Broadband Needs Assessment for the Benicia Industrial Park

Prepared for the City of Benicia
by Successful.com, September 15, 2010

Table of Contents

Executive Summary

True highspeed broadband – Internet access speed measured in hundreds of megabits per second – is driving the engine of economic development in many communities across the United States. Making broadband a keystone of Benicia's economic development efforts reflects this trend, and will increase the market strength of existing companies within the Business Industrial Park (BIP) as well as attract new companies.

Working in partnership with the Center for Economic Development (CED) at California State University, Chico, we conducted quantitative research via a telephone survey of the BIP's 438 businesses. Our primary findings were:

- many BIP tenants (over 30%) believe available Internet services are inadequate for current high-bandwidth applications such as video and telephone calling over the Internet, and almost 20% feel their connections are insufficient for even basic applications such as e-mail and Web browsing (tenants' replies to open-ended questions indicate this is due to insufficient speed, poor coverage or both) at;

- Benicia Industrial Park tenants intend/hope to use Internet access within three-to-five years to run several bandwidth-intensive applications that tenants feel are important to them doing business nationally and internationally; and

- current Internet access services in the BIP will not enable tenants to use the online business applications they foresee being important in five years, particularly given that service in several areas of the BIP are too slow or nonexistent.

An additional finding is that BIP tenants currently receive poor price-to-speed benefits from their services when compared to services offered by some publicly owned networks. For example, one provider offers tenants a service with 5 Megabits per second (Mbps) of upload and download speed for $399 a month, while Chattanooga, TN just announced a 1 gigabit per second service costing $350 a month.

One main conclusion we draw from these findings, plus our understanding of the state of broadband in the United States, is that the BIP's broadband needs ultimately will be best met through a fiber network. The City of Benicia does not necessarily have to own and operate a broadband network within the BIP to achieve success, but the City must take charge of the process by which better broadband is brought into the BIP.

We present several possible business models for making broadband viable. We also offer several financial models to consider that include a bond option and creating a system whereby BIP tenants become investors and partial owners of the network since. There do not appear to be any

anchor tenant options save one or two of the BIP's largest tenants, which complicates the financial model options. The City should bring in financial and legal counsel to assess the business and financial options to best determine which models are in the City's best interest.

Introduction

The City of Benicia retained Successful.com to conduct a needs assessment of the business tenants of the BIP as part of the City's desire to better understand how a broadband network can economically impact Benicia's business community.

Internet access is currently available in the BIP from several large and small providers. The research was a critical first step to verify whether these services are adequate to meet the BIP tenants' business computing needs now and in the next three-to-five years. The City is forward thinking and wants to expand BIP tenancy to companies in industries such as high tech and biotech, so we also assessed prospective tenants' broadband needs.

Working with the Center for Economic Development (CED) at California State University, Chico, we conducted quantitative research via a telephone survey of the BIP's 438 businesses. We expanded on this quantitative research with additional qualitative research and fact-finding to further validate the need for better broadband services.

Given our primary mission was to determine whether or not BIP tenants are receiving broadband services that sufficiently meet their needs, the survey did not ask about specific broadband technology. We believe a municipality must first establish the needs, and then determine which technology best addresses those needs, whether it is wireless, wired or a hybrid of the two.

Successful.com called upon industry contacts and its expertise to help create an overview of the precedents for municipal involvement in broadband, present options for broadband business and financial models and to suggest potential next steps. We explored business model options, running the gamut from a network fully owned and operated by the City to one that the City encourages a private provider to build, own and operate.

These interviews and other tasks reinforced the conclusion that there is a need for broadband services that has not been met, primarily due to broadband providers not seeing a business case for offering faster service to the BIP. Larger providers feel there is not a business case to justify the infrastructure investment needed. Smaller providers don't have the resources to become a lead company in building out that infrastructure. However, we did look to open a discourse to help these providers see a path to participating with the City to make broadband happen.

We developed some preliminary cost estimates to help the City understand the challenges in this area. To move to the next step in bringing better broadband to the BIP, the City should get an engineering assessment of what technology it should pursue and how it should be configured to

meet the needs identified. An engineering or network management group can develop more specific cost estimates than we are able to provide.

I. Survey Methodology

The centerpiece of this needs assessment project was a telephone survey of the BIP tenants. We also conducted one group meeting and several one-on-one meetings with stakeholders from BIP, City staff, the Benicia Unified School District (BUSD), Internet service providers used by BIP tenants and several Benicia downtown businesses.

Successful.com tasked the Center for Economic Development (CED) at California State University, Chico with conducting a survey of the current tenants in the BIP. The survey was conducted between April 19th and May 21st, 2010 using a list of the tenants provided to us by the City of Benicia. They used tenant contact information provided by the City including addresses, telephone numbers and North American Industry Classification System (NAICS) codes. The university's Geographic Information System (GIS) department was tasked with creating GIS maps to represent the data collected.

CED staff called each listing, identified themselves as calling from CSU, Chico conducting a survey on behalf of the City of Benicia, asked for the person most knowledgeable about the tenant's Internet connection, and then asked that contact a series of structured questions. If the contact was not available, a message and call back number was provided. If no call back was received within a week, a second call was initiated and either a survey was completed or a message and call back number provided. A third and final call was then initiated, but if a survey could not be completed, no additional attempts to contact the tenant were made.

Table 1 summarizes the responses received. Of the 437 tenants on the original list, 188 surveys were completed, 134 tenants refused to participate, 52 did not return calls, and 6 lines were continuously busy lines. Four (4) respondents only partially completed surveys. Finally, 31 calls were to wrong or incorrect numbers, 16 calls were businesses not in the BIP and 8 telephone numbers were duplicates. Eliminating the wrong numbers, duplicate listings, or a number not in the Benicia Industrial Park, the survey achieved a 49% overall response rate.

Table 1: Summary of Responses

Result	Count
Busy/dropped	6
Completed	188
Duplicate	8
Left message/ no response back	52
Not in BIP	16
Partially Completed (not included in results)	4
Refused	134
Wrong #	31
Total	437

Response % excluding wrong numbers, duplicates, not in BIP	49%

Table 2 presents a breakdown of all industries that comprise the 437 tenants in the BIP.

Table 2: Breakdown of BIP tenants by industry

Industry	Industry % of Total Tenants	# Completing Survey	Percentage of Survey Respondents
Mining, utilities, and construction	16%	30	16%
Manufacturing	17%	41	22%
Transportation, warehousing, and trade	28%	45	24%
Professional services	21%	33	18%
Education, health, and social services	5%	9	5%
Recreation, accommodation, and food services	2%	2	1%
Personal, repair, and other services	11%	28	15%

Go to **Appendix I** to see the remaining survey results and also a general analysis of those results. The survey questions are in **Appendix II**.

II. Summary of Survey and Other Research Findings

The following are our key findings from the telephone survey.

1. We experienced a 50% completion rate of the potential survey respondents we contacted. Feedback indicates the rate could have been higher were people not suffering from "survey fatigue" from just responding to previous broadband surveys by providers, including one AT&T conducted in Fall 2009.

2. Tenants of the BIP collectively have mixed feelings about the adequacy of broadband coverage currently in BIP to facilitate various business tasks. Within specific industry groups, depending on the desired computing task, the dissatisfaction level can be over 50% or 60%, while the overall percentage of people who feel their service is inadequate hovers between 30% and 40%.

3. 60% of those completing the survey do not know what speeds they are receiving, which makes verifying advertised speeds difficult. As a point of reference, a recent FCC study broadband adoption reveals 80% of consumers in the U.S. do not know what Internet speed they receive.

4. A significant number, 30% or more, feel their broadband services are inadequate for data-intensive computing tasks such as Voice over IP (VoIP), telecommuting, video applications, and sending/receiving large data files. What is surprising is that about 18% of tenants find their broadband services inadequate for the relatively low bandwidth-consuming tasks of e-mailing and Web browsing. Comments from several indicate they expect there to be continued problems three-to-five years from now satisfying business needs such as cloud computing, telecommuting and running video applications.

5. Qualitative feedback from the survey offers a common theme of "paying too much for too little" for currently broadband services.

6. Survey results indicate the need for speed will increase as a greater number of tenants move to high-bandwidth consuming applications, with an expected 174% increase in broadband use for telecommunications (e.g. Voice over IP – VoIP), an 89% increase in cloud computing and 48% increase in video applications. By 2015, 89% of tenants expect to use broadband to regularly move massive data files, and 74% want to be running supplier/customer applications over broadband.

7. 64% of the tenants subscribe to wired broadband services (T1, DSL, cable). This level of adoption holds across all industries. The remaining 36% of tenants use wireless, satellite and "other" services. It is surprising that about 18% of tenants find their broadband

services inadequate for the relatively low bandwidth-consuming tasks of e-mailing and Web browsing.

Additional findings related to broadband needs of potential new businesses

The City hopes to alter the industry representation in BIP by attracting companies from new industries that offer high-wage jobs, such as high tech and clean energy. We contacted several communities that have built or plan to build broadband networks to get their views on what businesses broadband may help attract. In addition they were asked what broadband speeds would be significant enough to influence these companies' decision making based on their experience.

As you will read later in this section, and see reinforced in the following "Observations…" section, fiber is strongly considered the best choice for broadband in the BIP. Feedback from these conversations regarding potential tenants follows this them as it indicates the industries that Benicia could possibly woo to the BIP include those that have heavy broadband requirements (engineering design, software development, etc.). Broadband speeds of 100 megabits per second (Mbps) and up to a gigabit per second or more are the norm for these types of companies.

After discarding categories of companies that may not be likely to consider locating in the Bay Area (e.g. call centers, telemarketing operations) here are the strong contenders, particularly from a three-to-five year planning perspective.

- Digital media and related companies. These firms have to move gigabits of digitized video and graphic data to advertising agencies and their clients, TV stations, movie production-related companies. These companies will require 100 Mbps-to-1-gigabit broadband connections.

- Engineering design and software development firms. Both types of companies transport as well as provide access to, massive databases and software applications to employees, customers and contractors. The average company in this category may require 100 Mbps connections, but obviously, this could increase in three years.

- Co-office complex. This relatively new concept capitalizes on a growing trend to find alternatives to commuting. A co-office complex allows telecommuters to share office space and secure computer networks so they can alternate between working from home and from an office environment without having to commute long distances. This concept is part of a large broadband project near Boston recently funded by the American Recovery and Reinvestment Act. At least a gigabit connection is required.

- In addition, Phil Garrett of Colliers International pointed out that Benicia is still capable of attracting additional light industrial and construction with high-speed broadband as these industries transition to creating state-of-the-art facilities. These facilities are built to accommodate high-speed, computer-centric warehousing, inventory tracking and control and customer/workforce management technology including software applications.

Additional findings related to speed, price of available services

The advertised pricing and speeds in the BIP appear consistent with pricing for similar services we have observed in small towns elsewhere, and likewise tenants' complaints about paying too much for too little is consistent with criticisms against providers in those small towns. These survey results and comments counter arguments made by incumbents who are quoted frequently in news reports, saying that broadband coverage is both abundant and affordable because everyone has at least four or more providers available in an area. Many BIP tenants' comments paint a less rosy picture and they have at least 12 providers offering services.

Some services promoted in Benicia by the various providers are difficult to obtain by a number of tenants depending on their location within BIP. Tenants located in the Arsenal (a portion of the BIP closer to the town center) likely have better service than those in BIP proper. Broadband service quality and reliability appear questionable, with services from AT&T likely to be as inconsistent for some as services from the small resource-constrained local providers.

The bigger issue, though, is the ceiling on maximum speeds regardless of which providers deliver the service. T1 lines, for example, are a type of broadband cabling that has defined speed limits (approximately 1.5 – 2 Mbps) and these limits are increasingly unacceptable for tenants. Even if there was a notable difference in price between AT&T and TelePacific (the #1 and # 2 providers in the BIP respectively), many tenants of BIP find data speeds provided by both to be marginally valuable for current and future data-intensive business computing tasks.

There are similar frustrations with the maximum speed for available Digital Subscriber Lines (DSL - another type of broadband cabling), wireless and satellite broadband services in which broadband data is transmitted to and from customers via space satellites. Even if prices were lower, the maximum speeds of these technologies regardless of provider are unacceptable for bandwidth-intensive applications. Furthermore, because none of the small providers are strong challengers to ATT or Comcast, there is not a competitive environment.

To put the current pricing picture in Benicia into national context, following is the pricing offered by the municipal fiber network that serves Wilson, NC (population 47,000). Wilson also offers a gigabit service at a negotiated rate. Broadband speeds and pricing offered in Wilson are typical of other communities that own their own fiber networks. Their least expensive service is

only $35, yet delivers speeds comparable to just a handful of BIP tenants who pay hundreds of dollars more than those cities that run their own fiber networks.

Package	Downloads	Uploads	Monthly Price
10Mbps Tier	10 Mbps	10 Mbps	$34.95
20Mbps Tier	20 Mbps	20 Mbps	$54.95
40Mbps Tier	40 Mbps	40 Mbps	$99.95
60Mbps Tier	60 Mbps	60 Mbps	$199.95
100Mbps Tier	100 Mbps	100 Mbps	$299.95

Findings on technology costs

While a majority of BIP tenants (at least 55%) expressed a need for broadband to facilitate the use of bandwidth-intensive applications, there was a group of respondents who indicated they only need Internet access for basic online computing tasks. Fiber is the logical choice to deliver broadband speeds at a level to meet high-end needs, but some wireless technologies can deliver sufficient speeds for businesses with less demanding needs.

We want to give the City some ballpark figures for what a broadband network may cost to build. The following are estimates for a fiber network and for a wireless network should the City decide to integrate the two technologies.

Fiber costs

We sent a copy of the map displaying all of the business in the BIP to RidgeviewTel, a company that provides broadband network management services. One of its features took the map data and determined where fiber would have to be installed to reach within 100 – 200 feet of the facilities where all of the companies are located.

Including the various nooks and crannies that the mapping component identified as roadways and paths required to reach close proximity to the buildings, the network would require digging trenches for and laying approximately 130,996 feet of fiber cable. At the estimated benchmark cost of $9/foot to put fiber in the ground, the total cost for this part of the network is $1,178,964. If the City uses cable and poles for aboveground aerial deployment of the network, the benchmark is $7/foot for a total cost of $916,972.

The estimated time to complete an aerial deployment for an area the size of the BIP is three months, assuming there are poles already in place. The time for an underground buildout is nine-to-ten months, but the City should factor in delays caused by bad weather.

In the map we provide in **Appendix III**, you can see the potential trenching plan represented in green. An aerial deployment would follow a similar path. This buildout only brings fiber close to the facilities so those offices/building owners who want fiber connections can have the cabling extend from the main infrastructure to inside of the buildings where computer networks are linked to the fiber cables.

The software analyzed the map and identified several small areas of empty space as potential spots for new buildings, and subsequently added a diagram of additional 10,368 of trenching, which is highlighted in purple. The cost would be $93,312, or $72,576 for aerial deployment. RidgeviewTel recommends adding a 15% fudge-factor to these numbers until you develop a formal engineering plan.

These are all starting costs for just putting "dark" fiber in place, meaning the cabling is not able to transmit data. There is a cost for the technology required to link dark fiber to a network operating center (NOC) and for "lighting" the fiber to enable it to transmit data. Special components that sit on the end of the fiber cable lines dictates the speed of the network, and you increase the network speed by switching from one set of components to another.

There is an additional expense of running cable from the main infrastructure to the individual buildings where businesses then will connect up their Internet services. This cost can be between $7,500 and $10,000 per building, but extensive calculation is needed once you determine who wants fiber.

There is the on-going cost of running the NOC. Finally you have the cost of running a fiber cable from the BIP to the central office of whichever incumbent the infrastructure will connect to in order for the network reach the outside Internet. For example, if the AT&T central office is three miles (15,840 feet) from the BIP, that's a total cost of $142,560.

As the City evaluates its business and financial options, plus considers revenue potential, it must keep in mind that this is a project that is going to come with a $1.5 million to $2 million price tag for the buildout. In determining business and financial models, the City can determine whether it pays the costs for some or all of these various expenses, or service providers/venders and/or BIP tenants pick up the costs. Several of the business models we present may reduce the cost of the infrastructure buildout for the City, subsequently allowing some of the $2 million price tag to be devoted to on-going operating costs.

Wireless costs

We created a preliminary map of wireless coverage (**Appendix IV**). This is based on installing five WiMAX wireless transmitters within the BIP at an estimated cost of $5,000/transmitter. This is not a recommendation for WiMAX per se, but we cite this technology as a way to establish

some potential costs. An engineering design process will identify the best technology options and costs.

The map is a "composite coverage map." It shows what the combined signal strength is from all of the transmitters. Anything between -50 and -77 is an excellent signal and will make for an easy install. It will also support 3 Mbps or more of throughput at those signal levels. They would also support VoIP over that connection. With another tower or two strategically placed you could hotspot nearly the entire BIP area for easy access with laptops in addition to in-building coverage. Also, increasing the amount of backhaul speed increases the throughput of each transmitter. Our map assumes the transmitters will link to a BIP-wide fiber infrastructure being built.

III. Observations and Suggested Next Steps

Following our analysis of results from our survey of BIP tenants, we have several observations of broadband options Benicia can pursue, plus recommendations for actions we feel are appropriate to help the City reach its economic development goals.

We can distill the findings of the survey into three key discussion points:

- Many BIP tenants (over 30%) believe available Internet services are inadequate for current high-bandwidth applications, and almost 20% feel their connections are insufficient for even basic applications such as e-mail and Web browsing.
- Benicia Industrial Park tenants intend/hope to be able to use Internet access in three-to-five years to run several bandwidth-intensive applications that tenants feel are important to doing business nationally and internationally;
- From our research and what we know of the broadband industry in general, current and foreseeable Internet access services in the BIP will not enable tenants to use the online business applications they foresee being important in five years.

We conclude that the City of Benicia must take an active role in making available to BIP tenants broadband that is reliable and fast enough to meet their future needs. If improving and fortifying the economic development of Benicia is a critical concern, broadband is key to reaching this goal, as the technology is playing an increasing role in businesses' ability to succeed.

The City does not necessarily have to own the eventual network, but it must own the process by which better broadband is brought to the BIP. While the smaller local providers may not have the resources to be leaders in the broadband effort, and large incumbents are not interested in driving needed broadband deployment in the BIP alone, providers could easily be key participants in the drive.

Forward-thinking analysts and communities understand that tomorrow's mission critical business applications will require speeds of 100 megabits up to a gigabit per second. With our findings that broadband offerings in the BIP are sub par for these applications, and slim possibilities exist that current providers will offer the speeds required without some intervention and/or encouragement from local forces, the City must step into the breach.

<u>Vision statement</u>

To successfully drive an initiative to bring highspeed broadband to Benicia, the City needs a vision that is easily understood and sufficiently motivational to rally the necessary support and

resources required to implement what is an expensive project. One possible vision statement we suggest for the City's broadband initiative is the following, which of course the City can modify:

Benicia will transform Benicia Industrial Park into a stronger economic engine for the city and surrounding areas by implementing a highspeed broadband network that increases the market strength of existing companies and attracts new ones.

Technology options

DSL and other broadband technologies (both wired and wireless) BIP tenants have available now are delivering speeds that appear to be near or below the technologies' respective maximum capabilities. If we cannot expect faster speeds from available technology because it has reached its maximum capability, and tenants tell us those speeds are inadequate for their current needs, the City must look beyond available technology to meet future needs. (Read our Broadband Technology Inventory in **Appendix V** for a detailed breakdown of available speeds and prices)

We believe that a fiber network is the surest bet for meeting future needs. With BIP survey results showing a significant potential increase in the number of businesses planning to use bandwidth-intensive applications, fiber offers the best potential to meet those needs. Furthermore, if you review in the additional findings our short list of potential businesses that BIP could attract if it has better broadband, you see that the BIP need gigabit speeds.

That said, there are BIP tenants in certain industries such as professional services and other service companies that currently do not use high bandwidth applications, nor are they expected to increase their usage of these applications as much as other industries. There may be a case for adding fixed wireless capability onto the fiber network for the extra price of five-to-ten transmitters. Tenants who need faster speeds than currently available, but may be satisfied with 15 or 20Mbps could find this to be an affordable offer.

Fixed wireless as a standalone broadband solution may be worth considering for the short-term if it delivers faster speed and more reliable service than current options. However, there is still the need to build out some amount of fiber to use for backhaul since this is how you would get maximum possible wireless speeds. Cable and even wireless can be used for backhaul, but they are slower than fiber. At least with building the fiber backhaul for wireless in the short term, you can expand the fiber in a year or two when the economy is better.

Since we did not ask people to identify specific speeds they think they may need in five years, the City should informally poll tenants about wireless before issuing an RFP for a network buildout. The objective would be to determine if enough people were satisfied with the idea of using wireless if it met certain speed expectations. Just keep in mind that many tenants do not

know what speed they currently have, so this survey would be only one perspective of the entire picture. Formal or informal meetings with tenants may be advisable to get additional input.

Implications of technology decision

It is accepted in public policy and technology discussions that fiber broadband networks represent the future. There is nothing that can match it for speed once constituents need more than 30 megabits per second (Mbps). Communities must reconcile, however, the tradeoff between fiber's benefits and the significant drawback of the time and expense of installing a fiber network.

The City must take the long-term view on an investment in fiber if it moves down this path. A fiber infrastructure will work for decades, so the payback in benefits is ongoing and far-reaching. Also, there is less chance of obsolescence since upgrading the network to faster speeds only requires changes at a few points in the fiber lines, not a re-digging and replacement of the entire infrastructure.

The City could opt for an alternative solution, which is fixed wireless. The term "fixed" when applied to wireless typically means the Internet data traffic is beamed to and from one primary wireless transmitter to multiple wireless transmitters within the main unit's "line of sight" (if you stand by one transmitter, you can see the others). WiMAX falls into this category, and data transmission speeds can reach 30Mbps download and 20 Mbps upload depending on how the network is built.

WiFi wireless technology can be used, but the way in which it is designed requires more transmitters because each unit sends data over shorter distances than the WiMAX transmitters that can send data over a mile between each unit. Supporters of each technology have a list of reasons for favoring WiFi and WiMAX, but looking at BIP's needs, we would probably find many technical people who feel WiMAX is more robust for a purely business crowd and can deliver faster speeds.

Business models

The following is an overview of the various business models that those currently deploying broadband expect to use, or have used in the previous 10 years. We offer a general assessment of each, some more favorable than others. The City needs to thoroughly evaluate these options based on its goals, objectives, available resources, a thorough financial and legal analysis and the politics of the area.

We often refer to broadband networks as “the business” because in affect, any broadband project is a business. The network must generate revenues, deliver or facilitate delivery of services, be run following sound financial practices and be supported with an organization that provides marketing, customer service, technical support and technology upgrades.

Complete municipal ownership and operation

In this model, a municipality will contract out the building of the broadband infrastructure that the municipality then pays for, owns and operates, or it may contract some of the operations out to another entity.

Advantages

- City maintains control over the direction of the broadband business
- The business is potentially most responsive to BIP tenants and City’s economic development needs
- City has more technology options for buildout
- Likely (but not guaranteed) will ensure greater competition in services offered tenants

Disadvantages

- City must raise the full amount to build and operate network
- City assumes the financial and political risks that come with operating a telecom business
- The network can become a political football when there are changes in elected officials and representatives
- City staff must take on some level of broadband business management responsibilities, which may or may not be among their core competencies, or the City incurs the expense of hiring such people

With the surge in popularity of municipal WiFi networks in 2005, the concept of a municipality owning and its IT staff running the network became more popular. Smaller cities such as Chaska, MN started and continue to run muni WiFi networks. However, in 2007, Muni WiFi for the general public fell out of favor and a number of local governments such as Providence, RI and Oklahoma City built these networks only for local government use.

In 2008, local government ownership of fiber broadband networks that provide service for some or all of their residents and businesses started increasing in popularity, though a few city-owned

fiber networks have existed for nearly a decade. A city that offers a good example of a successful municipal-run broadband business is Santa Monica, CA. They own their network, and the city's IT staff run all aspects of the business including the marketing. Their business strength lies in generating much of their working capital from savings through the government replacing antiquated communications infrastructure with the fiber network, and selling fiber services directly to local companies. They don't sell consumer services, and just recently they partnered with a provider to offer 10-gigabit services for businesses.

Loma Linda, CA, Wilson, NC and Chattanooga, TN are among the more than 60 municipalities, county governments and public utilities that have built and operate fiber or wireless networks.

Private sector completely owns the network

This business model, such as it is, basically puts responsibility for the network totally on the back of the private-sector service provider. The provider comes in to build and operate the network, with neither the local government nor the community having a monetary or other investment in the project.

Advantages

- City has very little financial risk plus no overhead-management issues
- City is not responsible for hiring and managing a telecom business staff
- There is little political exposure
- Technology management issues are someone else's responsibility.

Disadvantages

- Government has little influence on who gets served and with what type of services
- Quality and types of service can be contractually mandated, but remedying a contract breach would be challenging
- Benicia doesn't plan to be an anchor tenant on the network, which other cities do to give them leverage in the relationship
- The network is vulnerable to a provider financially failing, though governments write "take back the network" clauses in their contracts

Having the private sector be fully in charge of the network has the overarching benefit of minimizing headaches for the City. However, it is this freedom that presents the major potential downside, which is the lack of leverage to use the network achieve economic development objectives. Benicia, in considering this option, should give thought to what leverage it might be able to wield to enable the City to get the network to achieve economic development goals.

Public-private partnerships

Public-private partnership (PPP) is a term used quite frequently, but it is applied to a variety of business relationships forged to implement broadband projects. This section highlights several of the most commonly used models.

Muni-owned, leased back

In this PPP arrangement, the City would own the network infrastructure outright and lease it back to an entity to run all aspects: maintenance, upgrades, service sales, customer support, etc. There are likely several ways to structure the lease payment plan for the vendor or provider.

I've spoken with two communities, Greene County, NC and Corpus Christi, TX that created or wanted to create such a partnership. In the early part of the last decade, LaGrange, GA leased back 70% of its broadband capacity to Charter Communications. Corpus Christi several years ago tried to lease to EarthLink the city's WiFi network that was being used by government workers only, but EarthLink insisted on buying it with a large cash down payment. When EarthLink later abandoned the WiFi business, Corpus Christi got to keep the network and the money.

The primary benefit of this arrangement is that the City offloads network buildout and management responsibilities. If the leasing arrangement is developed properly, the City has a revenue stream that enables it to recoup its investment. Because this is a complex financial issue, we do not feel qualified to address the intricacies of a leasing arrangement of this sort, or their potential upside and downside.

A variation on this particular PPP that merits consideration is a relationship in which the City sub-contracts aspects of the business operation to private companies that can do them more effectively and cost efficiently, while still retaining management control. These outsourced operations include marketing, customer service and building and/or running the NOC. The NOC comprises the equipment and technology that are the "brains" enabling the network to do what it does, and for the City to hire the appropriate staff it could cost $300,000 - $400,000 annually. The position of running the NOC can demand a six-figure salary by itself.

By outsourcing various aspects of network operations, Benicia still can avoid expenses such as building a NOC and hiring staff. However, there also could be legal issues with leasing city-owned equipment (the first option) to other entities, and Benicia would avoid these by outsourcing construction and operations of various network functions. The City attorney could probably advise on the particulars of this arrangement.

Municipality owns infrastructure, ISPs provide services

A variation on the PPP gaining popularity are arrangements in which governments build, own and maintain network infrastructure in much the same way local or county governments own roadways and sewer systems, and sell service providers access to the network. In this model, any providers can offer any services they want, from Internet access to specialized applications such as VoIP and cloud computing.

One example of this model is provided by the Utah Telecommunication Open Infrastructure Agency (UTOPIA), which is a regional project involving 24 small cities and towns in Utah. UTOPIA owns the infrastructure and charges residents a connection fee and service fee, which in time is supposed to cover the buildout and operating costs. Service providers are not charged a fee to access the network, and they generate revenues through sales to network subscribers.

A proposed regional fiber project in Vermont being run under the name EC Fiber and one for Ontario County, NY will both have the local governments be the network owners. Providers will pay the governments to access the networks and then offer subscriber services and applications.

The primary distinctions between this and previous models is that there is a clear line between the municipalities' roles in managing infrastructure and delivering service. In Santa Monica's city-owner model, for example, until recently they provided services as well as had total ownership and control of the network infrastructure. In the lease-back model, a municipality gives operational control to an outside entity. With the muni-owned infrastructure model, there is a clear demarcation between infrastructure owner and service/content provider, with the local government carrying full responsibility for the network.

The operational effort and expense is considerably lower for government since it has no responsibility for customer-facing tasks such as marketing, sales and customer support. Government maintains its ability to direct coverage to constituents most in need by determining where the network is built, its capacity, which providers to recruit that offer the services constituents want and so forth. The muni may still decide to outsource NOC operations and pay contractors to upgrade and maintain the infrastructure under the direction of the IT staff. Maximizing these advantages requires government attorneys write thorough, forward-looking contracts with providers.

Nonprofit ownership

During the past six years, a model pursued by local and county governments has been to create a nonprofit organization to run the network. Boston and Philadelphia were among the first to take

this tact. The broadband stimulus program inspired quite a few to be created as the stimulus rules encouraged this by giving extra weight to proposals from nonprofits.

There are several ways to structure a broadband nonprofit organization, but core constituencies contributing to or participating in this new organization typically include local business, the nonprofit community, local government (often the economic development agency) and possibly the provider/tech vendor community. The mayors of Boston and Philadelphia initiated their respective nonprofits.

One of the main advantages of having nonprofit entities be responsible for network ownership, management and operations is that the day-to-day tasks and many long-term projects do not fall under as intense political scrutiny as then a city owns the network. Philadelphia structured its network so the Board of Directors appointed by the City would have staggered terms so no one administration would influence over the entire board.

In reviewing nonprofits that were created to take advantage of broadband stimulus opportunities, two things stand out. One is that a nonprofit's major advantage is that this type of entity can more readily qualify for certain government-sponsored and possibly foundation grants. The other thing we observed is that a nonprofit will likely do better if it contracts out all or most of the network operations rather than actually build and operate the network itself. This is because the contracted entity is qualified to run a network business, and a nonprofit is often poorly suited to be a business operator.

Conclusion

We tend to lean toward a model in which the City owns the infrastructure and brings in ISPs and other businesses to provide services and online applications such as VoIP and cloud computing. The City's finance manager and attorney can evaluate the issue to determine whether the infrastructure should be leased to someone to operate (we're lukewarm to this idea) or contract out some of the operational tasks. With the latter, I believe the City maintains better control of the outcomes the network produces.

Financing options and considerations

Who's going to pay for the network is a constant refrain as communities ponder these broadband projects. The answers have ranged from the conventional to the creative, depending on costs and various circumstances such a local politics, the financial health of a community and the degree to which a network will be able to finance itself.

At the outset of this project, we had hoped to identify several candidates to be anchor tenants on the network, meaning a small group of subscribers that generate enough revenue to offset a significant percentage of the network's operating costs. Libraries, medical facilities and local governments are typical anchor tenants for a broadband network. The feedback we gathered indicated conclusively that there are no likely candidates. This places the burden of revenue generation squarely with the current and future tenants of the BIP.

Bonds, capital leasing

The use of municipal bonds has become a popular topic of conversation and educational sessions during conferences focused on broadband issues at which community representatives are in attendance. Simply stated, Bonds are a large loan divided into small amounts that are then "sold" to individuals and entities. There are two types of bonds. One is a general obligation (GO) bond that is backed by a town's taxing authority. Those backing the bonds have a high assurance of getting their money back because cities can levy taxes to recover the investment in case a project runs into financial problems.

The other type of bond is a revenue bond. These are not secured by a commitment to passes taxes, but cities are required to re-pay the bond with revenue from whatever the bonds are used to build (e.g. parking garages, sports stadiums, muni networks). The risk for these bonds is considered generally higher than GO bonds because the municipality may not be able to earn enough revenue. Historically, however, towns in that predicament will find a way to repay the debt so they maintain a high credit rating.

A third similar option is to arrange to create a capital lease for the cost of the network buildout, which then gets divided into small increments called Certificates of Participation (COP) that are sold to investors. At the end of the lease payment period, the city can buy the network for an agreed to amount.

One of the reasons these financial instruments are talked about a great deal is that they allow communities to treat a broadband network infrastructure project the same as any other muni project and spread the financing payback period out for 12-to-25 or 30 years. Repayment for a multi-million dollar project stretched out over many years subsequently becomes an easier cost for a community to vote for and to absorb.

While these are often discussed, bonds and leasing are not currently pursued very much because the economy is bad, leading to a poor financial environment for attracting investors. That said, there is anecdotal evidence that communities plan to pursue bond financing for network projects as soon as the economy revives. They are inspired by Salisbury, NC and other communities that used bonds to finance their fiber networks before the downturn, and by Ontario County, NY, which recently went against the tide to approve a $5 million bond in the current economy to pay

for their fiber network. Benicia would have to assess the bond market to determine if this is an avenue to pursue.

It is possible to arrange with a bank or other financial institution for conventional bank financing as well when the economy improves. Cambria County, PA in 2007 was courted pretty heavily by these entities offering loans for its network infrastructure project rather having to pursue the banks. The county believes this was due to the strength, depth and credibility of its financial projections that were reinforced with various towns' commitments to buy services on the network. In the end, Cambria County opted for a $10 million capital lease from a bank. Conversely Wilson, NC is one city that settled on a conventional 12-year bank loan.

Local investors

An option that merits consideration is finding local investors who will put money into a project because of community pride plus they have a vested interest in the economic development of the area. Though it does not appear that there is a pool of wealthy individuals (the typical angel investors) in Benicia who could be play this role in the project, it could be possible to execute a variation of the strategy.

One variation is to determine if several local businesses would be interested in becoming an investment group. How much money they would need to raise depends on how much can be acquired first through financing or grants. However, my sense is that there are only a couple of businesses in the BIP that might have the available capital.

Another variation is to create a co-op of sorts in which The City gets 10 – 12 largest tenants to agree to pay for services + "x" dollars, in which "x" is an additional amount that qualifies the tenant as an investor. The City would have to figure out some type of dividend or ROI program.

Whether or not you pursue the coop strategy, the City still needs to identify these same tenants to pre-sell them on the network. They collectively represent potential anchor tenants that will buy enough services to fund a significant portion of the network's operating expenses. I consider Valero to be the primary tenant to win over since they represent significant revenue, and their being a customer to have a big influence on other tenants.

Looking outside of the box, another variation could be to create and sell a plan to make the BIP a "technology park," a "research center" or some other designation that both attracts businesses and investors. For example, if Benicia promotes BIP as an Engineering Design Complex, this attracts companies that need a lot of broadband bandwidth, plus they get a sense of being part of a community catering to their industry. Structure a contract in which broadband services and an investment in the network are part of the package that comes with being a member of this new community.

This latter idea requires a lot of marketing thought, plus consideration of what happens to current tenants if Benicia changes the environment. But thinking long-term, this could be a transition that needs to happen for the greater economic development good of the city.

Grants

Grants, thanks to the broadband stimulus, have become very popular as a potential funding source. Unfortunately, Benicia has difficulty qualifying for some of the obvious types of programs. The city was too small for the stimulus, and due to its small size, a longshot for the Google gigabit broadband opportunity. The project's focus on a relatively small geographic and a small population is not a positive, and the State of California isn't particularly supportive of economic development projects.

The one state program that offers some hope is the California I-Bank program that supports infrastructure programs. Much depends on whether in the next few months the department decides to fund public-private partnership projects. Currently they do not, so the project would have to be run entirely by the City in order to qualify. Even owning the infrastructure and leasing space for providers to offer services could disqualify the project.

The City should pursue other options, but monitor I-Bank closely. It would make sense to identify other funding sources, but be ready to apply to I-Bank if a favorable decision comes out while Benicia is still in the planning and early development phase.

IV. Recommended Additional Actions

These are some general recommendations for actions the City should take to move this project to the next level.

Get BIP tenants buy in

The survey results and the free form comments offered by respondents clearly indicate a high level of dissatisfaction with current broadband options. The results also point to a potentially high number of subscribers to new and better services. The next step should be to meet with a group of tenants to present the idea of a fiber network, its potential total cost and some possible rates for various speeds of service to gage:

- how interested are tenants in this project moving forward
- are they serious about becoming customers
- what prices are they willing to play

We suggest using the Wilson, NC price chart and getting a price chart from Chattanooga, TN so tenants can have some perspective on price and speed. The pricing from both of these cities seems high when compared with broadband prices in Europe and Asia, but they are much better than the service pricing from incumbents in those communities.

Follow the group meeting with a mailing to the tenants that has an overview of why the broadband project is beneficial to them and include a short survey that asks how committed they might be to buying services on the network. While the feedback is valuable, you also want to build enthusiasm and word-of-mouth support.

Line up several providers willing to participate on the network

Several providers we interviewed indicated a willingness to offer services on a fiber infrastructure if one is built, such as wireless broadband services. The City should meet with these to explore what they can do and the potential costs to tenants. This process should help the City start building its revenue model and business plan based on what these services will be, pricing for tenants, potential fees to the City for accessing the infrastructure, etc.

Speak with several cities that are building networks

Over the past several years, we have spoken and met with numerous communities that are building broadband networks, or are aggressively pursuing them currently. However, it is most beneficial for City staff to speak with some of these in order to get a better feel for the

advantages and disadvantages of various options Benicia has. Our perspective is not the same as the City's, though we do bring objectivity to the process. Several communities we recommend are:

Santa Monica, CA
Loma Linda, CA
Chattanooga, TN
Salisbury. NC
Ontario County, NY
Longmont, CO

Address the electrical issues of BIP facilities

Several survey respondents pointed out that the electrical systems in some of the BIP facilities may not support a significant increase in the demand that increased online computing will bring. Everything from the number and type of electrical outlets to the condition of current wiring may work against the City's plans. Increased bandwidth means tenants will use a greater number of more powerful servers, more computers and peripherals and run these for longer hours. Insufficient electrical resources negate many of the benefits resulting from better broadband, and could be a factor that loses new-tenant deals. We advise finding a way to engage tenants and building owners in an assessment of resources, and be willing to assist tenants improve conditions.

Appendix I: Survey Results and Analysis

After getting general information about the respondent's business, the survey inquired how the tenant connected to the Internet. An overwhelming majority of the tenants (85%) identified themselves as connecting to the Internet via a broadband connection (**Table 3**).

Table 3: How do you connect to the Internet?

Method	Count
Broadband	160 (85%)
Dial-up	8 (4%)
Don't know	4 (2%)
No Internet	12 (6%)
Other	5 (3%)

The survey then asked the tenants what company provides their Internet connection. **Table 4** shows the providers of Internet service currently in the Benicia Industrial Park.

Table 4: Who provides your Internet connection?

Provider	Count	Percent
AT&T	67	36%
Tele Pacific Communications	26	14%
Day Wireless	12	6%
I Systems Technology	9	5%
Sprint	6	3%
Covad	5	3%
Hughes Net	5	3%
Air Cloud	4	2%
Comcast	4	2%
Speak Easy	4	2%
Verizon	4	2%
Intuitive ISP	3	2%
Dial-up (various)	8	4%
Other	17	9%
Unknown/No Answer	12	6%

In addition to asking about provider information, the survey asked for cost information – what are people currently paying for Internet access. **Table 5** below, breaks out the costs of Internet access with a little over half (53%) of the tenants reporting a monthly cost of less than $100, 13% reported costs of between $100-$249 per month, 16% had costs of between $250 and $499 per month, and 8% paying more than $500 per month.

Table 5: What is your cost/month for your Internet connection(s)?

Cost per Month	Count	Percent
<$50	38	24%
$50-$99	45	29%

$100-$249	21	13%
$250-$499	25	16%
$500 or more	13	8%
Unknown	15	10%

While most did not know the speed of their Internet service, of those who did nearly half (46%) were paying for speeds of less than 2 megabits per second (Mbps), 23% had speeds of between 2.0 and 9.9 Mbps, 21% had speeds between 10 and 99.9 Mbps, and 10% knew that they were paying for speeds in excess of 100 Mbps (**Table 6)**.

Table 6: Do you know the speed level for which you signed up?

Known speed	Count	Percentage
Don't know	112	
<2.0	24	46%
2.0-9.9	12	23%
10.0-99.9	11	21%
100.0 or more	5	10%

Though the data does not provide for a direct one-for-one comparison, from Tables 4 and 5 we can deduce that roughly half of the BIP tenants are paying up to $100 per month for Internet speeds of up to 2 Mbps. Another quarter of the tenants are paying up to $250 per month for speeds up to 10 Mbps, with a final quarter of the tenants paying more than $250 for Internet speeds greater than 10 Mbps.

Tables 7 below provide a comparison of vendors that highlights the range of services respondents said they receive, and the range of prices respondents are charged for these services. There can be a fairly wide range in the reported prices given the different bandwidth levels available for both direct connections and Digital Subscriber Line (DSL) services. For example, the base level DSL service for AT&T was reported as $25 per month, whereas faster DSL service from the same provider was reported at $300 per month.

Table 7: Vendors, Services and Pricing *

Vendor	Direct Connection (e.g. T-1)	Digital Subscriber Line (DSL)	Cable	Satellite	Wireless
Air Cloud	$400			$175 - $180	$40
AT&T	$200 - $650	$25 - $300			
Comcast			$30 - $60		
Day Wireless					$39 - $50
Hughes Net				$99 - $300	
I Systems Tech	$60 - $300			$60 - $90	$229
Intuitive ISP		$59 - $60			
Speak Easy	$55 - $850	$400	$415		
Sprint					$59 - $70
Tele Pacific	$120 - $1,100				
Verizon					$60 - $150

*Note: Prices can vary depending upon the type/speed of service provided.

Broadband Connections by Industry Type

We wanted to know what industry groups within the Benicia Industrial Park were paying for their broadband connections. **Table 8** shows that firms categorized in the mining/utility/ construction, manufacturing and transportation/warehousing/trade industries on average paid significantly more for their broadband connections. Professional service firms averaged about half of what the higher end industries paid, and the educational, food service, accommodations, and recreation based industries paid about what one would expect for low speed DSL service. The industries listed here and throughout our report are in order based on their NAICS codes.

Table 8: What is your cost/month for your Internet connection(s)?

Industry	Average cost per month
Mining, utilities, and construction	$ 265.52
Manufacturing	$ 202.94
Transportation, warehousing, and trade	$ 240.55
Professional services	$ 120.13
Education, health, and social services	$ 33.33
Recreation, accommodation, and food services	$ 23.50
Personal, repair, and other services	$ 84.94
Average	$ 182.69

Table 9 shows by count the types of broadband services being purchased by the various industry groups, and **Table 10** shows the same data but as percentages of the total number of respondents.

Table 9: How do you get your broadband Internet Service? (Count)

Industry	Cable	DSL	Direct Connect	Fiber-optic	Satellite	Wireless	Other	Total Responses
Mining, utilities, and construction	0	5	15	0	1	9	3	33
Manufacturing	3	8	15	6	5	16	4	57
Transportation, warehousing, and trade	6	12	21	4	3	13	7	66
Professional services	5	15	8	2	1	9	2	42
Education, health, and social services	2	4	1	0	0	3	0	10
Recreation, accommodation, and food services	0	1	0	0	0	1	0	2
Personal, repair, and other services	3	11	5	3	1	7	2	32
Total	19	56	65	15	11	58	18	242

Interestingly, the total number of responses shown in Table 9 (242) exceeds the total number of respondents to the survey. This is because some tenants obtain broadband services from more than one source and via more than one technology.

Table 10: How do you get your broadband Internet Service? (Percent)

Industry	Cable	DSL	Direct Connection	Fiber-optic	Satellite	Wireless	Other	Total
Mining, utilities, and construction	0%	15%	45%	0%	3%	27%	9%	100%
Manufacturing	5%	14%	26%	11%	9%	28%	7%	100%
Transportation, warehousing, and trade	9%	18%	32%	6%	5%	20%	11%	100%
Professional services	12%	36%	19%	5%	2%	21%	5%	100%
Education, health, and social services	20%	40%	10%	0%	0%	30%	0%	100%
Recreation, accommodation, and food services	0%	50%	0%	0%	0%	50%	0%	100%
Personal, repair, and other services	9%	34%	16%	9%	3%	22%	6%	100%
Total	8%	23%	27%	6%	5%	24%	7%	100%

How BIP tenants use broadband

For the next series of questions we gave the BIP tenants the following list of typical broadband applications in this order:

- E-mail
- Web browsing
- Send/receive large data files
- Send/receive graphically intense files
- Run video applications
- Run supplier/customer applications
- Telecommunications
- Telecommuting
- Cloud Computing

For each application we asked respondents 1) for what business tasks do they currently use broadband, 2) is their broadband connection adequate for the tasks and 3) what tasks they would like to use broadband for in the next three-to-five years. **Table 11** shows this data for all respondents. Percentage values in **BOLD** represent the applications with the highest percentage of respondent dissatisfaction. **Figure 1** below displays the same data in a comparison chart. The tables and figures on the following pages break out this same data by industry groups.

Table 11: Use and Adequacy of Internet Service (All Respondents)

	Question 7: What do you do currently with broadband?		**Question 8:** Is your Internet connection adequate for these tasks.		**Question 9:** What do you want to do with broadband in next 3-5 years?	
Activity	Count	Percent	Answering "No"	Percent	Count	Percent
E-mail	175	94.09%	32	17.20%	183	98.39%
Web browsing	177	95.16%	35	18.82%	182	97.85%
Send/receive large data files	147	79.03%	63	**33.87%**	165	88.71%
Send/receive graphically intense files	111	59.68%	61	**32.80%**	143	76.88%
Run video applications	85	45.70%	60	**32.26%**	126	67.74%
Run supplier/customer applications	111	59.68%	41	22.04%	137	73.66%
Telecommunications	38	20.43%	55	29.57%	104	55.91%
Telecommuting	76	40.86%	45	24.19%	116	62.37%
Cloud Computing	44	23.66%	29	15.59%	83	44.62%

Figure 1: Use and Adequacy of Internet Service (All Respondents)

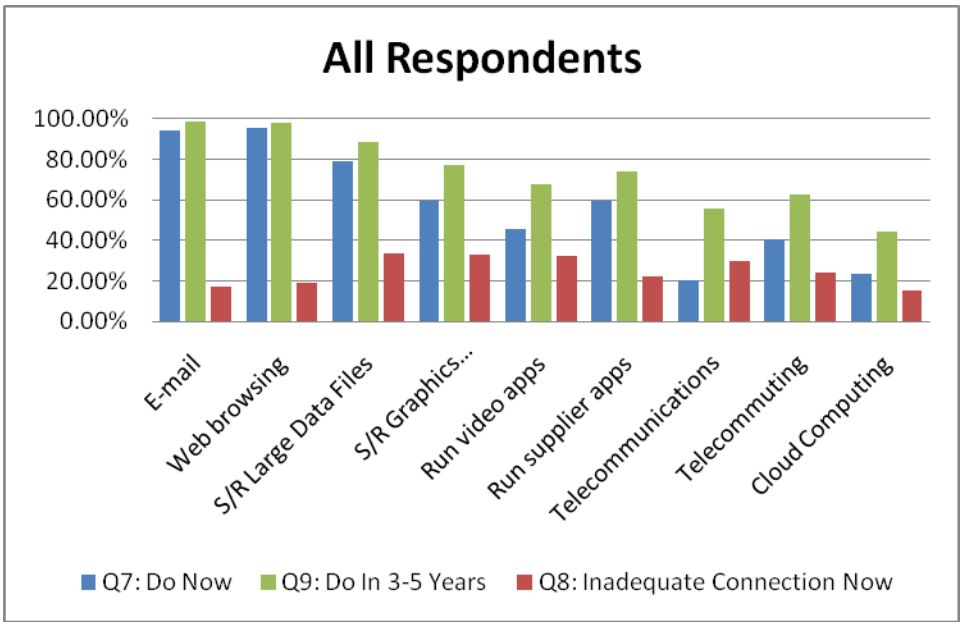
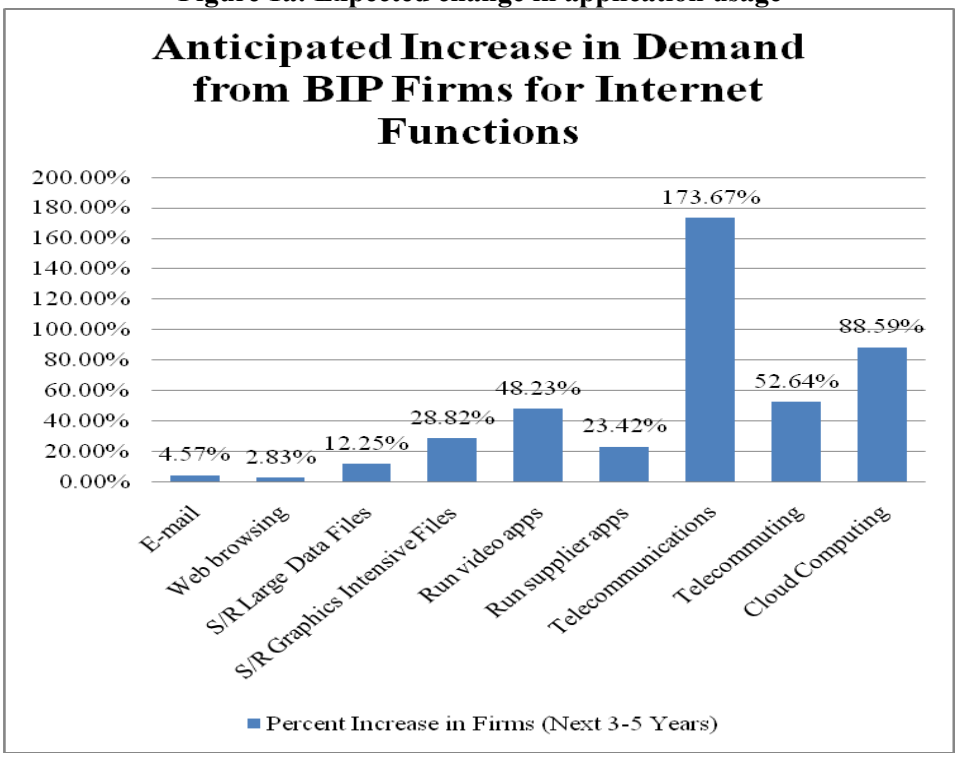


Figure 1a: Expected change in application usage



From the chart above in **Figure 1A**, it is apparent that in the next three-to-five years the tenants at the Benicia Industrial Park expect to use the Internet to do more things and to transport increasingly greater volumes of data through their broadband connections. E-mail and Web browsing has almost reached total saturation among BIP tenants and so there is little need for additional adoption here. Though broadband dissatisfaction is highest for moving large data files (34%), usage for this task at near 80% is fairly close to that of e-mail and browsing.

Note that the greatest expected increase in usage is with tenants using broadband for phone calls, cloud computing and telecommuting. This is not surprising considering that these three applications are the least used in the BIP. Running video applications is a close fourth place for expected increased usage over the next five years.

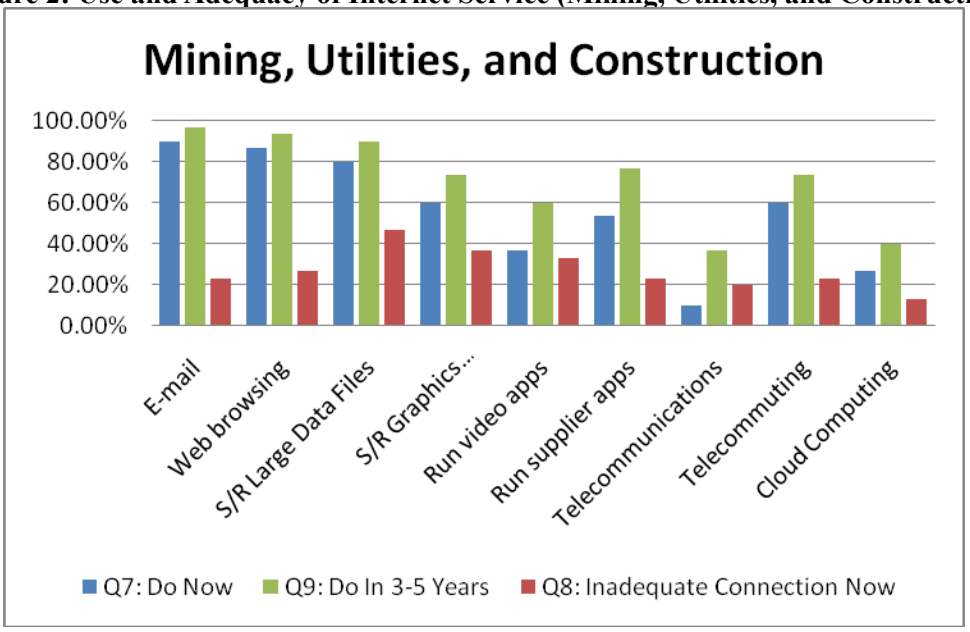
Also note that the three industries that make up the largest percentages of tenants in BIP (transportation/warehousing/trade, manufacturing and professional services, as reported in **Table 2,** page 5) also pay three of the four highest broadband service bills (**Table 8**, page 25). Mining, utilities and construction tenants rank #4 in percentage of total tenants, but pay the highest average monthly services fees. Since businesses in these industries are the heart of Benicia's economic center, it obviously behooves the City to pay particular attention to their needs as expressed in the following charts.

Although they expect to increase their use of the Internet to send/receive large data files and run bandwidth intensive applications (**Table 12**), the mining, utilities and construction tenants' level of dissatisfaction is higher than the average for the BIP as a whole.

Table 12: Use and Adequacy of Internet Service (Mining, Utilities, and Construction)

Mining, Utilities, and Construction	**Question 7**: What do you do with your Internet connection?		**Question 8:** My internet connection is not adequate.		**Question 9:** What do you want to do with broadband?	
Activity	Count	Percent	Count	Percent	Count	Percent
E-mail	27	90.00%	7	23.33%	29	96.67%
Web browsing	26	86.67%	8	26.67%	28	93.33%
Send/receive large data files	24	80.00%	14	**46.67%**	27	90.00%
Send/receive graphically intense files	18	60.00%	11	**36.67%**	22	73.33%
Run video applications	11	36.67%	10	**33.33%**	18	60.00%
Run applications with suppliers, customers, etc.	16	53.33%	7	23.33%	23	76.67%
Telecommunications	3	10.00%	6	20.00%	11	36.67%
Telecommuting	18	60.00%	7	23.33%	22	73.33%
Cloud Computing	8	26.67%	4	13.33%	12	40.00%

Figure 2: Use and Adequacy of Internet Service (Mining, Utilities, and Construction)



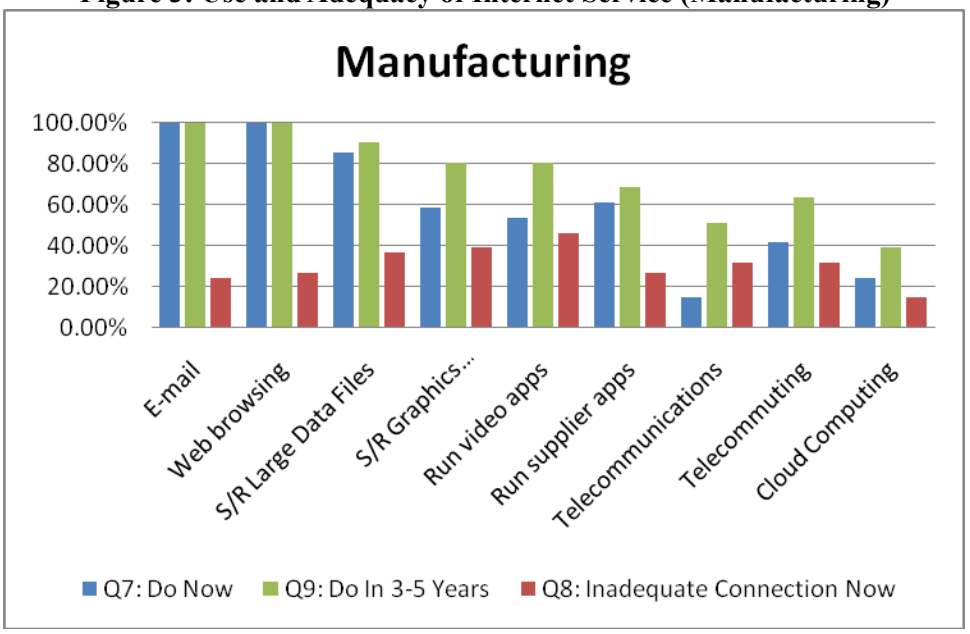
The manufacturing tenants (**Table 13**) anticipate major use of the Internet to include sending large data files, graphics intensive files and running video and supply chain applications. They also report higher than average levels of dissatisfaction with their broadband connections when trying to run these same functions currently.

Table 13: Use and Adequacy of Internet Service (Manufacturing)

Manufacturing	**Question 7:** What do you do with your Internet connection?		**Question 8:** My internet connection is not adequate.		**Question 9:** What do you want to do with broadband?	
Activity	Count	Percent	Count	Percent	Count	Percent
E-mail	41	100.00%	10	24.39%	41	100.00%
Web browsing	41	100.00%	11	26.83%	41	100.00%
Send/receive large data files	35	85.37%	15	**36.59%**	37	90.24%
Send/receive graphically intense files	24	58.54%	16	**39.02%**	33	80.49%
Run video applications	22	53.66%	19	**46.34%**	33	80.49%

Run applications with suppliers, customers, etc.	25	60.98%	11	26.83%	28	68.29%
Telecommunications	6	14.63%	13	31.71%	21	51.22%
Telecommuting	17	41.46%	13	31.71%	26	63.41%
Cloud Computing	10	24.39%	6	14.63%	16	39.02%

Figure 3: Use and Adequacy of Internet Service (Manufacturing)



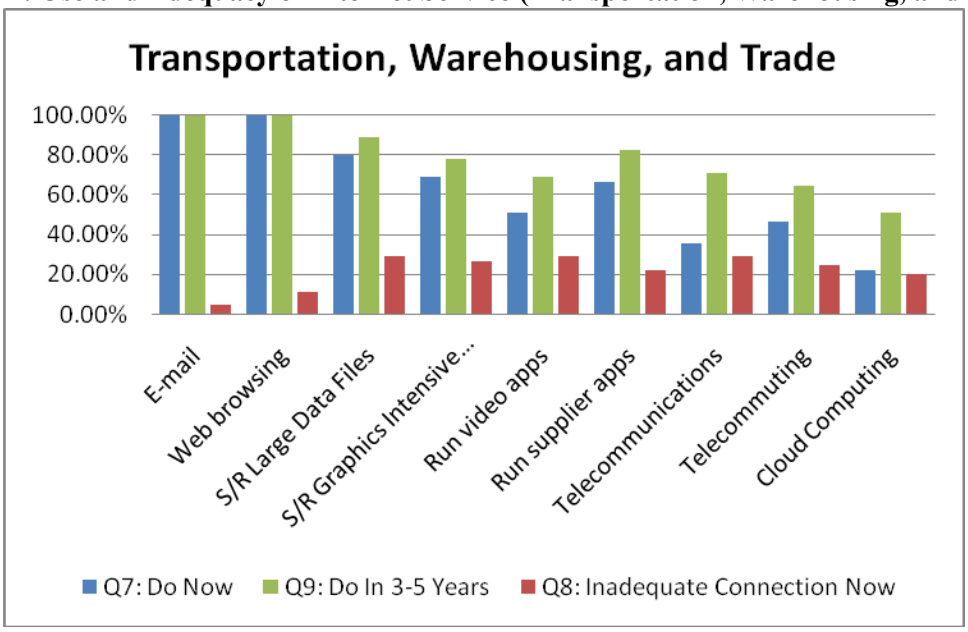
The percentage of transportation, warehousing and trade tenants (**Table 14**) reporting that their broadband connections are not adequate is below average in most categories. However, their level of dissatisfaction is still notable, particularly for bandwidth-intensive applications.

Table 14: Use and Adequacy of Internet Service (Transportation, Warehousing, and Trade)

Transportation, Warehousing, and Trade	**Question 7:** What do you do with your Internet connection?		**Question 8:** My internet connection is not adequate.		**Question 9:** What do you want to do with broadband?	
Activity	Count	Percent	Count	Percent	Count	Percent
E-mail	45	100.00%	2	4.44%	45	100.00%
Web browsing	45	100.00%	5	11.11%	45	100.00%
Send/receive large data files	36	80.00%	13	**28.89%**	40	88.89%
Send/receive graphically intense files	31	68.89%	12	26.67%	35	77.78%
Run video applications	23	51.11%	13	**28.89%**	31	68.89%

Run applications with suppliers, customers, etc.	30	66.67%	10	22.22%	37	82.22%
Telecommunications	16	35.56%	13	**28.89%**	32	71.11%
Telecommuting	21	46.67%	11	24.44%	29	64.44%
Cloud Computing	10	22.22%	9	20.00%	23	51.11%

Figure 4: Use and Adequacy of Internet Service (Transportation, Warehousing, and Trade)



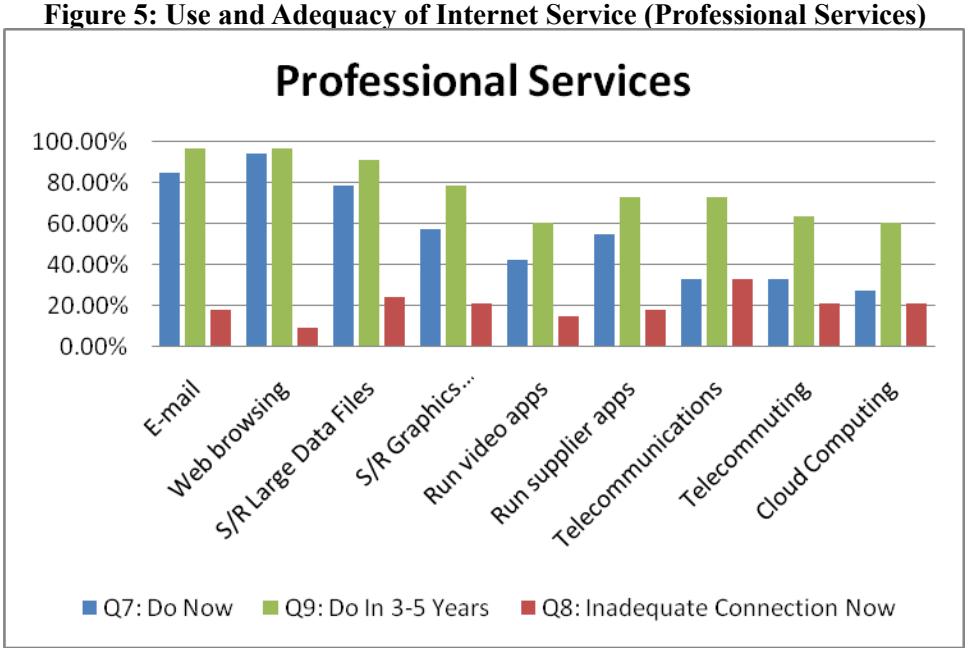
The professional services tenants (**Table 15**) anticipate major increases in the use of broadband particularly in the areas of telecommuting, telecommunications and cloud computing. One-third of all the professional services tenants report the need for better broadband for telecommunications activities. However, they appear to be more satisfied than average with their service for other applications.

Table 15: Use and Adequacy of Internet Service (Professional Services)

Professional Services	**Question 7:** What do you do with your Internet connection?		**Question 8:** My internet connection is not adequate.		**Question 9:** What do you want to do with broadband?	
Activity	Count	Percent	Count	Percent	Count	Percent
E-mail	28	84.85%	6	18.18%	32	96.97%
Web browsing	31	93.94%	3	9.09%	32	96.97%
Send/receive large data files	26	78.79%	8	24.24%	30	90.91%

Send/receive graphically intense files	19	57.58%	7	21.21%	26	78.79%
Run video applications	14	42.42%	5	15.15%	20	60.61%
Run applications with suppliers, customers, etc.	18	54.55%	6	18.18%	24	72.73%
Telecommunications	11	33.33%	11	**33.33%**	24	72.73%
Telecommuting	11	33.33%	7	21.21%	21	63.64%
Cloud Computing	9	27.27%	7	21.21%	20	60.61%

Figure 5: Use and Adequacy of Internet Service (Professional Services)



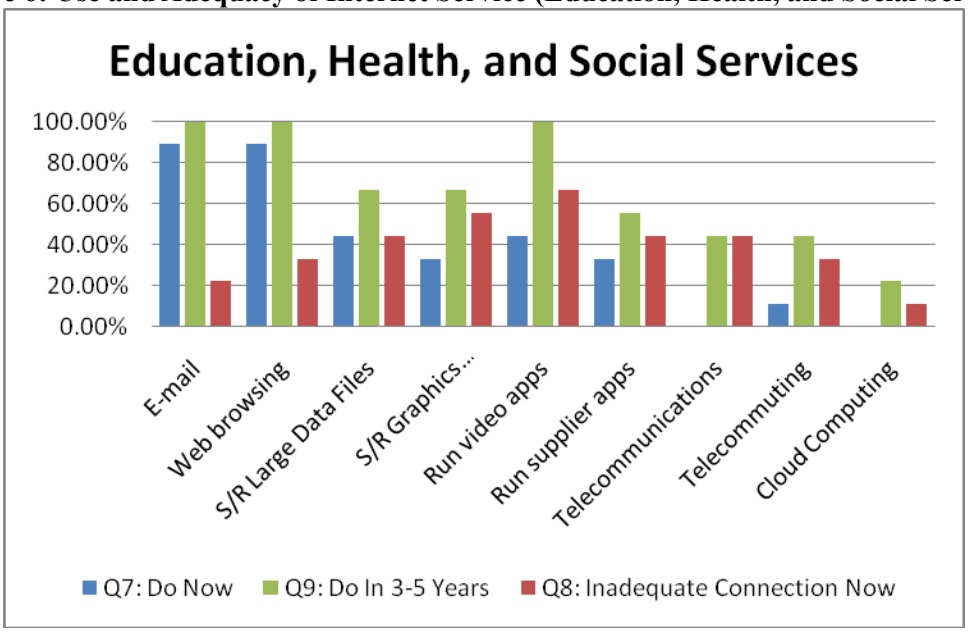
While tenants in the education, health category and social services category (**Table 16**) have the highest level of dissatisfaction with their broadband connections, they also are the most hopeful in their planned use of broadband applications over the next three-to-five years.

Table 16: Use and Adequacy of Internet Service (Education, Health, and Social Services)

Education, Health, and Social Services	**Question 7:** What do you do with your Internet connection?		**Question 8:** My internet connection is not adequate.		**Question 9:** What do you want to do with broadband?	
Activity	Count	Percent	Count	Percent	Count	Percent
E-mail	8	88.89%	2	22.22%	9	100.00%
Web browsing	8	88.89%	3	33.33%	9	100.00%
Send/receive large data files	4	44.44%	4	**44.44%**	6	66.67%
Send/receive graphically intense files	3	33.33%	5	**55.56%**	6	66.67%

Run video applications	4	44.44%	6	**66.67%**	9	100.00%
Run applications with suppliers, customers, etc.	3	33.33%	4	**44.44%**	5	55.56%
Telecommunications	0	0.00%	4	**44.44%**	4	44.44%
Telecommuting	1	11.11%	3	33.33%	4	44.44%
Cloud Computing	0	0.00%	1	11.11%	2	22.22%

Figure 6: Use and Adequacy of Internet Service (Education, Health, and Social Services)



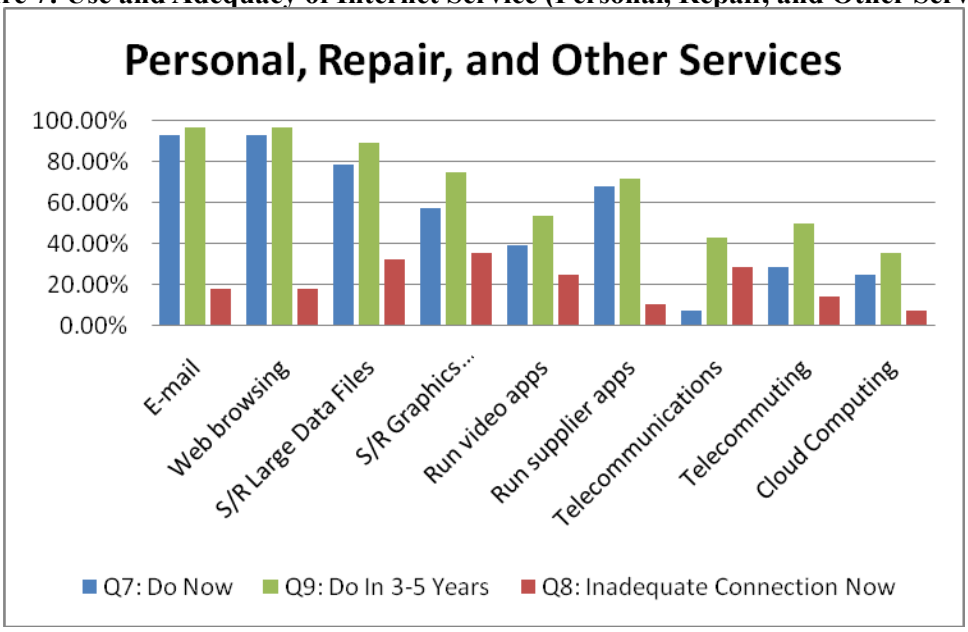
For those tenants falling into the category of personal, repair and other services (**Table 17**), more than a third believe their current broadband connection is not adequate for handling their file transfer needs – both for large data files as well as graphics intensive files. They do appear, however, to be more satisfied than the average with their broadband performance when running other applications. It could be due to them sending and receiving relatively smaller files with these applications.

Table 17: Use and Adequacy of Internet Service (Personal, Repair, and Other Services)

Personal, Repair, and Other Services	**Question 7:** What do you do with your Internet connection?		**Question 8:** My internet connection is not adequate.		**Question 9:** What do you want to do with broadband?	
Activity	Count	Percent	Count	Percent	Count	Percent
E-mail	26	92.86%	5	17.86%	27	96.43%
Web browsing	26	92.86%	5	17.86%	27	96.43%
Send/receive large data files	22	78.57%	9	**32.14%**	25	89.29%

Send/receive graphically intense files	16	57.14%	10	**35.71%**	21	75.00%
Run video applications	11	39.29%	7	25.00%	15	53.57%
Run applications with suppliers, customers, etc.	19	67.86%	3	10.71%	20	71.43%
Telecommunications	2	7.14%	8	28.57%	12	42.86%
Telecommuting	8	28.57%	4	14.29%	14	50.00%
Cloud Computing	7	25.00%	2	7.14%	10	35.71%

Figure 7: Use and Adequacy of Internet Service (Personal, Repair, and Other Services)



Additional analysis of customer dissatisfaction

The final two tables present a different view of those tenants who feel their current broadband services are inadequate. **Table 18** presents by service provider the number of people who feel their broadband connection is inadequate for the various business applications we listed for them. **Table 19** shows what percentage of each service provider's customers who responded to the survey feel their broadband connection is inadequate for the business applications these customers run or attempt to run.

Table 18: Connection Inadequate Now for Service, by Provider (excludes respondents who do not use broadband for these respective applications)

Provider	E-mail	Web browsing	Send/ receive large data files	Send/ receive graphically intense files	Run video applications	Run applications with suppliers, customers, etc.	Telecommunications	Telecommuting	Cloud Computing
AT&T	9	12	20	21	19	11	20	14	9
Tele Pacific Communications	1	2	4	5	4	2	5	6	4
Day Wireless	1	2	6	7	5	4	2	4	1
I Systems Technology	1	1	4	2	4	2	3	1	1
Sprint	3	2	3	1	1	1	2	1	0
Covad	2	2	3	3	2	2	1	2	2
Hughes Net	2	2	3	3	3	3	1	2	1
Air Cloud	2	1	2	2	2	3	2	2	2
Comcast	0	0	0	0	0	0	1	0	0
Speak Easy	1	0	0	1	1	0	1	0	1
Verizon	0	0	2	2	4	1	3	2	1
Intuitive ISP	0	0	0	0	0	0	0	0	0
Dial-up (various)	5	4	3	3	3	5	1	3	1
Other	4	6	9	9	8	7	10	8	5
Unknown/No Answer	3	3	4	3	4	2	4	2	3

Table 19, below, is color coded to highlight the level of satisfaction or dissatisfaction. If 50% or more of the respondents feel that their service is not sufficient to perform the referenced task, the table cell is coded red. If 25-49% of respondents believe that the cited task is not adequately handled by their current service, the cell is coded yellow. And, if less than 25% of the respondents believe that the service is inadequate to handle the cited function, the cell is coded green. If every customer of a service provider believes that the current level of service is adequate to perform the cited function, then the cell retained a white background and the “0%” is shown in green.

Table 19: Connection Inadequate Now for Service, by Provider (Percent of respondents who use the Internet for this purpose now)

Provider	E-mail	Web browsing	Send/ receive large data files	Send/ receive graphically intense files	Run video applications	Run applications with suppliers, customers, etc.	Telecommunications	Telecommuting	Cloud Computing
AT&T	13%	18%	33%	43%	40%	24%	59%	37%	41%
Tele Pacific Communications	4%	8%	17%	24%	27%	11%	33%	27%	33%
Day Wireless	8%	17%	50%	64%	83%	50%	50%	57%	20%
I Systems Technology	11%	11%	44%	25%	67%	29%	100%	50%	50%
Sprint	50%	33%	60%	50%	50%	50%	100%	100%	0%
Covad	40%	40%	60%	60%	50%	50%	50%	50%	100%
Hughes Net	40%	40%	75%	100%	100%	75%	100%	67%	100%
Air Cloud	50%	25%	50%	67%	67%	75%	100%	67%	67%
Comcast	0%	0%	0%	0%	0%	0%	50%	0%	0%
Speak Easy	25%	0%	0%	33%	50%	0%	100%	0%	100%
Verizon	0%	0%	50%	50%	100%	50%	100%	100%	100%
Intuitive ISP	0%	0%	0%	0%	0%	0%	0%	0%	n/a
Dial-up (various)	100%	80%	75%	100%	100%	100%	100%	100%	100%
Other	24%	35%	53%	69%	80%	44%	100%	80%	71%
Unknown/No Answer	25%	25%	40%	43%	57%	22%	67%	40%	50%

≤ 24%	**Connection Sufficient**
25% - 49%	**Connection Marginal**
50% ≥	**Connection Inadequate**

The City of Benicia should be concerned that the ability to move the massive amounts of data that future computer applications will required will be limited severely, based upon the feedback on current broadband capabilities that current park residents provided in this study.

Open-Ended Questions

On the following pages, a series of open-ended questions were asked of those taking the survey. The answers to those open-ended questions are shown without any editing or consolidation so as to provide the reader with a sense of how the respondents feel about their broadband connection.

A number of the respondents for all three questions reiterated the needs expressed in the quantitative data captured, particularly the desire to run video applications. When asked to comment about what else they might want to do using broadband, several tenants indicate an interest in remote computing to support the communication of branch offices in Benicia with their home offices, or to communicate with customers. It is likely that many of the tenants who say they want to use broadband for telecommuting fall into the former category, and are not people who work at home, given that broadband in BIP may not help them.

There is an interest in using GPS to track vehicles and equipment. Phil Garrett of Colliers also mentioned this as being a computing category of increasing interest among manufacturing and transportation companies in general, and this is driving the importance of broadband when these companies are looking to expand to new towns.

Several comments related to would like to do if they could hint at a need to link two or more facilities owned by the same company, but located in different parts of Benicia ("interconnect all 3 stores" "remote access to camera configurations"). The City may want to consider this scenario in its broadband planning. It is interesting to note that several respondents commented that companies currently have people working from home (where broadband connections are faster) and want better broadband in the BIP so they can bring these workers back into the office.

One particular point raised by a respondent and in one-on-one meetings with several stakeholders is that some of the buildings are not sufficiently wired to support a major increase in computing equipment or computing activities. If broadband access significantly improves, bringing with it a tremendous increase in servers and other computing equipment by BIP tenants, the electrical infrastructure may collapse unless it is likewise upgraded.

The third question that asked respondents to say what they feel about the state of broadband in the BIP unleashed a torrent of nearly four pages of commentary, most of it critical of what is available. The common themes expressed by 70% - 80% are: broadband costs too much, it is too slow for what they need and there is not enough competition. Since 12 providers are identified earlier in the report, we assume the last complaint means there are not enough competitors offering high-speed broadband (10+ Mbps) at an affordable price. Possibly close to 10% feel broadband in the BIP is sufficient, at least for now.

What other uses do you have for your Internet connection, currently?

Advertising
Banking
Business cannot operate without internet
Business heavily relies on the internet
Cable TV
download programs, GPS tracking of vehicles and equipment
eventually will need more bandwidth as company grows
Expand business, use more video conferencing
He has a dial up line that is used specifically for processing UPS orders. This line is adequate for that purpose as well
International Communications via Skype
Internet is currently down
Internet radio show, which is sometimes extremely slow and drops the connection
IT company, does a lot of programming, etc
lots of research over the internet
More Video Conferencing or Telecommuting
Mostly run off of servers that are out of state
remote desktop support
run business more efficiently, has to use three separate computer systems (internal, dial up, and wireless)
Skype
Surveillance
Transmit data by internet to third party administers
Updating her website
Upgrading software. The longer this takes the greater the chance that the download is compromised. Downloads are spotty. In this day and age, he should be able to do this efficiently
uses connection primarily for credit card transactions
Video conferencing
VPN connection to their corporate HQ
We do a lot of online training
we have a private network set up between their arsenal office and office in the BIP
Web Page
Yes, working on new website but connection is slowing them down
Yes. Everything.

What do you want to do with your Internet connection currently, but cannot?

Be able to access for online media
Be able to have higher quality images produced, Have all computers working at the same speeds rather than some being slower than others at times because of internet connectivity
Be able to run our business on location and not from workers homes because internet is too slow.
Connect servers to outside, most of everything is all internal
Everything
Faster processors locally
Get more done, work faster
He's worried about the security of his connection

Improve everything
Improved efficiency on every application.
Interconnect all 3 stores
Membership data base needs to be sent to our headquarters
More efficient applications, internet service is so bad.
Remote access to camera configurations
revamp website, set up FTP site to give clients a place to go and download files
send and receive larger files more quickly and smoothly (over 10 megabytes slows the system)
Set up an interactive Web site for customer access to company, and offering ability to order online
streaming video
to be able to conduct video file streaming and file uploading faster.
to have the capability to perform credit card transactions from trucks.
turns itself off sometimes and device gets hot. Internet is shut down too often.
use internet more to connect with and gain more customers
use UPS, credit card, and banking services online but it takes 15 minutes to load…because their internet is so slow they cannot/have not given much thought into what they would like to do in the future
Want to set up an online shopping cart but can't because internet is too slow.
what he perceived he needs it for he feels is limited by the connection he's got. He can't foresee anything else he can use, but would like to take advantage of more as it becomes available. However, there aren't many offerings to businesses like his.
wish it were free and had no troubles
work faster and more efficiently
Would like to perform business related tasks
Would very much like to use it for VoIP. There are lots of possibilities, but the building is old as well and not adequately wired

What else would you like to do with your Internet connection in the next 3-5 years?

Maybe change service providers
ERP system - globally with company in future.
streaming video
grow their business, would like wireless for their business.
just want faster internet connection
keeping email up, allowing everyone to access internet at same time without it crashing
video conferencing in the future

Is there anything else related to the issue of broadband access in the BIP that you think we should know?

Adequate, but could be better. Occasionally slow or drops the connection. She has lost data because the connection fails.
Anything other than a T1 was really slow and had lots of problems
Anyway to get some sort of better connection to the area would be helpful (DSL, Cable, etc.) internet is slow
Aren't very many options - really only one option beyond Air-cloud. We love speed of Air-cloud, but proven unreliable - would like to have backup.
AT&T and Comcast did not have any service available for the business' location
AT&T is the only service provider and they are too expensive. And the connection speed is too slow for the price.
AT&T is unreliable and too expensive.

AT&T has installed fibers, but won't do it unless pay for them to do it. Expensive. Fiber would be good. Or cable.
AT&T connection is not adequate.
be a big help if people had it, beats dial up, sometimes gets upset with T1 line, has to use 2 computers sometimes due to amount of RAM
Benicia is a place where there is no broadband in the park. The choices are limited to T-1 lines which cost $500 and dial-up which is inefficient. For years the options for broadband have been AT&T or Comcast, they either provide service or not at all.

Broadband costs too much

Broadband service as been running smoothly.

Can't get cable or DSL so that's why they use shared t1

catch up with the times
Choice were limited to providers, More competition, can't get cable, had problems with lines in the street but has since been resolved

Choices are limited
city needs affordable and universal pricing system - w/ Comcast, 1 and a half month struggle to get internet turned on and then had to really fight to get the price- almost turned him off from getting internet at all
Concerned that he can't get DSL or anything else out there. When they got internet five years ago T1 was the only option.

connection is slow, and day wireless is their only option

Connection too slow and unreliable

Day wireless is very good and the city should contact them to see if they can provide it for the rest of the park
does not agree with any of this, thinks the corporations have enough money and should pay for the broadband by themselves, they all self serving, won't benefit the rest of the city, city doesn't take care of anyone but themselves, tired of paying the officials for doing nothing...should go through the local businesses like ISP to help with local economic growth
DSL isn't available in the park, but his office in the arsenal has it. There needs to be some alternative, though he doesn't know what that alternative is. Tele-Pacific is a private situation with few competitors. There needs to be alternatives.

Expensive, lousy service.

Faster internet

Faster!, need "real" broadband access

Had a hard time getting internet to the facility, There are no other options besides Day Wireless
Had no other options but to get T1. They could save about $4200 a year if they were able to get DSL. When the business began, they had no idea they would have to pay such a high cost for internet and therefore it wasn't included in the calculation of their overhead. Feels "gypped" for being in the park. Would love a faster and more economical internet service.

Had to get Hughes Net because Comcast doesn't offer service out here.

Had to upgrade on their own

Hates that AT&T does not have any competition in the park
Have aging infrastructure even though the Park isn't that old. When first moved in, couldn't get good lines and they had to put new ones in, still have problem i.e. last week a line got wet so didn't have phone service for 2 days. Need to put more money into improving this issue.
He is the sole employee of his business. His internet connection is more than adequate for himself but if his business were larger he would definitely need something better/faster.
He started looking into internet in 2000, ATT told him they wouldn't develop out there because of the low population. He won't change as long as his current company is around.

Heard that DSL wasn't available and so he ordered t1
He's in the arsenal, building built in 1884, even the phone wiring isn't the best. It could always be faster, but he;s pretty happy with what he has. He said he is designing a broadband system for the city right now.
If AT&T or Comcast were offered, I would switch services. I Systems drops connections. There are no other alternatives right now. Can't do dial-up. No privacy. Unhappy because speed fluctuates up and down.

If companies are out here, should let them do normal business. AT&T not financially fit to be out here.

Internet could be better, faster. Would like to do remote accessing in the future

Internet is just fine for his purposes

Internet is something we all rely on greatly these days and it "sucks" out here - potentially keeping rents down and discouraging businesses from moving into the Park

It needs to be faster, always improvements coming out and now apparently more options.

It would be nice if it was all centralized

Its really hampering his business that he has no true and reasonable access to broadband. Something has to be done.

just put in fiber optics and is happy

Lacking in choices

Limited suppliers. Slow service.

Loses internet connection during peak hours, is frustrating

Lousy internet, can't get internet where he's at unless through satelite or t1

Lousy. The connection will just drop out of nowhere. She has had ATT come out numerous times and the problem doesn't get fixed.

love to have Comcast, LOVE to have something faster, biggest complaint in this office is about slow internet, hear it every day from employees, it's terrible

Many businesses in the area have asked where we get our service, they find it difficult to find different classes of service, it's secluded, there is an effort to bring in more classes like DSL, t1, etc. but it hasn't been a problem with us but then again we are small and don't need any more sophistication.

more affordable broadband

More speed would be better, would be able to accomplish more

Most of the park is too far away for DSL. T1 is expensive and can be cost prohibitive for smaller businesses. OK for them

Need higher speed

Need more internet speed

Need to have more provider competition because the price is very high right now and without competition the price will remain very high

need to run some lines through the area, right now its just AT&T and they're not giving up rights to use it, get on the ball, if the price is right he would switch to high speed, but for now his Wi-Fi stick is working fine for him

Needs to be faster!!!

No decent internet connection, cannot afford a T-1 line. There was a power surge 6 months ago, where there was no access to the network or database, and no ability to perform business.

no internet due to zoning - as consumer, annoying to not be able to get what you want because cable companies didn't run line in that area; not cost effective

Not sure what internet service is available in our area

Nothing is available out here.

Nothing is available where we are at I would have to put in a line myself If I wanted one.

Nothing to add, satisfied with their connection

Occasionally gets disconnected from the internet when it is rainy or windy

on edge of Park, so on higher end of connection & satisfied

on other side of freeway-port right down the street. Used to be really bad, could only gt lowest level of DSL and no Comcast, now can get high speed Comcast and DSL. Now considering switching to Comcast due to telephone charges (int'l calls) rather than internet service. 5-10 person office. just one person telecommutes. largest office in this building, others are 1-2 person offices

only problem, fortunate they can get wireless, can't get other internet solutions

only T1 is available, there is little option for getting good high quality internet in the region. Feels like the 90s.

Pretty satisfied with connection

Pretty satisfied with internet service

Satellite is affected by the weather, and he's limited to 400 mgs per 24 hour period. Once he's surpassed this amount, his internet slows significantly. This is why is the connection is inadequate. He has been trying for years to get a landline.

Satisfied

Satisfied; cable guy provides great service

service in the area is limited and expensive

She's been there for 9 years and she was just now able to get internet

She's satisfied with her carrier, serves its purpose well.

Should be cheaper and it was difficult to get an internet connection there initially. On the spot repairs should be available

Slow, only staying with Earthlink because he doesn't want to deal with the hassle of changing email etc.

small company owned by Coca Cola so wasn't sure on a lot of the answers…

Small outfit, Tele-Pacific might go out of business because of a lack of customers

Some times the connections points for his bundled phone, internet and tv get dirty and everything fails but experience overall is good

Sometimes there is interference with the connection

Sorely needed. Her business would be much more efficient with better/faster internet service

Sucks having to be wireless, only internet provider in the area is Day Wireless and they were very dissatisfied with them.

T-1 Lines are expensive. It would be nice to have more services and offered at a lower price.

T-1 Lines are expensive! Would like to be able to add more lines if cheaper.

Tenants would like to see broadband/faster internet connection

The bandwidth as the park is horrible. If one person is on the connection listening to internet radio, someone else cannot even browse the internet at a decent speed. They would like to at least have a comparable connection to their home service with Comcast. Videos take ten minutes to load. AT&T cell service is very bad in the park too. All smartphones are unable to function in their building.

The Benicia Industrial Park internet service is lacking for small businesses because it's not cost effective for a fast T1 and the other less expensive services are too slow to run a business.

The Industrial Park 10 years ago used T-1 lines. Did not have high speed DSL and the cost was $120. Expansion has been delayed because half a million commercial properties will take more demand. Suspect need to expand network capabilities for networking requiring more capacity.

the internet is way too slow and inconvenient for doing business at time. The internet shuts down. A lot of other customers and ma and pop shops have adequate internet from satellite. The DSL is slow as molasses

The reason they went to I-System was for greater speed, DSL line was very slow

The wave of the future and would afford us faster connectivity so we can do our jobs faster - what we do now is all we know.

the whole Park is slow and needs to be upgraded

There are no T-1 lines. Companies would have to hook up their own T-1 lines to have them.

There are not many options for internet connection. No cable.

They are having more issues with the phone line than with broadband

They have a lot of failures, they are limited by their internet service. He has a lot of problem.

They would like to have more options in service such as Comcast. Their connection is extremely slow with little bandwidth. When multiple people are online at the same time their connection is too slow for functionality.

Things are adequate, but could be better

This company is an internet service provider and provides great connection to companies. Complaint that AT&T has promised better connection for years.

Too slow

Too slow and unreliable

Too slow and unreliable

Tried satellite once, it was a disaster. He would rather have cheaper internet, but right now T1 is the only option.

Very limited and had to cancel, only one vendor to use, couldn't supply everything.

Very limited besides installing a bunch of satellites.

Want cheaper service

Want more affordable internet service and more options

Wants better access without having to Put a dish outside, phone company should upgrade

We would certainly like to get a less expensive connection than a T1, Fiber or DSL would be nice.

Wishes she could get Comcast because it's a lot faster than ATT. Very limited internet options.

Would be nice to not have to use Covad b/c its expensive, would ideally like to use a local company like Comcast rather than connect to the corporate HQ in Wisconsin

Would like it faster and Cheaper, no competition for air cloud lot of neighbors splitting T1 lines

Would like to get cable her.

Would like to have more options

Would use connection more if it connection were more adequate, not as smooth as cable or DSL

Appendix II: Benicia Industrial Park Telephone Survey Questions

From Tenant/Business Listing [Information Already Provided]:

Tenant Name: _____
Tenant Telephone Number: _____
Tenant Address: _____
NAICS: _____

<Survey Questions>

1. Tenant Contact *Name & Title*
   (Confirm name and title of the person answering the questions):

   _____

2. How do you connect to the Internet (Check one)?
   a. Dial-up?
   b. Broadband (e.g. Cable / DSL / Direct)?

3. Who provides your Internet connection (name of provider company)?

   _____

4. What is your cost/month for your Internet connection(s)?

   _____

[**If Dial-up, Skip to 7**]

5. How do you get your broadband Internet Service? (Check all that apply)
   a. Cable Modem
   b. DSL Service
   c. Direct Connection
   d. Fiber
   e. Satellite
   f. Wireless

6. Do you know the speed level for which you signed up?
   a. Yes – [note level or rate] _____
   b. No

7. What do you currently do with your Internet connection? [**Check all that apply**]
    a. Email
    b. Browser – view supplier or competitor web sites
    c. Send/Receive large data files (e.g. manuals, brochures, PowerPoint presentations)
    d. Send/Receive graphically intensive files (e.g. color catalogs, schematics, complex images)
    e. Run video applications (e.g. online training/sales videos, live video conferencing, live video streaming)
    f. Run applications between your company and suppliers, customers, partners, etc. (e.g. inventory mgmt, ordering systems, Electronic Data Interchange – EDI, collaboration software)
    g. Telecommunications such as VoIP (phone calls over the Internet) or PBX software
    h. Remote access by mobile or home based workers and executives, telecommuting
    i. Cloud computing (running software applications stored on remote computers), running Web-based applications such as Salesforce.com
    j. Other (fill in)

    _____

8. What would you like to do now, or do more frequently/intensively, that you currently cannot do because your existing Internet connection is inadequate? (**Check all that apply**. Please be sure to distinguish between inadequate broadband and cost of the application and/or the technology.)
    a. Email
    b. Browser – view supplier or competitor web sites
    c. Send/Receive large data files (e.g. manuals, brochures, PowerPoint presentations)
    d. Send/Receive graphically intensive files (e.g. color catalogs, schematics, complex images)
    e. Run video applications (e.g. online training/sales videos, live video conferencing, live video streaming)
    f. Run applications between your companies and suppliers, customers, partners, etc. (e.g. inventory mgmt, ordering systems, Electronic Data Interchange – EDI, collaboration software)
    g. Telecommunications such as VoIP (phone calls over the Internet) or PBX software
    h. Remote access by mobile or home based workers and executives, telecommuting
    i. Cloud computing (running software applications stored on remote computers), running Web-based applications such as Salesforce.com

j. Other (fill in)

_____

9. Looking three (3) to five (5) years in the future, what would you potentially need or want to do with your Internet connection? (**Check all that apply**)
    a. Email
    b. Browser – view supplier or competitor web sites
    c. Send/Receive large data files (e.g. manuals, brochures, PowerPoint presentations)
    d. Send/Receive graphically intensive files (e.g. color catalogs, schematics, complex images)
    e. Run video applications (e.g. online training/sales videos, live video conferencing, live video streaming)
    f. Run applications between your companies and suppliers, customers, partners, etc. (e.g. inventory mgmt, ordering systems, Electronic Data Interchange – EDI, collaboration software)
    g. Telecommunications such as VoIP (phone calls over the Internet) or PBX software
    h. Remote access by mobile or home based workers and executives, telecommuting
    i. Cloud computing (running software applications stored on remote computers), running Web-based applications such as Salesforce.com
    j. Other (fill in)

    _____

10. Is there anything else related to the issue of broadband access in the Benicia Industrial Park that you think we should know?

    _____

Thank you for your time and consideration. Look for the survey results to be part of the larger BIP Broadband Needs Assessment report that the City will release later this year. Have a great day.

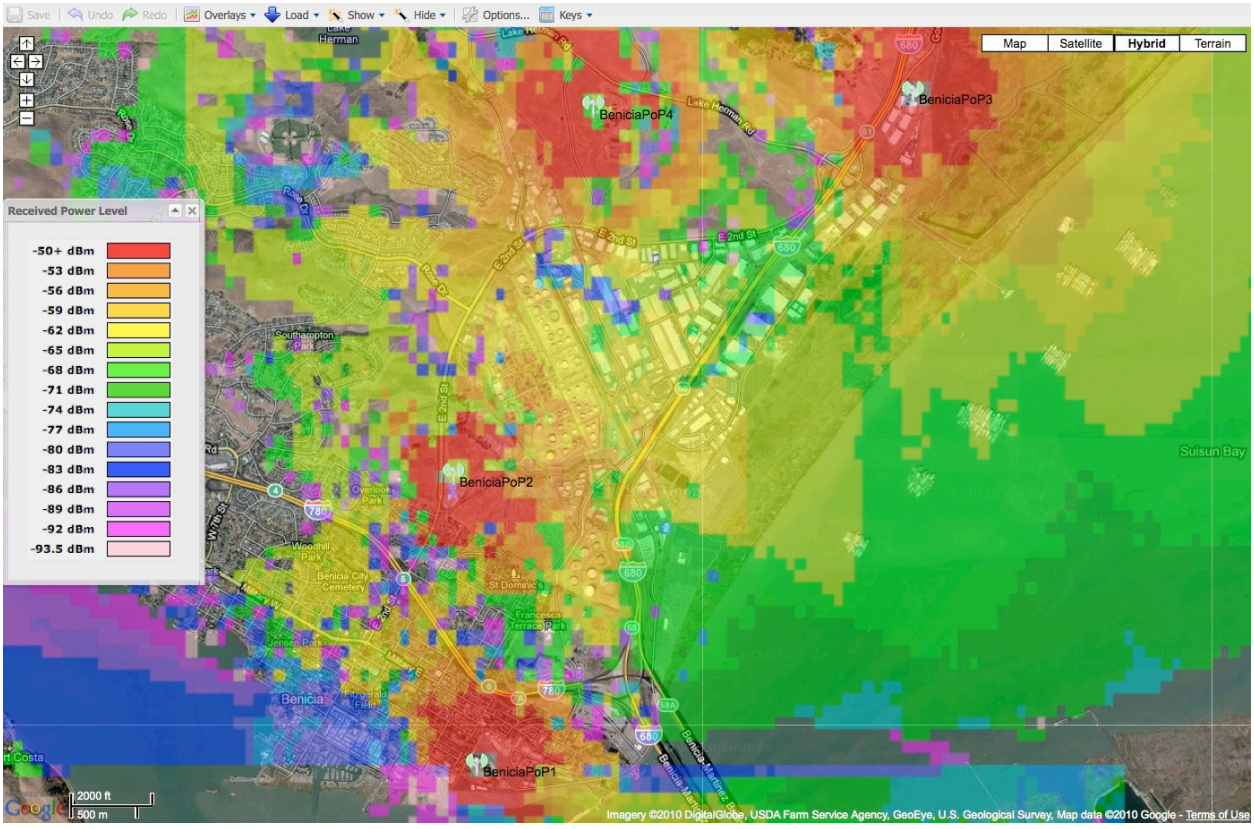
Appendix III – Potential Benicia Industrial Park Fiber Buildout

On this map, the green lines represent the path along which fiber cabling can be place in the ground (or hung from poles if these are put in place) to pass within 100 feet or less of most of the existing buildings in the BIP. The software that created the map also generated purple lines to indicate areas where the software determined future facilities might be built.

Appendix IV – Potential Benicia Industrial Park Wireless Buildout

The color-coding on this map represents wireless signal strength of WiFi reception within various areas of the BIP based on where WiFi radio transmitters in the 802.11g category (indicated as BeniciaPOP) are placed. Areas having between -50 dBm and -70 dBm will receive approximately 5 Mbps of Internet access speed, those with –70 dBm to –80 dBm will get about 3 Mbps speed and those in the –80 dBm to –85 dBm range with get 1 Mbps or less.

These estimated speeds are for outdoor and indoor coverage. All of the buildings in the BIP would need signal boosters place on their roofs to relay the WiFi signals inside the buildings.



Appendix V: Broadband Technology Inventory

Wired and wireless services

This is a breakdown of the various wired and wireless broadband services that are available, excluding dial up and satellite.

We used the survey of BIP tenants to cross check our list of providers. 49% of the tenants we contacted answered the survey questions, and from this we compiled the following data on providers:

Who provides your Internet connection?

Provider	Count	Percent
AT&T	67	39%
Tele Pacific Communications	26	15%
Day Wireless	11	6%
iSystems Technology	9	5%
Sprint	6	4%
Unknown	5	3%
Covad	5	3%
Hughes Net (satellite)	5	3%
Air Cloud	4	2%
Comcast	4	2%
Speak Easy	4	2%
Verizon	4	2%
Intuitive ISP	3	2%
Other	18	11%

Of these providers, we selected those that had a notable share of customers among survey respondents (5% or greater), plus providers with fewer customers but indicated they have an apparent interest in marketing to Benicia organizations (i.e. Air Cloud, Comcast). Below is the inventory we have collected to date. Comcast a presence in Benicia via their fiber services that the City uses. They have provided some information via phone about fiber assets near BIP and possible services they are willing to offer, but we are waiting for verification of this in writing before including it in our report.

Air Cloud

(Kbps = Kilobits per second, Mbps = Megabits per second)

This is a wireless service provider.

SOHO (Small Office, Home Office)– $99- $109/month 750Kbps up, 1.5Mbps down

Business 2000/Business 3000/Business 5000 –
$179/$249/$399/month 2Mbps to 5Mbps symmetrical (up & down)

Business Dedicated – Custom pricing 5Mbps to 45Mbps symmetrical

In addition to the services and prices listed here, the company has hopes of providing an outdoor wireless service in the Benicia downtown area.

AT&T

The largest provider in the area, both in terms of company size and percentage of BIP tenants served. The information on their Web site seemed incomplete and inconsistent. Hopefully they will provide additional information to clarify what we have.

Business Class DSL $142.45

SOHO DSL $ 99.95

Managed service - no price listed Up to 6 Mbps

Comcast

Starter	$59.95	2 Mbps up/12 Mbps down
Premium	$99.95	5 Mbps up/22 Mbps down
Deluxe	$189.95	10 Mbps up/50 Mbps down

We should note that the phone survey data indicates Comcast is delivering services in the BIP. However, this is not verified by the coverage area data on the provider's Web site.

Day Wireless

This is a rather unique "provider." They are actually a 25-year old provider of radio communication gear, with their main product line in recent years being Motorola Canopy point to multipoint network infrastructure. They bought a dedicated T1 line to increase the backhaul speed for the Canopy network they built outside their offices for their own use. Several businesses in BIP noticed and asked if they could "rent" some of the wireless bandwidth.

Day Wireless is limited by bandwidth constraints in how many companies they can provide with service. The company wants to bring in a fiber optic network line so they can increase capacity for them and their customers. Day Wireless has not provided a list of their specific services and fees.

i-Systems Technology

Point to multipoint wireless service (each main antenna provides multiple customers with line-of-site access to an Internet connection)

Office Service - $59.95/month	756K up, 1 Mbps down
Business Service - $89.95/month	1 Mbps up, 1.5 Mbps down
Business T1-level - $179.95/month	1.5 Mbps symmetrical
Corporate 3M service - $229.95/month	3 Mbps symmetrical
Enterprise 5M services - $379.95/month	5 Mbps symmetrical

TelePacific Communications

They provide T1 (T1s are broadband cables that enables 1.5 Mbps broadband speed) services, and orders are configured and priced based on individual customers' needs. So far, they have not provided prices. In addition to these services listed, the company says it plans to begin offering fiber services in a year or two. Bonded T1 means the provider physically meshes two or more T1 lines together and adds technology so that the combined lines offer faster speed. For example, one T1 line offers 1 Mbps, 3 T1 lines bonded could deliver 4.5 Mbps or more speed. DS3 is the designation of cabling equipment that enables up to 45 Mbps of speed over a network.

T1	1.5 Mbps symmetrical

Bonded T1 3 – 12 Mbps symmetrical

DS3 access 20, 30 or 45 Mbps symmetrical

Additional technology resources

This is a breakdown of broadband-related technology that exists within Benicia that we will consider in our final analysis and recommendations.

1. The City itself has fiber services that it gets from Cogent, and is used by city government offices and the public library. One of the fiber lines runs from City Hall to edge of BIP. City IT Manager Bill Guggemos states that it is not possible to expand fiber services on this network to BIP because this would degrade speeds for the entire network below acceptable levels. To get telephone and broadband service to the City's water treatment plant on the opposite side of the BIP, the City uses a T1 line as a bridge between the fiber line and the plant.

The City also has dark fiber that Comcast makes available. However, the contractual arrangement with Comcast that defines how this fiber is to be used, maintenance prices, etc. is about to be re-negotiated. It's uncertain if negotiations will enable the City to use this dark fiber for anything other than city government applications. The City has plans to purchase DSL service to provide redundancy for the fiber network.

The City's mobile workers such as public safety use regular commercial wireless services such as those from Sprint, so there is no infrastructure BIP can leverage such is the case with communities that build (or have private companies build) their own wireless networks. In general, mobile workers probably would not fit into any plans to build a muni network infrastructure because currently there is no budget for the type of heavy-duty mobile hardware workers would require.

2. A key element of most community broadband network plans is the "central office." This is the point at which special hardware enables data moving from a network to reach the Internet, and passes data from the Internet to the network.

Unless a community is buying Internet services from an established provider whose infrastructure is linked to a central office, the network a community builds has to link to a central office somewhere. The distance from a central office affects the network's buildout costs since the further away the C.O. is, the more a community has to spend extending the infrastructure to reach that point.

In Benicia, the good news is that the C.O. is only a mile and a half away from the edge of BIP. However, AT&T controls the C.O. and this could present problems since the company is anti-municipal networks and could become an obstacle by preventing access to the C.O.

3. We spoke with Benicia Library Director Diane Smikahl to see if there are technology or other resources they can bring to the table. The library uses the same network as the City, but they are pretty unhappy with the speeds they currently get. The library is working through several sources trying to secure faster broadband as part of a network infrastructure specifically for libraries in the county.

Given the library's physical location and its proximity to the central office where all fiber cables except those used by Comcast terminate, it is difficult to see how a network built specifically for the library could facilitate getting faster broadband to BIP. Conversely, though, any highspeed broadband coming BIP could possibly assist the library since any fiber used in that network infrastructure would run near the library.

4. The downtown merchants don't appear to have any tech resources to bring to the picture, but a couple of them who replied to an informal survey indicate that outdoor wireless would be a boon to drawing in additional business. In several of my reports on economic development and broadband, this is proven out in many cities and towns of all sizes.

Day Wireless believes it can facilitate downtown WiFi without too much difficulty if they get an increase in their fiber capacity. The short version of their approach is: increase significantly the backhaul they currently use to 40 Mbps – 50 Mbps, place Motorola Canopy radios in several key locations downtown that allow a line-of-sight connection with one of the radios in the BIP and connect WiFi access points to the downtown radios.

5. Comcast and AT&T provide fiber as a backhaul service, but both are reluctant to deploy fiber to the Business BIP. Since it has been impossible so far to engage either company in a meaningful discussion, it is difficult to say what Benicia's options with these companies will be once it is ready to move forward on planning. However, when we have all of the data from the surveys in report form, the City itself may want to consider demand a meeting.

6. The school district has fiber network built initially by AT&T, and expanded by Comcast, for use by school students, teachers and administrators. Though we wonder about potential contractual restraints, the District's Director of Information Technology seemed to believe that the only barrier to them opening the network to others is the need for staff and a network operating center (NOC) they do not have. We will address this option in our final recommendations.

7. There does not appear to be any public works or other City projects in the work on which the City can piggy back a broadband infrastructure buildout.

National perspective on technology options

In looking at the options available in a majority of other communities, there isn't so much a technology gap between them and Benicia as there is a "service delivery" gap. Point-to-multipoint, WiFi, fiber all exist in Benicia. However, getting providers to deliver those services out to BIP is a challenge and where we have private sector shortcomings. The same challenge exists with moving fiber from city-only applications to use by any constituents and stakeholders within Benicia other than the school district, which has its own fiber network.

WiMAX is the one technology available in about 80 US markets that is not available in Benicia. On the other hand, WiMAX has a cloudy future, which is addressed in the next section.

From the BIP tenant survey and data supplied by providers, the pricing and speeds offered for wireless services appear similar to those offered in other communities, including cities that run their own wireless networks. It has been well documented in news reports over the past year that advertised speeds are often not the speeds customers get, so we assume this to be true with the advertised speeds of providers in Benicia. The speed offerings for DSL and T1 lines also appear constant with what we've seen in other areas. Prices for these services are hard to compare since these are frequently negotiated on a customer-by-customer basis.

What's up next for broadband technology

It is always hard to determine what technology in the wings may become the next WiFi or Facebook in terms of popularity and impact on broadband adoption and use. We see three trends the City should track, but in the end they may or may not have an impact on the City's broadband plan.

1. WiMAX

WiMAX is a type of wireless technology that is popular among some broadband planners because WiMAX can traffic data at speeds faster than typical cellular wireless technology. There are dozens of markets that have deployed, or plan to deploy WiMAX networks. However, for BIP and the City's purposes, this does not rival the speeds of fiber networks. It is a lower priced

option for a speedy yet not-as-fast solution. The greater consideration, though, is that despite the hype surrounding it, WiMAX may not become as widespread as people expect.

2. LTE

LTE, short for Long Term Evolution, is technology that enables wireless networks to provide significantly faster speeds for uploading and downloading data. This is a case of a technology that represents more hype than reality as it may be years before the technology is stable and widely available. Unfortunately, several of the major wireless companies are strong supporters as they feel they need to market this future technology to keep customers loyal, leading communities to think they need to abandon WiMAX plans in anticipation of LTE. From our perspective, LTE probably won't be mature enough as a technology to impact Benicia's plans. There is a slight potential negative impact, though, in that many companies that planned to offer WiMAX are abandoning it in favor of LTE. WiMAX may as a result cease to be an option even for communities still interested in it.

3. Video/digital imaging

One of the major applications that will drive broadband network buildouts is the increased use of live video and transporting data-intense images (x-rays, MRIs, manufacturing schematics etc.). The recession has led companies to significantly reduce travel, subsequently increasing the popularity of applications such as WebEx and accelerating the sophistication of that technology to the point where many new uses for video will come to light.

Benicia should expect these types of applications, along with sophisticated digital imaging applications, will be the staples of companies the City wants to attract to BIP. The network Benicia eventually settles on will need to be able to support the data throughput speeds these applications require.

Appendix VI: BIP Maps from survey data

The following maps represent survey data categorized by:

- NAICS industry codes
- Service providers
- Type of service
- Price for services
- Speed of services
- Current broadband usage for applications requiring the highest bandwidth
- Tenants with inadequate service for high bandwidth-intensive applications
- Estimated future use of high bandwidth-intensive applications

We have created .pdf versions of these maps that have been exported with layers. If the City has Adobe Acrobat Professional or the newest version of Adobe Acrobat Reader (free), staff should be able to turn the layers on and off as needed in order to view different aspects of the data. These map files will be made available for downloading via FTP at the City's request.

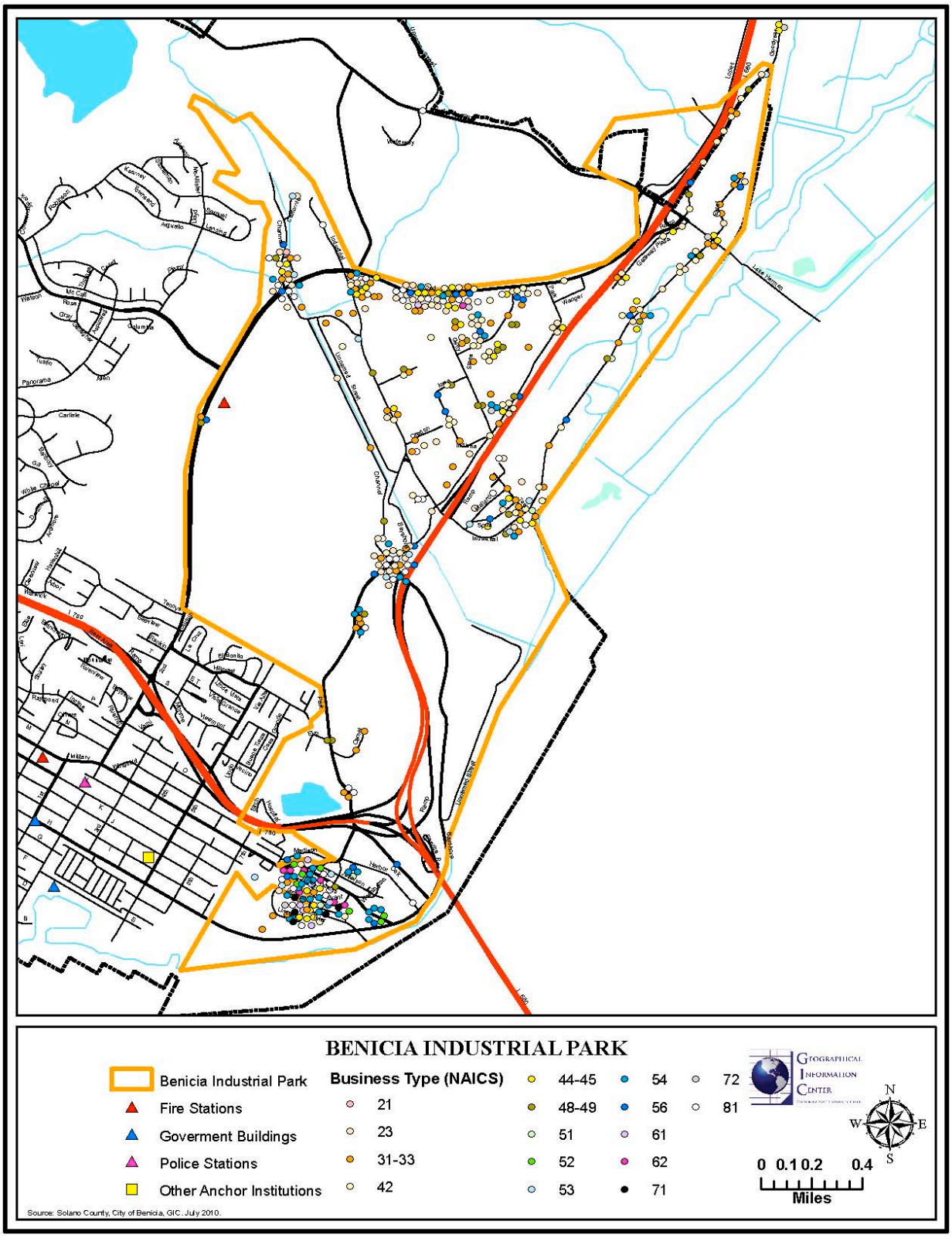
For convenience, we determined that we should represent the data on broadband usage, inadequate broadband service and projected usage just for those survey respondents using or wanting to use graphics and video applications. These two application categories represent what are typically the most bandwidth-intensive uses of broadband, and therefore the type of usage a BIP broadband build out should address.

The first map presents all of the 437 tenants in the BIP according to NAICS codes (**Table 20**). The remaining maps only show data for those who responded to the survey. Subsequently those maps give the impression of being incomplete because there are fewer dots for survey respondents. Rest assured that all data points are represented.

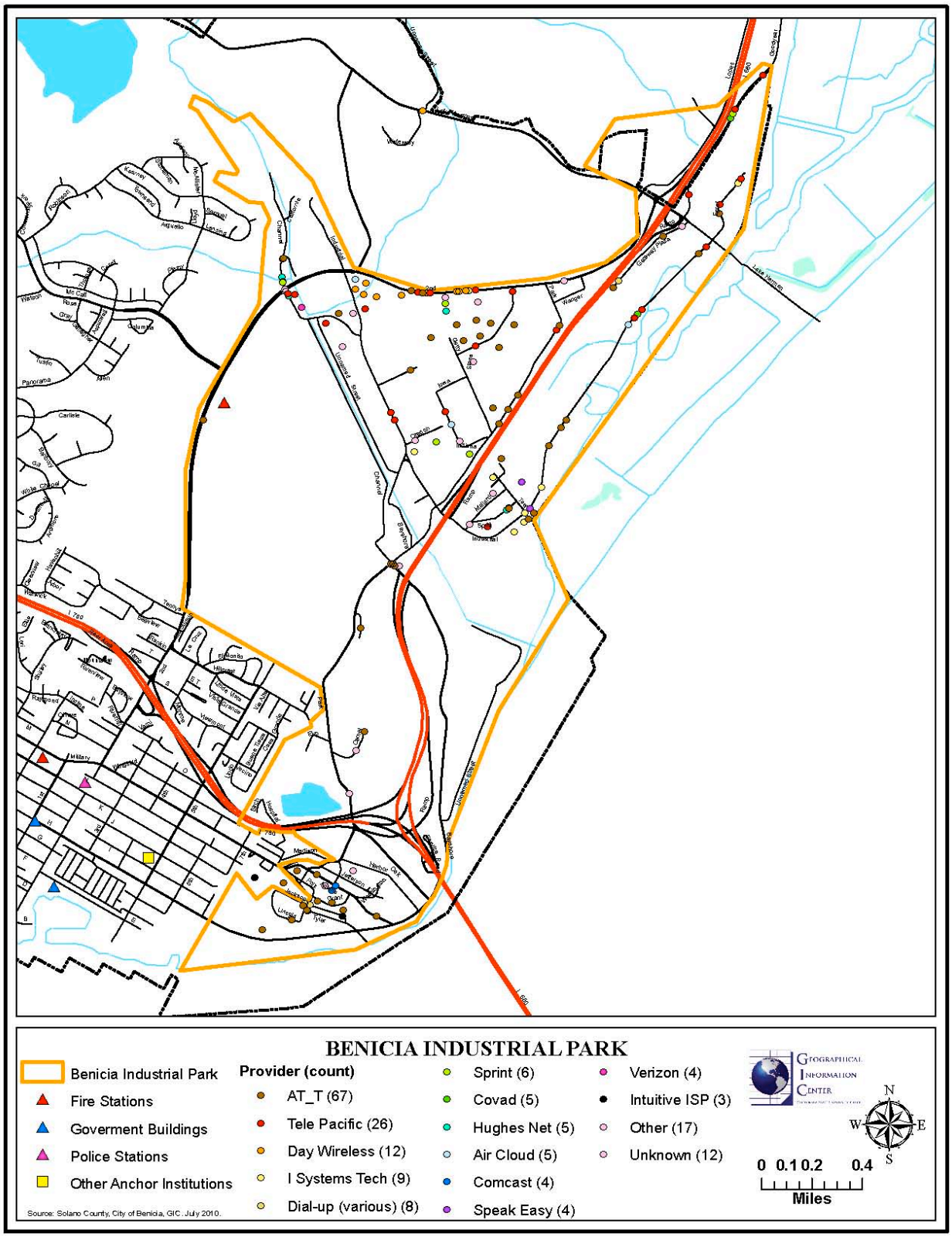
Table 20: All BIP tenants by abbreviated NAICS codes

Industry	Abbreviated NAICS
Mining, utilities, and construction	21, 23
Manufacturing	31-33
Transportation, warehousing, and trade	42, 44-45, 48-49
Professional services	51-54, 56
Education, health, and social services	61-62
Recreation, accommodation, and food services	71-72
Personal, repair, and other services	81

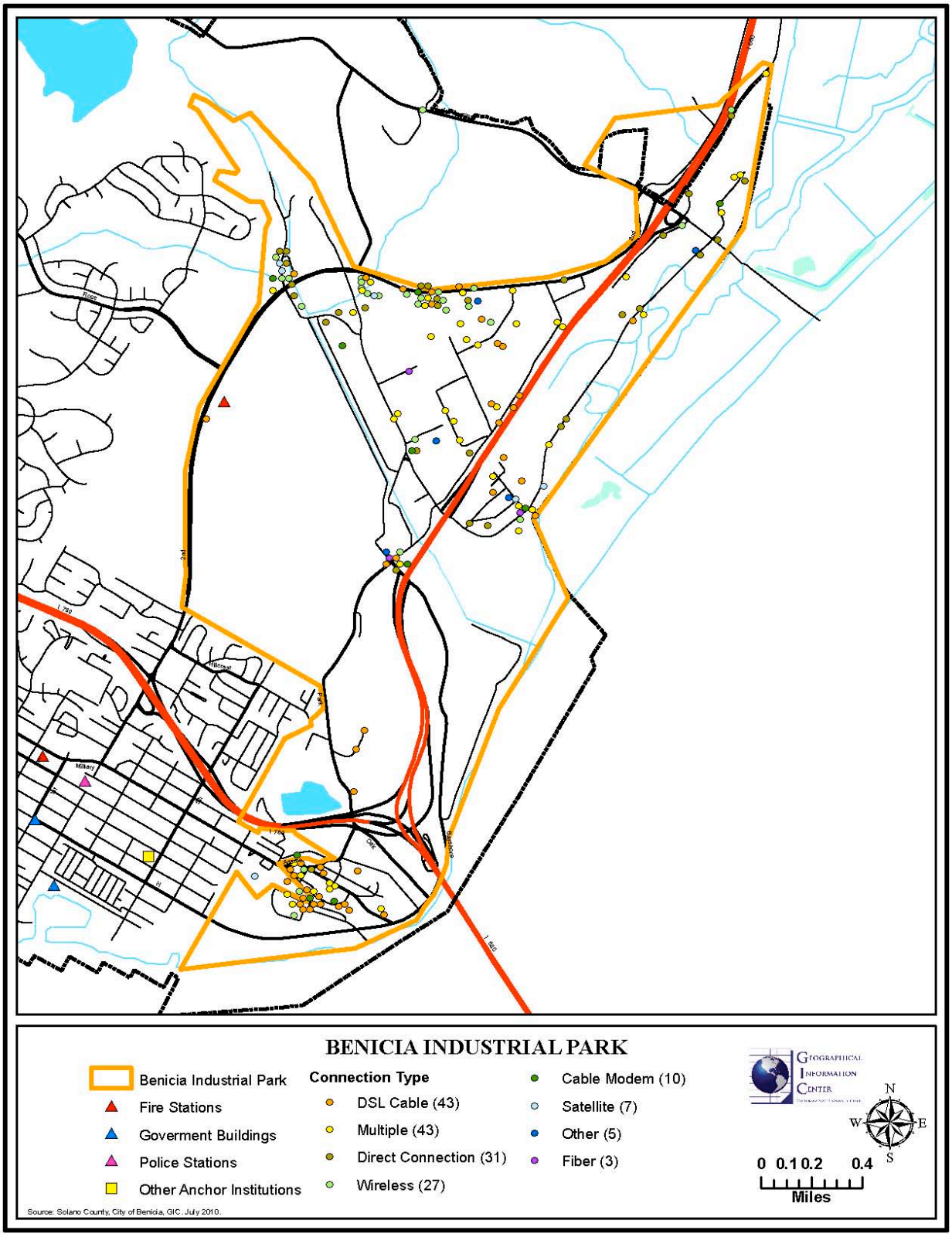
BIP tenants by industry



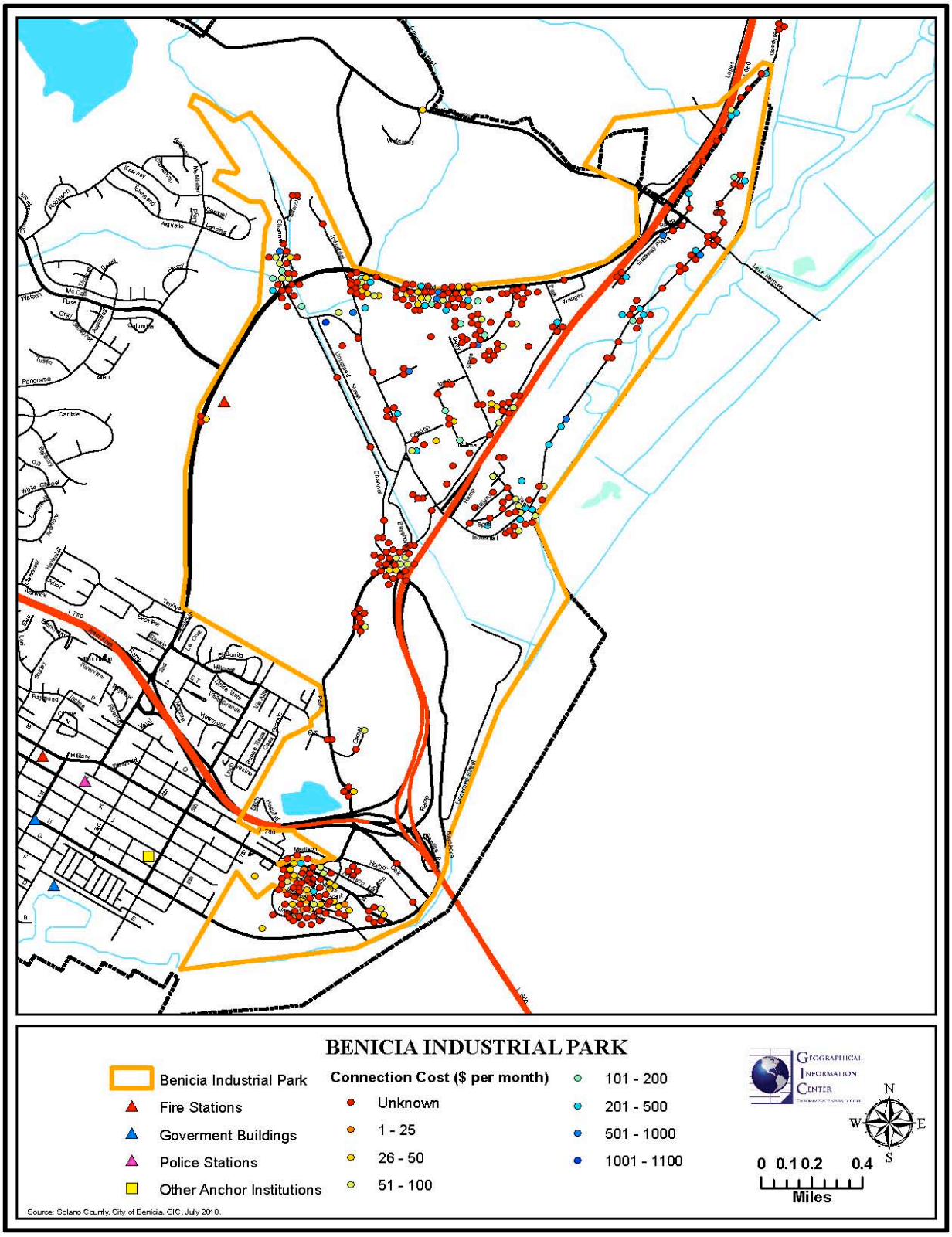
Service Providers



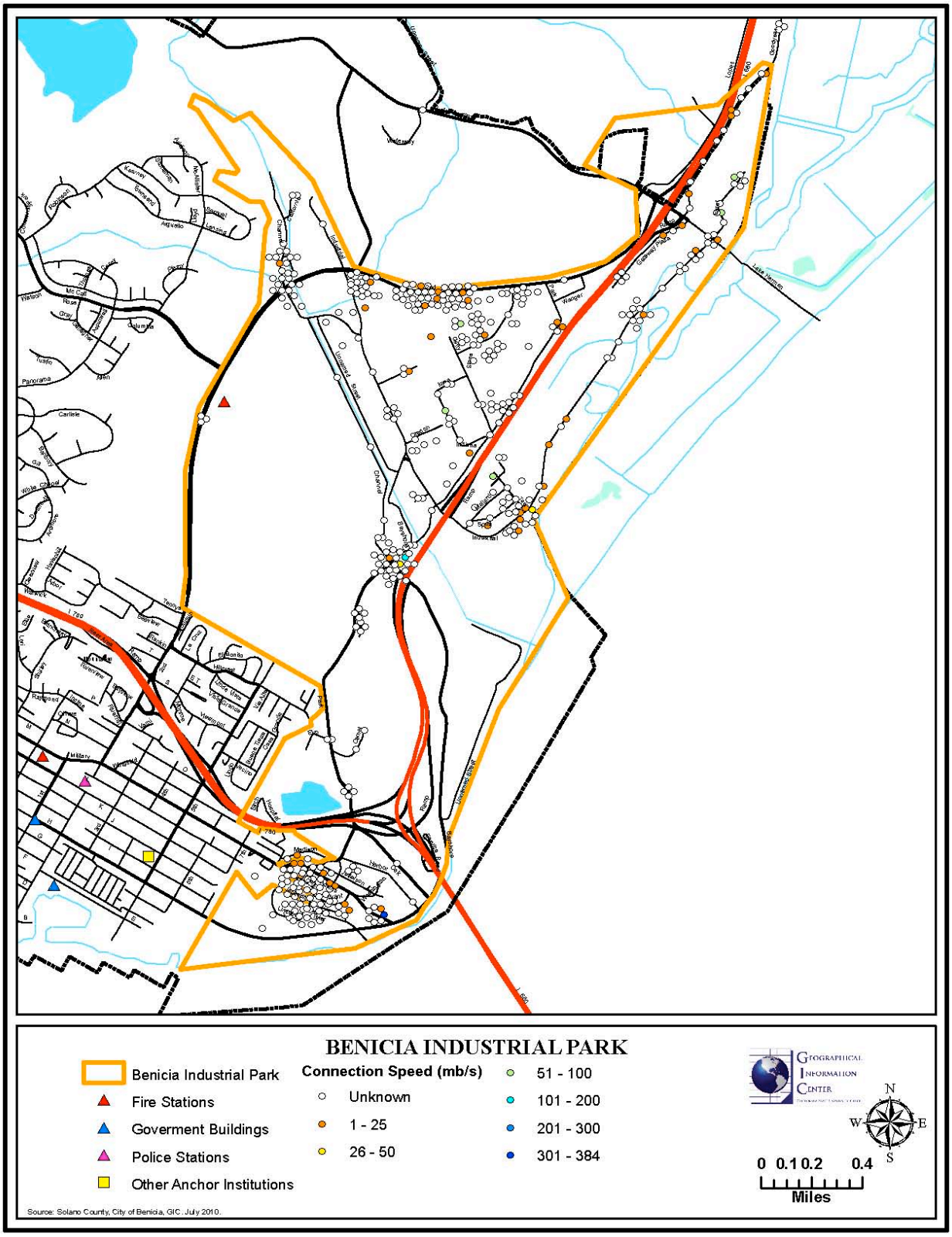
Type of broadband service



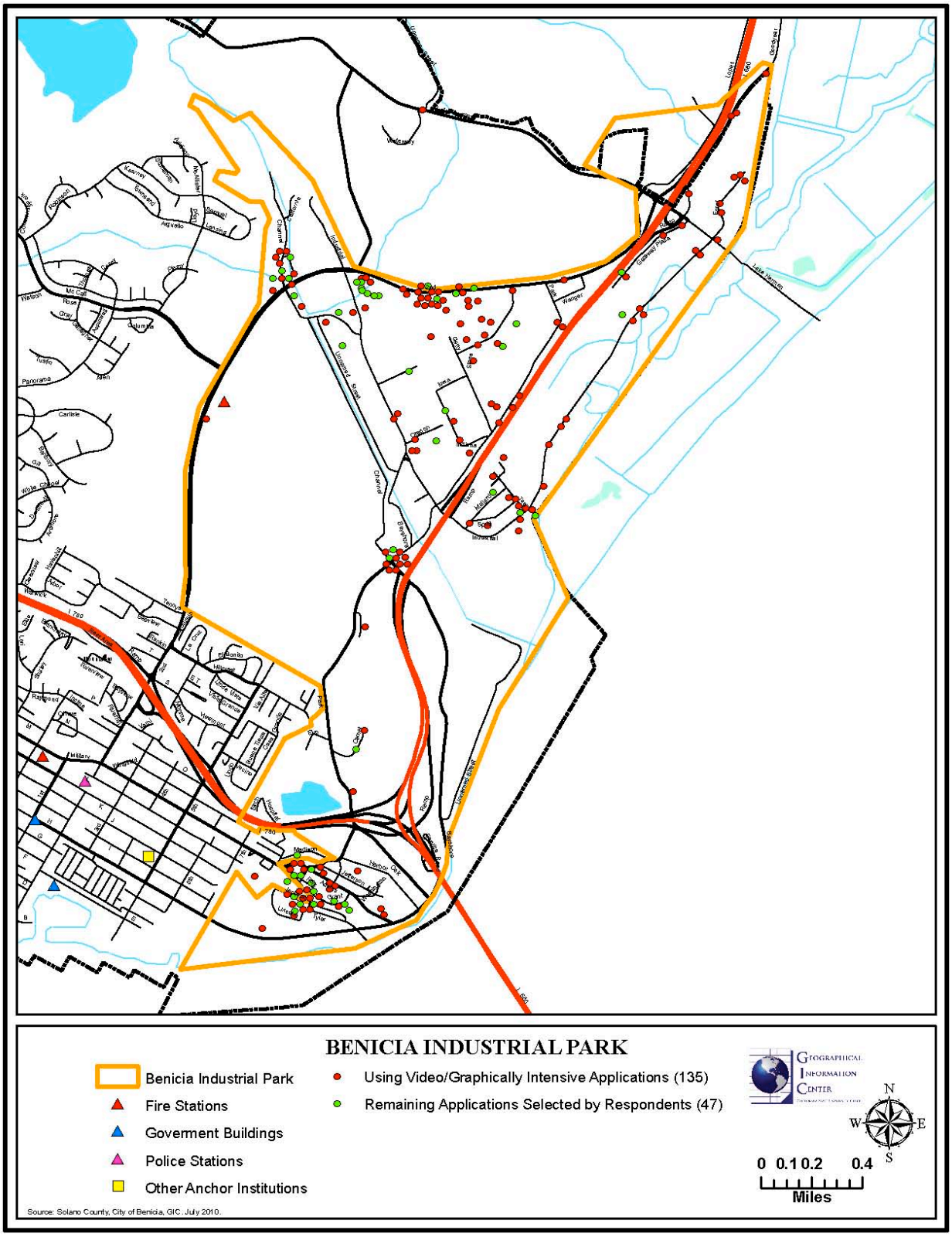
Price of service



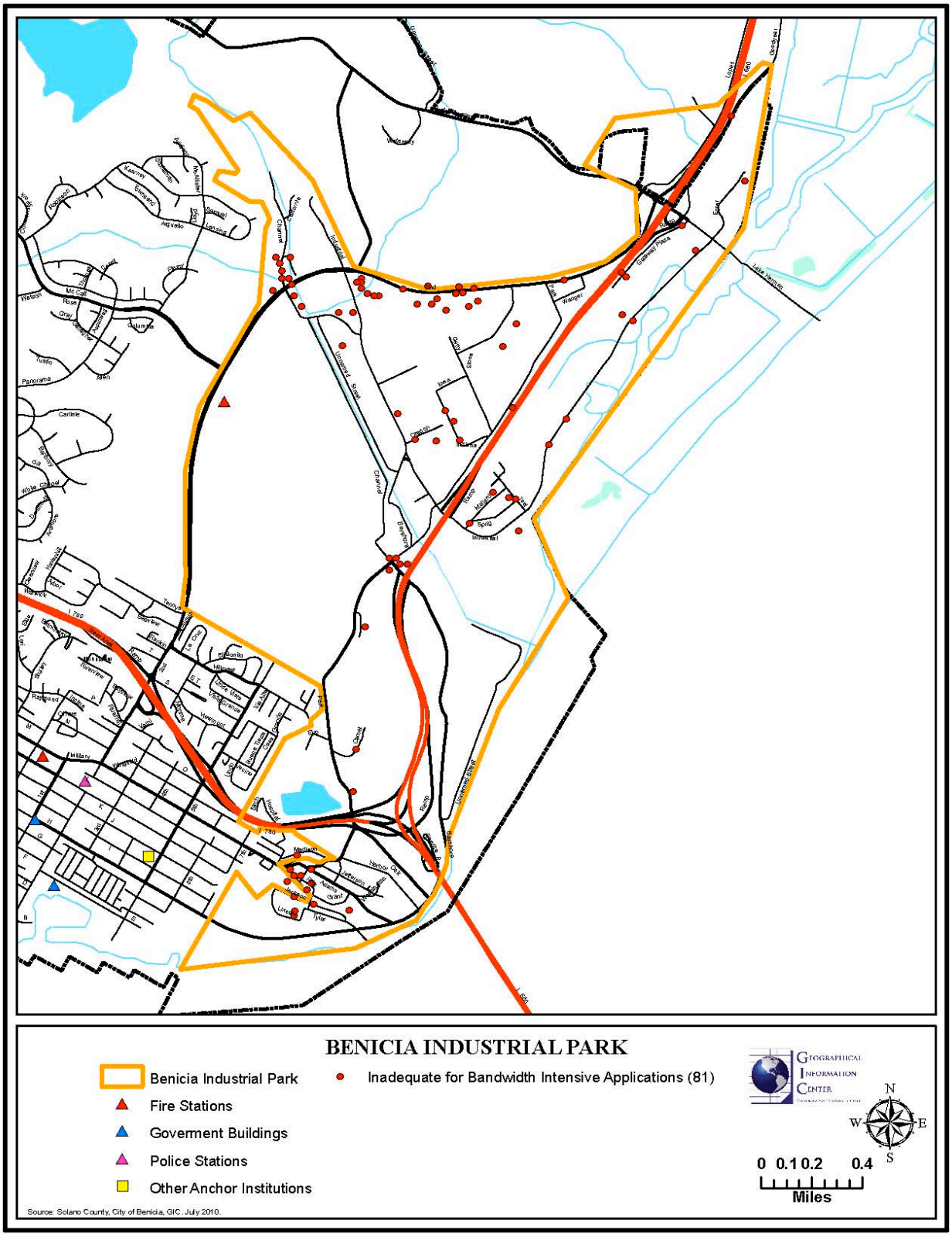
Speed of service



Current broadband usage



Inadequate broadband coverage



Future broadband usage