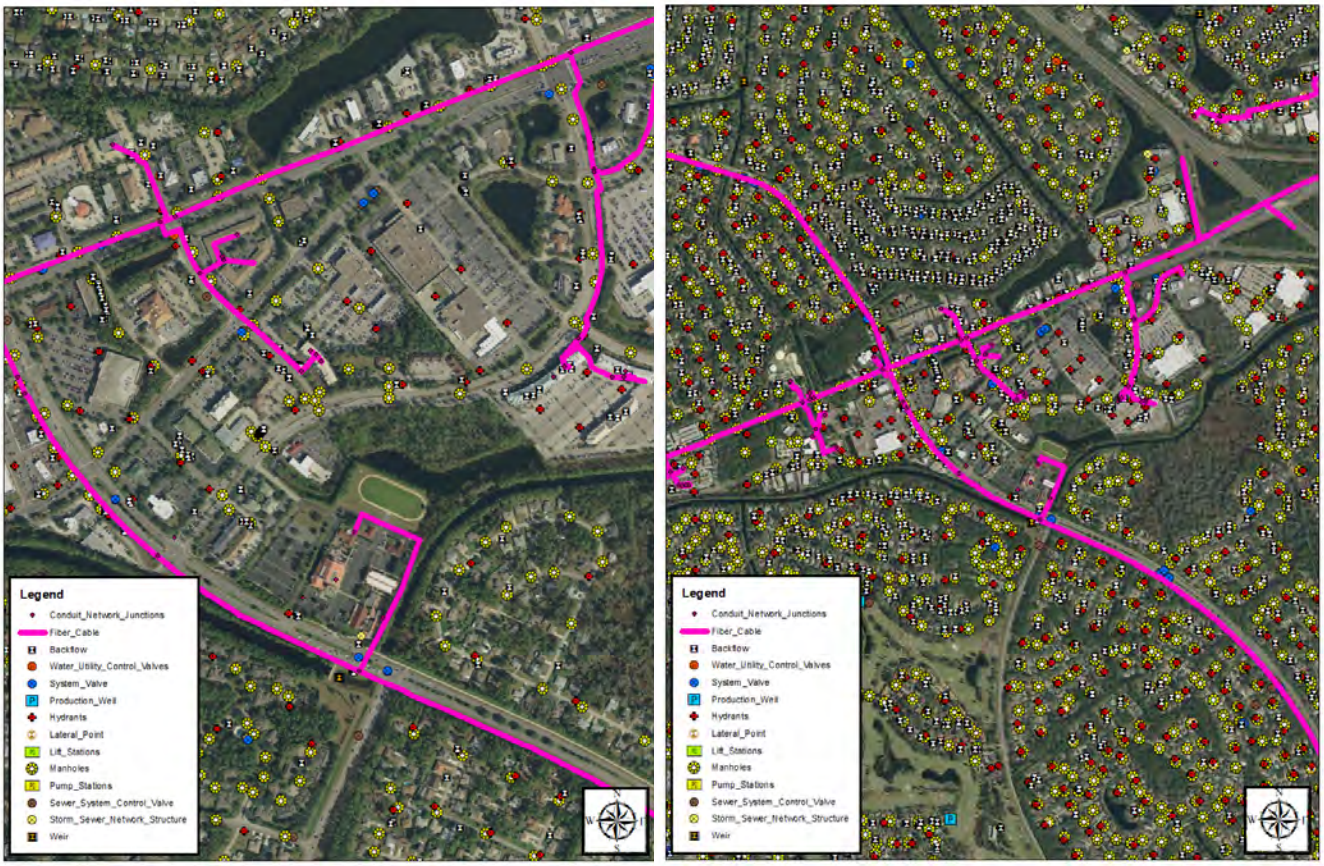


Table 20: Total market along existing routes

TOTAL MARKET ALONG EXISTING ROUTES

BROADBAND ZONE	ON-NET BUSINESS	NEAR-NET BUSINESS	ON-NET SMART CITY	NEAR-NET SMART CITY	TOTAL POTENTIAL CONNECTIONS
EAST	43	288	210	1,584	2,125
CENTRAL	8	77	284	1,788	2,157
NORTH	-	-	86	1,460	1,546
SOUTH	3	30	39	178	250
SOUTHEAST	-	60	15	4	79
WEST	106	416	252	2,264	3,038
TOTAL:	160	871	886	7,278	9,195

Preference was given to those Broadband Zones which have the greatest impact and were relatively easy to serve. These were considered low-hanging fruit and provided a positive ROI when compared to project expansion costs within the respective Zone. To calculate ROI, we used a Capital/Revenue Potential Ratio to determine the Zones that required the least Capital Funding but provided the most financial opportunity (return). For purposes of this modeling exercise, these Broadband Zones, and Connection Types made up FiberNet's market – the total potential market from which connection uptake (take rates) were determined.

While East, Central and West Broadband Zones were prioritized in these models, this is only because of current densities which are dictated by areas built out within Palm Coast. Palm Coast should focus efforts to expand FiberNET when possible into other Zones, or through strategic alignment of Capital Projects or Private Development. Further, as density increases in these areas, the ROI metrics will change. The North, South and Southeast just do not have many FiberNet assets at this point, and they are up and coming areas for development within the City.

4.6 FiberNet 2.0 CAPEX Analysis

While Palm Coast's goal is to maintain long-term ownership of any FiberNet assets, it is likely that it will shoulder most capital expansion costs. In many cases, network betterment or improvements, fiber drop premise connections, including CPE could be passed onto the selected P3 Partner, under the right agreement. Under these models, Palm Coast would invest over $7 million in a Retail Model, while a P3 would cost nearly $5.2 million, where the City is only investing in passive infrastructure and assets, such as conduit, boxes, and fiber-optic cable.

Table 21: CAPEX comparison

CAPEX CATEGORIES	RETAIL MODEL	P3
FIBER FEEDER/DISTRIBUTION	$ 2,587,000	$2,587,000
FIBER PREMISE CONNECTIONS	$ 1,960,849	$1,960,849
HEADEND EQUIPMENT/PM	$ 1,590,000	$ 565,000
GENERAL EQUIPMENT	$35,000	$35,000
WIRELESS EQUIPMENT	$1,000,000	$ -
TOTAL:	**$7,172,849**	**$5,147,849**

Under the P3 model, the City would invest in Fiber Feeder/Distribution, Fiber Premise (drops), project deployment, oversight, and general equipment related to managing passive infrastructure. The City should work to push the drop costs to the P3 partner, allowing them to work to collect customer construction fees when possible, passing them back to the City as capital expansion fees are incurred. This would further reduce the City's capital requirements, and is standard practice in the industry today.

Additionally, a core recommendation of the FiberNet 2.0 Business Plan is to incorporate a wireless (WiFi) component from which the City can provide wireless internet services as an amenity in corridors and locations of the City, while it would serve a dual purpose of connecting the City's mobile workforce, and as a secure platform to further enable Smart City.

4.7 FiberNet 2.0 OPEX Analysis

Palm Coast FiberNet's future Operating Expenses (OPEX) are vastly different given Retail Operations vs. that of a P3. Further, both of the OPEX scenarios outlined below are very different than the models used to support the operation of FiberNet.

Table 22: OPEX comparison

OPEX CATEGORIES	RETAIL MODEL	P3
STAFFING	3 + ($250K YR 1)	0-1
DATA CENTER RACK & POWER	$2,500 YR	$0
BROADBAND TRANSPORT & INTERNET	$60,000 YR	$0
OWNERS REP/CONSULTING	$50,000 YR	$175,000
FACILITIES MAINTENANCE, POWER, ENV.	$5,000 YR	$5,000 YR
MISC.	1% OF REV.	1% OF REV.
NETWORK & HEADEND MAINT.	$12,000 YR	$0
SOFTWARE MAINTENACE	15% OF SOFTWARE	$0
FIBER O&M	$30,000 - $60,000	$30,000 - $60,000
SG&A	$36,500/ 2% BAD DEBT	$36,500/ 2% BAD DEBT
NOTES:	EXPENSES INCREASE WITH ADDITIONAL SUBS	EXPENSES INCREASE WITH MORE NETWORK ASSETS

Under a Retail Model, the City would have to add at least three staff at a cost of over $250,000 in Year 1 to operate the current FiberNet network, and to support the planned expansion. These positions would include a Manager/Director, Network Engineer, Sales/Marketing, Customer Service, and OSP/GIS. In addition, FiberNet would incur charges for data center racks and power, broadband transport and internet, owners rep/consulting services, facilities maintenance, power and environmental controls, network and headend maintenance, software maintenance., fiber Operations and Management (O&M), and Sales, General, and Administrative (SG&A). The City would be staffing a new Fiber Utility division, adding City staff to manage the day to day administration and operations.

Under a P3 Model, staffing is kept to a minimum, focusing only on roles around network expansion and maintenance, and P3 contract oversight and performance, which can be mostly outsourced. The City would not incur any costs for data center or facilities, broadband transport and internet, software, or network headend maintenance.

Under both models, costs will increase over time, however the drivers for cost increases are much different. In a Retail Model, FiberNet's expenses increase as additional subscribers (users) are added to the network, while in a P3 Model, FiberNet expenses increase due to an increase in the amount of network assets the City owns and manages.

4.8 FiberNet 2.0 Financial Model Assumptions

Broadband Financial Models are heavily dependent on assumptions. As noted below, assumptions have been developed for modeled services and pricing, adoption and connection rates, as well as revenue share potential. Each of these assumptions is a key factor in the models (retail and P3), and each can be adjusted upward or downward to adjust the model.

Table 23: Financial model assumptions

ASSUMPTION DESCRIPTION	ASSUMPTION
BUSINESS 1GBPS BEST EFFORT INTERNET	$325
BUSINESS 100 MBPS BEST-EFFORT	$85
BUSINESS 1GBPS DEDICATED	$1,295
BUSINESS 100 MBPS DEDICATED	$350
SMART CITY CONNECTION FEE	$35
BUSINESS ADOPTION RATE	60% OVER 4 YRS
SMART CITY CONNECTION RATE	70% OVER 4 YRS
P3 REVENUE SHARE %	40%

** Note that this would be a change from current operations that use FiberNet at no-cost.

The services outlined in this model represent a Low Tier (100 Mbps Service), and High Tier (1 Gbps Service), service offering, both in a dedicated (guaranteed, reserved), and best-effort service level. These suggested rates are comparable to the market in Palm Coast, and represent high quality, high-speed data transport and internet services. The Smart City Connection Fee is derived from the City's current Verizon MiFi device costs, and is assumed to replace the need for third party connectivity, rather than funding connectivity through an internal service, either City supplied fiber or wireless. This line item represents a cost deferral opportunity, whereby the City is self-serving its connectivity needs through enhanced use of FiberNet.

The Business Adoption Rate identifies the rate at which customers would take service over time, and only from the available market (on-net, near-net). For Business Adoption Rates, the model targeted 60% adoption over a 4-year period. For Smart City Connection Rates, the adoption is 70% of on-net devices over the same 4-year period, again, only of the available markets defined.

Finally, the P3 Revenue Share percentage is the amount of revenue the City could expect to receive from a P3 provider given final negotiations and agreements. We believe the City could likely receive a revenue share of approximately 40%, perhaps as high as 50%, depending on the potential provider and the City's ability to fund infrastructure expansion. In short, the more

Risk the City assumes, the greater revenue share it should expect. Conversely, the City could receive smaller proposed revenue shares from partners, however, they may assume more capital investment requirements, or larger roles in managing/expanding FiberNet, and therefore would keep more of the revenues generated. The City should be open and inclusive to all proposals and should look toward innovative partnerships which can lead the City to meeting its long-term vision and goals.

4.9 FiberNet 2.0 Financial Model Projections and KPIs

Financial Model projections and KPIs, Key Performance Indicators, were developed for both FiberNet expansion models (Retail, P3), and various financial metrics and KPIs have been determined to support this analysis.

While the table below provides the financial metrics that could be expected through FiberNet's expansion, this does not identify or detail the internal efficiencies or community benefits realized. These represent the soft benefits gained through continued use of the network, which are very real returns for local government and community organizations.

Table 24: KPI comparison

KPIs	RETAIL MODEL	P3
BUSINESS ADOPTION RATE (60%)	615 CONNECTIONS	615 CONNECTIONS
SMART CITY CONNECTION RATE (70%)	620 CONNECTIONS	620 CONNECTIONS
TOTAL CONNECTIONS	1,235	1,235
20-YEAR CUMULATIVE REVENUES	$29,262,137	$19,838,883
20-YEAR CUMULATIVE GROSS PROFIT	$21,831,101	$14,527,169
20-YEAR CUMULATIVE EBITDA	$16,301,442	$13,074,558
20-YEAR CUMULATIVE NET-INCOME	$6,642,894	$7,076,674
YEAR POSITIVE EBITDA	YR 1	YR 1
YEAR POSITIVE NET INCOME	YR 4	YR 1
20-YEAR CAPITAL EXPENDITURES	$7,172,849	$5,147,849
20-YEAR PAYMENT IN LIEU OF TAX	$2,711,544	$3,690,796
20-YEAR FREE CASH FLOW (CASH + RESERVES)	$2,529,361	$1,983,888
FUNDED RESERVES AT YEAR 20	$2,050,000	$3,000,000

As we look at Business and Smart City Connections, these grow to 615 business connections, and 620 Smart City connections over time. This is the same under both modes, as they use the same uptake assumption. Total connections equal 1,235.

Revenues generated under the Retail Model are much higher than the P3 for the simple fact that under the Retail Model, 100% of the revenue is retained. Under the P3, only 40% is projected at this point under an assumed revenue share. The Retail Model's cost of operations will eat into gross profit, EBITDA, and net-income KPIs, allowing the P3 to have a greater cumulative net income by nearly $7 million over 20 years. Under both models, PILOT (payments in lieu of tax), and reserve funding is appropriated as well.

Over the 20-year period, the Retail Model includes nearly $7.2 million in capital expenditures, over $2.5 million in PILOT payments to the City's general fund and includes free cash flow and funded reserves at over $2.5 million. The P3 requires nearly $5.2 million in capital expenditures, includes nearly $3.7 million in PILOT payments, and free cash flow and funded reserves total over $1.9 million.

In short, this exercise helps us to understand that in using a P3 approach the City would be required to spend less capital, and will end a 20-year period with over $1.9 million cash in the bank, nearly $3 million in PILOT payments, all while increasing the City's broadband asset inventory by nearly $1.9 million of new infrastructure.

4.10 Breakeven Scenario

Magellan also provided a break-even scenario that analyzed the minimum Business Adoption Rates required to breakeven, over a 20-year period, under similar assumptions. These break-even scenarios do include funding renewal and replacement reserves which are necessary to sustain the network over the long term.

Table 25: Breakeven comparison

KPIs	RETAIL MODEL	P3
BUSINESS ADOPTION RATE (→)	420 CONNECTIONS (41%)	256 CONNECTIONS (25%)
SMART CITY CONNECTION RATE (70%)	620 CONNECTIONS	620 CONNECTIONS
TOTAL CONNECTIONS	1,040	876
20-YEAR CUMULATIVE REVENUES	$25,793,834	$17,230,861

KPIs	RETAIL MODEL	P3
20-YEAR CUMULATIVE GROSS PROFIT	$18,397,481	$11,945,228
20-YEAR CUMULATIVE EBITDA	$12,937,188	$10,544,777
20-YEAR CUMULATIVE NET INCOME	$3,937,186	$5,261,598
YEAR POSITIVE EBITDA	YR 1	YR 1
YEAR POSITIVE NET INCOME	YR 6	YR 1
20-YEAR CAPITAL EXPENDITURES	$6,648,524	$4,184,104
20-YEAR PAYMENT IN LIEU OF TAX	$659,953	$1,723,086
20-YEAR FREE CASH FLOW (CASH + RESERVES)	$2,103,873	$2,676,465
FUNDED RESERVES AT YEAR 20	$2,050,000	$2,050,000

Under these scenarios, capital expenditures are reduced primarily due to less overall connections, resulting in less fiber drops. Revenues, and other associated 20-year calculations also all decrease.

In order for the Retail Model to breakeven, it must hit a 41% uptake on business services, whereas the P3 requires a breakeven uptake rate of 25%.

4.11 FTTH Scenario

Magellan also ran projections at the City's request to show potential FTTH deployment to 100% of the existing platted lots within the City of Palm Coast – this covered over 35,000 lots, and did not include future residential development areas at this time. In order for Palm Coast to be able to provide FTTH services, it would have to enhance current capacity, and extend FiberNet along every City corridor and neighborhood street, comparable to the way the water distribution network is architected – each home would require a connection. At a 45% adoption rate over 20 years, and with 2% growth, the City would connect nearly 22,000 residential customers, in addition to the business and Smart City connections identified previously, for a total of 23,478 network connections.

Once GPON is established for business, buildouts to residential neighborhoods, within or outside the proposed areas, may be considered for FiberNet services as well. The GPON network connection to a residential unit is the same to that of the proposed business connections. FiberNet could utilize the Fiberhood buildout concept, allowing the City to expand its fiber network in areas where there is enough demand. In this model, FiberNet would assess the interest level of a particular neighborhood or area and extend FiberNet's network and services once enough residential subscribers have signed up. FiberNet should develop a program to selectively install extra conduit when the undergrounding of other utilities takes place. This would allow FiberNet to provide service in new communities undergoing development and would allow them to do so at a substantial savings. It would also provide FiberNet with a captive market that would likely choose advanced FTTP infrastructure over legacy copper offerings. The overall process for building to residential subscribers is exactly the same as for businesses, using feeder/distribution networks, drops, OLT (optical line termination) ports, and ONTs (optical network termination) at the subscriber premise.

Table 26. Preliminary Fiber-to-the-Home cost estimates (Passive OSP only)

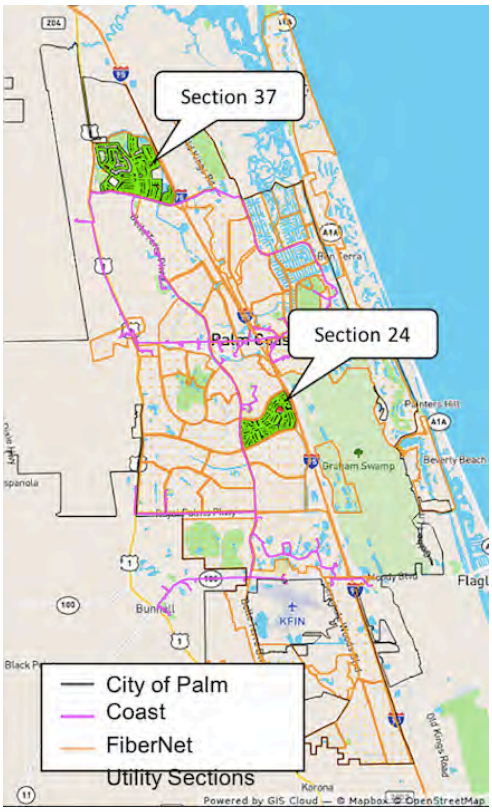
EST.	PRICE/ PASSING	CONSUMERS	FTTH NO DROPS[21]	DROP COST	FTTH WITH DROPS
HIGH	$1,800.00	35,363	$63,653,400	$34,478,925	$98,132,325
LOW	$1,500.00	35,363	$53,044,500	$34,478,925	$187,523,425

As shown in Table 26, it will require between $130 million and $145 million to deploy a full FTTH OSP infrastructure in Palm Coast. It will cost between $1,500 and $1,800 on average to connect a customer with FTTH. Drops from the access network to the Optical Network Terminals and into premises constitute some 35% to 40% of those expenses. Backbone and distribution network account for about 60% to 65% of FTTH deployment costs.

These estimates were generated from common FTTH cost components and levels applied to two representative City of Palm Coast Utility sections, shown in Table 26. The ratio of road miles to area was calculated, along with number of consumers, and those were generalized to other sections to calculate total network mileage and number of drops. These figures presume no infrastructure is in place, and do not consider any infrastructure that might be deployed as part of conditioning new developments, to serve commercial areas, or to address City needs and opportunities.

[21] All installation would be 100% underground. Estimates do not include headend equipment, permit fees, or drop cost, and assume no environmental issues.

Figure 47: Utility sections used for estimating FTTH costs



These estimates also do not include any network equipment, back office systems, ongoing operations, and other potential funding requirements needed to deploy a fully operational FTTH network and operations.

Under the P3 Model, which is the only sustainable FTTH option, 20-year FTTH revenues surpass $137 million, while 20-year cumulative net income is over $37.5 million. The FTTH P3 hits positive EBITDA by Year 1, and positive net income in Year 4. The City would be poised to spend nearly $70 million in capital expenditures over the same 20-year period, excluding customer drops, which would have to be passed onto the P3 partner, as the City could not sustain drop charges as well.

Table 27: FTTH KPIs

KPIs	FTTH
RESIDENTIAL ADOPTION RATE (45%)	21,997 – 2% GROWTH
BUSINESS CONNECTION RATE (60%)	861 CONNECTIONS
SMART CITY CONNECTION RATE (70%)	620 CONNECTIONS
TOTAL CONNECTIONS	23,478 CONNECTIONS
20-YEAR CUMULATIVE REVENUES	$137,158,479
20-YEAR CUMULATIVE GROSS PROFIT	$130,538,569
20-YEAR CUMULATIVE EBITDA	$126,739,566
20-YEAR CUMULATIVE NET INCOME	$37,571,164
YEAR POSITIVE EBITDA	YR 1
YEAR POSITIVE NET INCOME	YR 4
20-YEAR CAPITAL EXPENDITURES (P3 HANDLES DROPS)	$69,999,943
20-YEAR PAYMENT IN LIEU OF TAX	$6,122,582
20-YEAR FREE CASH FLOW (CASH + RESERVES)	$18,158,648
FUNDED RESERVES AT YEAR 20	$10,000,000

Over the 20-year period, the PILOT totals that would be contributed to the City's general fund surpass $6.1 million, in addition to over $18 million in free cash flow and funded reserves. While a P3 FTTH could provide a healthy revenue stream to the City, it is by far the riskiest option available due to the shear amount of capital investment and borrowing that would be required. Alternatively, the City could look to push more of the investment requirements onto

the partner to push the FTTH initiative, however the City should expect a smaller revenue share, and much less control, as the total capital investments required to move forward with this option are substantial.

4.12 FiberNet 2.0 Future Development Opportunities and Capital Projects

The City of Palm Coast also has a tremendous opportunity to solidify its development codes, requiring thorough development conditioning, the construction of underground conduit and telecommunications systems as new greenfield[22] developments begin buildout. Using a master planned approach, the City would require backbone, feeder/distribution, and drop infrastructure to be installed as portions of the planned communities are built out.

Table 28: Development opportunities analysis

SUBSCRIBERS			DEVELOPER	ANNUAL REVENUE POTENTIAL			20-YR
DEVELOPMENT	*RESIDENTS*	*BUSINESS*	*BACKBONE/FEEDER/DIST*	*DEVELOP DROP COSTS EST.*	*RESIDENTS*	*BUSINESS*	REVENUE
Town Center	2,500	600	$4.65M	$2.325M	$2.07M	$612K	$53.54M
Palm Coast Park	3,600	500	$6.15M	$3.075M	$2.98M	$10K	$69.816M
Colbert Ln/Roberts Rd, Marina Del Palma, SR 100	4,046	56	$6.153M	$3.076M	$3.35M	$7.12K	$68.144M
Total Potential			$16.953M	$8.476M	$8.4M	$1.179M	$191.6M

Costs:	
Residential Internet	$69
Business Internet	$85
Per Passing Cost	$1,500
Drop Cost 100% Premise	$750

Using assumptions of $69 per Residential Internet Customer, $85 per Business Internet, $1,500 per passing cost (average CAPEX per household passed), and a drop cost of $750, we are able to project total Developer Backbone/Feeder/Distribution Costs, as well as drops, and total annual revenue potential. Further, between the City's planned development projects, Town Center, Palm Coast Park, and Colbert Lane/Roberts Road, over 10,000 new residential subscribers and over 1,100 new business subscribers would enter the market. As these are long-term development plans, the City would have to understand the developer's absorption schedules to determine actual buildout timelines and premise counts – in short, not all subscribers would be

[22] Greenfield development refers to property not previously used for residential or commercial purposes, providing a blank canvas for the developer and minimizing redevelopment or demolition costs.

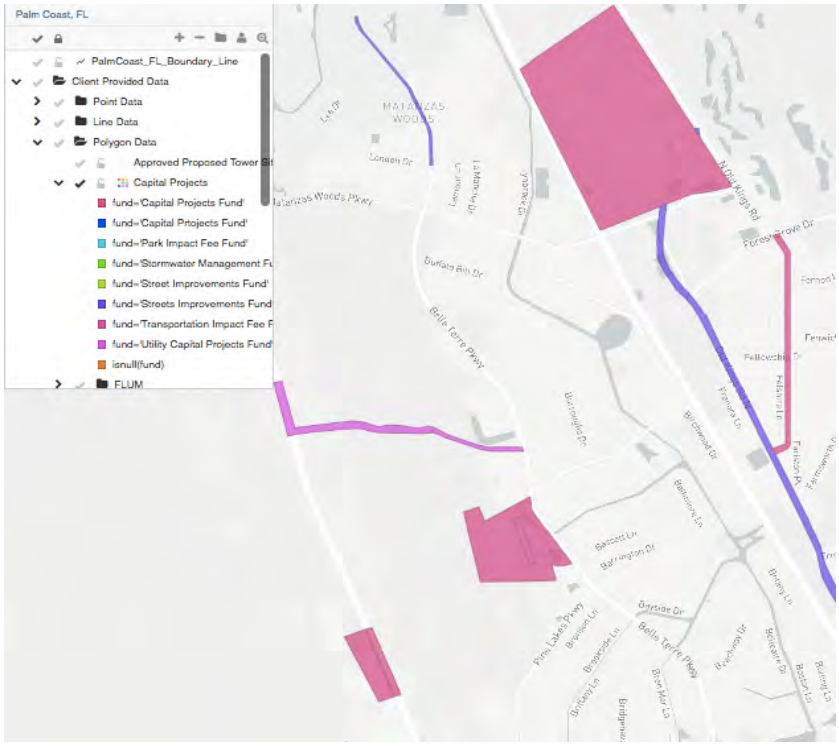
available to take service in Year 1, therefore actual revenue will be more delayed, being realized as development of subscriber units occur.

This Development Opportunities Analysis shows us that Palm Coast could receive in new infrastructure assets (or could save from having to deploy), over $25 million of new conduit, fiber and boxes, while having the opportunity to participate in nearly $192 million of potential telecom spend projected over the 20-year period. Given the proper broadband utility structure, the City would add significant assets to its balance sheet, and participate in future revenue opportunities without having to expend large amounts of capital. Under these assumptions, and through a P3, $192 million in revenue would not be realized by the City, but only a portion, subject to the P3 revenue share that would be agreed upon.

4.12.1 Capital Projects

The City of Palm Coast has an extensive Capital Improvements Program (CIP), including road widenings/maintenance, utility extensions, intersection improvements, and development of new City sites and facilities. Each of these types of projects lends itself to potential coordination and collaboration for the deployment of underground conduit and fiber systems. As depicted on the left, Palm Coast has utilized its GIS capabilities to identify all CIP projects within the 5-year planning forecast. Municipalities who adopt underground conduit and fiber systems specs and standards, find great success in including these into other municipal capital projects. Municipalities can save a tremendous amount of money through this coordination. The City should work through each capital project item that could incorporate FiberNet standards, and begin to incorporate those requirements into the work plans, taking into account the incremental costs that would be attributed to these initiatives. Again, as previously outlined in the funding discussion, the City should look to departments to jointly fund this infrastructure if there is truly project or department benefit that can be derived through it.

Figure 48: Example - Capital Projects



5 Recommendations and Action Plan

1. The City should reach consensus on the approach outlined in this Plan; the City has generally concluded that while it sees value in ownership and expansion of FiberNet, that it desires a new plan and approach to managing the assets, serving community organizations, and in spurring innovation throughout the community.
    a. The City should immediately begin to seek a potential private partner who could function as a FiberNet Network Operator and FTTP Services Provider.
    b. The City should not expend capital to expand FiberNet until a P3 Partner has been selected, and an expansion plan/approach has been agreed to with said Partner.
    c. The City should push to structure an agreement based upon a revenue share on gross revenues generated over FiberNet assets.
    d. The City should push aid to construction costs, or connection fees to subscribers, or allow the P3 Partner to assume drop/connection costs. While City ownership of the drops should be of interest to the City, it could structure a buy back over time from the Partner.
    e. Be open to innovative P3 approaches. Many interested firms will have different investment requirements, differing risk profiles, operational expertise or experience. The City should be open to innovation and should adjust its Business Plan and vision for a P3, to find the best solution that meets the City's long-term goals.
    f. The City should brand the P3, as "P3 Partner, powered by Palm Coast FiberNet," and should share in the branding and marketing efforts, while supporting the partner's sales efforts. With a P3 partnership, the City will not grow its revenues unless/until the Partner does – the City should be incentivized and must assist in driving use.
    g. Agree on business development and operations plans for the partnership, in close coordination with Town Center master developer selection process. Town Center should be targeted as an Innovation District focused as a potential pilot project.
2. As an Infrastructure Owner, the City will continue to manage OSP infrastructure, managing the design, construction, and fiber O&M on FiberNet's passive assets.
    a. The City has recently awarded contracts with Danella Construction and PCS Fiber for Fiber Construction and OSP O&M services – nothing further is required here.
    b. The City must invest in and manage a Fiber Management System, capable of integrating with ESRI GIS, and tracking of OSP assets, including fiber strand and splice details. The City should issue an RFP for these services.
    c. While the City's primary focus should be on developing a P3 as previously documented, it should continue to make its assets available strategically to the greater market.
        i. The City has excess conduit available along backbone routes and it should make this available to industry at a competitive cost.
    d. Allocate resources to and assign ownership of network facilities—buildings/cabinets, conduit, fiber, poles, etc.—deployment and maintenance. Determine final operational structure, and location of FiberNet within the City organization.

3. FiberNet needs oversight and regular checkup on strategic direction. A FiberNet Task Force or Governance committee with a cross membership from FACT and Innovation teams, should be charged with execution and governance—to ensure recommendations are agreed on and implemented.
    a. Engage external stakeholders, particularly entrepreneur, innovation, and tech people, on the task force.
4. The City should work to strategically address bottlenecks, gaps, etc., and stage the network for prospective partners.
5. Explore smart city applications, focusing on feasibility, to generate reasonably comprehensive and detailed City requirements. The City should identify key smart city applications and initiatives which can advance the City Council and community's goals.
6. Utilize FiberNet as a platform for innovation and to further entrepreneurship and workforce goals.
7. Develop a vision and design for Town Center that includes next generation technologies for energy, fitness, information, mobility, production, recreation, etc.
8. Host solution events focused on key network applications/smart city opportunities in conjunction with partners.
    a. Actively involve and promote to target customers.
    b. Use solutions events to show what's possible and a visioning process to focus possibilities on what's important and needed.
9. Track activities, milestones, and outcomes, share and celebrate them, too. Create and report on FiberNet performance metrics.

6 Appendix A - Glossary

3G – Third Generation	The third generation of mobile broadband technology, used by smart phones, tablets, and other mobile devices to access the web.
4G – Fourth Generation	The fourth generation of mobile broadband technology, used by smart phones, tablets, and other mobile devices to access the web.
ADSL – Asymmetric Digital Subscriber Line	DSL service with a larger portion of the capacity devoted to downstream communications, less to upstream. Typically thought of as a residential service.
ADSS – All-Dielectric Self-Supporting	A type of optical fiber cable that contains no conductive metal elements.
AE – Active Ethernet	Active Ethernet uses
AMR/AMI – Automatic Meter Reading/Advanced Metering Infrastructure	Electrical meters that measure more than simple consumption and an associated communication network to report the measurements.
ATM – Asynchronous Transfer Mode	A data service offering that can be used for interconnection of customer's LAN. ATM provides service from 1 Mbps to 145 Mbps utilizing Cell Relay Packets.
ARIN	American Registry for Internet Numbers
Bandwidth	The amount of data transmitted in a given amount of time; usually measured in bits per second, kilobits per second (kbps), Megabits per second (Mbps), and Gigabits per second (Gbps).
Bit	A single unit of data, either a one or a zero. In the world of broadband, bits are used to refer to the amount of transmitted data. A kilobit (Kb) is approximately 1,000 bits. A Megabit (Mb) is approximately 1,000,000 bits. There are 8 bits in a byte (which is the unit used to measure storage space), therefore a 1 Mbps connection takes about 8 seconds to transfer 1 megabyte of data (about the size of a typical digital camera photo).
BPL – Broadband over Powerline	A technology that provides broadband service over existing electrical power lines.
BPON – Broadband Passive Optical Network	BPON is a point-to-multipoint fiber-lean architecture network system which uses passive splitters to deliver signals to multiple users. Instead of running a separate strand of fiber from the CO to every customer, BPON uses a single strand of fiber to serve up to 32 subscribers.
Broadband	A descriptive term for evolving digital technologies that provide consumers with integrated access to voice, high-speed data service, video-demand services, and interactive delivery services (e.g. DSL, Cable Internet).
CAD – Computer Aided Design	The use of computer systems to assist in the creation, modification, analysis, or optimization of a design.
CAI – Community Anchor Institutions	The National Telecommunications and Information Administration defined CAIs in its SBDD program as "Schools, libraries, medical and healthcare providers, public safety entities, community colleges and other institutions of higher education, and other community support organizations and entities". Universities, colleges, community colleges, K-12 schools, libraries, health care facilities, social service providers, public safety entities, government and municipal offices are all community anchor institutions.
CAP – Competitive Access Provider	(or "Bypass Carrier") A Company that provides network links between the customer and the Inter-Exchange Carrier or even directly to the Internet

	Service Provider. CAPs operate private networks independent of Local Exchange Carriers.
Cellular	A mobile communications system that uses a combination of radio transmission and conventional telephone switching to permit telephone communications to and from mobile users within a specified area.
CLEC – Competitive Local Exchange Carrier	Wireline service provider that is authorized under state and Federal rules to compete with ILECs to provide local telephone service. CLECs provide telephone services in one of three ways or a combination thereof: 1) by building or rebuilding telecommunications facilities of their own, 2) by leasing capacity from another local telephone company (typically an ILEC) and reselling it, and 3) by leasing discrete parts of the ILEC network referred to as UNEs.
CO – Central Office	A circuit switch where the phone lines in a geographical area come together, usually housed in a small building.
Coaxial Cable	A type of cable that can carry large amounts of bandwidth over long distances. Cable TV and cable modem service both utilize this technology.
CPE – Customer Premise Equipment	Any terminal and associated equipment located at a subscriber's premises and connected with a carrier's telecommunication channel at the demarcation point ("demarc").
CWDM – Coarse Wavelength Division Multiplexing	A technology similar to DWDM only utilizing less wavelengths in a more customer-facing application whereby less bandwidth is required per fiber.
Dark Fiber	Un-used or un-lit fiber-optic cable.
Demarcation Point (“demarc”)	The point at which the public switched telephone network ends and connects with the customer's on-premises wiring.
DDOS	Distributed Denial-of-Service is a disruptive cyber-attack where the perpetrator uses more than one unique IP address, often thousands of them.
Dial-Up	A technology that provides customers with access to the Internet over an existing telephone line.
DLEC – Data Local Exchange Carrier	DLECs deliver high-speed access to the Internet, not voice. Examples of DLECs include Covad, Northpoint and Rhythms.
Downstream	Data flowing from the Internet to a computer (Surfing the net, getting E-mail, downloading a file).
DSL – Digital Subscriber Line	The use of a copper telephone line to deliver “always on” broadband Internet service.
DSLAM – Digital Subscriber Line Access Multiplier	A piece of technology installed at a telephone company’s Central Office (CO) and connects the carrier to the subscriber loop (and ultimately the customer’s PC).
DWDM – Dense Wavelength Division Multiplexing	An optical technology used to increase bandwidth over existing fiber-optic networks. DWDM works by combining and transmitting multiple signals simultaneously at different wavelengths on the same fiber. In effect, one fiber is transformed into multiple virtual fibers.
E-Rate	A Federal program that provides subsidy for voice and data circuits as well as internal network connections to qualified schools and libraries. The subsidy is based on a percentage designated by the FCC.
EON – Ethernet Optical Network	The use of Ethernet LAN packets running over a fiber network.
EvDO – Evolution Data Only	EvDO is a wireless technology that provides data connections that are 10 times as fast as a traditional modem. This has been overtaken by 4G LTE.

FCC – Federal Communications Commission	A Federal regulatory agency that is responsible for regulating interstate and international communications by radio, television, wire, satellite and cable in all 50 states, the District of Columbia, and U.S. territories.
FDH – Fiber Distribution Hub	A connection and distribution point for optical fiber cables.
FTTN – Fiber to the Neighborhood	A hybrid network architecture involving optical fiber from the carrier network, terminating in a neighborhood cabinet with converts the signal from optical to electrical.
FTTP – Fiber to the premise (or FTTB – Fiber to the building)	A fiber-optic system that connects directly from the carrier network to the user premises.
GIS – Geographic Information Systems	A system designed to capture, store, manipulate, analyze, manage, and present all types of geographical data.
GPON- Gigabit-Capable Passive Optical Network	Similar to BPON, GPON allows for greater bandwidth through the use of a faster approach (up to 2.5 Gbps in current products) than BPON.
GPS – Global Positioning System	A space-based satellite navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites.
GSM – Global System for Mobile Communications	This is the current radio/telephone standard developed in Europe and implemented globally except in Japan and South Korea.
HD – High Definition (Video)	Video of substantially higher resolution than standard definition.
HFC – Hybrid Fiber Coaxial	An outside plant distribution cabling concept employing both fiber-optic and coaxial cable.
ICT – Information and Communications Technology	Often used as an extended synonym for information technology (IT), but it is more specific term that stresses the role of unified communications and the integration of telecommunications, computers as well as necessary enterprise software, middleware, storage, and audio-visual systems, which enable users to access, store, transmit, and manipulate information.
IEEE – Institute of Electrical Engineers	A professional association headquartered in New York City that is dedicated to advancing technological innovation and excellence.
ILEC – Incumbent Local Exchange Carrier	The traditional wireline telephone service providers within defined geographic areas. Prior to 1996, ILECs operated as monopolies having exclusive right and responsibility for providing local and local toll telephone service within LATAs.
IP-VPN – Internet Protocol-Virtual Private Network	A software-defined network offering the appearance, functionality, and usefulness of a dedicated private network.
IPv6 – Internet Protocol Version 6	This is the most recent version of the Internet Protocol, providing location and computer identification for computers on the Internet.
ISDN – Integrated Services Digital Network	An alternative method to simultaneously carry voice, data, and other traffic, using the switched telephone network.
ISP – Internet Service Provider	A company providing Internet access to consumers and businesses, acting as a bridge between customer (end-user) and infrastructure owners for dial-up, cable modem and DSL services.
ITS – Intelligent Traffic System	Advanced applications which, without embodying intelligence as such, aim to provide innovative services relating to different modes of transport and traffic management and enable various users to be better informed and make safer, more coordinated, and "smarter" use of transport networks.
IVR – Interactive Voice Response	Technology that allows a computer to interact with humans through the use of voice and DTMF tones input via keypad.
Kbps – Kilobits per second	1,000 bits per second. A measure of how fast data can be transmitted.

L2 Network Architecture	Layer 2 Network Architecture – refers to the data link layers concerned with moving data across the physical links in the network.
L3 Network Architecture	Layer 3 Network Architecture – refers to the network layer; routers and switches perform these functions.
LAN – Local Area Network	A geographically localized network consisting of both hardware and software. The network can link workstations within a building or multiple computers with a single wireless Internet connection.
Last Mile Fiber	Telecommunications technology that carries signals from the telecommunication backbone along the relatively short distance to the home or business.
LATA – Local Access and Transport Areas	A geographic area within a divested Regional Bell Operating Company is permitted to offer exchange telecommunications and exchange access service. Calls between LATAs are often thought of as long distance service. Calls within a LATA (IntraLATA) typically include local and local toll services.
LEC – Local Exchange Carrier	The term for a public telephone company in the U.S. that provides local service.
Local Loop	A generic term for the connection between the customer's premises (home, office, etc.) and the provider's serving central office. Historically, this has been a copper wire connection; but in many areas it has transitioned to fiber optic. Also, wireless options are increasingly available for local loop capacity.
MAN – Metropolitan Area Network	A high-speed intra-city network that links multiple locations with a campus, city or LATA. A MAN typically extends as far as 30 miles.
Managed Network Services	Network services that include monitoring, fault analysis, performance management, provisioning of network and network devices, and maintaining the quality of service.
Mbps – Megabits per second	1,000,000 bits per second. A measure of how fast data can be transmitted.
MPLS – Multiprotocol Label Switching	A mechanism in high-performance telecommunications networks that directs data from one network node to the next based on short path labels rather than long network addresses, avoiding complex lookups in a routing table.
ONT – Optical Network Terminal	Used to terminate the fiber-optic line, demultiplex the signal into its component parts (voice telephone, television, and Internet), and provide power to customer telephones.
Overbuilding	Building excess capacity. In this context, it involves investment in additional infrastructure projects to provide competition.
OVS – Open Video Systems	OVS is a new option for those looking to offer cable television service outside the current framework of traditional regulation. It would allow more flexibility in providing service by reducing the build out requirements of new carriers.
PBX	Private branch exchange, a private telephone switchboard
PON – Passive Optical Network	A Passive Optical Network consists of an optical line terminator located at the Central Office and a set of associated optical network terminals located at the customer's premise. Between them lies the optical distribution network comprised of fibers and passive splitters or couplers. In a PON network, a single piece of fiber can be run from the serving exchange out to a subdivision or office park, and then individual fiber strands to each building or serving equipment can be split from the main

	fiber using passive splitters / couplers. This allows for an expensive piece of fiber cable from the exchange to the customer to be shared amongst many customers, thereby dramatically lowering the overall costs of deployment for fiber to the business (FTTB/FTTP) or fiber to the home (FTTH) applications.
PRTG	PRTG is a network software that uses lookups for some sensor types and for some sensors with custom channels. In general, lookups make data more human friendly because they map status values as returned by a device (usually integers) to more informative expressions in words that show you the status of a monitored device as a clear message.
QOS – Quality of Service	QoS (Quality of Service) refers to a broad collection of networking technologies and techniques. The goal of QoS is to provide guarantees on the ability of a network to deliver predictable results, which are reflected in Service Level Agreements or SLAs. Elements of network performance within the scope of QoS often include availability (uptime), bandwidth (throughput), latency (delay), and error rate. QoS involves prioritization of network traffic.
RF – Radio Frequency	A rate of oscillation in the range of about 3 kHz to 300 GHz, which corresponds to the frequency of radio waves, and the alternating currents which carry radio signals.
Right-of-Way	A legal right of passage over land owned by another. Carriers and service providers must obtain right-of-way to dig trenches or plant poles for cable systems, and to place wireless antennae.
RMS – Resource Management System	A system used to track telecommunications assets.
RPR – Resilient Packet Ring	Also known as IEEE 802.17, is a protocol standard designed for the optimized transport of data traffic over optical fiber ring networks.
RUS – Rural Utility Service	A division of the United States Department of Agriculture, it promotes universal service in rural unserved and underserved areas of the country with grants, loans, and financing. Formerly known as “REA” or the Rural Electrification Administration.
SIP – Session Initiation Protocol	A communications protocol for signaling and controlling multimedia communication sessions.
SCADA – Supervisory Control and Data Acquisition	A type of industrial control system (ICS). Industrial control systems are computer controlled systems that monitor and control industrial processes that exist in the physical world.
SLA – Service Level Agreement	Service level agreement common within the terms of contracts with customers to define the level(s) of service being sold in plain language.
SNMP – Simple Network Management Protocol	An Internet-standard protocol for managing devices on IP networks.
SONET – Synchronous Optical Network	A family of fiber-optic transmission rates.
Streaming	Streamed data is any information/data that is delivered from a server to a host where the data represents information that must be delivered in real time. This could be video, audio, graphics, slide shows, web tours, combinations of these, or any other real time application.
Subscribership	Subscribership is how many customers have subscribed for a particular telecommunications service.

Switched Network	A domestic telecommunications network usually accessed by telephone, key telephone systems, private branch exchange trunks, and data arrangements.
T-1 – Trunk Level 1	A digital transmission link with a total signaling speed of 1.544 Mbps. It is a standard for digital transmission in North America.
T-3 – Trunk Level 3	28 T1 lines or 44.736 Mbps.
Threat Actor	A person, actor, entity or organization that initiates a security scenario, (Hacktivists, Cybercriminals, Disgruntles insiders, Nation States, Careless employees, Nature)
UNE – Unbundled Network Element	Leased portions of a carrier's (typically an ILEC's) network used by another carrier to provide service to customers. Over time, the obligation to provide UNEs has been greatly narrowed, such that the most common UNE now is the UNE-Loop.
Universal Service	The idea of providing every home in the United States with basic telephone service.
Unmanaged Network Services	Network services that do not include monitoring, fault analysis, performance management, provisioning of network and network devices, and maintaining the quality of service.
Upstream	Data flowing from your computer to the Internet (sending E-mail, uploading a file).
UPS – Uninterruptable Power Supply	An electrical apparatus that provides emergency power to a load when the input power source, typically main power, fails.
USAC – Universal Service Administrative Company	An independent American nonprofit corporation designated as the administrator of the Federal Universal Service Fund (USF) and E-Rate program by the Federal Communications Commission.
VDSL – Very High Data Rate Digital Subscriber Line	A developing digital subscriber line (DSL) technology providing data transmission faster than ADSL over a single flat untwisted or twisted pair of copper wires (up to 52 Mbps downstream and 16 Mbps upstream), and on coaxial cable (up to 85 Mbps down and upstream); using the frequency band from 25 kHz to 12 MHz.
Video on Demand	A service that allows users to remotely choose a movie from a digital library whenever they like and be able to pause, fast-forward, and rewind their selection.
VLAN – Virtual Local Area Network	In computer networking, a single layer-2 network may be partitioned to create multiple distinct broadcast domains, which are mutually isolated so that packets can only pass between them via one or more routers; such a domain is referred to as a Virtual Local Area Network, Virtual LAN or VLAN.
VoIP – Voice over Internet Protocol	An application that employs a data network (using a broadband connection) to transmit voice conversations using Internet Protocol.
VPN – Virtual Private Network	A virtual private network (VPN) extends a private network across a public network, such as the Internet. It enables a computer to send and receive data across shared or public networks as if it were directly connected to the private network, while benefitting from the functionality, security and management policies of the private network. This is done by establishing a virtual point-to-point connection through the use of dedicated connections, encryption, or a combination of the two.
WAN – Wide Area Network	A network that covers a broad area (i.e., any telecommunications network that links across metropolitan, regional, or national boundaries) using private or public network transports.

WiFi	WiFi is a popular technology that allows an electronic device to exchange data or connect to the Internet wirelessly using radio waves. The Wi-Fi Alliance defines Wi-Fi as any wireless local area network (WLAN) products that are based on the Institute of Electrical and Electronics Engineers' (IEEE) 802.11 standards."
WiMax	WiMax is a wireless technology that provides high-throughput broadband connections over long distances. WiMax can be used for a number of applications, including “last mile” broadband connections, hotspot and cellular backhaul, and high speed enterprise connectivity for businesses.
Wireless	Telephone service transmitted via cellular, PCS, satellite, or other technologies that do not require the telephone to be connected to a land-based line.
Wireless Internet	1) Internet applications and access using mobile devices such as cell phones and palm devices. 2) Broadband Internet service provided via wireless connection, such as satellite or tower transmitters.
Wireline	Service based on infrastructure on, in or near the ground, such as copper telephone wires, coaxial cable, or fiber cables underground or on utility poles.
WLAN – Wireless Local Area Network	Wireless computer network that links two or more devices using a wireless distribution method (often spread-spectrum or OFDM radio) within a limited area such as a home, school, computer laboratory, or office building. This gives users the ability to move around within a local coverage area and still be connected to the network, and can provide a connection to the wider Internet.

7 Appendix B - Financial Model Supporting Information

Magellan Advisors' Legal Disclaimer

This report (including any enclosures and attachments) has been prepared for the exclusive use and benefit of the Client and solely for the purpose for which it is provided. Unless Magellan Advisors provides express prior written consent, no part of this report should be reproduced, distributed or communicated to any third party. Magellan Advisors does not accept any liability if this Report is used for an alternative purpose from which it is intended, nor to any third party in respect of this report.

These materials have been prepared for informational purposes only and concern hypothetical and/or historical situations. The information is not intended as and should not be construed to provide any legal advice as Magellan Advisors does not provide legal services. Magellan Advisors and its directors, employees, contractors or associates shall not be liable for any direct or indirect consequential loss suffered by any person or organization as a result of using or relying on any statement in or omission from this Report (including any enclosures and attachments).

Magellan Advisors' Disclaimer on Financial Information, Assumptions, Forecasts and Risks

Magellan Advisors' financial models, estimates, forecasts and related financial and business risk analyses have been prepared for use solely by Magellan's Client in understanding the financial aspects of proposed broadband and telecommunications projects. Magellan accepts no responsibility or liability towards any third party in respect of this information or related content in this Report. This information is subjective in many respects, and, thus, susceptible to multiple interpretations and periodic revisions based on actual experience and business developments.

The financial information contained in this Report contains a significant number of subjective forecast assumptions including, but not limited to, subscriber take rates, rate structures, fixed and variable costs, costs of capital and related assumptions. Any deviation from the subjective forecast assumptions is likely to lead to results that are significantly different than those projected in the Report. Additionally, other events that are not explicitly allowed for in the Report and financial analysis may lead to significantly different returns or values.

Neither the financial information contained herein nor its outputs necessarily represent the opinion of value or future investment returns that are achievable. The financial information prepared by Magellan Advisors in this Report is provided for the sole purpose of indicative results based on a given set of assumptions. Neither Magellan Advisors itself, nor its directors, employees, contractors or associates shall be liable for any direct or indirect consequential loss suffered by any person or organization as a result of using or relying on any statement in or omission from this financial information or any information provided in connection herewith.

Cumulative Demand

	0	0								
umulative Uptake (from Assumptions)	15%	35%	40%	40%	40%	40%	40%	40%	40%	40%
Year #	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Cumulative Demand Summary	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Subtotal: Residential Demand	-	-	-	-	-	-	-	-	-	-
Subtotal: Business Demand On-Net	22	50	63	70	71	73	74	76	77	79
Subtotal: Business Demand Near-Ne	-	273	340	378	386	393	401	410	417	426
Subtotal: Large Enterprise/Dedica	-	-	-	-	-	-	-	-	-	-
Subtotal: Smart City Nodes	35	195	346	496	620	620	620	620	620	620
TOTAL DEMAND - ALL SERVICES	57	518	749	944	1,077	1,086	1,095	1,106	1,114	1,125
Percentage of Total Market - Resi	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Percentage of Total Market - Busi	20.0%	7.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%
Percentage of Total Market - Busi	0.0%	38.0%	46.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%
Percentage of Total Market - Larg	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Percentage of Total Market - Smar	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Total Internet Service Demand - R	-	-	-	-	-	-	-	-	-	-
Total Internet Service Demand - B	22	50	63	70	71	73	74	76	77	79
Total Internet Service Demand - B	-	392	489	544	554	566	577	589	600	613
Total Internet Service Demand - L	-	-	-	-	-	-	-	-	-	-
TOTAL DEMAND - INTERNET SERVICES	22	442	552	614	625	639	651	665	677	692
Total Smart City Nodes - On-Net	35	195	346	496	620	620	620	620	620	620

Cumulative Demand

umulative Uptake (from Assumptions)	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%
Year #	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*
Cumulative Demand Summary	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Subtotal: Residential Demand	-	-	-	-	-	-	-	-	-	-
Subtotal: Business Demand On-Net	80	82	83	86	87	89	90	92	94	96
Subtotal: Business Demand Near-Ne	434	443	452	461	470	480	490	499	509	519
Subtotal: Large Enterprise/Dedica	-	-	-	-	-	-	-	-	-	-
Subtotal: Smart City Nodes	620	620	620	620	620	620	620	620	620	620
TOTAL DEMAND - ALL SERVICES	1,134	1,145	1,155	1,167	1,177	1,189	1,200	1,211	1,223	1,235
Percentage of Total Market - Resi	0.0%	0.0%	0.0%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Percentage of Total Market - Busi	9.0%	9.0%	9.0%	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%
Percentage of Total Market - Busi	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%	51.0%
Percentage of Total Market - Larg	0.0%	0.0%	0.0%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Percentage of Total Market - Smar	0.0%	0.0%	70.0%	70.00%	70.00%	70.00%	70.00%	70.00%	70.00%	70.00%
Total Internet Service Demand - R	-	-	-	-	-	-	-	-	-	-
Total Internet Service Demand - B	80	82	83	86	87	89	90	92	94	96
Total Internet Service Demand - B	624	637	650	663	676	690	703	717	732	746
Total Internet Service Demand - L	-	-	-	-	-	-	-	-	-	-
TOTAL DEMAND - INTERNET SERVICES	704	719	733	749	763	779	793	809	826	842
Total Smart City Nodes - On-Net	620	620	620	620	620	620	620	620	620	620

Service Area Population Growth Rate

2.00% Subscriber Growth

Uptake by Customer Type	Residential	Business	ırge Enterpri:	Smart City Nodes
Year	% of Premises			Smart City Nodes
2019	15.00%	20.00%	0.00%	20.00%
2020	20.00%	25.00%	5.00%	35.00%
2021	5.00%	10.00%	5.00%	10.00%
2022	0.00%	5.00%	5.00%	5.00%
2023	0.00%	0.00%	0.00%	0.00%
2024	0.00%	0.00%	0.00%	0.00%
2025	0.00%	0.00%	0.00%	0.00%
2026	0.00%	0.00%	0.00%	0.00%
2027	0.00%	0.00%	0.00%	0.00%
2028	0.00%	0.00%	0.00%	0.00%
2029	0.00%	0.00%	0.00%	0.00%
2030	0.00%	0.00%	0.00%	0.00%
2031	0.00%	0.00%	0.00%	0.00%
2032	0.00%	0.00%	0.00%	0.00%
2033	0.00%	0.00%	0.00%	0.00%
2034	0.00%	0.00%	0.00%	0.00%
2035	0.00%	0.00%	0.00%	0.00%
2036	0.00%	0.00%	0.00%	0.00%
2037	0.00%	0.00%	0.00%	0.00%
2038	0.00%	0.00%	0.00%	0.00%
Total Uptake	40.00%	60.00%	15.00%	70.00%

Operating Cost Assumptions

	Type	Per Unit	Annual Change
Cost of Services			
Data Center Rack and Power (UM)	Fixed Annual	$ -	1.0%
Broadband Transport & Internet Costs	Fixed Annual	$ -	1.0%
Owners Rep/Business Consulting	Fixed Annual	$ 175,000	0.0%
Dark Fiber Operations & Maintenance	Fixed Annual	$ 60,000	3.0%
Facilities Maintenance, Power, Environmental	Fixed Annual	$ 5,000	1.0%
Miscellaneous	% of Revenue	1%	1.0%
Network & Headend Maintenance	% of Equipment	$ -	1.0%
Programming Costs Per Subscriber + Virtual Headend	Per Customer	$ -	1.0%
Software Maintenance	% of Software	15%	1.0%
Utilities	Fixed Annual	$ 5,000	0.25%
Vehicle Maintenance	% of Vehicles	0%	1.0%
Network Operations Outsource Contract	Per Customer	$ -	1.0%
Pole attachments	Fixed Annual	$ -	0.0%
			0.0%
Sales, General & Administrative Expenses			
Cost Allocation for City Services	Fixed	$ -	2.0%
Professional & Legal Fees	Fixed	*$ 15,000*	2.0%
Sales Commissions & Marketing Expense	% of Revenue	0.00%	0.0%
Reporting & Compliance	Fixed	$ 6,000	2.0%
Travel & Entertainment Expense	Fixed	$ 6,000	2.0%
Office Expense	Fixed	$ 3,000	2.0%
General Overhead	Fixed	$ 14,000	2.0%
Bad Debt Expense	Fixed	2.00%	0.0%

	B	C	D	E	F	G	H	I
2	Capital Plan			#REF!				
3								
4	Capital Plan							
5	Distribution Network Overlaid on Existing Fiber Routes	Year #		1	2	3	4	5
55	Premises Connected			2019	2020	2021	2022	2023
56								
57	Materials Cost Combined with Labor below							
58	Residential Drop Fiber Cost per Passing	Materials						
59	Commercial Drop Fiber Cost per Passing (Included in Lal	Materials						
60	Premise Inside Wiring Per Passing	Materials						
61	Other Materials	Materials						
62	Private Provider Partner to provide CPE							
63	Equipment Cost							
64	Commercial Optical Network Terminal + Power Supply	Equipment						
65	Residential Optical Network Terminal + Power Supply	Equipment						
66	Residential Gateway	Equipment						
67	Settop Boxes - 2.5 Per Subscriber @ 245 ea.	Equipment						
68								
69	Labor & Materials Cost Per Subscriber							
70	Commercial Drop Fiber Splicing, Installation and Terma	Labor	$1,960,849	$ 39,126	$ 926,251	$ 289,212	$ 195,843	$ 86,975
71	Residential Drop Fiber Installation, Splicing Termin	Labor						
72	Premise Equipment Installation	Labor						
73	Premise Inside Wiring Installation	Labor						
74								
75	Headend Equipment / PM			2019	2020	2021	2022	2023
76	Core switch routers	Equipment						
77	Encoders/Transcoders	Equipment						
78	Fiber termination panels	Equipment	$ 25,000	$ 25,000.00				
79	Firewalls	Equipment		$ -				
80	Internet routers	Equipment		$ -				
81	Intra-facility cabling	Equipment	$ 20,000	$ 20,000.00				
82	Ladder/raceway	Equipment	$ 10,000	$ 10,000.00				
83	OLTs	Equipment		$ -				
84	Racks/cabinets	Equipment	$ 10,000	$ 10,000.00				
85	Switches, servers, storage	Equipment		$ -				
86	IP TV Middleware	Equipment						
87	Video On Demand	Equipment						
88	Network Management Systems	Equipment		$ -				
89	Provisioning Systems	Equipment		$ -				
90	Billing Systems	Equipment		$ -				
91	Installation & Project Management	Labor	$ 500,000	$ 250,000.00	$ 250,000			
92								
93	Building Improvements			2019	2020	2021	2022	2023
94	Data Center Building Improvements	Materials						
95	NOC Improvements	Materials						
96	Administrative Offices	Materials						
97								
98	General Equipment			2019	2020	2021	2022	2023
99	Vehicles & Outfitting (2 @35K)	Equipment	$ 35,000	$ 35,000				
100	Splicing Trailer	Equipment						
101	OTDRs	Equipment						
102	Mobile Test Sets	Equipment						
103	Fusion Splicers	Equipment						
104	Toolkits	Equipment						
105	Miscellaneous Equipment	Equipment						
106								
107	Wireless Equipment			2019	2020	2021	2022	2023
108	Wireless RF Overlay on Exsting Fiber Network	Equipment	$ -					
109	Line & Antenna Equipment	Equipment						
110	Attachment Hardware	Equipment						
111	Miscellaneous Wireless Equipment	Equipment						
112								
113	Subtotal Categories Annual		Totals	2019	2020	2021	2022	2023
114	Feeder & Distribution Fiber Design & Construction		$2,587,000	$ 1,587,000	$ 1,000,000			
115	Premises Connected		$1,960,849	$ 39,126	$ 926,251	$ 289,212	$ 195,843	$ 86,975
116	Headend Equipment / PM		$ 565,000	$ 315,000	$ 250,000			
117	Building Improvements		$ -					
118	General Equipment		$ 35,000	$ 35,000				
119	Wireless Equipment, SW Licenses & Installation		$ -					
120								
121	Cumulative by Year Categories		Totals	2019	2020	2021	2022	2023
122	Feeder & Distribution Fiber Design & Construction		$2,587,000	$ 1,587,000	$ 2,587,000	$ 2,587,000	$ 2,587,000	$ 2,587,000
123	Premises Connected		$1,960,849	$ 39,126	$ 965,377	$ 1,254,589	$ 1,450,432	$ 1,537,407
124	Headend Equipment / PM		$ 565,000	$ 315,000	$ 565,000	$ 565,000	$ 565,000	$ 565,000
125	Building Improvements		$ -					
126	General Equipment		$ 35,000	$ 35,000	$ 35,000	$ 35,000	$ 35,000	$ 35,000
127	Wireless Equipment, SW Licenses & Installation		$ -					
128								
129	Subtotal Type Annual		Totals	2019	2020	2021	2022	2023
130	20 Year Lifetime (Materials / Labor)		$5,047,849	$ 1,876,126	$ 2,176,251	$ 289,212	$ 195,843	$ 86,975
131	10 Year Lifetime (Equipment)		$ 100,000	$ 100,000				
132								
133	Subtotal Type Cumulative			2019	2020	2021	2022	2023
134	20 Year Lifetime (Materials / Labor)		$5,047,849	$ 1,876,126	$ 4,052,377	$ 4,341,589	$ 4,537,432	$ 4,624,407
135	10 Year Lifetime (Equipment)		$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000
136								
137	Total Annual Capital		$5,147,849	$ 1,976,126	$ 2,176,251	$ 289,212	$ 195,843	$ 86,975
138	Total Cumulative Capital		$5,147,849	$ 1,976,126	$ 4,152,377	$ 4,441,589	$ 4,637,432	$ 4,724,407
139								
140	Depreciation			2019	2020	2021	2022	2023
141								
142	20 Year Lifetime (Materials / Labor)							
143	2019		$1,500,901	$ 75,045	$ 75,045	$ 75,045	$ 75,045	$ 75,045
144	2020		$1,653,951		$ 87,050	$ 87,050	$ 87,050	$ 87,050
145	2021		$ 208,233			$ 11,568	$ 11,568	$ 11,568
146	2022		$ 133,173				$ 7,834	$ 7,834
147	2023		$ 55,664					$ 3,479
148	2024		$ 13,775					
149	2025		$ 13,986					
150	2026		$ 15,058					
151	2027		$ 10,548					
152	Total:		$3,605,289					
153								
154								
155	10 Year Lifetime (Equipment)			2019	2020	2021	2022	2023
156	2019		$ 100,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000
157	2020		$ -					
158	2021		$ -					
159	2022		$ -					
160	2023		$ -					
161	2024		$ -					
162	2025		$ -					
163	2026		$ -					
164	2027		$ -					
165	Total:		$ 100,000					
166								
167								
168	Total Depreciation		$3,745,859	$ 87,064	$ 174,115	$ 185,685	$ 193,519	$ 196,999
169								
170								
171								

Pro Forma

Year #	1	2	3	4	5	6	7	8	9	10
	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Service Revenues										
Residential	-	-	-	-	-	-	-	-	-	-
Businesses On-Net on Existing Fiber Routes	8,520	27,360	42,636	51,175	54,015	55,227	57,567	58,803	60,039	62,501
Businesses Near-Net on Existing Fiber Routes	-	102,924	128,112	145,044	148,471	151,103	157,021	160,729	163,414	170,464
Large Businesses Dedicated Service	-	-	-	-	-	-	-	-	-	-
Smart City Nodes	2,940	19,320	45,444	70,728	93,744	104,160	104,160	104,160	104,160	104,160
Rents - Cell Towers	296,798	305,702	314,873	324,319	334,049	344,070	354,392	365,024	375,975	387,254
Existing FiberNet Fiber-optic Revenues	279,082	279,082	279,082	279,082	279,082	279,082	279,082	279,082	279,082	279,082
Subtotal: Service Revenues	587,340	734,388	810,147	870,349	909,361	933,642	952,223	967,799	982,670	1,003,461
Installation Revenues										
Residential	-	-	-	-	-	-	-	-	-	-
Businesses On-Net on Existing Fiber Routes	-	-	-	-	-	-	-	-	-	-
Busiensses Near-Net on Existing Fiber Toutes	-	-	-	-	-	-	-	-	-	-
Large Busineses Dedicated Service	-	-	-	-	-	-	-	-	-	-
Smart City Nodes	-	-	-	-	-	-	-	-	-	-
Subtotal: Installation Revenues	-	-	-	-	-	-	-	-	-	-
Equipment Rental Revenues										
Residential	-	-	-	-	-	-	-	-	-	-
Businesses On-Net on Existing Fiber Routes	-	-	-	-	-	-	-	-	-	-
Busiensses Near-Net on Existing Fiber Toutes	-	-	-	-	-	-	-	-	-	-
Large Busineses Dedicated Service	-	-	-	-	-	-	-	-	-	-
Smart City Nodes	-	-	-	-	-	-	-	-	-	-
Subtotal: Equipment Rental Revenues	-	-	-	-	-	-	-	-	-	-
TOTAL REVENUES	587,340	734,388	810,147	870,349	909,361	933,642	952,223	967,799	982,670	1,003,461
Cost of Services										
Direct Staffing	-	-	-	-	-	-	-	-	-	-
Data Center Rack and Power (UM)	-	-	-	-	-	-	-	-	-	-
Broadband Transport & Internet Costs	-	-	-	-	-	-	-	-	-	-
Owners Rep/Business Consulting	175,000	175,000	175,000	175,000	175,000	175,000	175,000	175,000	175,000	175,000
Vehicle Maintenance	-	-	-	-	-	-	-	-	-	-
Facilities Maintenance, Power, Environmental	5,000	5,050	5,100	5,150	5,200	5,250	5,300	5,350	5,400	5,450
Miscellaneous	115	1,496	2,162	2,669	2,962	3,105	3,187	3,237	3,276	3,371
Network & Headend Maintenance	-	-	-	-	-	-	-	-	-	-
Pole attachments	-	-	-	-	-	-	-	-	-	-
Software Maintenance	-	-	-	-	-	-	-	-	-	-
Utilities	5,000	5,013	5,025	5,038	5,050	5,063	5,075	5,088	5,100	5,113
Network O&M	30,000	60,000	61,800	63,654	65,564	67,531	69,556	71,643	73,792	76,006
Subtotal: Cost of Services	215,115	246,559	249,087	251,511	253,776	255,948	258,119	260,318	262,569	264,940
GROSS PROFIT	372,225	487,829	561,060	618,837	655,585	677,693	694,104	707,481	720,101	738,520
Sales, General & Administrative Expenses										
Administrative Staffing	-	-	-	-	-	-	-	-	-	-
Professional & Legal Fees	15,000	15,300	15,606	15,918	16,236	16,561	16,892	17,230	17,575	17,926
Sales Commissions & Marketing Expense	-	-	-	-	-	-	-	-	-	-
Reporting & Compliance	6,000	6,000	6,120	6,242	6,367	6,495	6,624	6,757	6,892	7,030
Travel & Entertainment Expense	6,000	6,000	6,120	6,242	6,367	6,495	6,624	6,757	6,892	7,030
Office Expense	3,000	3,000	3,060	3,121	3,184	3,247	3,312	3,378	3,446	3,515
General Overhead	14,000	14,000	14,280	14,566	14,857	15,154	15,457	15,766	16,082	16,403
Cost Allocation for City Services	-	-	-	-	-	-	-	-	-	-
Bad Debt Expense	11,747	14,688	16,203	17,407	18,187	18,673	19,044	19,356	19,653	20,069
Subtotal: Sales, General & Administrative Expenses	55,747	58,988	61,389	63,496	65,199	66,625	67,954	69,245	70,540	71,974
EBITDA	316,479	428,841	499,671	555,341	590,387	611,068	626,150	638,236	649,561	666,547
Depreciation & Amortization										
Depreciation	87,064	174,115	185,685	193,519	196,999	197,919	198,919	200,078	200,958	200,959
Amortization	-	-	-	-	-	-	-	-	-	-
Subtotal: Depreciation & Amortization	87,064	174,115	185,685	193,519	196,999	197,919	198,919	200,078	200,958	200,959
EBIT	229,415	254,726	313,987	361,822	393,387	413,150	427,231	438,158	448,603	465,588
Interest										
Borrowings	226,622	215,323	203,505	191,144	178,216	164,693	150,550	135,756	120,283	104,099
Subtotal: Interest Expense	226,622	215,323	203,505	191,144	178,216	164,693	150,550	135,756	120,283	104,099
NET INCOME	2,793	39,403	110,481	170,678	215,171	248,456	276,682	302,402	328,320	361,489
Debt Principal Payments										
Borrowings	245,947	257,245	269,063	281,424	294,353	307,875	322,019	336,812	352,285	368,469
Subtotal: Principal Payments	245,947	257,245	269,063	281,424	294,353	307,875	322,019	336,812	352,285	368,469
Reserve Fund Requirements										
Operating Reserve Fund										
Renewal & Replacement Fund										
Capital Expansion Fund										
General Fund Reserve										
Subtotal: Annual Reserve Fund Requirements	-	-	-	-	-	-	-	-	-	-
Subtotal: Cumulative Reserves	-	-	-	-	-	-	-	-	-	-
Capital Spending										
Capital Budget	1,976,126	2,176,251	289,212	195,843	86,975	22,959	24,975	28,957	21,976	28,957
Other										
Subtotal: Capital Spending	1,976,126	2,176,251	289,212	195,843	86,975	22,959	24,975	28,957	21,976	28,957
TOTAL NON-OPERATING, CAPEX AND RESERVES	2,222,073	2,433,496	558,275	477,267	381,328	330,834	346,994	365,769	374,261	397,426

Pro Forma

Year #	11	12	13	14	15	16	17	18	19	20
	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Service Revenues										
Residential	-	-	-	-	-	-	-	-	-	-
Businesses On-Net on Existing Fiber Routes	63,762	65,022	67,609	69,115	70,622	73,346	74,658	75,970	79,057	80,624
Businesses Near-Net on Existing Fiber Routes	173,418	177,201	184,602	187,837	191,694	199,688	203,849	207,784	216,183	220,426
Large Businesses Dedicated Service	-	-	-	-	-	-	-	-	-	-
Smart City Nodes	104,160	104,160	104,160	104,160	104,160	104,160	104,160	104,160	104,160	104,160
Rents - Cell Towers	398,872	410,838	423,163	435,858	448,934	462,402	476,274	490,562	505,279	520,437
Existing FiberNet Fiber-optic Revenues	279,082	279,082	279,082	279,082	279,082	279,082	279,082	279,082	279,082	279,082
Subtotal: Service Revenues	**1,019,294**	**1,036,303**	**1,058,616**	**1,076,052**	**1,094,492**	**1,118,678**	**1,138,022**	**1,157,557**	**1,183,760**	**1,204,729**
Installation Revenues										
Residential	-	-	-	-	-	-	-	-	-	-
Businesses On-Net on Existing Fiber Routes	-	-	-	-	-	-	-	-	-	-
Busiensses Near-Net on Existing Fiber Toutes	-	-	-	-	-	-	-	-	-	-
Large Busineses Dedicated Service	-	-	-	-	-	-	-	-	-	-
Smart City Nodes	-	-	-	-	-	-	-	-	-	-
Subtotal: Installation Revenues	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Equipment Rental Revenues										
Residential	-	-	-	-	-	-	-	-	-	-
Businesses On-Net on Existing Fiber Routes	-	-	-	-	-	-	-	-	-	-
Busiensses Near-Net on Existing Fiber Toutes	-	-	-	-	-	-	-	-	-	-
Large Busineses Dedicated Service	-	-	-	-	-	-	-	-	-	-
Smart City Nodes	-	-	-	-	-	-	-	-	-	-
Subtotal: Equipment Rental Revenues	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
TOTAL REVENUES	**1,019,294**	**1,036,303**	**1,058,616**	**1,076,052**	**1,094,492**	**1,118,678**	**1,138,022**	**1,157,557**	**1,183,760**	**1,204,729**
Cost of Services										
Direct Staffing	-	-	-	-	-	-	-	-	-	-
Data Center Rack and Power (UM)	-	-	-	-	-	-	-	-	-	-
Broadband Transport & Internet Costs	-	-	-	-	-	-	-	-	-	-
Owners Rep/Business Consulting	175,000	175,000	175,000	175,000	175,000	175,000	175,000	175,000	175,000	175,000
Vehicle Maintenance	-	-	-	-	-	-	-	-	-	-
Facilities Maintenance, Power, Environmental	5,500	5,550	5,600	5,650	5,700	5,750	5,800	5,850	5,900	5,950
Miscellaneous	3,413	3,464	3,564	3,611	3,665	3,772	3,827	3,879	3,994	4,052
Network & Headend Maintenance	-	-	-	-	-	-	-	-	-	-
Pole attachments	-	-	-	-	-	-	-	-	-	-
Software Maintenance	-	-	-	-	-	-	-	-	-	-
Utilities	5,125	5,138	5,150	5,163	5,175	5,188	5,200	5,213	5,225	5,238
Network O&M	78,286	80,635	83,054	85,546	88,112	90,755	93,478	96,282	99,171	102,146
Subtotal: Cost of Services	**267,325**	**269,787**	**272,368**	**274,970**	**277,652**	**280,465**	**283,305**	**286,225**	**289,290**	**292,386**
GROSS PROFIT	**751,969**	**766,516**	**786,248**	**801,082**	**816,840**	**838,213**	**854,718**	**871,333**	**894,470**	**912,343**
Sales, General & Administrative Expenses										
Administrative Staffing	-	-	-	-	-	-	-	-	-	-
Professional & Legal Fees	18,285	18,651	19,024	19,404	19,792	20,188	20,592	21,004	21,424	21,852
Sales Commissions & Marketing Expense	-	-	-	-	-	-	-	-	-	-
Reporting & Compliance	7,171	7,314	7,460	7,609	7,762	7,917	8,075	8,237	8,401	8,569
Travel & Entertainment Expense	7,171	7,314	7,460	7,609	7,762	7,917	8,075	8,237	8,401	8,569
Office Expense	3,585	3,657	3,730	3,805	3,881	3,958	4,038	4,118	4,201	4,285
General Overhead	16,731	17,066	17,407	17,755	18,110	18,473	18,842	19,219	19,603	19,995
Cost Allocation for City Services	-	-	-	-	-	-	-	-	-	-
Bad Debt Expense	20,386	20,726	21,172	21,521	21,890	22,374	22,760	23,151	23,675	24,095
Subtotal: Sales, General & Administrative Expenses	**73,329**	**74,728**	**76,253**	**77,704**	**79,198**	**80,826**	**82,382**	**83,966**	**85,705**	**87,365**
EBITDA	**678,640**	**691,788**	**709,995**	**723,379**	**737,643**	**757,387**	**772,335**	**787,367**	**808,765**	**824,978**
Depreciation & Amortization										
Depreciation	**190,960**	**190,961**	**190,962**	**190,963**	**190,964**	**190,965**	**190,966**	**190,967**	**190,968**	**190,969**
Amortization	-	-	-	-	-	-	-	-	-	-
Subtotal: Depreciation & Amortization	**190,960**	**190,961**	**190,962**	**190,963**	**190,964**	**190,965**	**190,966**	**190,967**	**190,968**	**190,969**
EBIT	**487,680**	**500,827**	**519,033**	**532,416**	**546,679**	**566,422**	**581,369**	**596,400**	**617,797**	**634,009**
Interest										
Borrowings	**87,172**	**69,467**	**50,948**	**31,579**	**11,320**	**108,352**	**86,345**	**63,327**	**39,252**	**14,071**
Subtotal: Interest Expense	**87,172**	**69,467**	**50,948**	**31,579**	**11,320**	**108,352**	**86,345**	**63,327**	**39,252**	**14,071**
NET INCOME	**400,508**	**431,361**	**468,085**	**500,837**	**535,359**	**458,069**	**495,024**	**533,072**	**578,545**	**619,938**
Debt Principal Payments										
Borrowings	**385,397**	**403,102**	**421,620**	**440,989**	**461,248**					
Subtotal: Principal Payments	**385,397**	**403,102**	**421,620**	**440,989**	**461,248**	**-**	**-**	**-**	**-**	**-**
Reserve Fund Requirements										
Operating Reserve Fund										
Renewal & Replacement Fund						100,000	100,000	100,000	100,000	100,000
Capital Expansion Fund						500,000	500,000	500,000	500,000	500,000
General Fund Reserve										
Subtotal: Annual Reserve Fund Requirements	**-**	**-**	**-**	**-**	**-**	**600,000**	**600,000**	**600,000**	**600,000**	**600,000**
Subtotal: Cumulative Reserves	**-**	**-**	**-**	**-**	**-**	**600,000**	**1,200,000**	**1,800,000**	**2,400,000**	**3,000,000**
Capital Spending										
Capital Budget	24,975	28,957	27,974	29,940	27,974	31,956	30,973	28,957	31,956	31,956
Other										
Subtotal: Capital Spending	**24,975**	**28,957**	**27,974**	**29,940**	**27,974**	**31,956**	**30,973**	**28,957**	**31,956**	**31,956**
TOTAL NON-OPERATING, CAPEX AND RESERVES	**410,372**	**432,059**	**449,594**	**470,929**	**489,222**	**631,956**	**630,973**	**628,957**	**631,956**	**631,956**

Pro Forma

Cash Flow:	2019 Yr 1	2020 Yr 2	2021 Yr 3	2022 Yr 4	2023 Yr 5	2024 Yr 6	2025 Yr 7	2026 Yr 8	2027 Yr 9	2028 Yr 10
Beginning Cash	-	2,956,899	663,482	320,358	120,253	60,160	82,337	115,722	155,653	212,403
Add: Net Income	2,793	39,403	110,481	170,678	215,171	248,456	276,682	302,402	328,320	361,489
Add: Depreciation	87,064	174,115	185,685	193,519	196,999	197,919	198,919	200,078	200,958	200,959
Add: Loan Proceeds	5,147,849	-	-	-	-	-	-	-	-	-
Less: Principal Payments	(245,947)	(257,245)	(269,063)	(281,424)	(294,353)	(307,875)	(322,019)	(336,812)	(352,285)	(368,469)
Less: Capital Expenditures	(1,976,126)	(2,176,251)	(289,212)	(195,843)	(86,975)	(22,959)	(24,975)	(28,957)	(21,976)	(28,957)
Less: In Lieu of Taxes (10% of Gross Revenues)	(58,734)	(73,439)	(81,015)	(87,035)	(90,936)	(93,364)	(95,222)	(96,780)	(98,267)	(100,346)
Less: Funded Reserves	-	-	-	-	-	-	-	-	-	-
Ending Cash	2,956,899	663,482	320,358	120,253	60,160	82,337	115,722	155,653	212,403	277,078

Pro Forma

Cash Flow:	2029 Yr 11	2030 Yr 12	2031 Yr 13	2032 Yr 14	2033 Yr 15	2034 Yr 16	2035 Yr 17	2036 Yr 18	2037 Yr 19	2038 Yr 20
Beginning Cash	277,078	356,245	442,877	546,468	659,733	787,385	692,595	633,810	613,136	632,317
Add: Net Income	400,508	431,361	468,085	500,837	535,359	458,069	495,024	533,072	578,545	619,938
Add: Depreciation	190,960	190,961	190,962	190,963	190,964	190,965	190,966	190,967	190,968	190,969
Add: Loan Proceeds	-	-	-	-	-	-	-	-	-	-
Less: Principal Payments	(385,397)	(403,102)	(421,620)	(440,989)	(461,248)	-	-	-	-	-
Less: Capital Expenditures	(24,975)	(28,957)	(27,974)	(29,940)	(27,974)	(31,956)	(30,973)	(28,957)	(31,956)	(31,956)
Less: In Lieu of Taxes (10% of Gross Revenues)	(101,929)	(103,630)	(105,862)	(107,605)	(109,449)	(111,868)	(113,802)	(115,756)	(118,376)	(120,473)
Less: Funded Reserves	-	-	-	-	-	(600,000)	(600,000)	(600,000)	(600,000)	(600,000)
Ending Cash	356,245	442,877	546,468	659,733	787,385	692,595	633,810	613,136	632,317	690,796