

Wireless Minneapolis

Municipal Broadband Initiative Business Case

Version 3.0

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1.0 EXECUTIVE SUMMARY

The City of Minneapolis issued a Request for Proposal on April 13, 2005 to solicit proposals from the private sector to build, own and operate a reliable, flexible and open wireless broadband network that leverages and augments the City's existing, owned Fiber Optic network assets. The City requires a broadband network to; enhance Public Safety, strengthen the vitality of the City's technology infrastructure, support staff mobility for a more cost effective delivery of City services, promote a more sustainable Minneapolis, maximize economic development opportunities, address disparities to support strong, healthy families, and enhance the City's livability.

The Wireless Minneapolis network will be comprised of additional Fiber Optic assets, which the City will own; and building mounted antennas and street light pole mounted radio access devices, which will be owned by the Private Partner.

Cities such as Portland, Philadelphia, Anaheim, Milwaukee, Long Beach, Oakland, and New Orleans have successfully developed plans for the implementation of similar networks.

There are three major target market segments for the City of Minneapolis broadband wireless network: Institutional (Government), Residential, (including underserved populations), and Businesses. Such a deployment will provide the City's Public Safety personnel and 911 First Responders with an enhanced mobile communications system that complies with State and Federal Homeland Security directives requiring incident management communications systems that are reliable, interoperable and scalable. It will provide non-emergency personnel with the tools to interact in real time with City information systems from the field and complete 311 service requests more quickly. Aligning IT investments with strategic priorities and business imperatives established by the Council and City department heads is a critical organizational imperative.

In addition, the wireless network will also serve as a desirable City amenity, stimulating interest in the City and providing convenience for citizens, business owners and visitors alike.

This network will offer ubiquitous broadband access City-wide, thereby eliminating existing "dead zones" or areas of limited penetration by current broadband market providers. The deployment planned for the City of Minneapolis is inclusive and will offer network neutrality through wholesale access for new and existing Internet Service Providers, as well as for new and existing Hot Spots, allowing them to acquire broadband connectivity at more competitive rates.

City Staff is prepared to guide the implementation of a network that offers benefits to all residents, as well as those who work, visit, or attend school in Minneapolis. Central to our strategy is the requirement that the network provide the same high level of network access in every neighborhood throughout the City. This is critical for Public Safety applications and essential to ensure inclusion in the digital economy for all residents.

Our society and economy is increasingly reliant on information technology. Many low-income communities are isolated from recent technological advances and do not have access to personal computers, the Internet and the interactions and opportunities these technologies provide. This experience defines the “digital divide” – the separation between those who do and those who do not have access to information technology.

City of Minneapolis will draw from the documentation, developed and prioritized by Community Computer Access Network and Alliance for Metro Stability from community input, to craft a community benefits agreement, develop seed funding mechanisms for digital inclusion initiatives, and develop a structure for ongoing oversight in conjunction with CCAN; sponsor of the Computer Technology Empowerment Program (CTEP) as integral elements of the contract negotiations process.

Access for individuals, capacity building for organizations, content and applications development, taken together, constitutes a comprehensive strategy for creating digital inclusion. The Wireless Minneapolis initiative serves the important function of building the expanded Fiber Optic infrastructure and wireless overlay upon which we can develop strategies for greater social and economic success. Parallel to this universal access strategy, we need efforts that promote the development of relevant content for residents, businesses and visitors and innovative applications that can support the work of community based organizations focused on promoting equity and, economic, social and cultural benefit for the residents, businesses, visitors and employees of City of Minneapolis.

To ensure that the design of the desired broadband network meets the technical and business requirements of City institutional users, the project team initiated a series of working group sessions beginning in August, 2004 (in anticipation of City Council Committee Action) and continuing into 2005, and numerous one on one and small group meetings with City personnel that continue today. Each working group developed a summary of recommendations for network services, technical requirements, management strategies, contract priorities, and potential services for City Departments, residents, community technology centers, neighborhood associations, parks, schools, libraries and businesses to assist the project team in the development of a Request for Proposal.

In addition, project team members presented at numerous technology and digital communities conferences in Minneapolis and the surrounding area, spoke with other local municipalities, met with technology providers, neighborhood and business leaders and community based organization working groups to communicate ideas, gather input and gain insight into issues and opportunities.

Members of the project team also researched the global broadband market to gather as much information as possible on deployed and planned municipal scale broadband networks. This effort included interaction with broadband network equipment and software vendors, as well as more in depth discussions with representative from various municipalities and counties nationwide.

Members of the working groups and the project team discussed the various ownership business models for the broadband network. The total capital funding requirement to fully implement this program is projected to exceed \$25 million dollars (see page 54). It is estimated that more than \$10 million dollars will be needed to construct the wireless portion of the network. Fiber Optic improvements will exceed \$3.5 million dollars. Investment in personnel, marketing, advertising, and seed funding for digital inclusion initiatives will likely top \$1.6 million dollars. First year losses may approach \$12 million dollars. Based upon Council direction, City capital budget constraints, existing bond obligations, exposure to risk, potential regulatory/legal impediments, and the complexity of network start up and ongoing operations management, it was ultimately determined that the Public/Private partnership business model was the most appropriate model for the City to pursue. It is City staff's recommendation that this model be utilized.

The Public/Private Partnership model allows the City to continue to own all existing and new Fiber Optic network assets, contribute use of pole and City building hanging assets, facilitate the procurement process and serve as an anchor tenant for network services. The Private Partner will fund, build and operate the wholesale and retail wireless network, and coordinated required applications development and integration.

'Indeed, let there be Wi-Fi! But let's not pretend that idea of municipal ownership is seizing the nation. There's every indication that municipal broadband projects--where cities attempt to own and operate their own competitive networks--are in retreat, and that private enterprise will build it and own broadband. And that's the right way to go.'

Steve Titch, Jan. 5, 2006

(Steve Titch is the Senior Fellow for information technology and telecom policy at The Heartland Institute, a nonprofit organization devoted to discovering and promoting free-market solutions to social and economic problems.)

Jupiter Research recently compiled information on 83 different municipal wireless initiatives. Their report, dated June 14, 2005, entitled "***Municipal Wireless: Partner to Spread Risks and Costs While Maximizing Benefit Opportunities***" extensively discusses the threats, alternatives, and opportunities for the use of municipal wireless broadband networks.

Some of the key findings of this Jupiter Research report are as follows:

- Government effectiveness and efficiency are the top priorities and justifications for build out.
- Governments must work with commercial entities to share the costs and risks of municipal networks. Such partnerships offer ISP's stable anchor tenants, lowered build out costs, and customer acquisition opportunities, while governments gain a new way to improve business operations, offer City amenities, and improve public safety.

- Building, running, and maintaining a citywide or countywide network to support a large number of users is complex. Although city and county authorities have departments of information technology, they are not resourced as commercial service providers and do not have the necessary institutional knowledge to take on this role.
- Municipal networks face substantial operational and technological hurdles going forward – this will lead to a variety of failures. Jupiter cites some of these hurdles as: setting pricing, estimating benefits, unproven scalability, and technology change.

Subsequent to the data gathering, requirements development, and vendor/product analysis, the project team proceeded with the development of an extensive Request for Proposal. A strong turnout at the Pre Proposal Conference, with more than 90 companies in attendance, represented by more than 125 individuals demonstrated widespread interest in addressing the City's broadband gap.

Many of these initial 90 companies later formed business consortia to improve their position in the competitive bidding process. Twenty organizations registered as potential Prime Contractors. Nine teams submitted proposals for consideration and were involved in the analysis and selection phase of the project.

The overall project team, designated members of the working groups and the selection committee, with the assistance of the internationally recognized Yankee Group Market Research and Consulting firm, thoroughly analyzed and rated each of the nine RFP responses that were received by the RFP response deadline. Ultimately, two finalists were selected: EarthLink, Inc. and US Internet Wireless.

Now that the City's project team and its associates have selected two finalist companies, these finalists are schedule to conduct focused near-term pilot projects for the broadband network. The recommended pilot project sites have been selected to provide a cross-section of City areas that will be served by the proposed City-wide broadband network deployment. The pilots will demonstrate "proof-of-concept" for both the technology itself and effective support for City institutional requirements.

The City will host open house events and CCAN's CTEP AmeriCorps project, in association with Intermedia Arts, will facilitate community workshops at Community Technology Centers located within each pilot area. In addition, members of the project team continue to solicit input from numerous community organizations, City Council members, and other interested parties to both inform the community of the project direction as well as to elicit recommendations for continuing design and negotiation efforts.

It is staff's recommendation that the City move forward to implement the Broadband IP Data Access Services program in conformance with the Ways and Means resolution dated November 11, 2004.

2.0 WIRELESS MINNEAPOLIS PROGRAM GOALS

From economic and social development to revenue generation, cities and municipal governments have a variety of motivations for bringing together wireless broadband users, including city employees, residents, employers, and visitors. Wireless technologies can bring more efficiency to government operations, provide a seamless connectivity experience for residents and travelers, and help bridge the digital divide in low-income and underserved neighborhoods.

The City of Minneapolis is currently engaged in a number of closely linked initiatives that are focused on enhancing Public Safety (implementation of new E-911 and Computer Aided Dispatch systems); improving City of Minneapolis services for residents, businesses and visitors; streamlining processes associated with City of Minneapolis service delivery (311 and Remote Inspector programs); reducing costs for all City of Minneapolis departments; and improving communications to and within all workgroups of City of Minneapolis government (upgrade of the City-wide telecommunications system). To support City of Minneapolis goals, challenges and initiatives, Public Safety personnel and other institutional department workgroups require ubiquitous access to reliable, high-speed, high-performance fixed and mobile broadband IP data connectivity services. These services will be deployed to optimize the cost-effectiveness of City of Minneapolis operations and to improve overall service delivery to constituents.

The City of Minneapolis Business Information Services (BIS) Business Plan 2006-20010 aligns Broadband plans with the City's strategic goals. BIS defines its Mission as transforming City government to be more integrated, customer-centric, efficient, accountable, and accessible. One of the key trends and challenges the BIS Department cites in the plan as a focus for 2006 is Broadband Internet. The plan states: "Broadband Internet technology is rapidly emerging in cities as an option to meet institutional, business, residential and visitor demand for low cost, high-speed Internet services. BIS will implement a fixed and mobile broadband Internet services capability to meet the City's internal institutional needs and provide a universal broadband communications backbone that benefits the residents and businesses as well."

The BIS Business Plan proceeds to list the City goals and to cite ways in which BIS, either directly or indirectly, can contribute to the specific goal. The ways in which BIS feels they will be able to contribute to attainment of the City goals that are listed below have been extracted from the BIS Business Plan. The Broadband network project team believes that successful deployment of the planned broadband network will help to ensure the effectiveness of the BIS contribution to attainment of these City goals.

Build communities where all people feel safe and trust the City's public safety professionals and systems.

- Provide the City with a robust public safety system that will assist Police, Fire, and the City Attorney in effective and efficient emergency services, law enforcement, and prosecution.
- Easy query of information provides trends and assistance in the tracking and capturing of criminals to improve public safety and confidence.

- Provide information to the Fire department regarding the property so they are better-prepared when they arrive at the scene and may reduce lives lost.
- Collaborate with the City's public safety departments to meet their needs with the tools and services that will improve efficiencies and provide necessary information.

Maintain the physical infrastructure to ensure a healthy, vital, and safe City.

- Collaborate with Public Works to meet its needs with the tools and services to improve efficiencies and provide information necessary to maintain the City's physical infrastructure.
- Work with MPD to expand programs like the Safe Zone initiative to improve quality of life and attract new businesses.

Deliver consistently high quality City services at a good value to our taxpayers.

- Leverage the City's investment in technology through improved utilization and standardization of current assets, tools, and systems.

Create an environment that maximizes economic development opportunities.

- Build an institutional network of high-speed broadband Internet service to all areas of the City to encourage businesses to invest in the City.
- Provide and support the technological infrastructure to enable businesses to establish economic development and promote digital inclusion and provide access to all residents.

Preserve and enhance our environmental, economic, and social realms to promote a sustainable Minneapolis.

- Collaborate with City departments to re-engineer business processes and implement systems that promote a sustainable Minneapolis.

Promote public, community and private partnerships to address disparities and to support strong, healthy families and communities.

- Promote development of the technological infrastructure to close the digital divide and provide access to everyone.

Strengthen City government management and enhance community engagement.

- Align IT investments with strategic priorities and business imperatives established by the Council and City department heads.
- Expand direct community involvement in major enterprise initiatives such as One Call/311, One Stop, Broadband Internet Services, i-Site and Safe Zone. Through these programs, BIS builds relationships with organizations such as CCAN, AmeriCorps-CTEP, Minneapolis BOMA, Minneapolis Chamber of Commerce, Metropolitan Airport Commission, Metro Transit, University of Minnesota, GMCVA, Park and Recreation Board, Library Board, School Board, and NRP.

Municipal governments who are taking a leadership role in the deployment of wireless Internet networks face numerous policy and planning issues. The goal setting discussions associated with this program will attempt to explore these questions.

- How does city government build consensus among institutional network stakeholders and meet constituents' needs?
- How will the network be funded?
- Is a public / private partnership desirable for building out and managing the network?
- Where will revenues flow?
- How can the City's Institutional requirements be best served?
- How will we most appropriately address our immediate Institutional needs and support our long range strategy?

3.0 BACKGROUND

The Broadband Industry

Driving forces for implementing a municipal broadband IP data access network, according to the MIT Internet and Telephony Consortium Group (<http://itel.mit.edu/>), include the following:

- Local broadband needs have not been met by many private sector providers in an adequate manner.
- The current economic environment, especially in regards to telecommunications, makes such deployment highly unlikely in the near future
- Regulatory and legal delays caused by the 1996 Telecommunications Act and initiated by the RBOC's have resulted in institutional stalemates and excessive cost factors to create an inefficient path to broadband deployment.
- A precedent exists for the establishment of City-wide broadband networks. There are over 200 broadband networks today in towns and municipalities throughout the United States.

The City of Minneapolis is currently served by a wide variety of communications services providers offering both wired and wireless broadband connectivity to residents and businesses in the metropolitan area. The marketplace includes a variety of provider categories offering a range of connectivity options at widely varying prices.

The Broadband Industry has developed sophisticated wireless broadband access, mesh and backhaul strategies. These companies can take advantage of their state of the art fixed wireless infrastructure components to deploy a community-wide, wireless cloud. Such a deployment can provide the City's Public Safety infrastructure with an enhanced mobile broadband communications system that complies with State and Federal Homeland Security directives requiring incident management communications systems that are reliable, interoperable and scalable.

Other City departments will be able to utilize this network system in myriad ways. Spectrum will also be available across the network to provide robust fixed and mobile services to residential, commercial and visitors within the City's borders.

In recent years, many equipment manufacturers have advanced their broadband technology platforms to the point that there are now implementing city scale systems capable of delivering economical, reliable and secure wide area coverage with universal access across a metropolitan area. The public's growing acceptance and adoption of wireless enabled mobile devices such as laptops and PDA's, combined with the enormous growth of content transported over the Internet, has resulted in significant increases in demand and the ability to effectively utilize an efficient wide area delivery of high-speed bandwidth.

This public demand has motivated municipalities (like Minneapolis) to search for infrastructure solutions that will provide truly mobile and interoperable voice, video and data applications for both institutional users, residents, businesses and increasingly for homeland security and public safety purposes. By providing mobile broadband services to Minneapolis through a public / private partnership model, the City will ultimately enable deep market penetration, continually increasing opportunities for continuous upgrades of network functionality.

The potential provider categories investigated include:

- Local Telephone Company – Qwest – offers DSL, T-1, and T-3 access to municipal departments, residents and businesses
- Cable TV Service Provider – Time Warner Cable resells Internet access services from Qwest and EarthLink and is in market trials in selected markets with additional offerings.
- Standard Internet Service Providers – numerous ISP’s offer Minneapolis businesses and residents an array of wired and wireless services. Providers include EarthLink, VISI.com, US Internet, TCQ Internet, Twin Cities Internet, etc.
- Wireless Internet Service Providers – offer wireless broadband connectivity in a range of bandwidth capacities to residents and businesses in the metropolitan area. Providers include Stonebridge and Implex.Net
- Wireless Point-to-Point Providers – offer fixed wireless broadband connectivity primarily to local businesses.
- Hot Spots – there are hundreds of Hot Spot locations in the metropolitan area that offer either free or subscriber-based access to the Internet via their own access facility. Hot Spot locations include numerous hotels, restaurants, cafes, coffee shops, and other businesses.

The new broadband IP data access network planned for the City of Minneapolis will offer wholesale access to new and existing Internet Service Providers, as well as to new and existing Hot Spots, thereby allowing them to acquire connectivity at more competitive rates and ensuring network neutrality. This new network will offer ubiquitous broadband access City-wide, thereby eliminating existing “dead zones” or areas of limited penetration by current market providers.

Municipal Trends

As the deployment of municipal broadband wireless networks proliferates nationally, municipalities are facing numerous legal and regulatory hurdles. As a case in point, the City of Philadelphia has been actively engaged in planning for the acquisition and is nearing the start of the deployment of a City-wide wireless broadband network. Under its initially proposed business model for the network, the City intended to finance, own, and operate the network. Subsequent to heavy political infighting and, apparently, a high level of commercial lobbying, Pennsylvania’s Governor Ed Rendell signed into law a bill that restricts municipalities in Pennsylvania from offering broadband services for compensation. Philadelphia was exempted from the restrictions but has modified its strategy to contract with EarthLink to provide a provider owned network through Wireless Philadelphia; a not for profit agency formed by the City.

Jupiter Research recently compiled information on 83 different municipal wireless initiatives. Their report, dated June 14, 2005, entitled “***Municipal Wireless: Partner to Spread Risks and Costs While Maximizing Benefit Opportunities***” extensively discusses the threats, opportunities, and alternatives for the use of municipal wireless broadband networks. Some of the key findings of this Jupiter Research report are as follows:

- Standalone commercial Internet service is not and should not be the goal of municipal networks.
- Government effectiveness and efficiency are the top priorities and justifications for build out.
- Developing and maintaining a municipal network is costly, at an average of \$150,000 per square mile over five years. On this basis, nearly 50% of initiatives will not break even with a benefit stream of \$25 per user per month.
- Governments must work with commercial entities to share the costs and risks of municipal networks. Such partnerships offer ISP’s stable anchor tenants, lowered build out costs, and customer acquisition opportunities, while governments gain a new way to improve business operations, offer City amenities, and improve public safety.
- For governments, wireless broadband networks enable new applications that improve core services, including: better public safety, more efficient transportation systems, a more productive field force, and improved regional vitality.
- The media, policy think tanks, and incumbent telecommunications providers have seized on the notion that municipal authorities are attempting to enter the market for commercial Internet service as subsidized providers. Out of 83 networks, Jupiter Research found only a small fraction (four percent) is dedicated to providing wireless broadband to residents and businesses. In areas with a serious lack of available commercial services, municipalities are taking on the role as a service provider of last resort. The majority of initiatives (63 percent) are aimed at mixed uses—selectively supporting commercial and government needs in combination. The remainder (34 percent) is focused on specialized government applications.
- Effectiveness and efficiency top the list of goals for municipal networks—64 percent to 68 percent of initiatives—ahead of universal accessibility, which ranks seventh with only 21 percent of initiatives that have it as a goal.
- Although many municipalities listed incremental revenue as a goal of municipal networks, this is overly optimistic. Any revenue will offset expenses in the best case.
- Building, running, and maintaining a citywide or countywide network to support a large number of users is complex. Although city and county authorities have departments of information technology, they are not resourced as commercial service providers and do not have the necessary institutional knowledge to take on this role.
- Municipal networks face substantial operational and technological hurdles going forward – this will lead to a variety of failures. Jupiter cites some of these hurdles as: setting pricing, estimating benefits, unproven scalability, technology change, and quality of service and mobility challenges.
- Municipalities should not be commercial ISP’s with obligations to provide open access to broadband. The cost and complexity associated with building and maintaining municipal networks is high, and city departments have little institutional knowledge.

Municipal Network Growth

Over the past decade, broadband data network deployment and use has grown rapidly with U.S. broadband penetration standing at more than 25% of households. The rising popularity of Wireless Fidelity, or Wi-Fi, with more than 120 million client devices in existence today, has created a consumer and municipal demand for anytime, anywhere broadband data access. This growth in broadband access for households is being dramatically echoed by the growth in municipal and county-wide broadband networks. The February 2006 MuniWireless list of U.S. wireless broadband deployments shows growth from July 2005's 122 cities and counties in the U.S. with operational networks, Hot Zones, municipal use-only networks, and planned deployments to a total of 186 installed or planned deployments in February 2006.

The facts show, quite simply, that these networks are *today* giving citizens and businesses the low-cost broadband access they want, are saving lives, making first responders more productive, improving the efficiency of municipal workers and much more. No matter whether municipal broadband wireless networks are provisioned by a city or a carrier, regardless of whether their purpose is improved public safety, stronger economic development, or more broadband Internet access, they are working. Consider the following from customer experiences:

FACT: Municipal wireless networks make broadband available for solving unique City scale problems

Portsmouth (UK) is rolling out the PORTAL project which combines real time bus passenger information delivered via Wi-Fi, with touch screen information and Internet services integrated within bus shelters, providing a range of great travel services for the 41,000 or so daily passengers across the city. The project cost £3.5m (partly funded by a £1.5m of grant from the Department for Transport). It aims to dramatically improve confidence and awareness in public transport for a land-locked, mainly island city struggling to cope with 1.5 million car transits per week.

Given that it is a tourist destination and a university town, they've got serious traffic problems. Since there are few major roads in and out of the city, they encourage people to take public transportation by making it easy to find bus and train info, reducing waiting times for buses, etc.

Here's what their new system looks like:

- a wireless broadband network connected to a satellite-based bus tracking system – the first application of its type in the world - providing not only predicted arrival times, but current locations for all scheduled bus services in the city;
- bus shelters with the very latest in real-time information display screens and fully integrated information touch screens providing up to the minute bus arrival times, timetables, free email and a broad range of useful services like journey planning, train departure information, BBC news and local job vacancies. The unique print facility providing copies of maps and will be adapted to provide travel cards;
- an accurate, low cost fleet management and scheduling service for bus operators.

FACT: Municipal wireless networks contribute to lower crime rates.

New Orleans, LA, was well underway with installing a unique citywide public safety video surveillance network using a metro-scale Wi-Fi mesh network prior to Katrina. According to City officials, in the initially deployed areas, the innovative combination of high-end camera technology, Wi-Fi mesh, motion detection and other elements reduced the murder rate by 57% in six months and auto theft by 25%. Citizens do report feeling safer as a result of the cameras being in place. More than 160 churches, Neighborhood Watch groups and other civic organizations had signed up to “Adopt a Camera”. The city planned to rapidly expand the network to cover the majority of the city with hundreds of cameras scheduled to be deployed. By working closely with law enforcement and Homeland Security, leveraging Wi-Fi mesh networking technology and integrating several other key technologies, the City of New Orleans has rapidly deployed a unique new law enforcement tool at relatively low cost on a network that can serve double duty for first responder data communications.

FACT: Municipal wireless networks are a valuable public safety tool.

Mobile access to driver’s license, gang and Amber-alert databases, as well as in-field report writing, submission and retrieval over a metro-scale Wi-Fi mesh network also contributes to improved public safety. Police officers in San Mateo, CA reportedly now spend 8,000 or more additional hours a year out on their beats, because metro-scale wireless mesh networks free them from wired network connections in the office. Safer citizens and more productive first-responders reap the benefits of this new technology.

FACT: Municipal wireless networks help lower costs and improve service with public works departments.

In Corpus Christi, TX, a metro-scale Wi-Fi mesh network is automating utility meter reading to cut costs and improve service. Using the system, the city is now reading 73 water meters per second - compared to minutes per meter using the old manual process. The city also plans to enable their building inspectors to use the network; a move the City projects will cut up to one month out of an average four-month construction cycle by speeding inspections and approvals.

Minneapolis Demographics

Minneapolis is Minnesota’s largest city with an area of 58.7 square-miles. It includes 162,353 Housing units, 382,618 people, and is located in Hennepin County (2000 U.S. Census data). Residents of the City of Minneapolis are increasingly accessing the Internet from their homes. An April 2003 survey by Nielsen/Net Ratings entitled “*Top Internet Markets*”, ranked the City 20th nationwide in terms of household Internet penetration with 68.2%. A September 2004 survey, also by Nielsen/Net Ratings, entitled “*Top Broadband and Narrowband Markets*” ranked Minneapolis 15th with 46.9% of the City’s Internet users employing broadband access. Using the above surveys, the U.S. 2000 Census data, and the 2003 City of Minneapolis Resident Satisfaction Survey, which show an average of 2.36 persons per household, the number of broadband households in Minneapolis is estimated to be 30-32% of total households.

Minneapolis Population

According to the 2000 Census, Minneapolis had a population of 382,618 with a median age of 31.2 years of age. The median household income is \$37,974 and 21% of the residents over 25 years old have at least a bachelor's degree. Minneapolis is ethnically diverse with a population that is 65% white, over 7% Hispanic, 18% black or African American, over 6% Asian and over 2% American Indian.

Economy and Industry

There are over 12,000 businesses in Minneapolis, which employ more than 216,227 people. Minneapolis businesses include construction, manufacturing, wholesale and retail establishments, financial and service businesses, as well as a host of other industry segments. The chart below presents the 2000 statistics for the number of businesses broken down by quantity of employees.

Employee Size	Quantity of Businesses
1-4	20,980
5-49	17,012
50-99	1,352
100-499	1,046
500-1,000	78
1,000+	97
Total	40,563

Housing

According to the 2000 Census and the City of Minneapolis GIS system, there are a total of 162,353 households within the City. The quantities by ward (2000) are as follows:

Ward	Quantity of Households
1	12,073
2	12,396
3	10,503
4	10,838
5	10,690
6	13,779
7	16,924
8	10,582
9	12,377
10	14,981
11	11,588
12	12,353
13	13,269
Total	162,353

4.0 MINNEAPOLIS STRATEGY

In keeping with the City of Minneapolis City Council resolution dated November 1, 2004, approving the CIO's request for authorization to initiate a program that will provide Citywide Broadband Wireless Internet services to all residential, commercial and institutional users and close the 'Digital Divide', the City, under the leadership of the Business Information Services department, initiated a project to assess institutional broadband data access requirements and to develop and issue a Request for Proposal for a City-wide Broadband IP Data Access network. Council further directed staff that the City would fund this initiative through a public/private partnership.

Request for Proposal Development Process

The City of Minneapolis formed a program organization to provide program oversight and management. The two Leadership Groups are:

- Executive Oversight Committee
- Steering Committee

The City of Minneapolis formed five Working Groups tasked with defining business requirements and applications for a Broadband IP data access network. The five Working Groups are:

- External Advisory Group
- Board Working Group
- Institutional Working Group
- Public Safety Working Group
- Business, Finance and Franchise Working Group

The City of Minneapolis formed two groups tasked with reviewing proposal submissions and coordinating the vendor due diligence process. The two Evaluation Groups are:

- Evaluation Committee
- Selection Committee

To ensure that the design of the desired broadband IP data access network would meet the technical and business requirements of City institutional users, the project team initiated a series of Oversight, Steering and Working Group sessions beginning in August 2004 and continuing through November 2004. Each Working Group developed a summary of recommendations for network services, technical requirements, management requirements, contract requirements, and potential services for businesses and residents to assist the project team in subsequent development of the RFP. In addition, members of the project team solicited input from numerous community organizations, City Council members, and other interested parties to both inform the community of the project direction as well as to elicit recommendations for continuing design efforts.

The participants and areas represented in the business requirements process are outlined in the Appendices. The business and applications requirements summaries that were developed as an outcome to the Working Group process are also included in the Attachments to this document. It is also important to note that the primary collection point for all input received throughout the process was most commonly, the RFP document. A copy of this document is also included in the Appendices.

Public/Private Partnership Approach

While Federal and other State's telecommunications law is in the state of flux (City of Philadelphia narrowly navigated new State of Pennsylvania law during the RFP stage of its project and reports being hampered in some areas of contract negotiation by the Telecomm Act of 1996), State of Minnesota law does not restrict municipal telecommunications utilities in any way, except to require a two-thirds majority approval in a referendum if the city intends to provide telephone service. In an effort to understand more fully how to navigate a potentially volatile regulatory landscape and work within Council directives, the City's project team researched a variety of business models available to City of Minneapolis.

Members of the Working Groups and the project team assessed the various ownership business models for the broadband network. It was agreed that four distinct business models would be investigated.

- The City finances, owns, and operates the network.
- The City finances and owns the network, and a private company operates the network.
- A privately company owns and operates the network, wherein the contractor finances the cost of design, construction, and operation of the network and subsequently owns and operates the network without using any City assets for deployment of necessary network infrastructure, or
- A Public/Private Partnership Model, in which a private contractor finances the cost of design, construction, and operation of the network and subsequently owns selected components of the network and operates the entire network. The contractor leverages the City's installed and expanded fiber network, which the City owns and makes available to the private company as well as other available City assets for deployment of necessary network infrastructure. The City acts as the anchor tenant on the network and has a role in governance

Based upon Council direction, City capital budget constraints, existing bond obligations, exposure to risk, potential regulatory/legal impediments, and the complexity of network start up and ongoing operations management, it was ultimately determined that the Public/Private partnership business model was the most appropriate model for the City to pursue. The public / private partner will have the use of the City infrastructure (publicly-owned building rooftops, towers, street lights and other "hanging assets") for the deployment of the system.

A public / private partner, by providing the intellectual property, finances and infrastructure to deploy and operate such an open system, allows City-wide broadband communications that can address current public safety issues (including Homeland Security compliance issues) and growing demand within the communities for economical, universal access to high speed broadband services. From a commercial perspective, the public / private partner will have a major anchor customer (the City) and greatly reduced operating costs through discounted use of the City's equipment hanging assets and reduced fee arrangements. Lastly, the public / private partner will ultimately be able to offer wholesale services to other providers and retail services to residents, businesses and visitors. The City seeks a win-win public / private partnership.

Minneapolis can feature the public / private partner's advanced system in its economic development efforts. The public / private partner will benefit from the public's positive perception of reliability and security connoted by City Government's utilization of the network (especially those of public safety and Homeland Security). The Fiber Optic infrastructure remains a City asset and the private partner is fully responsible for the operation of the network.

Before reaching this conclusion, however, staff examined all alternatives noted above. Of these stated alternatives, the first to be eliminated was; a privately company owning and operating the network, wherein the contractor finances the cost of design, construction, and operation of the network and subsequently owns and operates the network without using any City assets for deployment of necessary network infrastructure or partnership with the City. This alternative depends almost entirely upon incumbent carriers or local telephone operating companies taking the initiative to proactively invest in innovative infrastructure solutions that may in fact cannibalize current offerings.

The City discussed such options with local and national providers. In many ways, they are a logical source of complex communications solutions. Their lack of enthusiasm in committing to such strategic investments and their inability to meet City of Minneapolis targeted price points and bandwidth requirements for the broadband mobility solutions required to support new scheduled Public Safety and non-emergency application roll outs narrowed the potential options examined to the following:

BUSINESS MODEL ALTERNATIVES EXAMINED

	PUBLIC/PRIVATE PARTNERSHIP	PUBLIC OWNERSHIP/ PRIVATE MANAGEMENT	PUBLIC OWNERSHIP & MANAGEMENT
Fiber Network Ownership	City	City	City
Construction Costs	Private Partner	City	City
Wireless Equipment Ownership	Private Partner	City	City
System Operations & Maintenance	Private Partner	Shared	City
Customer Service	Private Partner	Shared	City
Technology Replacement Cost	Private Partner	City	City
Marketing & Sales	Private Partner	City	City
Digital Inclusion Initiatives	Shared	City	City

In its evaluation of the remaining three options staff considered the following issues/opportunities:

A Public/Private Partnership model implemented to meet the requirement for City institutional application and resident/business and visitor Internet Protocol (IP) based services including digital inclusion initiatives provides the following benefits and opportunities:

- Allows the City to maintain full ownership of the existing and expanded fiber optic infrastructure; a valuable City asset.
- No financial risk to the City. The capital investment and issues related to construction, start up, systems operations and maintenance, and rapidly evolving wireless technology refresh/replacement will be born by the private partner.
- The City will not have to be involved in technology for its own sake and can focus on managing the business requirements analysis, procurement and contract management of Broadband Wireless Network services.

- The City will use its buying power to leverage contractual commitments from the service provider including a comprehensive Community Benefits Agreement with seed funding, and digital inclusion applications and content solution support from the provider.
- Allows ubiquitous network coverage to every point in the City at availability levels and technical standards designed to meet public safety requirements and guaranteed by the provider.
- The City will not have to be involved in the marketing, sales, revenue generation and 7x24x365 customer service required to sustain this business. These areas are clearly not our core competencies.

A Public Ownership/Private Management model implemented to meet the requirement for City institutional application and resident/business and visitor Internet Protocol (IP) based services including digital inclusion initiatives requires:

- The City to fund capital investment in the range of \$20 to \$25 million by reallocating current capital budgets or by issuing new bonds. Issuing 10 bonds for this investment at 5% would result in annual debt service obligations of \$2.6 to \$3.2 million. The City Charter limits the issue of GO bonds to \$15 million per individual project (see page 53).
- The City to bear all financial risk. The capital investment and issues related to construction, start up, and rapidly evolving wireless technology refresh/replacement will be born by the City.
- The cost to of Private Management would be incurred from day one when revenues are at their lowest point and the City will be required need to cover losses.
- The City to ramp up its capabilities to:
 - Become experts in a still emerging and rapidly changing technology.
 - Engage in a new bidding process to acquire and contract for the installation of the technology.
 - Acquire the skills, or contract for the maintenance and upkeep of the technology.
- Considering the rapid changes in this emerging technology, ensure sufficient additional funding is available for inevitable technology refresh/replacement (both finalist's proposals acknowledge and detail this requirement).
- Limit its revenue sources to providing wholesale access only to Internet Services Providers (ISP) and Wireless Internet Service Providers (WISP), or bear still further investment to ramp up to being a full fledged ISP/WISP.
- Establishing and acquiring the necessary start up expertise to successfully break into an existing and increasingly sophisticated and competitive private sector arena.
- Establishing and acquiring the necessary sales and marketing skills to solely provide these services which are a critical element of risk management in this model.
- Establishing and acquiring the necessary customer service skills to solely provide this critical element of the business, in addition to solely providing all systems operations and management services.

- Establish, fully fund and solely manage a comprehensive community benefits program that ensures the implementation of digital inclusion initiatives for underserved populations, and appropriate content development services for limited English speaking populations.
- Be prepared to navigate and litigate potential law suits by existing telecommunications providers related to claims of unfair competition and address emerging legislation, both at the Federal and State level, which is being written to prohibit or significantly curtail public ownership of telecommunications networks.
- Allows ubiquitous network coverage to every point in the City at availability levels and technical standards designed to meet public safety requirements and guaranteed by the City.
- The City will have to provide the marketing, sales, revenue generation and 7x24x365 customer service required to sustain this business. These areas are clearly not our core competencies.
- Allows the City to maintain full ownership of the existing and expanded fiber optic infrastructure; a valuable City asset.

A Public Ownership/Public Management model implemented to meet the requirement for City institutional application and resident/business and visitor Internet Protocol (IP) based services including digital inclusion initiatives requires:

- The City to fund capital investment in the range of \$20 to \$25 million by reallocating current capital budgets or by issuing new bonds. Issuing 10 bonds for this investment at 5% would result in annual debt service obligations of \$2.6 to \$3.2 million. The City Charter limits the issue of GO bonds to \$15 million per individual project (see page 53).
- The City to bear all financial risk. The capital investment and issues related to construction, start up, and rapidly evolving wireless technology refresh/replacement will be born by the City.
- The City will have to be involved in technology for its own sake and can not focus on its core competency of managing the business requirements analysis, procurement and contract management of Broadband Wireless Network services.
- The cost of all sales and marketing, customer support, systems operations and management would be incurred from day one when revenues are at their lowest point and the City will be required need to cover losses.
- The City to ramp up its capabilities to:
 - Become experts in a still emerging and rapidly changing technology.
 - Engage in a new bidding process to acquire and contract for the installation of the technology.
 - Acquire the skills, or contract for the maintenance and upkeep of the technology.
- Considering the rapid changes in this emerging technology, ensure sufficient additional funding is available for inevitable technology refresh/replacement (both finalist's proposals acknowledge and detail this requirement).
- Bear the investment to ramp up to being a full fledged ISP/WISP.
- Establishing and acquiring the necessary start up expertise to successfully break into an existing and increasingly sophisticated and competitive private sector arena.

- Establishing and acquiring the necessary sales and marketing skills to provide these services which are a critical element of risk management in this model.
- Establishing and acquiring the necessary customer service skills to provide this critical service, in addition to systems operations and management services.
- Allows ubiquitous network coverage to every point in the City at availability levels and technical standards designed to meet public safety requirements and guaranteed by the City.
- The City will have to provide the marketing, sales, revenue generation and 7x24x365 customer service required to sustain this business. These areas are clearly not our core competencies.
- Establish, provide seed funding, and solely manage a comprehensive community benefits program that ensures the implementation of digital inclusion initiatives for underserved populations, and appropriate applications and content development services for limited English speaking populations.
- Be prepared to navigate and litigate potential law suits by existing telecommunications providers related to claims of unfair competition and address emerging legislation, both at the Federal and State level, which is being written to prohibit or significantly curtail public ownership of telecommunications networks.
- Allows the City to maintain full ownership of the existing and expanded fiber optic infrastructure; a valuable City asset.

RISK/REWARD PROFILES

	PUBLIC/PRIVATE PARTNERSHIP	PUBLIC OWNERSHIP/ PRIVATE MANAGEMENT	PUBLIC OWNERSHIP & MANAGEMENT
Public Financial Risk	Minimal	High	High
Private Financial Risk	High	Minimal	None
City Revenue Sources	Fiber Network & Revenue Sharing	Wholesale Access Only	Wholesale & Retail ISP Services
Private Revenue Sources	Wholesale & Retail ISP Services	Management Fees	None

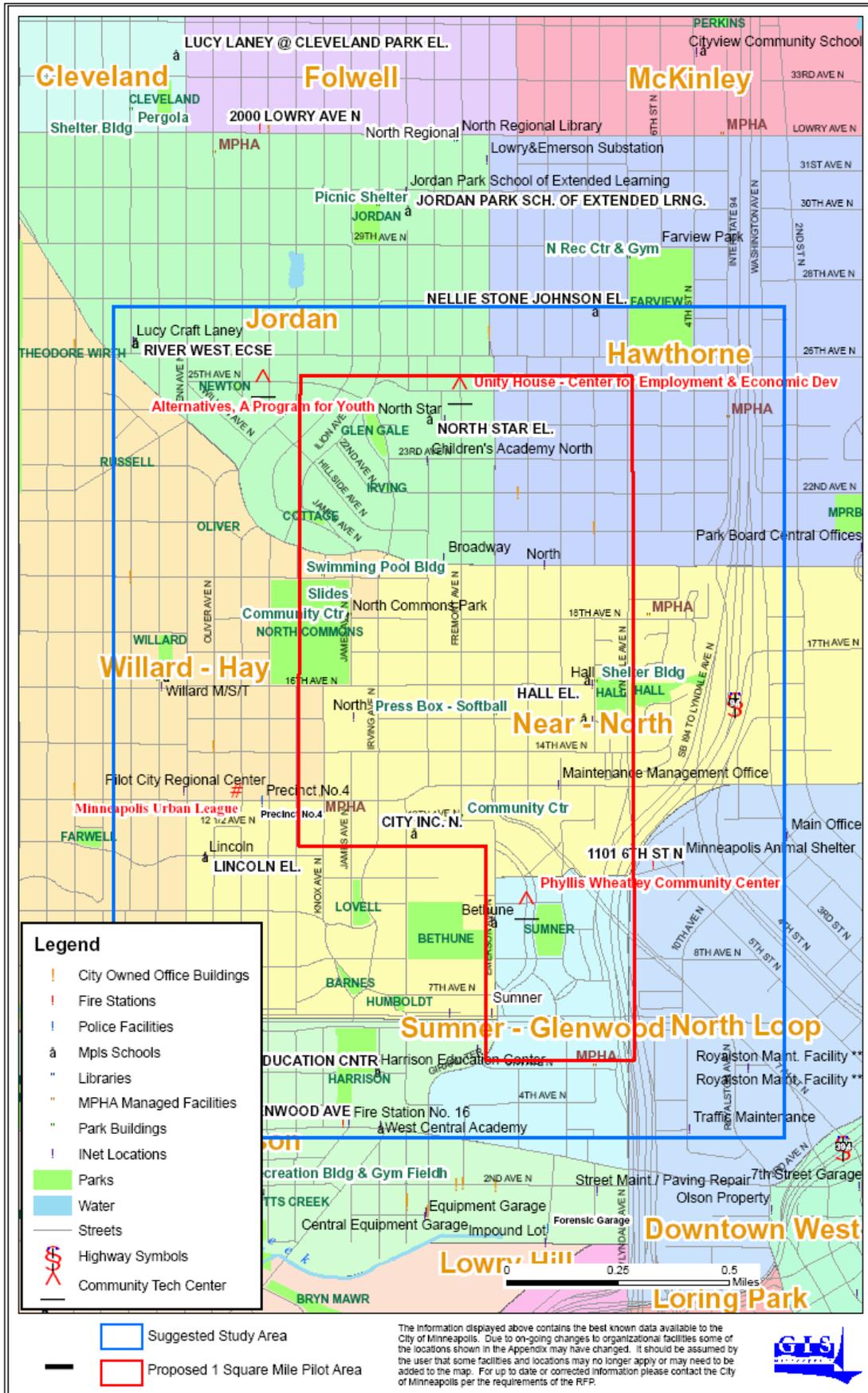
Pilot Process

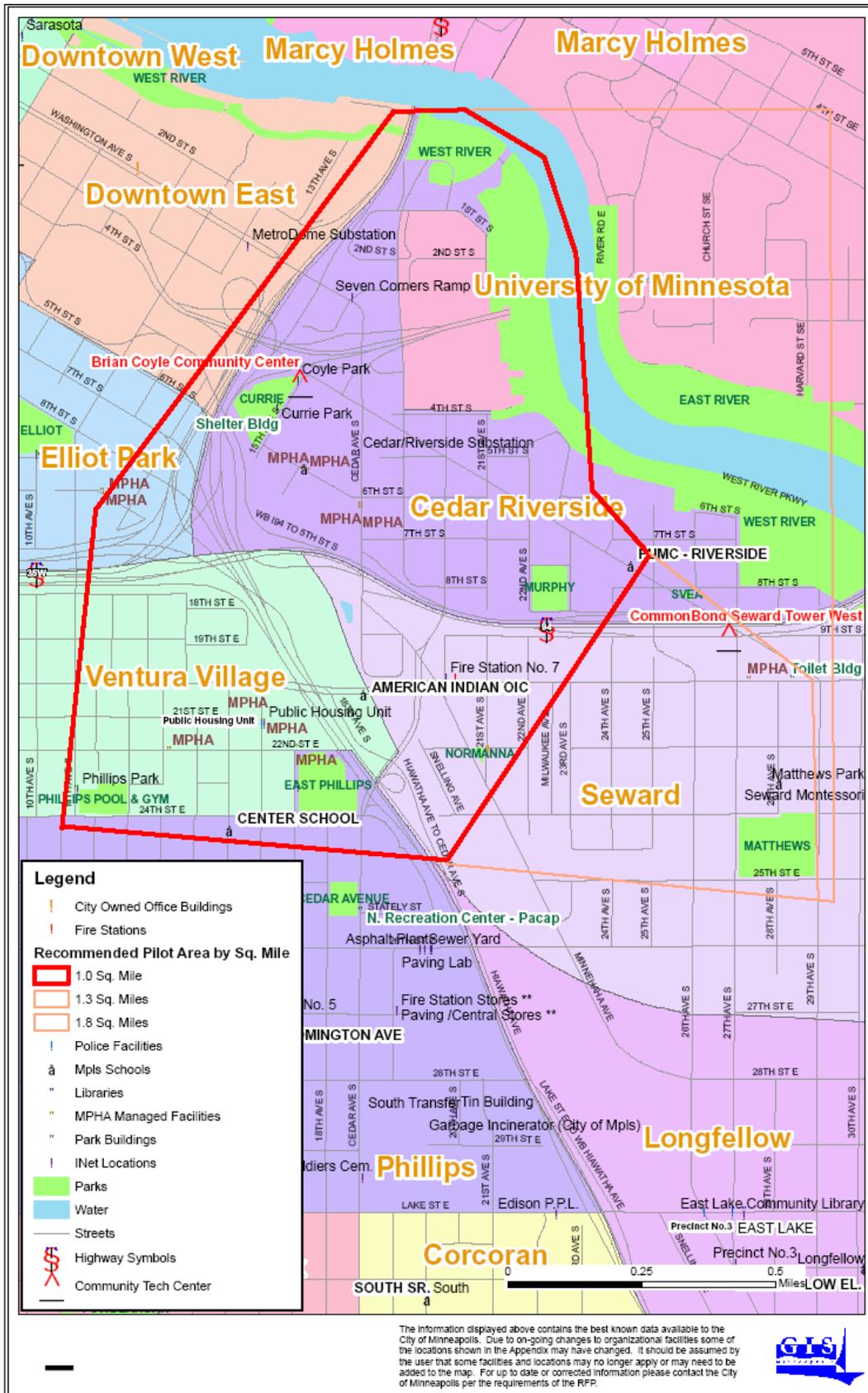
The City is in the process of planning with the two finalists from the RFP process to conduct two pilot projects in separate 1-1.5 mile areas of the City. The two finalist companies are now in the design and permitting process in preparation for the near-term pilot projects which will be used to test the broadband IP data access network for City institutional uses and serve as a focal point for continued community open house events and Computer Technology Center demonstrations.

EarthLink – Near North Pilot Area Map (approximate):

US Internet – Cedar Riverside Pilot Area Map (approximate):

(Please refer to the following two pages)





The recommended pilot project sites have been selected to provide a cross-section of the types of City areas that will be served by the ultimate City-wide broadband network deployment. In addition to immediately demonstrating the City's interest in deploying broadband technology, the pilots will demonstrate "proof-of-concept" for both the technology itself and effective support for City institutional requirements. The pilot sites will also demonstrate the City's commitment to promote efficiency for mobile and other City workers, deploy the latest technologies to foster economic development and enhance City competitiveness, and create community inclusion in the digital age.

The cost of all pilot projects will be borne by the two finalists selected during the RFP process. The pilot projects will not only demonstrate the capabilities of the finalist vendors but also prove the relative effectiveness and potential superiority of the technologies the individual vendor finalists deploy.

Network Deployment Strategy

The following is the project approach that has been followed for the City of Minneapolis broadband IP data access network implementation:

- Phase 0 – Planning, Budget and Requirements Definition
- Phase 1 – Development of the RFP for a Public/Private Partnership
- Phase 2 – Pilot Installation of Broadband Network
- Phase 3 – Contract Negotiation and Citywide Launch
- Phase 4 – Broadband Network Ongoing Operations
- Phase 5 – Upgrade Planning

It has been estimated that a full metro-scale wireless broadband access network would require deployment of approximately 1100-1300 Wi-Fi cells/access points in a mesh network. These Wi-Fi cells will be linked to tower antennas which in turn will be "wired" to the backhaul network for ultimate connectivity to the City/vendor's Internet uplink facility.

According to the City of Minneapolis Assessor database, the GIS database, and other City sources, the City has the following assets:

- City of Minneapolis Public Works Properties – 579
- City of Minneapolis MCDA Properties – 695
- City of Minneapolis Leased Parking – 22 ramps, 8 parking logs and about 6,350 parking meters
- Parks & Recreation Board – 476
- Minneapolis Library Board – 206
- Minneapolis Board of Education – 62
- Minneapolis Public Housing Authority – 747
- Total of 2,576 sites

Streetlights

There are 28,000 wooden streetlight poles deployed throughout the City that are owned by Excel Energy. The Excel-owned poles serve all areas of the City except the downtown core area. The Excel streetlights are individually powered and equipped with photoelectric “eyes”. The City has worked with Xcel to coordinate access for proposers to poles for an added cost to the private partner per pole/per year.

The City’s downtown core area is served by approximately 17,000 metal streetlight poles owned by the City. About 50% of these poles are 12 feet high and the other 50% are 30 feet high. The City streetlight poles are not individually powered, but rather are powered from approximately 800 service cabinets. The service cabinet range is a low of 10 feet to a high of 800-1,000 feet.

Traffic Lights

The City has 804 traffic lights throughout the City and they are predominantly hung at a height of 12 feet. An undetermined small amount of traffic lights are hung at a height of 30 feet.

Parkway Lights

The Park Board is responsible for approximately 2,400 parkway lights. Some 700 of these are not able to be leveraged for hanging wireless devices.

Back-Haul Requirements

With the focus on selecting the right access technology, many wireless network operators overlook another important part of their network--backhaul. Once customer traffic reaches the access point or subscriber hub, consolidated traffic needs to be reliably and cost-effectively transported back to switches and the main Internet gateway. These transmission links need to be reliable since they carry traffic from a large number of subscribers. The City of Minneapolis will provide access to its Fiber Optic infrastructure as a means to connect these wired access points to the main backhaul transport facilities.

Retail Pricing

The two Offerors that have been selected as finalists to move to the pilot demonstration phase of the project, Earthlink and US Internet, are both long-term Internet Service Providers that offer a wide range of service categories and products for the institutional, commercial, and residential markets. While the ultimate retail pricing structure will be determined in negotiations with the ultimately selected contractor, both of the finalists are planning to offer fixed wireless high-speed broadband Internet access to residents for their basic service level. Premium offerings providing higher bandwidth connectivity will also be available. In addition, both finalists have offered to provide attractive discounted monthly pricing to low-income subscribers. Retail pricing for subscribers includes various levels of support for web hosting services, e-mail accounts, anti-virus protection, and unsolicited bulk e-mail filtering.

Wholesale Pricing

The selected provider will make their proposed network solution open to other ISP's and WISP's. Under this wholesale arrangement, the provider will offer wholesale pricing to other providers in an open environment. As an example, an open access business model provides open access to qualified service providers at wholesale rates. It is expected that the ultimately selected broadband network contractor would offer wholesale prices to all qualified service providers enabling residents and businesses will be able to contract with any customer provider that chooses to contract for wholesale services on the network.

Wireless Minneapolis Community Engagement

Community Engagement Objectives

- Engage Minneapolis residents and communities in a discussion about the benefits and opportunities of a wireless, broadband network that reaches every corner of the City.
- Collect ideas and feedback from Minneapolis residents, communities and other stakeholders about the Community Benefits package that the City of Minneapolis should advocate for during negotiations with a vendor.
- Build a level of understanding about Wireless Minneapolis among the City's communities, stakeholders and the general public so that they are aware of the opportunities to participate in a public dialogue about Community Benefits for the project.
- Utilize strong community engagement strategies to reinforce transparency about the process and build enthusiasm for the opportunities that Wireless Minneapolis can bring to all the city's communities.

Audiences

- Residents
- Neighborhood Organizations
- Community & Business Leaders
- Non-profit Community & Social Service Organizations
- Community Technology Center Users, Volunteers & Staff

Community Engagement – Opportunities for public participation

Experience Wireless Minneapolis & Give Us Your Ideas

The Wireless Minneapolis community engagement plan calls for seven public meetings/open houses (detailed below). The meeting locations will be spread out geographically through the city; each will be open to the public at large (rather than being limited to area residents).

- Opportunity #1: **Neighborhood Organization/Leadership Meeting** (Conduct prior to pilot project construction). Invite neighborhood organization leaders (board, staff ... general public is welcome) to attend a meeting to learn more about Wireless Minneapolis and the upcoming pilot projects. Begin discussion – and collect feedback and input about Community Benefits the City should advocate for in negotiations.
- Opportunity #2 **Community Meetings (2)** (Conduct prior to launch of pilot project). Invite the public to attend a meeting to learn more about Wireless Minneapolis and the upcoming pilot projects. Begin discussion – and collect feedback and input about Community Benefits the City should advocate for in negotiations.
- Opportunity #3 **Pilot Projects – Open Houses (2)** (Conduct during pilot projects). Invite the public to attend a meeting to learn more about Wireless Minneapolis, see demos of the system (what we are testing) and discuss/provide feedback and input about Community Benefits the City should advocate for in negotiations.
- Opportunity #4 **Community Meetings (2)** (Conduct after the pilot project but prior to contract negotiations). Invite the public to attend a meeting to learn about the status and next steps of Wireless Minneapolis; to hear a presentation about the Community Benefits ideas the City has received and to provide feedback on Community Benefits.

Tell Us What Is Important to You

- Opportunity # 5 **Online Comments & Feedback** (Currently in operation; ongoing)- Encourage folks to provide ideas and feedback on Wireless Minneapolis' Community Benefits through a comment box in the Wireless Web site.
- Opportunity #6 **Wireless E-mail** (Currently in operation; ongoing): wireless@ci.minneapolis.mn.us. Promote this e-mail address using all our communications vehicles as a way for the public to provide comments, ideas and feedback on the Community Benefits agreement. This address was used to invite the City's 81 neighborhood organizations and groups to the Ways and Means meeting on Feb 21, 2006.
- Opportunity #7 **Community Benefits survey** (beginning ASAP). Promote the C-CAN/Community Technology Empowerment Project on-line survey with a link from the City of Minneapolis Web site. Encourage participation in the survey.
- Opportunity #8 **Distribute "idea boxes"** and paper copies of C-CAN surveys at City government, Park, Library buildings, Neighborhood Organization offices, and Community Technology Centers. (Set up prior to launch of pilot projects) Encourage feedback.
- Opportunity #9 **Youth Perspective.** (Begin planning prior to pilot construction; conduct through process). Solicit comments, ideas and feedback from young people through public schools. This needs further exploration to determine if we can have dialogues (forums) at public schools (ideally a role that elected officials can play) or if we must rely on Idea Boxes set up at central locations in schools.
- Opportunity #10 **City Employees Survey via CityTalk and Survey boxes** (Beginning during pilot projects). Encourage employees to submit ideas about how Wireless Minneapolis can help them do their work more efficiently and effectively and as residents how they think wireless technology could be used to make Minneapolis a more attractive place to live, to work, to go to school and conduct businesses.

Learn About Wireless Minneapolis & Give Your Comments/Ideas/Feedback

Opportunity #11 Wireless Minneapolis Web site

www.ci.minneapolis.mn.us/wirelessminneapolis with updated information about Wireless Minneapolis initiative and the Community Benefits Agreement. This also features a way to sign up to receive updates on Wireless Minneapolis (see below) and to provide comments and feedback. (Live on Feb. 15; ongoing).

Opportunity #12 Wireless Minneapolis e-update list. Encourage people to sign up to receive e-mail updates on Wireless Minneapolis, including information about upcoming meetings and public events. This system is currently in operation with 62 subscribers (subscribers received an announcement about the Ways and Means meeting on Feb 21, 2006).

Opportunity #13 Keep the Public informed of survey results and public comments.

Maintain a summary of meetings, results of surveys, and public comments posted on the Wireless Minneapolis Web site.

5.0 REQUIREMENTS, DESIRED SERVICES, AND EXPECTED BENEFITS

There are three major target markets for the City of Minneapolis broadband wireless network: Institutional (Government), Residential, and Business. In addition, the wireless network will also serve as a desirable City amenity stimulating interest in the City and providing convenience for citizens and visitors alike. Each of these target markets is addressed in the sections that follow below.

Public Safety

For several years, police departments have used low-bandwidth wireless systems to check suspect IDs and vehicle license plates. An example of these wireless systems is the Cellular Digital Packet Data (CDPD) network. This type of network supports a theoretical throughput of 19.2 Kbps of symmetrical bit rate and actual throughput of about 9-13 Kbps. Many applications used by the City's mobile work force require that similar amounts of data be both "unlinked" (from the client device to the base station) and down linked. This early dial-up modem speed is simply not enough to support high-bandwidth applications such as transmission of mug shots to, and photos from, police patrol cars. While there are now newer technologies available, such as 3G and 1xRTT, these systems all inherently limit actual throughput due to the robust overhead (error correction and coding) required to function at low signal levels. Wireless broadband, on the other hand, was designed for wireless LAN applications with high symmetric throughput to low speed nomadic clients.

Public safety services have an obvious need for such high-speed mobile data services to allow police, fire, and emergency personnel to access on-line data (e.g. to link to criminal databases and automobile registry data) and communication critical data in real-time (e.g. to relay medical information from an ambulance to the hospital). With the advances in communications technology and, more recently, with the explosion of interest and services based on wireless LAN technologies operating in the unlicensed spectrum such as Wi-Fi, there is growing interest in implementing public safety systems using such technologies.

Police Departments can now have always-on connectivity in patrol cars – police officers will have real-time access to a multitude of relevant information such as perpetrator details, mug shots, identification lineups, and fingerprints. Extensive access to critical information can speed up investigations and help prevent further incidents by keeping peace officers in the field with real time information availability. For instance, using a broadband link to security cameras, Police officers will be able to gather critical information about a location prior to risking life and limb by entering a situation blindly. Additionally, there will be less paperwork. Through rapid auto-completion of data, forms and paperwork can be filled out on the fly and would not require additional data entry. This remote capability will cut down on officers' time in the office thus increasing "street time". Through utilization of the potential data communications within the Hot Zone, public safety officers should realize greatly enhanced safety and efficiency.

Institutional Services

Broadband wireless connectivity is the solution to making emergency, public safety, and generally mobile City workers highly effective. Non-mobile staff in City buildings will also benefit from the ability to access the Internet via a laptop or PDA from any room in a City building. Migrating from current low-speed data connections to wireless broadband will enable mobile, in-car access to the Amber Alert sex offender database with full photo resolution, as well as rapid access to automobile registry systems. The City will also seek to integrate the broadband wireless network with current 700 MHz public safety systems and to interoperate with other regional jurisdictions. Descriptions of the capabilities and benefits that will accrue to various City entities, whether mobile or non-mobile, follow below.

Mobile City Workers-Non-Public Safety

There are many departments within the city that have mobile workers other than public safety related workers. Examples include Public Works project supervisors, social workers, building code inspectors, health inspectors and the like. Outfitting such government workers with wireless devices (laptops or PDAs) will enable them to send data in real-time back to government computers as well as to download instantly information needed to successfully complete the job at hand. In addition, non-mobile city workers such as judges, lawyers, and Council members can maintain constant access to information via the broadband network using secured technologies such as VPN's. Laptops and hand-held devices could be used in any room or area of City Hall without the need for tethered connections.

Parking Monitoring and Management

The City of Minneapolis operates a number of public parking facilities throughout the City. In addition, parking enforcement officers patrol metered street spaces to enforce time limits and, when necessary, issue tickets. The implementation of a broadband wireless network can assist in the monitoring of parking facilities and improve the productivity of parking enforcement. Consider a traffic officer who uses a PDA to collect data on illegally parked cars and then uses a wireless connection at the station house to download the information to automate issuing tickets and reduce data entry errors. If this system is expanded to support mobile broadband data while the traffic officer is on patrol, an automatic cross-check can be made of licenses to see if there are any outstanding warrants or other problems that require special action (e.g. booting or towing the car).

Parking Statistics

The City has provided the following information regarding its Parking Enforcement operations. There are approximately 6,200-6,500 parking meters deployed on City streets. The City issues approximately 270,000 parking tickets per year providing a revenue stream of about \$2 million annually. Parking enforcement personnel utilize about 50 AutoSite hand-held ticket writer devices that are not currently Wi-Fi enabled. The newest models of these devices are Wi-Fi enabled. If these devices were Wi-Fi enabled, parking enforcement personnel could have direct, real-time access to appropriate City databases. Such database access would enable City staff on the streets to determine whether a car with a disabled person sign was actually the car to which the sign was issued, to run auto license plates to determine if a car is stolen, or to see whether the person to whom the car/plates are registered is a "scofflaw".

Separately, although the current parking meters are not digital, if they were, they would be able to send a Wi-Fi signal to a hand-held device alerting the nearest traffic enforcement officer that a meter time had expired.

The City also owns and operates eight parking lots and 22 parking ramps, of which three are automated. There are approximately 25,000 parking spaces within this complement of ramps and lots. The City Impound lot yields approximately \$5 million in annual revenue. There are some 2,000 surveillance cameras deployed throughout the 22 ramps. The City has substantial investment in fiber and other hard-wired connectivity to the parking ramps for digital audio and video, emergency call stations, revenue collection booths, and variable message signs. For this reason, the City would be reluctant to expend more capital to add wireless connectivity to existing ramps, however the City sees the benefit of adding wireless connectivity in the future to any newly constructed ramps.

Taxis

There are currently 397 registered taxis serving the City of Minneapolis. All taxi inspections are now handled using manually completed forms. It has been suggested that, if taxi inspectors were to be equipped with Wi-Fi enabled hand-held devices, such inspections could be completed in the field with the data transmitted real-time to appropriate City databases.

Public Works Applications

A wireless broadband mesh network will enable the City to establish remote monitoring of facilities. This will save time and money by monitoring and controlling mechanical devices, valves, pumps and signs from a central location. The City can use remote monitoring (or "telemetry") to improve its operating efficiency, equipment protection, and customer service. Remote monitoring allows savings through reductions of travel and manual information gathering. Staff can focus on managing exceptions and preventative maintenance thus maximizing productive time of field employees and the useful life of equipment. Early detection of malfunctions can prevent more costly problems from occurring.

Remote monitoring solutions can use wireless network connections to obtain data from distant or remote locations, allowing the user to store or analyze data in a central location. Data can be transmitted at pre-determined intervals, upon request, and/or when alarm thresholds are met. Timely and consistent data collection can improve the accuracy and validity of analysis. Moreover, there would be an increase in the accuracy of metering. Through use of telemetry, there will be a reduction in human error as data is sent electronically – certainly, there would be increased efficiency in the high-low readings.

Data can also be processed through a variety of systems (billing, etc) without additional data entry (from hard copy forms to digital). The Public Works department can realize substantial cost savings on the deployment of their limited resources. As additional bandwidth for the City offices will be provided, multiple 56k dialup connections can be replaced by high-speed broadband connectivity.

Video Surveillance

Security cameras are designed to transmit images every one to four seconds. Surveillance cameras are designed to transmit video or a collection of images every second. Security cameras are used to detect motion and events, while surveillance cameras are used to proactively monitor locations in lieu of having onsite personnel.

Wireless cameras operate on the Wi-Fi or 802.11b spectrum, enabling them to be fully compatible with a broadband wireless mesh network and high-speed Internet connection. Either type of camera could serve as both a deterrent and an investigational tool for public safety in City parks, business environments, and parking lots, and can be used to help reduce the occurrence of vandalism and other crimes as part of the City's Safe Zone program.

As wireless technology cameras can be installed and removed quickly, the City could also deploy wireless security cameras at public events anywhere in the City. Stadiums, arenas, and parks could all have Wi-Fi available for the public, police, fire department staff, and other government workers.

Graffiti Management

The proliferation of graffiti on both public and private buildings in the City of Minneapolis has become a major problem for both building owners/managers and the City itself. The City expends significant capital to remove graffiti, yet the cleaned building very quickly becomes an enticing target again for the same or a different graffiti "artist".

As noted in the section immediately above, wireless cameras can serve as an effective deterrent to vandalism. It is possible to install a wireless point and tilt camera equipped with a motion sensing mechanism so that the camera is pointed at a frequently used graffiti site. When motion is detected at that site, the camera will begin to operate and will wirelessly transmit video to the appropriate police response location.

Desired Residential Services

Residences in the City will be able to acquire broadband Internet access at speeds of 1 Mbps. This service will be deployed in a later phase of the network deployment. Ideally, the City's private partner can capture two segments of the residential market. The first segment is comprised of households that are unable to acquire cable or DSL services at their location. Typically these customers currently opt for 56k dial up services or no service at all, with a select few utilizing DSS (Digital Satellite Systems) for broadband access.

By providing broadband speeds at highly competitive rates to typical local dial up pricing or where DSL's limited range from the telephone company's Central Office will not allow residents to acquire DSL, the private partner can capture a generous portion of the available market. The second segment to capture is more difficult to achieve. It consists of customers who currently use DSL or cable for broadband Internet access. The private partner would entice these customers to their broadband offerings on the basis of ease of use, convenience, and portability, no annual or multi-annual contractual agreements, and pricing.

Desired Business Services

The City will foster economic development and project an image of a technologically advanced, business-friendly community through the deployment of the broadband IP data access network. Most Minneapolis area commercial businesses utilize wired services from the local telephone company for Internet access. These access links range from dial-up service and DSL to full T-1 or T-3 service. Wireless access provided via the planned municipal broadband network can serve as a competitive replacement for current wired services typically at reduced monthly recurring cost. In addition, local businesses may wish to retain their wired service link to the local telephone company and acquire broadband wireless access as a recovery option in a potential disaster situation.

A lower cost for technology infrastructure enhances the capabilities of commercial enterprise to exploit the features and benefits through utilization of high-capacity bandwidth. Hotels, conference centers, new business parks, and malls can all utilize wireless broadband without having to build in extensive wiring and trenching. Fewer wires and cables on poles improve the impact on the environment as well. As the wireless broadband system is compliant with FCC rules and regulations, it is compatible with pre-existing systems. New businesses can use existing technology that may have been built into their systems to seamlessly integrate into the city's technology sector. Lower costs for broadband Internet connectivity will stimulate business growth.

In many cities nationally as in Minneapolis, heavily trafficked retail establishments such as bookstores, restaurants, cafes, and coffee shops, typically in downtown areas, have begun their own grass roots efforts to deploy "Hot Spots" for wireless Internet access. Customers with wireless-equipped laptops and PDA's can easily access the Internet through a base station/access point deployed in the retail facility. The Minneapolis broadband wireless network could facilitate economic development for the city and increased customer traffic at city businesses. A "hot zone" in a downtown area that encourages increased shopping traffic offers public goods benefits since stores that do not support access but are in the coverage area and benefit from the traffic will still derive benefit.

Broadband as City Amenity for Residents and Visitors

The City broadband access network can also be integrated with the convention center to provide paid temporary wireless services to exhibitors and free wireless access to convention providers and assigned City workers. This application makes the City a more attractive convention destination, especially for high-tech conventions, and simultaneously increases convention attendee spend while in the City. The broadband IP data access network will also provide broadband Internet connectivity for City residents using such municipal facilities as libraries, mass transit, light rail, City parks, and other public spaces.

Impact of Wireless Minneapolis

The City expects to receive myriad benefits from the deployment of the broadband IP data access network. The City will be able to experience numerous communications improvements from the deployment of the network and it fully expects to reap the following benefits over time:

- Reduced costs for both emergency and non-emergency wireless communications while enabling a greater number of City of Minneapolis mobile workers to have information access to citizen requests and work orders from the field
- Reduced costs and improved level of services for Public Safety employees protecting Minneapolis residents, utilizing a City-wide high-speed broadband infrastructure
- Increased accessibility thereby improving productivity, responsiveness, and public safety
- Greater mobile data access and interoperability with other City emergency communications systems, e.g. 800 MHz radio communications system integration and integration with the Police Records Management System,
- Real-time video surveillance and monitoring of high traffic, high crime, and frequent graffiti sites
- Rapid, mobile access to Amber Alert information
- Rapid, mobile access to Mug shots, in-field photo lineups, fingerprints, DMV records
- Public Works-Remote monitoring of utility meters
- Mobile database access for city building inspectors, health inspectors, social workers, and maintenance workers
- Mobile Internet connectivity for City Hall employees, judges, lawyers, etc.
- Traffic management-video traffic monitoring
- Parking monitoring and management-field access for parking enforcement personnel
- Maintain the image of the City of Minneapolis as a leader in providing services to its citizens and business, both in the State of Minnesota and in the nation as a whole
- Community-based web “splash pages” with information regarding community services, events, etc.
- Internet-based, streaming video broadcasts of meetings from City Hall, schools, parks, and libraries; community events, outdoor concerts, and sporting events
- Contractor support for City Community Technology Centers and community organizations

The City of Minneapolis is using its market position to compel a business to build a fast, reliable network that offers benefits to all our communities, as well as those who work, visit, or attend school in Minneapolis.

Central to our negotiations is the requirement that the vendor provide the same level of coverage in every neighborhood throughout the City. As part of the contract negotiations, we will also advocate:

- Free broadband and wireless service at each of the city’s Community Technology Centers (which today number about 100).
- That the private vendor contributes to digital divide initiatives (we will engage in discussions in the community about what efforts will help close the digital divide).

- Free wireless access at City of Minneapolis parks.
- Free broadband (1 to 3 meg access) access at (to be determined?) public spaces throughout Minneapolis (how can we define “public spaces”).

While it is premature for the City quantify the projected savings that will result from deployment of the broadband IP data access network, other cities that have already installed municipal broadband networks have experienced savings through the reduction of telephone company links and have realized savings due to a reduced requirement to expand municipal staff to meet defined goals. The City of San Mateo, California, which has had a municipal broadband network installed to serve its police department since early 2005, has discovered that its police now spend much more time in the field where they are needed, policing the streets and performing vital services for the residents and visitors of San Mateo. The City states that their ability to more quickly and efficiently solve crimes within their borders has already been proven and future network and application enhancements will continue to improve the investigative and preventative policing capabilities of the department. The end result is a much safer community without the need to increase the number of patrols on the street.

The City of Corpus Christi, Texas installed a wireless mesh network initially to more effectively automate its reading of gas and water meter data and the transmission of this data to the city’s Utilities Business office system. City management has stated in industry conferences that is now more effectively receiving and transmitting meter reading data at reduced cost.

The Mayor of Minneapolis, in an article recently published in the Minneapolis Star Tribune, stressed the City’s effort to avoid the type of legal minefields encountered by Philadelphia when he stated:

“We are the first city to use our position in the market to compel business to provide a service to everyone. The city of Philadelphia originally proposed a city-owned system. But after seeing our model, they're following in our footsteps. In doing so, they're avoiding further legal battles with industry providers who claim that tax-subsidized wireless service is unfair competition. We've avoided those legal problems altogether.

Our approach is groundbreaking. A strictly private-sector, "hands off" approach would mean that the city wouldn't increase efficiency and that lower-income neighborhoods inevitably would be left underserved and unconnected. A strictly public-sector approach is another "do nothing" option, because it would have the taxpayers paying at least \$25 million to build a network that could be obsolete the day it goes live. Our whole 2006 capital budget for roads, bridges and everything else we build is \$23 million.

Whichever vendor gets the contract in the end, they, not taxpayers, shoulder the risk of ensuring that their technology solutions are reliable, that the system is continually updated to keep up with emerging technology and industry standards and that they work effectively with other Internet service providers and content providers, as well as operate this network as a profitable venture.”

Our society and economy is increasingly reliant on information technology (IT). Many low-income communities are isolated from recent technological advances and do not have access to

personal computers, the Internet and the interactions and opportunities these technologies provide. This experience defines the “digital divide” – the separation between those who do and those who do not have access to information technology.

We must work to understand the impact technology transformation has on low-income communities with two key questions guiding our efforts. First, how might existing and emerging technologies be used as a tool to support community-building efforts? Second, can we draw from the decades of experience in the community-building field to inform current efforts to bridge the digital divide?

The current focus of policymakers, community activists and IT industry leaders is largely to create policies and programs that provide low-income communities with training and access to information technologies. Access for what purpose? The policy dialogue must go beyond the current access-centered paradigm. The next steps for IT policy and practice must support the creation of local content and build the technology capacity of community based organizations.

Our community technology policy agenda should include:

- Promotion of universal access and training;
- Technology capacity building for community based organization;
- Creation of community driven content; and,
- Development of new applications and expansion of relevant local content

Community based organizations are rich storehouses of local information, but they frequently lack the technology capacity to either use this valuable resource themselves or to share it with other community serving organizations. Those who are using it to support their work and extend their impact have developed proficiencies in:

- Advocacy and online organizing;
- Community information clearinghouses;
- Networking and online communities;
- Innovations in service delivery;
- Interactive database development; and,
- Community mapping.

In Minneapolis, a number of community technology centers and technology assistance providers have been established as a result of programs and policies initiated by Federal Government, State of Minnesota, Hennepin County, City of Minneapolis and directed philanthropy. If one goal is to strengthen neighborhoods using the power of information technology, it is critical to understand the importance of the existing infrastructure and its connection to local constituents. Our community based organizations are the gate keepers of local information and are, therefore, the appropriate actors for creating local content that is relevant, useful and available online.

Local content – relevant and meaningful community and neighborhood based information on topics such as employment, housing, community events, education, childcare and social services – must be able to be understood by limited-literacy users, published in appropriate languages and offered in culturally appropriate ways.

As we develop policies and programs to bridge the digital divide, we must insure that these are linked to broader strategies for social change in two ways. First, we must allow the wisdom and experience of the existing community infrastructure to guide our efforts. Second, we must focus our efforts on using emerging technologies as a tool to strengthen and support our existing community infrastructure. Strategies that promote a culture-of-use in community based organizations, and the constituencies they work with, are critical. Some activities that will promote a culture-of-use include:

- Developing stronger and deeper links between technologists and community builders to that awareness of technology's impact is better understood;
- Creating an inventory of community based applications, along with technology descriptions, that illustrate how IT tools can be used as a tool for social change; and,
- Creating online and offline opportunities for community based organizations to share knowledge and experience around developing content and applications.

Many local communities around the globe have demonstrated that Internet technologies can be an effective tool in boosting local economic and social development. As a result, the social appropriation of Internet technologies is emerging as a research and practice called "Community Informatics." Community Informatics is the application of information and communications technologies to enable community processes and the achievement of community objectives. International researchers and funding agencies have moved towards the term Community Informatics Systems (CIS) as a parallel for Management Information Systems (MIS).

Community Informatics Systems focus on distributed systems and not aggregated ones. CIS is also based on a premise of active interaction in the development, use and appropriation of the systems. Other significant aspects of the "Community Informatics" approach include the development of strategies for the analysis of community and social requirements for designing community based processes of technology appropriation and planning; technology program planning; and, outcomes evaluation research.

In preparing for the next phase of the emerging information and communications technology-enabled environment, a new social contract is required that binds and partners civil, private and public sectors in delivering social inclusion and social cohesion in ways that strengthen economic, social and cultural benefit in the information society. City of Minneapolis should represent itself as a facilitator and active member of this network of community leaders.

The financial stability of community information and communications technology initiatives needs policymakers and funding approvers to acknowledge their long-term responsibilities and involvement. "Project culture" and "social experiment" approaches are incompatible with meaningful attempts to build and sustain active and healthy communities in the information society. Communities themselves will ultimately determine the sustainability of community technology. Active participation of a local community – at every stage of the long term responsibilities and involvement life cycle – is essential if the community is to identify with and develop a sense of ownership of an initiative. Active citizenship, human-centered design and communal participation from the early planning stages are therefore prerequisites for sustainability.

A human-centered approach to community informatics recognizes the realities of community life by attempting to incorporate them into the design, implementation and development of community technologies. It is important to evaluate the tensions that exist between the competing social agenda of funding approvers, technologists, community and voluntary groups, public sector agencies, researchers, and communities themselves. Within a community policy context, this requires an understanding that no two communities are alike. Each has different norms and cultural value systems historically constructed as a result of social circumstances. Local information society policies must acknowledge and reflect this diversity.

In the design process, technology should be viewed as a tool to be designed, used and shaped by humans for human purposes. Technological systems are subordinated to community needs across a broad spectrum of considerations – not just in terms of service requirements and applications, but in fundamental system designs, as well.

Because communications is a central dynamic of active community life, social cohesion – which focuses on the promotion of social dialogue – is communications with a view to improving conditions. Communication in which knowledge can be exchanged within and between diverse cultures should be a key goal.

For a dynamic system to successfully operate, all the elements of the system have to share some critical common ground. The common ground is in recognizing that community communication is a dynamic process, with various meanings for the people involved, with varying attitudes toward privacy and published access, with various motives behind the act of communication. Definitions of what constitutes the personal and informal in communication – as opposed to that which is public, external and functional – should come from the communities themselves.

From a technical perspective, given the hard-wired nature of information and communication technology and the commonly practiced top-down approach accompanying it, technocratic values can sometimes invisibly and even unintentionally saturate an entire community technology initiative. Issues around cost, access and control, privacy and distribution, amongst many others, have to be considered at the design stage from a community perspective.

Technological imperatives, which distort human or community actions, are ultimately dysfunctional and form a dangerous basis for determining community policy and practice. The fundamental questions of who benefits from community technology, who owns it, who controls its distribution and applications, and who defines the nature of communication are central to any consideration of the sustainability of community technology.

In recent years, innovative examples of community based organizations using technology as a strategic tool to support the community have begun to surface. Digital technologies are effective tools to support and enhance advocacy and organizing efforts. E-mail listservs, facilitated discussion lists, online action alerts, and other tools, are most successful when they promote and build upon offline activities.

One of the most effective uses of IT tools is to facilitate coordination of activities, improve communication and build or strengthen relationships. These tools can also be applied to improve the delivery of social services. For example, the strategic use of technology can

streamline service delivery, help social service organizations serve a larger number of constituents, and facilitate collaboration across organizations.

The Internet is moving more and more towards interactivity, with complex back-end databases allowing users to create individual online experiences by accessing information that is customized to their needs. Community groups use interactive databases to help their constituents find employment, community assets, and other local information. GIS and other information systems help identify and organize data according to location. These tools are being used for public policy development, neighborhood planning, advocacy and research.

City of Minneapolis (COM) has the opportunity to take a leadership role in closing the “digital divide” by establishing a set of principles to guide the operations of a collaborative effort. COM can help to coordinate community technology initiatives to create a common technical platform and ensure the usefulness and consistency of applications. We can help to decentralize access to information and database tools, promote communication and cross-learning across our community technology centers, provide strategic seed funding, and provide accessible and affordable central support and technical assistance.

Access for individuals, capacity building for organizations, content and applications development, taken together, constitutes a comprehensive strategy for bridging the digital divide. The Minneapolis Broadband Wireless and Fiber Network initiative serves the important function of building the infrastructure upon which we can develop strategies for greater social and economic inclusion. Parallel to this universal access strategy, we need efforts that promote the development of relevant content for residents, businesses and visitors and innovative applications that can support the work of community based organizations focused on promoting equity and, economic, social and cultural benefit for the residents, businesses, visitors and employees of City of Minneapolis.

CTEP AmeriCorps has selected City of Minneapolis as a 2004-05 Host Site partner. We have the opportunity to recruit, select and supervise a volunteer resource for the next year to assist us with the Minneapolis Wireless Broadband and Fiber Network initiative. I believe the focus of these individuals’ efforts should be on completing necessary research and community planning activities to help City of Minneapolis develop policies and programs to bridge the digital divide.

General Benefits

The public / private partner’s network will provide extensive coverage of broadband capabilities to the entire City. Even residents or businesses that cannot receive digital cable or DSL services will be able to receive broadband services. Customers will be able to realize true portability. Anyone with a wireless account through this service will be able to roam from location to location within the broadband wireless mesh.

In a typical first stage of this initiative, users will be able to use one account anywhere in the city. Where DSL and cable require new accounts at each location, broadband wireless users will be able to use one account at all locations— home, office, parks, restaurants, etc. The approval of this initiative by the City would emphasize the City's support of homegrown businesses and its continued backing of the local economy. More local jobs can improve the economy, minimize commuter traffic and improve public perception of the City as an economic and technological leader.

By being among the first cities to deploy the a city scale wireless network, it is likely Minneapolis based businesses and individuals will be involved in the creation of new third party software and communications applications that can be used in municipal wireless networks throughout the USA and world. Location based services (GPS) for public safety, commerce, and tourism are just a few among many types of applications yet to be developed that we in Minneapolis can develop, test, and prove out for a new emerging industry. Jobs and businesses will be created in Minneapolis if we move forward first becoming a leader with new products and services that other wireless network system operators will use.

Future Services

Future applications that could be supported on the municipal wireless network include Voice over IP (or Internet Telephony) and streaming entertainment. Next generation intelligent IP communications devices add VoIP communications together with wireless installations. Home media centers with built-in 802.11 gateways capable of accepting streaming entertainment directly to the home are just beginning to emerge on the market.

6.0 PRODUCT AND SERVICES SOLUTIONS

Products and Services

The subsections that follow below summarize the expected products, services, and capabilities that will be deployed and/or become enabled City-wide by the ultimately selected private contractor that will own, install, and operate the broadband network.

- Subscriber Services (each service will likely be branded):
 - Fixed Managed High-Speed Wireless Broadband Connectivity
 - Internet Access – provides broadband wireless access for the City, residences and businesses
 - T-1 Replacement – broadband wireless access as a replacement for a telephone company or other carrier’s wired T-1 service
 - Disaster Recovery / Redundant Access – broadband wireless access as an addition to wired service to serve as a backup route in a disaster recovery scenario
 - Mobile Managed High-Speed Wireless Broadband Connectivity
 - Emergency – high-speed broadband access for mobile police, fire, and other public safety and emergency personnel
 - Non-Emergency – broadband access for non-public safety or emergency city workers, including public works, building inspectors, traffic and parking enforcement, social workers, etc.
 - Mass Transit (low-speed for non subscribers, but high-speed for subscribers) – broadband wireless access for subscribers while riding mass transit or light rail vehicles
 - Water Meter Reading – wireless dispatch of readings from water meters or other utilities controlled by the city
 - Homeland Security – broadband wireless access available as an alternative method of communication for mobile City staff associated with Homeland Security mandates
- Added Value Services:
 - Web Hosting Solutions – provided to residential and small business subscribers – available as a standard or premium level service
 - Email Hosting Solutions – fixed number of e-mail addresses provided as part of the subscription service to both small businesses and residential customers – available as a standard or premium level service
 - Anti-Virus and UBE (Unsolicited Bulk Email) Filtering - provided as part of the subscription service to both small businesses and residential customers

- Amenity Services:
 - Fixed Managed Low-Speed Wireless Narrowband Internet Connectivity (casual user)
 - Casual Internet Access – low-speed Internet connectivity would be made available Citywide to all residents and visitors. This service would mirror the typical Hot Spot connectivity available at nearly 300 locations throughout the metro area today. Subscribers to the Minneapolis broadband wireless service would have high-speed connectivity available to them at all locations throughout the City. The targeted locations include City parks, libraries and other public spaces.
 - Mobile Managed Low-Speed Wireless Narrowband Connectivity
 - Casual Internet Access – low-speed for non-subscribers, but high-speed for subscribers. The targeted locations include buses, light rail and vehicles.

Fixed Managed High-Speed Wireless Broadband Connectivity

In addition to supporting the defined business requirements for the City’s institutional users, the selected private partner will also focus on the provisioning of broadband Internet access to businesses and residents. Bandwidth is typically provided over the 2.4 GHz (Giga-Hertz) spectrum. To access this service, a user will have to either call the toll free number provided on the web site and other marketing materials or sign up online via a secure web portal page. The user will be provided with a user name, password, and access instructions upon approval of their credit card. Users will initiate a connection via their built in Wi-Fi, external USB Wi-Fi, or internal PCI or PCMCIA Wi-Fi Card and enter their login information. The users will then have a symmetrical connection (upload and download speeds are expected to be the same) to the Internet. This connection is equivalent in quality to business-class SDSL services. Users will have access to email services and complete portability within the Wi-Fi cloud.

T-1/Wired Service Replacement and Disaster Recovery

The selected private partner, via use of the licensed spectrum, can also offer high capacity HiCap bandwidth services to businesses. Bandwidth services differ from access services primarily in terms of available bandwidth. HiCap bandwidth services typically use the 5GHz frequency. This is equivalent in quality to business-class wired services without the local loop or mileage charge requirements of the Local Exchange Carrier (LEC). By tapping in to key points on an existing fiber network, a public/private partner can set up a transmission/regeneration tower that transmits the bandwidth via microwave to the next regeneration tower utilizing radios and antennae.

It is important to remember that this technology is providing T1 type bandwidth to businesses without utilizing the Local Exchange Carrier (LEC) and the business will be responsible for their own internal network, which may or may not be Wi-Fi capable. Businesses that wish to keep their wired service connections (T-1, etc.) can also subscribe to broadband wireless access to ensure “always-on” connectivity in the event of a disaster situation that renders their wired service inoperable.

Technology - 802.11 and 802.16 Standards

The Institute of Electrical and Electronics Engineers (IEEE) has published a set of ratified standards for the deployment and operation of wireless Local Area Networks under the 802.XX family. The IEEE 802 LAN/MAN Standards Committee develops Local Area Network standards and Metropolitan Area Network standards. The most widely used standards are for the Ethernet family, Token Ring, Wireless LAN, Bridging, and Virtual Bridged LANs.

802.11 refer to a family of specifications developed by the IEEE for wireless LAN technology and specify an over-the-air interface between a wireless client and a base station or between two wireless clients. The IEEE accepted the specification in 1997. There are several different specifications within the 802.11 family:

- 802.11 -- applies to wireless LANs and provides 1 or 2 Mbps transmission in the 2.4 GHz band using either frequency hopping spread spectrum (FHSS) or direct sequence spread spectrum (DSSS).
- 802.11a -- an extension to 802.11 that applies to wireless LANs and provides up to 54 Mbps in the 5GHz band. 802.11a uses an orthogonal frequency division multiplexing encoding scheme rather than FHSS or DSSS.
- 802.11b (also referred to as 802.11 High Rate or Wi-Fi) -- an extension to 802.11 that applies to wireless LANs and provides 11 Mbps transmission (with a fallback to 5.5, 2 and 1 Mbps) in the 2.4 GHz band. 802.11b uses only DSSS. 802.11b was a 1999 ratification to the original 802.11 standard, allowing wireless functionality comparable to Ethernet.
- 802.11g -- applies to wireless LANs and provides 20+ Mbps in the 2.4 GHz band.

802.16, the specification for Wireless Metropolitan Area Networks, released in early 2003, was an air interface standard for broadband wireless access systems using point-to-multipoint infrastructure designs, and operating at radio frequencies between 10 GHz and 66 GHz. It targeted an average bandwidth performance of 70 Mb/s and peak rates up to 268 Mb/s. The 802.16 standard is intended to address some of the perceived limitations of 802.11 such as range and mobility. Ongoing development within the IEEE working groups for 802.16 has provided additional changes to the original specification that are summarized below.

- 802.16a-- 802.16a, or WiMAX. 802.16a, which was approved by the IEEE in January 2003, is basically an amendment to the more general 802.16 core standard developed by the IEEE. The 802.16a collection of amendments took into account the emergence of licensed and license-exempt broadband wireless networks operating between 2 GHz and 11 GHz, with support for non-line-of-sight architectures that could not be supported in higher frequency ranges. 802.16a added specifications for enhancements at the Physical and Media Access Control layers for improved interoperability.
- 802.16 Revision D--While 802.16a does much to improve on the original standard, the core standard had so many amendments attached to it that the IEEE re-drafted the specification. The new standard, referred to as 802.16 Revision D was approved by the IEEE-SA Standards Board on June 24, 2004.
- 802.16e—A new amendment, 802.16e, that introduces mobility into the WiMAX standard was approved, as IEEE Std 802.16e-2005, by the IEEE-SA Standards Board on 7 December 2005. The 802.16e amendment covers "Physical and Medium Access Control Layers for Combined Fixed and Mobile Operation in Licensed Bands".

According to a Visant Strategies study: <http://www.visantstrategies.com/pr80216.htm>; the more robust 802.16 standard, for high-speed broadband wireless delivery to laptops and desktops, will augment the burgeoning Wi-Fi market. The position of the 802.16a standard today parallels that of WLAN technology in the late 1990's, when the market finally grew as 802.11 prices vs. performance gains converted WLAN from a niche to mass market. "Under the current conditions, 802.16a could emulate 802.11's rise several years from now," said study author Visant Strategies Senior Analyst Andy Fuertes. "Many chip and equipment vendors ignored the chance to get into the 802.11 market early and create market share due to market-size limitations created by high equipment costs, a much smaller potential audience and no need for all things Internet and Intranet yet. WiMAX offers these technology companies a fresh start."

The 802.16a and 802.16e standards are considered the next step beyond Wi-Fi because they are optimized for broadband operation, fixed and mobile, in the wide area network. The 802.16 standards include numerous advances such as quality of service, enhanced security, higher data rates, and mesh and smart antenna technology.

The City's decision to contract with a private partner to deploy, operate, and continuously upgrade the planned broadband network eliminates the need for the City to continuously monitor standards development as well as the costs and the responsibility to deploy new, more effective broadband technologies on an ongoing basis.

The table below presents a comparison of the capabilities of equipment that complies with both the 802.11 standard and the evolving 802.16 standard.

Category	802.11	802.16	Technical Explanation
Range	<ul style="list-style-type: none"> Optimized for users within a 100 meter radius Add access points or high gain antenna for greater coverage 	<ul style="list-style-type: none"> Optimized for typical cell size of 7-10 Km Up to 50 Km range No “hidden node” problem 	<ul style="list-style-type: none"> 802.16 physical layer tolerates 10 more multi-path delay spread than 802.11
Coverage	<ul style="list-style-type: none"> Optimized for indoor environments 	<ul style="list-style-type: none"> Optimized for outdoor environments Standard support for advanced antenna techniques and mesh 	<ul style="list-style-type: none"> 802.16: 256 OFDM (vs. 64 OFDM) Adaptive modulation
Scalability	<ul style="list-style-type: none"> Channel bandwidth for 20 MHz is fixed 	<ul style="list-style-type: none"> Channel bandwidth is flexible from 1.5 MHz to 20 MHz for both licensed and license exempt bands Frequency re-use Enables cell planning for commercial service providers 	<ul style="list-style-type: none"> Only 3 non-overlapping 802.11b channels; 5 for 802.11a 802.16: limited only by available spectrum
Bit rate	<ul style="list-style-type: none"> 2.7 bps/Hz peak data rate; up to 54 Mbps in 20 MHz channel 	<ul style="list-style-type: none"> 3.8 bps/Hz peak data rate; up to 75 Mbps in a 20 MHz channel 5 bps/Hz bit rate; 100 Mbps in 20 MHz channel 	<ul style="list-style-type: none"> 802.16: 256 OFDM (vs. 64 OFDM)
Quality of Service	<ul style="list-style-type: none"> No QoS support today – 802.11e working to standardize 	<ul style="list-style-type: none"> QoS designed in for voice/video, differentiated services 	<ul style="list-style-type: none"> 802.11: contention-based MAC (CSMA) 802.16: grant request MAC

Preferred Architectural Direction

The City's broadband network RFP noted that the City recommended deployment of a broadband IP data access network that would provide support for the 802.11b and 802.11g standards and that this 2.4 GHz network employ a mesh architecture for the most effective coverage and a reduction in wired access points. The mesh overlay should dynamically route wireless traffic along the highest throughput path to a wired gateway. This intelligent routing will negate the effect of radio frequency interference and eliminate 90-95% of the wired backhaul traditionally associated with wireless network access point solutions. Additionally, the City's contractor should use a combination of City fiber and fixed point-to-multipoint wireless technology for its backhaul connections.

Equipment based upon the 802.16 standard for Metropolitan Wireless Area Networks will provide more range and increased mobility options, and major manufacturers of 802.11b compliant equipment are now introducing equipment that complies with the 802.16 specifications. It is expected that the ultimately selected private partner will utilize a range of network infrastructure equipment that will include forward-compatibility functionality.

Technology and Service Offerings

The chart inserted below lists various service types and applications that can be offered on the planned metro-scale broadband access network from the ultimately selected private partner. For each of the services and applications that will be supported, the chart provides the opportunity level (High, Medium or Low) currently estimated for adoption of that particular service or application in the three primary markets of Institutional, Residential, and Business customers. A column has also been inserted to cite the services expected to be adopted by City visitors, convention exhibitors and others who would access the network and consider it a City amenity.

Wireless Service Offering	Residential	Institutional	Business	City Amenity and Visitors
Fixed Managed High-Speed Wireless Broadband				
Internet Access	High	Low	High	High-convention exhibitors
T-1 Replacement	N/A	High	High	Medium-exhibitors
Disaster Recovery/Redundancy	N/A	Medium	High	N/A
Mobile Managed High-Speed Wireless Broadband				
Emergency/Public Safety	N/A	High	Medium	N/A
Public Works	N/A	High	N/A	N/A
Building Inspectors	N/A	High	N/A	N/A
Traffic/Parking Monitoring & Enforcement	N/A	High	Low	N/A
Social Workers	N/A	High	N/A	N/A
Fixed Managed Low-Speed Wireless Narrowband Connectivity				
Casual Users in parks, plazas, libraries	High	Medium	High	High
Mobile Managed Low-Speed Wireless Narrowband Connectivity				
Casual Users in buses, light rail, and other mass transit	High	Low	Medium	High

Customer Support

The ultimately selected private partner will be required to provide an exemplary level of customer service. In addition, the private partner must ensure that the deployed network provides the highest level of technical functionality possible. The City's expectations include:

- Fast and Professional Installation where required
- Reliable and dependable Quality of Service (QoS)
- Highly secure connections
- Always-On Access
- 24x7x365 Customer Service

Installation

The selected private partner will provide comprehensive installation services, where required, to ensure that all new customers are brought on line quickly and accurately. While physical installation will only be necessary for businesses and for those residential facilities where residents have not purchased and installed their own Customer Premise Equipment (CPE), the overall goal of the enterprise will be to provide prompt and effective installations. This will include:

- On-site pre-installation review and design
- Service installed within 10 business days of receipt of order
- Baseline service certification, including on-site signal, speed, and other testing metrics

Help Desk Services

The City of Minneapolis wireless broadband access network provider will be required to provide a toll-free number directly to call center agents in its technical service center, as well as on-line access to the technical center for E-trouble/service tickets 24 hours a day.

- Hardware – The private partner will provide a one-call source for hardware and software help desk support. The kinds of help offered will include
 - Support for new installations
 - Problem diagnosis and resolution
 - How-to-do-it assistance
 - 7x24x365 on-call emergency support
- Software – The private partner will provide a one-call source for software help desk support. The service will include:
 - Connection to a software support specialist
 - Access to technical expertise 7x24x365

Marketing and Sales

While the initial deployment of the broadband IP data access network is intended to provide support for City operations, the ultimate success of the private partner to install and manage a metro-scale wireless broadband access network will depend upon the effectiveness of the marketing and sales strategy that is employed to promote and sell network connectivity and wireless access services. Through the RFP process, the City of Minneapolis requested information from competing vendors regarding the sales and marketing strategies that they would employ to promote the highest level of adoption by residential subscriber and business customers. Cities that have completed or just recently begun deployment of such wireless networks have utilized a host of marketing and sales techniques to ensure the success of their cooperative initiatives, to increase public awareness of the offerings available, and to guarantee the market penetration the contractor needs to achieve the ROI or revenue streams envisioned in their planning processes. Some cities have held large, public events introducing the community at large to their new wireless networks. Cities are also publicizing the availability of wireless broadband access on their web sites, in City publications, in marketing approaches to potential convention managers, in press releases and other documents issued by their Economic Development organizations, in local newspapers and magazines, and in City utility bills.

Both of the finalists selected have extensive sales and marketing capabilities, which they employ to acquire new subscribers or to offer additional services to existing subscribers. One of the finalists, US Internet is already a leading provider of IP based network services in Minneapolis, with thousands of Minneapolis based business and residents as customers. Wireless broadband, with its flexibility, would enhance their current offerings to existing customers along with giving them an excellent opportunity to earn new subscribers throughout Minneapolis, as well as expanding their product offering to existing customers. Both of the finalists have indicated that they would use a variety of sales and promotional tactics and strategies to foster the economic success of their proposed solutions. In addition to using the services of Value Added Resellers to market their planned service offerings, the ultimately selected contractor would utilize a multitude of sales and marketing strategies that would likely include the following:

- Telemarketing services
- On-Line Web advertising
 - o Portals
 - o Browser capture and signup for transient traffic
- Radio
- Bill Board Advertising
- Direct Mail
- Existing Sales Teams
- TV Advertising
 - o Local Networks
 - o Cable
 - o Satellite
- Airport advertising
- Transportation Advertising
 - o Light Rail
 - o Taxi
 - o Bus
- Newspapers
 - o Star Tribune
 - o Pioneer Press

- Magazines
 - o Local publications
 - o Airline magazines

Network Operations

It is critical that a broadband wireless network be properly managed to ensure effective service management, service provisioning, quality /class of service management, performance management, configuration management, and appropriate billing. Under the City's planned approach, this service would be provided by the network service provider. One company, Pronto Networks, manufactures and distributes their Operations Support Systems software and this suite is becoming the de facto industry standard for service management. A description of the software suite follows below:

Pronto's Hotspot OSS™ is a carrier-class Operations Support System for large-scale, public wireless broadband networks. The Hotspot OSS is an open, standards-based Wi-Fi service delivery solution that enables rapid, cost-effective wireless broadband deployment and lower ongoing operational costs.

The OSS provides a tightly integrated platform that enables plug-n-play provisioning of edge devices, real-time authentication, subscriber management, billing mediation, customer care, roaming settlement and network management, all in a single platform for optimal efficiency. Key features of the Pronto OSS include:

- **Plug-n-Play Provisioning of Edge Devices:** enables remote provisioning, monitoring and management of multi-vendor edge devices.
- **Subscriber Management:** allows for bulk provisioning of existing users as well as Network Operations Center (NOC) managed user provisioning. Provides real-time session, subscriber and network information. Includes customer care functionality, including subscriber self-care, incident tracking and account adjustment and refund.
- **Service Creation:** enables definition of different service plan profiles, including usage-based, flat rate plans, peak/off-peak billing, and location-specific plans. Handles multiple payment options, including credit cards and pre-paid cards, and allows definition of different Classes of Service.
- **Multiple Authentication Realms:** provides Radius AAA and 802.1x support as well as multiple authentication options through external sources, including Radius, SIM, SMS, MSN Passport, etc.
- **Billing and Mediation:** enables rating and billing mediation into existing postpaid billing systems, including XML, AAA, and IPDR formats and supports pre-paid billing.
- **Remote Network Management:** allows real-time viewing and management of the Wi-Fi network edge elements. Manages real-time session quality and network information. Stores all subscriber and network (QoS) Quality of Service data for customer care and network maintenance. Provides ability to set alert thresholds for edge elements and generate automatic email alerts.
- **Roaming Services:** manages roaming agreements with major aggregators, including iPass, GRIC and Boingo and offers Inter-WISP roaming. Provides integrated clearing, settlement and reconciliation.

One excellent capability of such software, whether it is provided by Pronto Networks or not, is that it allows subscribers to be provisioned with specific Classes of Service, e.g. standard, premium, etc. For example, the City and its selected contractor could negotiate an arrangement to allow anyone access to e.g. 256 Kbps access from a City park but, when a premium user logs on, they could be recognized as such and provided with full T-1 access.

Security

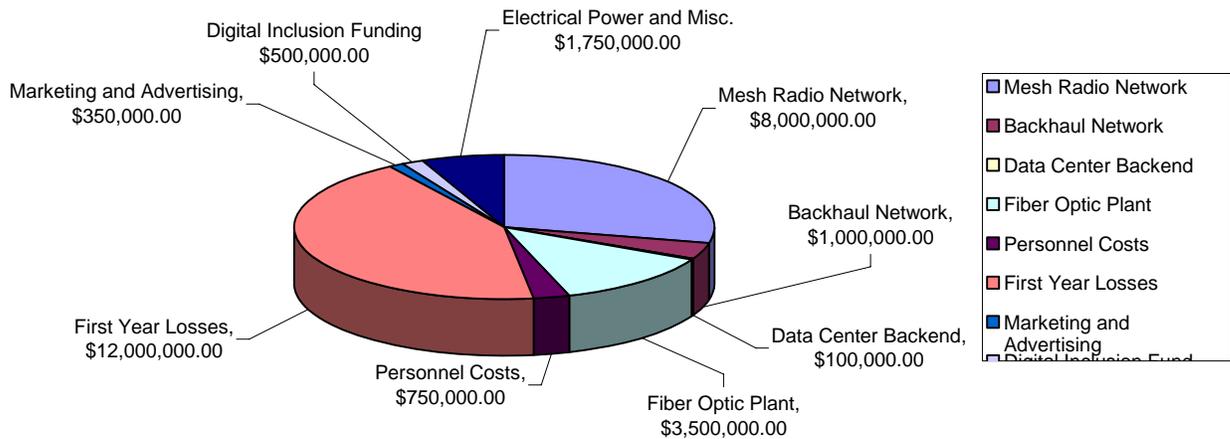
The City is highly cognizant that network security is a high-priority for a wireless broadband system and fully understand that it is important to identify key methods of providing data encryption within the system. A wireless mesh network utilizes several components to ensure data security. These include:

- User-defined traffic filters, including filters that allow access only to authorized VPN servers
- MAC address access control lists
- AES encryption of wireless routing protocols
- 128/40 bit WEP
- Full VPN compatibility

The 802.11x standard wireless protocol provides two types of basic encryption: Service Set Identification (SSID) and Wired Equivalent Privacy (WEP). It is however, a relatively well-known fact that wireless networks – by themselves – do not provide adequate security. In addition to the security requirements stated above, new security measures have recently been issued under 802.11i. The new IEEE standard brings stronger encryption and better security protocols to the table in an aim to replace the *de facto* security protocol known as WEP (wired equivalency protocol). Building on WPA, 802.11i not only uses the Temporal Key Integrity Protocol (TKIP), which routinely switches encryption keys before they can be easily hacked, but also requires the Advanced Encryption Standard (AES), which meets the US Federal Information Processing Standard (FIPS) 140-2 specification. The City has planned for this contingency by ensuring that the RFP process requested that competing vendors provide extensive information regarding the technologies that they would employ to ensure the highest level of security within their proposed wireless broadband access network. Their responses to these questions were a very key evaluation criterion in the selection of the finalist vendors.

7.0 FINANCIAL SUMMARY

Wireless Minneapolis Start Up Costs



Total Capital Funding Requirement
\$27,950,000

-15% \$23,757,500

+15% \$32,142,500

The numbers in the pie chart above are based on detail provided in the RFP responses from nine different vendors including the finalists; USI Wireless and EarthLink. In addition, prior BIS and Time Warner design and cost estimates to complete the fiber infrastructure were utilized to validate required investment for fiber optic plant. The Public Works Department provided helpful input regarding the complexity and potential cost of provisioning power to city owned street lights and facilities used to support wireless antennas and access point radios. Numerous discussions with community based organizations regarding digital inclusion initiatives, as well as a series of community input meetings, was used to create an estimate of seed funding required to address priority needs.

The reference to \$150,000 per square used on page 10 of this report is associated with the five year cost of ownership for the wireless infrastructure only. The estimate of \$8 million for these mesh radio network components divided by 59 square miles equals \$136,000 per square mile.

8.0 FUNDING

Funding for the deployment of the citywide broadband wireless network could come from four sources: taxpayers, vendors, investors, and grants.

Taxpayers

The capital required by the City to cover the cost of system varies greatly depending upon the business model selected. If the City chooses to own the system in its entirety, the most like recourse is to issues bonds or divert capital from our existing budget obligations. The annual principal and interest payments (debt service) on \$20-25M for 10 years at 5% is \$2.6-3.2 million. The assumption would be that the City would pay this from user fees, but the City takes the business risk that we don't sign up enough customers. The key question we must ask is, if we have a ten year plan to pay off our bonds and if five years down the road a new technology emerges that undercuts our offerings and we loose customers, how will we retire our dept obligations? Who do we want to bear that risk, the City or the private sector? We are dealing with emerging technology here and obsolescence in three to five years is a great concern.

Under the City Charter the City can't issue more than \$15 million in General Obligation bonds for a single project. If we need to borrow more than \$15 million we have the following options:

- We may have more than one project; if so, then we can issue up to \$15 million for each. Our bond counsel and City Attorney need to help answer this question.
- Ask the voters of Minneapolis for the approval to issue more (we rarely do this).
- Ask the legislature for special law (we rarely do this).
- Change the form of borrowing to a tax-exempt lease, which is somewhat more costly and rarely done, but possible.
- Use cash reserves to fund the amount in excess of \$15 million.
- If the system is privately operated we may be able to have the private operator provide all or a portion of the capital fund via a lease. This is more costly than most other options.

Vendors

Various wireless network service providers have provided cities with the required capital to acquire the necessary equipment and deploy wireless municipal networks. There is, however, a limited pool of capital sources focused on city scale wireless business opportunities. The ability to secure capital for programs such as the Minneapolis initiative will become increasingly difficult as cities such as Chicago and Houston enter the market. Both cities have stated they intend to follow the Public/Private Partnership business model that depends upon such sources of capital.

Investors

Minneapolis may also directly seek capital from outside investors by releasing the wireless network business plan complete with appropriate cost and revenue projections. As outlined above, the most likely source of such investment is through the bond markets.

Grants

The City may also seek to fund portions of the network deployment cost with capital obtained through various available grants. We believe this would be most applicable for improvements made to the fiber optic plant. Our design considerations afford the City significant expansion to support our desired Public Safety, Homeland Security and Emergency Preparedness driven infrastructure modifications. The preparation of specific grant requests earmarked to fund such enhancements is now underway.

Potential Sources of Revenue

	Year 1	Year 2	Year 3	Year 4	Year 5
City of Minneapolis Usage	-	750,000	1,000,000	1,300,000	1,500,000
Residential Broadband Access	75,000	2,500,000	4,500,000	7,500,000	9,000,000
Business Broadband Access	150,000	2,500,000	8,000,000	10,000,000	13,000,000
Fixed Wireless Connectivity	25,000	450,000	1,200,000	1,500,000	1,750,000
Business Traveler/Visitor	-	750,000	2,000,000	2,750,000	3,500,000
Applications Services	-	-	600,000	900,000	1,200,000
Wholesale Access	100,000	250,000	450,000	700,000	1,000,000
Total	350,000	7,200,000	17,750,000	24,650,000	30,950,000

We estimate the basic price point for broadband residential services to be in the range of \$18-\$24. Basic business services are estimated to be available at lower than current comparable DSL and T-1 pricing in the marketplace. Visitor pricing for mobile services city wide are estimated at rates favorable to current hotel and national hot spot offerings and offer superior bandwidth and roaming.

The estimates assume 168,000 households in Minneapolis with current Broadband penetration at approximately 45%. This means 76,139 home now utilize broadband services. According to internet retailer.com an additional 46,155 use dial up services and 55% of those users indicate they would switch to broadband if available and similar in price to dial up services.

The revenue projections further assume a take rate of 10% of this user community by year two. According to real estate industry research, there are 40,563 businesses in the City of Minneapolis, half of which employ fewer than five individuals. Only 25 businesses employ more than 5,000 individuals. Our estimate is that the provider will derive approximately \$1,000.00 per year in revenue from an estimated 2,500 businesses by year two. We anticipate break even levels of revenue from all sources will be achieved in year three. That points to a reasonable level of risk for experienced providers and a very high level of risk for a start up enterprise. There is no assurance that this level of subscriber revenue is sustainable.

Cedar Falls, Iowa has had a municipally owned communications system for nine years. The system has covered its operating costs since the second year, but not its capital and finance costs, which we can track with a financial measure called free cash flow to investors. The Cedar Falls municipal communications system has had negative free cash flow every year except one. It is \$3.1 million short of paying back what taxpayers have paid into it. Cedar Falls' municipal communications system has operated with a negative annual free cash flow to equity in all but one year. Its internal rate of return is -7.24 percent, meaning it has been a poor investment for taxpayers and ratepayers.

Muscatine, Iowa has had a municipal communications system for six years. It's had negative free cash flow every year except 2004. It is \$25.6 million short of payback. Muscatine's municipal system increased its total debt from \$20.30 million in 1998 to \$36.49 million in 2004. It is \$25,554,984 below its payback point after seven years of operation, and its internal rate of return is -84.7 percent.

Spencer, Iowa has had a municipal communications utility since 1999. Spencer had negative free cash flow until 2003 and seems to have had a positive cash flow since then ... but Spencer's electric utility has paid more than \$9 million in capital costs for the communications utility, transferred \$1.55 million in assets to the communications utility, and loaned it \$8 million at 4.5 percent interest, less than the 5.75 percent the electric utility pays for its own bonds. Spencer's communications utility appeared to achieve positive annual free cash flow to equity in 2003 and 2004 after four years of deficits, but it has received large subsidies from Spencer's electric utility. Adjusting for these subsidies eliminates Spencer's surplus. The combined investment by the two utilities is \$18,286,703 below its payback, and its internal rate of return is -45.79 percent.

Bristol, Virginia operates a municipal communications utility that it launched in 2002. It too is unlikely ever to achieve positive free cash flow. It was originally funded by a \$15 million revenue bond issue, and then refunded in 2004 at \$27.5 million. It has borrowed \$14.9 million from the electric utility and has had operating losses (including cost of capital and interest) of \$8.6 million so far.

The City's position in the Public/Private Partnership model, in contrast to the position of the cities noted above, provides significant leverage to ensure strong Vendor performance during the life of this contract. The City will own the fiber optic infrastructure.

This ownership, our control of the right of way, and the City's anchor tenancy will allow the City to fully enforce Community Benefits and Service Level Agreements, and ensure that by leveraging its position the same competitiveness and network performance will be available to residents and businesses. The City will negotiate specific consequences associated with network vendor's performance. Should the City determine that contract termination is appropriate; the terms typically negotiated will allow the City to assume full control and ownership of the network through a buy out option triggered by such non-performance.

9.0 Glossary of Telecommunications & Technology Terms

Baud - A measure of the speed at which data is transmitted, computed in number of elements changed per second. The “Baud Rate” is the speed in which computers can transfer data through a modem using communications software.

Bandwidth - A range of frequencies in the broadcast spectrum that is occupied by a transmission signal and the capacity of a telecom line or wireless transmission to carry signals. (For example, a television channel may have a bandwidth of 6 MHz.) The “necessary bandwidth” is the amount of spectrum required to transmit the signal without distortion or loss of information. Commission rules require suppression of the signal outside the band to prevent interference. In digital systems, the bandwidth of the system is the speed at which data is transmitted over the system, measured in bits per second (bps).

Base Station - A land station in the land mobile service. For example, in cellular and personal communications uses, each cell has its own base station; each base station is interconnected with other base stations and with the public switched network.

Broadband - Broadband is a descriptive term for evolving digital technologies offering consumers a signal switched facility offering integrated access to voice, high-speed data services, video-demand services, and interactive information delivery services. . The FCC's definition of broadband is any system capable of transmitting data in excess of 200 Kbps upstream and downstream. All communications systems that operate at a slower speed than broadband are called “narrowband”.

Broadcast - To transmit a signal over the spectrum to be received by two or more receiving devices.

Browser - A software program used to query, search and view information on computer sites connected to the Internet.

Local Exchange Carrier (“BLEC”) – The local telephone company.

Byte - A set of “bits” that represent a single character. Usually there are eight bits in a Byte.

Cable modem - A cable modem is a device installed in the home that enables cable modem subscribers to attach personal computers to a local cable TV line and interact with the Internet at high speeds.

Competitive Access Providers - Common carriers who provide local service and compete against local telephone companies’ access services that connect customers to long distance companies. These carriers often use fiber optic networks.

Convergence - In this context, convergence means that providers of communication systems can deliver products and services that compete with the products and services now delivered by other networks. One example would be a cable company providing local phone service or a local phone company providing video services.

Customer Premises Equipment (CPE) - Terminal devices, such as modems, routers etc. located on the customer's premises.

Digital Subscriber Line ("DSL") - A broadband service offered by telephone companies. DSL technology is capable of transmitting digital information at high bandwidths (up to 6 Mbps) on existing phone lines to homes and businesses. It also makes it possible to split phone lines into two parts, one of which can be used for voice or fax communication while the other is used to transmit data between computers.

Direct Broadcast Satellite (DBS/DISH) - A high-powered satellite that transmits or retransmits signals, which are intended for direct reception by the public. The signal is transmitted to a small earth station or dish (usually the size of an 18-inch pizza pan) mounted on homes or other buildings.

Download (Receive) - To receive data from another computer into your computer. It is also called "receive." The opposite is called "Upload."

Electronic Bulletin Board - A system located on a computer network that allows users to post or receive information; it facilitates file sharing.

Electronic Mail (E-Mail) - E-Mail allows the user to send a message via a computer instantly to one or many persons around the world. E-mail users typically have a "mailbox" on a network or a videotext system where other users can send messages to be retrieved by the recipient.

Fixed Service - Radio-communications service between specified fixed points.

Flat Rate - A method of pricing in which a fixed rate is charged for a given service, regardless of usage. The fixed monthly charge that a residential subscriber in a local exchange pays to be allowed to make an unlimited number of local calls is an example of a flat rate.

Footprint - The area in which a specific transmission can be received. Some footprints cover as much as one-third of the earth, such as satellite or cell systems.

Frequency - A measurement of the number of electromagnetic waves that pass a given point in a given time period. It is equal to the speed of light divided by wavelengths, and is expressed in Hertz (cycles per second).

Gateway - Gateways provide a single source through which users can locate and gain access to a wide variety of computer services. Gateways typically offer a directory of services available through them, and provide billing for these services.

Gigahertz (GHz) - A unit of frequency equal to one billion hertz (one billion cycles per second).

Global Positioning System (GPS) - A US satellite system that lets those on the ground, on the water or in the air determine their position with extreme accuracy using GPS receivers.

Headend - The electronic control center of a cable system. This is the site of the receiving antenna and the signal processing equipment essential to proper functioning of a cable system.

Hertz (Hz) - A unit of frequency equal to one cycle per second (cps). One kilohertz equals 1000 cps; one megahertz equals 1 million cps; one gigahertz equals 1 billion cps.

Host - Your Internet access provider's computer. You may use one of its hard-wired terminals, if you are at an institution with a mainframe computer connected directly to the Internet, or you may dial up via modem to connect with the Internet access provider's host computer.

Incumbent Local Exchange Carrier ("ILEC") - An Incumbent (such as Pacific Bell or GTE) is a telephone company in the U.S. that was providing local telephone service when the Telecommunications Act of 1996 was enacted. (Also see RBOC.)

Interconnection - The connection of one telecommunication carrier's network to another or the connection of a piece of telephone equipment to the nation-wide telephone network.

Interface - The point at which two systems or pieces of equipment are connected.

Interference - Unwanted electrical signals or noise causing degradation of reception on a communications circuit.

Internet - A computer network stretching across the world that links the user to businesses, government agencies, universities, and individuals. The Internet provides computers with the ability to connect with other computers for communicating, disseminating and collecting information.

Internet Service Provider ("ISP") - A company that provides individuals and other companies' access to the Internet and other related services such as web site building and hosting. An ISP connects subscribers to the Internet in a manner similar to the way in which phone lines connect users to the telephone network. Some ISPs offer specialized content to subscribers in addition to access to the Internet.

Kbps - Kbps stands for kilobits per second (thousands of bits per second) and is a measure of the speed data travels on a data transmission medium such as twisted-pair copper lines, coaxial cable, or optical fiber.

Local Loop - In telephony, a local loop is the wired connection from a telephone company's central office to a single customer's telephone. This connection is usually on a pair of copper line wires called twisted pair.

Mbps - Mbps stands for megabits per second (millions of bits per second) and is a measure of bandwidth (the amount of data that can flow in a given time) on a data transmission medium such as twisted-pair copper line, coaxial cable, or optical fiber.

Network/Networking - A group of computers connected in any way that allows data to be sent among these computers

Real Time - Usually used to describe situations when two or more people are interacting via their keyboards on the computer in real time, versus delayed back-and-forth communication, such as with e-mail.

Regional Bell Operating Company (RBOC) - Any one of the seven monopoly local phone companies. The Regional Bell Operating Companies, also known as the “Baby Bells”, were the created as a result of the divestiture of AT&T in 1984 at the conclusion of the U.S. Department of Justice antitrust lawsuit. Originally the seven companies were: Ameritech, Bell Atlantic, BellSouth, NYNEX, Pacific Telesis, SBC and U.S. West. SBC subsequently acquired Ameritech and Pacific Telesis, and Bell Atlantic acquired NYNEX and was subsequently acquired by Verizon, reducing the number of RBOCs to four.

Service Provider – A provider that owns circuit-switching or packet-switching equipment.

Telecommunications - Any transmission, emission or reception of signs, signals, writing, images, sounds or intelligence of any nature by wire, radio, optical or other electromagnetic systems.

Wide Area Network (“WAN”) or Local Area Network (“LAN”) - The term **WAN** is used to describe a data network used to interconnect a companies’ remote sites, or widely dispersed computer equipment. The term **LAN** is used to de-scribe a local data network, one that is used to interconnect the computer equipment of a commercial user.

Wireless Communication - Any broadcast or transmission that can be received through microwave or radio frequencies without the use of a cable connection for reception.

10.0 ATTACHMENTS

BIS Strategic Plan

Jupiter Research Report

Council Resolution

The RFP

City of Minneapolis Communications Plan

FAQ's

Draft Pilot Specifications

Workgroup Summaries

Participant List

Assessing the Digital Divide in Minnesota

State of the Digital Divide in Minneapolis