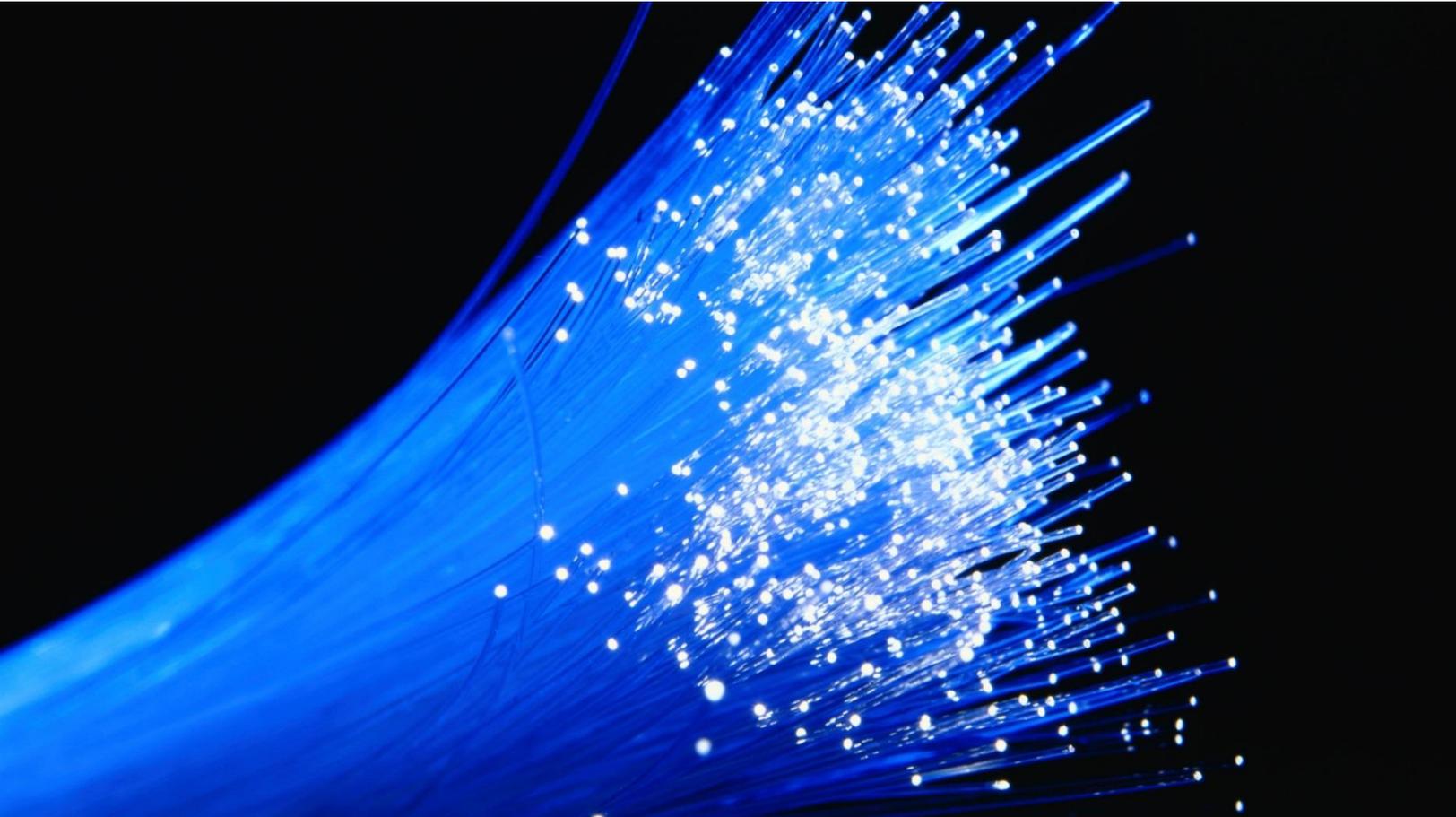


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## **DRAFT** Fiber-to-the-Premises (FTTP) Implementation Plan

Prepared for City of Madison  
May 2018

Columbia Telecommunications Corporation

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## 1 Executive Summary

As access to the internet has become an increasingly common and necessary part of everyday life, it has also become an issue of social inequality. A “digital divide” separates those who can and cannot afford—and indeed, even access—a fast connection to the internet. The digital divide has real consequences for those without adequate access.

In November 2015, the City of Madison’s Digital Technology Committee (DTC) was tasked with determining the feasibility of the City pursuing deployment of a citywide ultra-high-speed fiber-based broadband network. The DTC engaged CTC to prepare a fiber-to-the-premises (FTTP) feasibility analysis. The City then issued a resolution to accept the resulting report and direct the DTC to develop an implementation plan for the fiber network.

This implementation plan was prepared in early 2018 by CTC Technology & Energy (CTC) with input from City staff as part of the City’s ongoing effort to address the digital divide. The report:

- Summarizes the City’s efforts thus far to bring ubiquitous and equitable internet access to the City’s residents
- Provides an overview of the City’s request for proposals (RFP) for deployment of an FTTP network
- Discusses the financial implications of constructing a ubiquitous FTTP network using information gained from the RFP process
- Outlines the City’s potential next steps in terms of implementing an FTTP network

Based on the information in this report, the City may decide to proceed with the project as outlined in the RFP, pursue an alternative approach to bringing a high-speed fiber network to Madison, or defer the project.

### 1.1 The City Has Taken Many Steps Toward Achieving Its Broadband Goals

The City is engaged in efforts to bring ultra-high-speed broadband connectivity to the community. The City recognizes that fiber-based connectivity—particularly FTTP—is an important foundation for taking full advantage of the power of broadband.

The City’s analysis has focused on deploying an FTTP network that would pass all homes and businesses in Madison. A ubiquitous FTTP buildout would ensure that every resident and business has the opportunity to access the network, would provide consumer choice, and would support the community’s bandwidth needs for the foreseeable future.

The City has undertaken several steps toward achieving its broadband goals: It commissioned a digital divide pilot program, commissioned an FTTP feasibility study, and issued an RFP seeking partners for an FTTP deployment.

### 1.1.1 Digital Divide Pilot Program

In October 2015, the City awarded a contract to ResTech Services, LLC (ResTech) for a two-year pilot program aimed at addressing the digital divide by bringing broadband service to residential customers in four low-income areas in the City.<sup>1</sup> The program, dubbed “Connecting Madison,” was designed to serve customers in multi-dwelling unit (MDU) buildings ranging from two units to more than 100 units. The pilot was an effort to connect residents who may never previously have had access to broadband service—either because no service was available in their areas, or because they could not afford it. The pilot was also intended to provide the City with real-world data that could be used to inform future broadband deployment efforts.

The City terminated the contract with ResTech in January 2018. At that time, the pilot network had only 19 active customers. Despite the low adoption rate, the pilot project gave the City valuable insight into the challenges of both deploying broadband and encouraging adoption. Particularly, the City learned that the MDU broadband market is difficult to enter and that the availability of a high-speed service by itself is not enough to drive adoption. The pilot program is discussed further in Section 3.

### 1.1.2 FTTP Feasibility Study

In early 2016, the City hired CTC to research and prepare an FTTP feasibility analysis. We developed a high-level network design and projected the potential costs and benefits associated with deploying a ubiquitous FTTP network throughout the City. Our cost estimates and financial analysis used a range of assumptions to illustrate various FTTP deployment scenarios. This feasibility analysis assisted the City in identifying and articulating its goals for a fiber-based broadband network:

- *Racial equity:* Align the network with the City’s Racial Equity and Social Justice (RESJ) Initiative and digital divide goals
- *Ubiquity:* Deploy the network across the entire City
- *Competition in the marketplace:* Enable multiple providers to compete

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<sup>1</sup> “City of Madison - File #40237,” *City of Madison*  
<https://madison.legistar.com/LegislationDetail.aspx?ID=2473855&GUID=356DEBE5-18B0-44BC-835A-381CCED09BFE> (accessed April 2018).

- *Consumer choice:* Enable citizens to purchase service from multiple providers
- *Control:* Ensure the City’s long-term stake in the asset

The report recommended a “shared investment and risk” model in which the City and a private partner(s) find creative ways to share the capital, operating, and maintenance costs of a broadband network.

In this “Dark FTTP Partnership” model,<sup>2</sup> the City would deploy citywide fiber infrastructure for lease to a private partner. This infrastructure would include a fiber backbone spanning all major parts of the City, and distribution fiber that would be built past (but not connecting to) every home and business in Madison. The private partner would be responsible for constructing the fiber drop cables that physically connect the distribution fiber to each customer’s premises and providing network electronics and customer premises equipment (CPE) to “light” the network and deliver retail broadband services. Because this model is based on the type of agreement first established between Huntsville (Ala.) Utilities and its private partner, Google Fiber, we refer to it as the Huntsville model.

The feasibility study estimated that the City’s portion of the capital costs required to build the network would be approximately \$150 million, spread over three to five years. As a result of the feasibility study, the City decided to seek the interest of potential partners through a request for proposals (RFP) process.

### **1.1.3 Request for Proposals**

The City and CTC developed an RFP to seek a private partner that would help bring ubiquitous broadband to the City.<sup>3</sup> The RFP was issued in August 2017 (with responses due in late October) and specified the City’s goals and preferred business model for the network.

#### **1.1.3.1 The RFP Process**

The RFP described the City’s preference for a business model similar to the Huntsville model—and the deployment of a network that would be available to every home, business, and anchor institution (e.g., schools and libraries) in Madison. It specified that the City would be responsible for constructing and maintaining the dark fiber infrastructure up to the drop cable, while the partner would be responsible for installing fiber service drops and providing lit services. The City also allowed respondents to propose alternative business models.

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<sup>2</sup> “Dark” fiber refers to fiber that has been installed and is ready to be operated but is not yet “lit” by network electronics.

<sup>3</sup> The City and CTC had considered issuing a request for information (RFI) to gauge interest and solicit creative models for a public–private partnership to bring an FTTP network to Madison, but determined that an RFP would be more appropriate, given the City’s procurement processes and policies.

The guiding principles for the City's initiative, as outlined in the RFP, include equity, jobs, innovation, growth, investing in the future, furthering the City's RESJ objectives, promoting a competitive local broadband marketplace, and supporting unfettered access. The RFP placed special emphasis on the City's RESJ objectives.

The RFP specified a required format for all responses. Most notably, respondents were required to submit separate business plan proposals and pricing proposals; City procurement rules required the RFP evaluation committee members to evaluate the business plan proposals before seeing any pricing information.

In addition to their proposed business models, respondents were required to describe their operational capabilities, the services they would offer over the network, their proposed participation in local economic development, and their proposal's alignment with the City's RESJ goals; provide a proposed service implementation schedule and references; and complete a responsibility division matrix that described the responsibilities of the City and the partner.

The City received valid responses from four entities.

#### *1.1.3.2 The Proposal Evaluation Process*

The City formed an RFP evaluation committee, which collaborated with CTC to review qualifying responses in terms of their adherence to the City's goals and objectives and to the requirements specified in the RFP.

To guide the review process and to establish the validity of each response, CTC created an evaluation matrix that assigned a numerical score to basic elements outlined in the RFP. The evaluation matrix was designed to quantify some of the respondents' strengths and weaknesses, and to drive the discussion between the City and CTC.

The RFP evaluation committee members gave each proposal a preliminary score. One response was deemed incompatible with the City's goals and requirements during the scoring process; that respondent was eliminated from consideration.

The City then held interviews with the three remaining respondents to discuss their proposals in detail. Incorporating the information gained during the interviews, the committee then scored each qualifying response based on the requirements laid out in the RFP.

Through this process, the RFP evaluation committee narrowed its search to two respondents that the committee members felt were well positioned to execute a successful FTTP program in Madison. The committee then selected a lead respondent based on the score its proposal received.

### ***1.1.3.3 RFP Responses Indicate That a Ubiquitous FTTP Network May Require \$173 Million in Bonding***

CTC updated the financial analysis created for the FTTP feasibility study based on the fee structure proposed by the lead respondent. No proposal included a fee structure that would fully cover the construction cost of the FTTP network; in each proposal, a significant portion of the funding would need to be provided by the City.

In our updated model, we estimate the City would need to seek bonds totaling \$173.2 million in order to finance construction of the fiber network. Our analysis assumes the City would seek two types of 20-year general obligation bonds: a \$52 million bond to be repaid by the City's net revenue from fees collected from the private partner, and a \$121.2 million bond that would cover the remaining construction costs, to be repaid through other means.

The financial implications of building a ubiquitous FTTP network are discussed further in Section 5. Some "beyond the balance sheet" benefits of a ubiquitous FTTP network are discussed in Section 6.

## **1.2 Elected Officials and City Agencies Will Now Decide How to Proceed**

In the first half of 2018, CTC presented the results of the RFP process and its subsequent financial analysis to the Mayor and key City stakeholders. CTC's next step will be to present its finding to the City's Citywide Broadband Subcommittee (CBS). The CBS will decide whether the findings should be presented to the DTC. With approval from the DTC and the Mayor, the plan would proceed to the Common Council—which would decide whether the City should proceed with the FTTP buildout plan and begin negotiations with the preferred respondent.

We see four potential paths the Mayor and the Common Council could take upon reviewing the findings from the RFP process:

1. The Common Council could approve moving forward with the proposal submitted by the preferred respondent. In this scenario, the City would need to complete a public hearing process before executing a contract with the vendor and deploying the FTTP network (see below). In this scenario, the City would need to determine the details of its plan to finance the FTTP deployment.
2. The City could enter discussions with the preferred respondent to develop a variation of the proposed model—in particular, an approach in which the City would build fiber infrastructure only to selected areas at first, then expand the network over time. In discussions with the City's preferred respondent, CTC learned that the respondent has an interest in exploring such an alternative. An alternative business model may allow the City to mitigate some of the risks of a ubiquitous FTTP deployment while still meeting some

of the City's goals. Although the City would have some influence over which areas are deployed, this approach would not ensure the ubiquitous availability of FTTP.

3. The City could enter discussions with various providers (potentially including entities that did not respond to the City's RFP) about a middle-mile approach, in which the providers would lease only the City's middle-mile fiber infrastructure and would invest in the last-mile distribution fiber themselves. This model would greatly reduce the City's risk and its required investment. Under this model, another competitor would enter the Madison market, but the City would have no influence on which neighborhoods receive service, or when. CTC has had informal discussions with three potential providers that have shown an interest in this approach.
4. The Mayor and the Common Council may decide not to move forward with either the FTTP plan (i.e., negotiations with the preferred respondent) or the middle-mile plan at this time—in which case, it could opt to put these plans on hold for review at a later date.

While the proposals received by the City expressed a willingness to partner with the City on its RESJ goals, many of the details were left to future discussions. To see its RESJ goals addressed in a meaningful way, it is critical that the City establish concrete objectives and requirements during its negotiations with the preferred respondent. These objectives and requirements should be an enforceable component of the agreement between the City and its preferred respondent, with clearly stated responsibilities, metrics, and milestones for each party.

We also encourage the City to consider any next steps in light of the City's broader objectives. Specifically, the DTC and the Common Council should examine the implications of potential funding sources for the population it aims to serve through its RESJ goals.

### **1.3 If the City Moves Forward with FTTP, It Will Begin the Implementation Process with a Public Hearing**

If the Mayor, the CBS, the DTC, and the Common Council decide that the City should move forward, either with the lead respondent's proposal or an alternative approach to deploying FTTP with that respondent, the following are the next steps the City will need to take, based both on requirements identified by the City's attorney and best practices for broadband deployment:

- **Public Hearing:** The Implementation Plan must be released publicly along with the cost/benefit analysis 30 days prior to a public hearing<sup>4</sup> (*1 month*)

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<sup>4</sup> According to the City's attorneys, the City of Madison must perform a cost-benefit analysis with cost and revenue projections before constructing a broadband service in order to comply with Wisconsin Statute 66.0422(2)(c).

- **Respondent Negotiations:** The City and its selected respondent must negotiate the details of their partnership and execute an agreement *(6 to 12 months)*
- **Financing:** The City will need to work through the details and legalities of the proposed funding methods *(3 to 6 months)*
- **Design and Engineering:** The City will work with its chosen respondent and any additional contractors to design and engineer the FTTP network infrastructure *(6 to 12 months)*
- **Initial Construction:** Depending on the network design, the initial construction phase will include much of the network's backbone infrastructure and fiber distribution in the first service area(s); at the end of this period, the first customers will be activated on the network *(6 to 12 months)*
- **Final Construction:** The final construction phases will see the completion of any remaining backbone infrastructure and distribution fiber throughout the City; during this time, the City's partner will begin signing up and activating customers as each service area is completed *(24 to 48 months)*

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According to the City's attorneys, CTC's 2016 feasibility study complies with this statute. If the City's Common Council gives its approval to proceeding with the FTTP construction, the City must then hold a public hearing regarding the plan and must release this analysis publicly at least 30 days prior to the hearing.

## 2 Broadband Adoption in Madison

Twice a year, internet service providers (ISP) nationwide submit data to the Federal Communications Commission (FCC) via Form 477, reporting where their wireline broadband services are available and the percentage of households subscribing to their services. This information is then aggregated by the FCC and released to the public roughly one year after collection. The data illustrate the percentage of homes with minimum internet speeds within a given census tract.

Census tracts are defined by geographical boundaries (rather than population) and can contain from 1,200 to 8,000 people.<sup>5</sup> Thus, it is impossible to obtain from Form 477 data a definitive number of households that are internet subscribers. Rather, the most recent available data (from June 30, 2016) show the percentage of households receiving a service of at least 200 Kbps one-way, and at least 10 Mbps/1 Mbps (downstream/upstream) within 75 census tracts in the City.

Table 1 provides a breakdown of Madison’s subscription rates by census tracts.<sup>6</sup>

**Table 1: Broadband Subscription Rates by Census Tract in Madison**

Percent of Households	Census Tracts with at Least 200 Kbps (One Way)	Census Tracts with at Least 10 Mbps Downstream/1 Mbps Upstream
0	1	1
1 to 20%	1	1
21 to 40%	1	2
41 to 60%	4	6
61 to 80%	13	40
81%+	55	25

The majority of census tracts have a subscription rate of 80 percent or above for 200 Kbps service, and a 60 to 80 percent subscription rate for 10 Mbps/1 Mbps. While these adoption rates are slightly higher than the nationwide average,<sup>7</sup> it should be noted that neither of these speeds meet the current FCC definition of broadband, which is 25 Mbps/3 Mbps.<sup>8</sup>

<sup>5</sup> “Geographic Terms and Concepts – Census Tract,” United States Census Bureau: [https://www.census.gov/geo/reference/gtc/gtc\\_ct.html](https://www.census.gov/geo/reference/gtc/gtc_ct.html) (accessed April 2018).

<sup>6</sup> “Residential Fixed Internet Access Service Connections per 1000 Households by Census Tract,” Federal Communications Commission: <https://www.fcc.gov/maps/residential-fixed-internet-access-service-connections-per-1000-households-by-census-tract/> (accessed April 2018).

<sup>7</sup> “Internet Access Services Reports,” Federal Communications Commission: <https://www.fcc.gov/file/12343/download> (accessed April 2018).

<sup>8</sup> “2015 Broadband Progress Report,” Federal Communications Commission: <https://www.fcc.gov/reports-research/reports/broadband-progress-reports/2015-broadband-progress-report> (accessed April 2018).

When superimposed over a map of the City, the data illustrate the geographical areas with lower subscription rates. Figure 1 (below) shows 200 Kbps adoption rates by census tract; Figure 2 shows 10 Mbps/1 Mbps adoption rates by census tract. In these maps, dark purple and red represent areas with higher adoption rates, while light purple/red and white represent areas with lower adoption rates.

Both maps show lower subscription rates in the areas northeast and southwest of downtown. There is a particular block (bordered by Mineral Point Road to the north, South Whitney Way to the east, Schroeder Road to the south, and South Gammon Road to the west) with uncommonly low subscription rates.

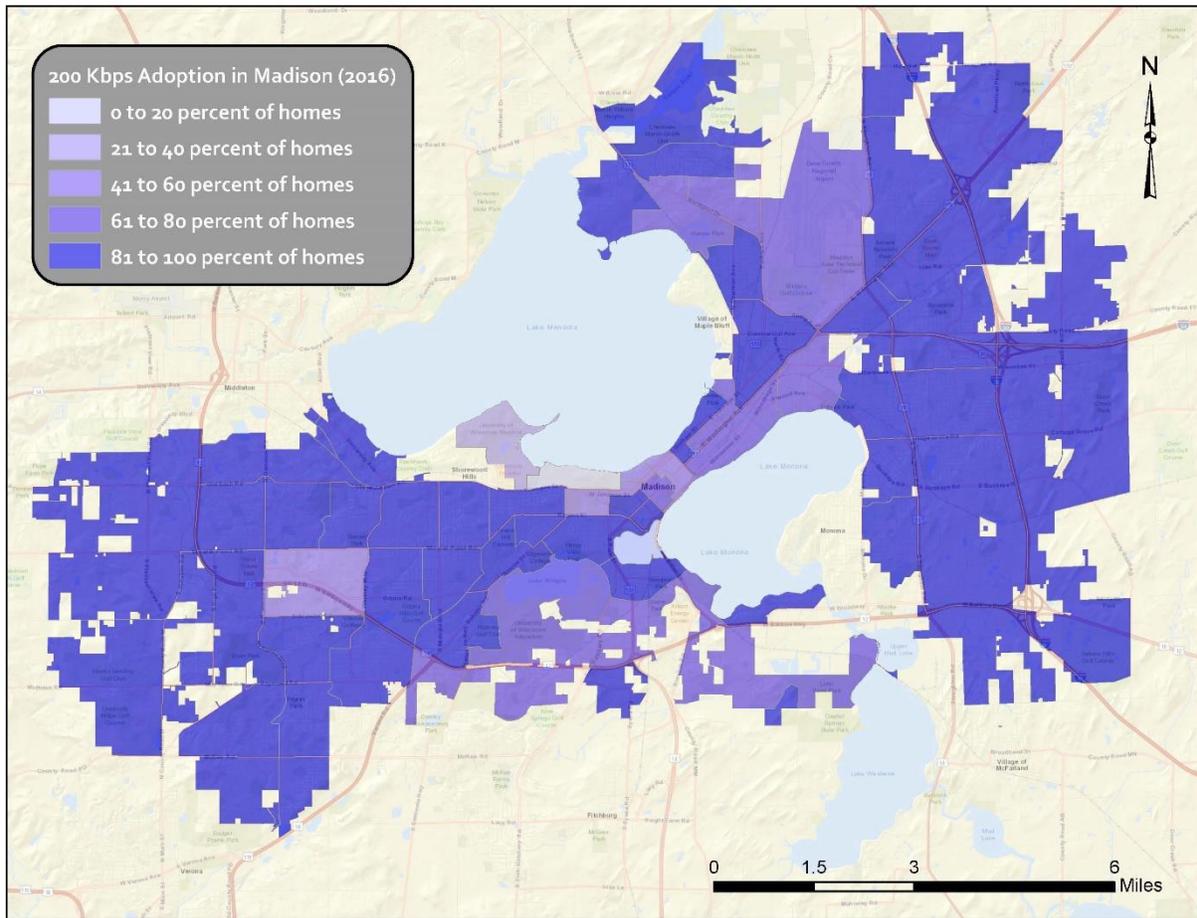
Figure 3 (below) illustrates census tracts by yearly household income, with dark purple representing higher average household income.<sup>9</sup> This map illustrates a correlation between average household income and broadband adoption in Madison—particularly at speeds over 10 Mbps/1 Mbps.

The commonalities of the geographic distribution in the data sets demonstrate that areas of the City with low household income also have lower broadband subscription rates.

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<sup>9</sup> “2016 Planning Database Data and Documentation,” United States Census Bureau, [https://www.census.gov/research/data/planning\\_database/2016/](https://www.census.gov/research/data/planning_database/2016/) (accessed April 2018).

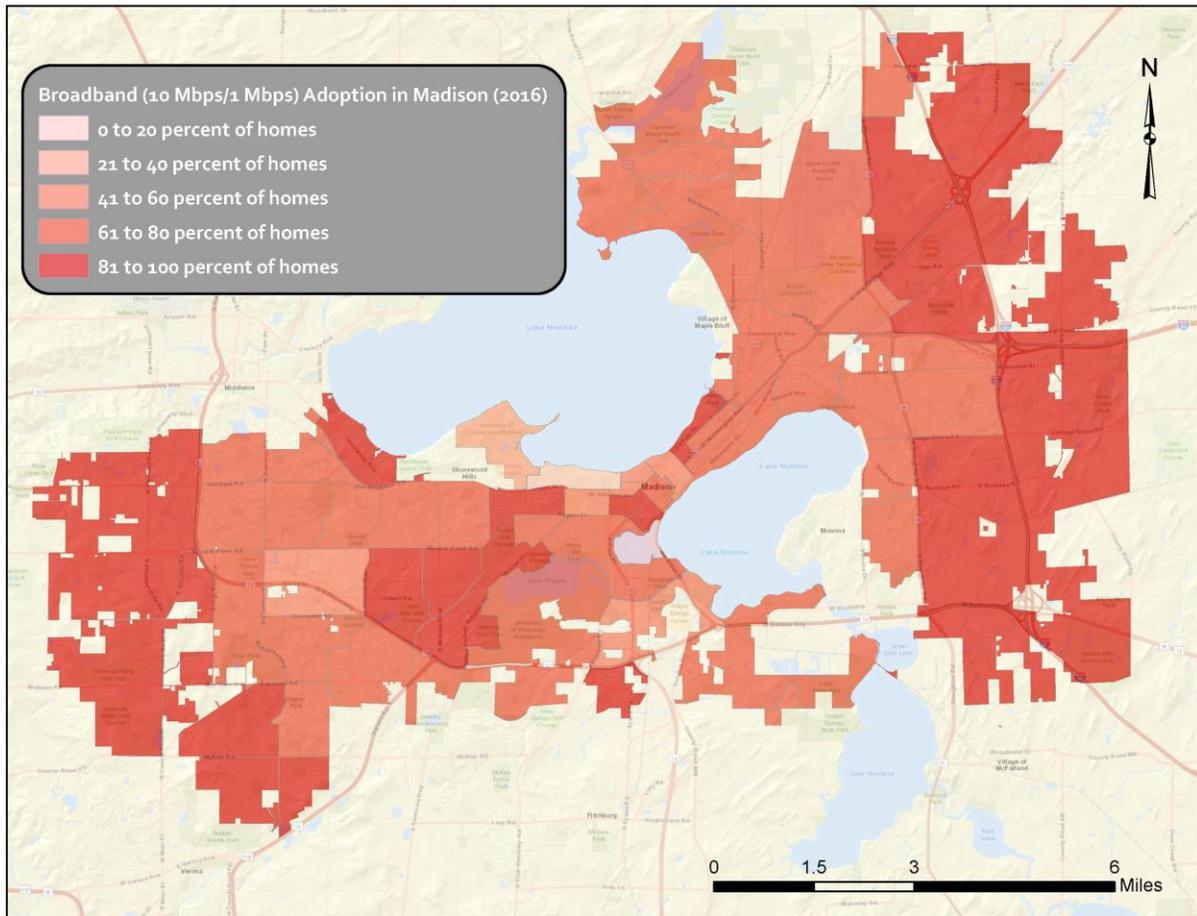
Figure 1: Percent of Households with at Least 200 Kbps Service<sup>10</sup>



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<sup>10</sup> “Residential Fixed Internet Access Service Connections per 1000 Households by Census Tract,” Federal Communications Commission, <https://www.fcc.gov/maps/residential-fixed-internet-access-service-connections-per-1000-households-by-census-tract/> (accessed April 2018).

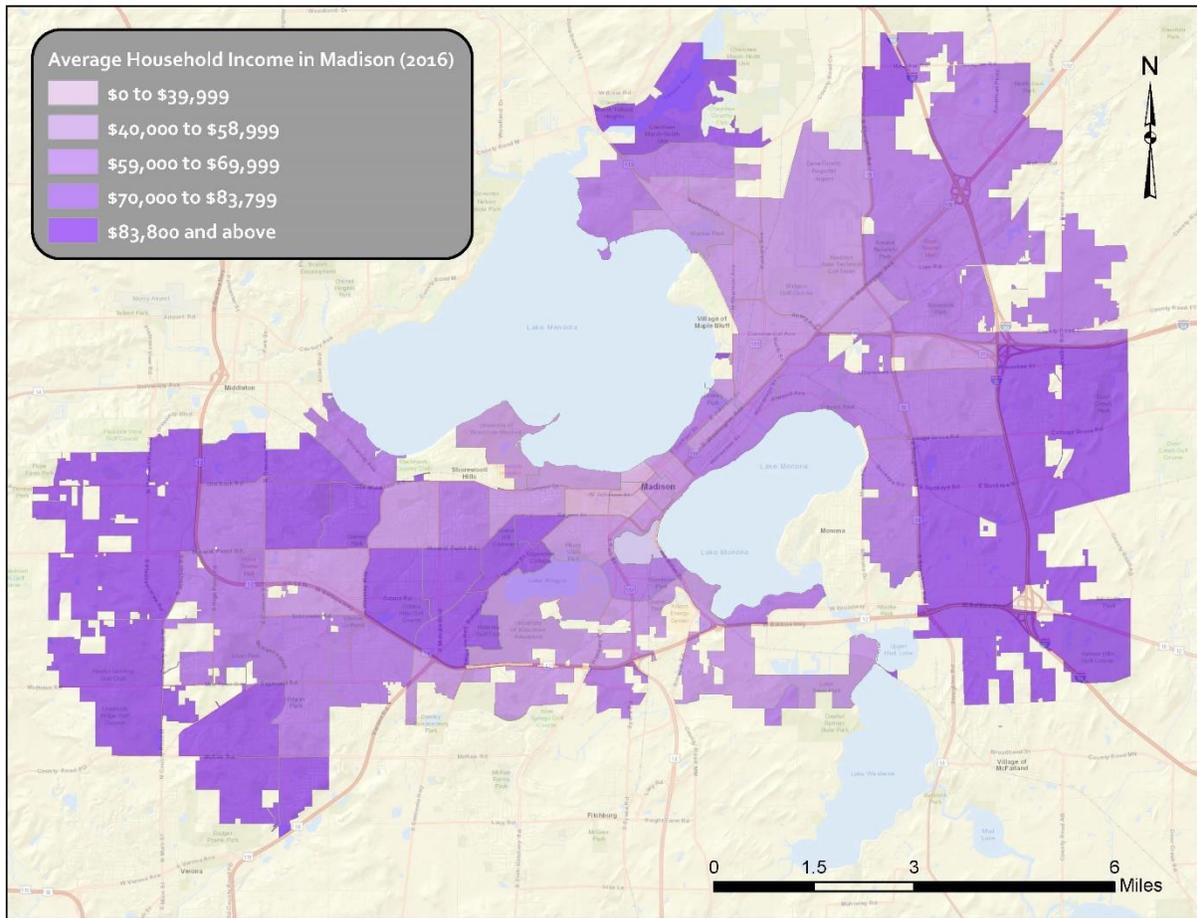
Figure 2: Percent of Households with at Least 10 Mbps/1 Mbps Service<sup>11</sup>



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<sup>11</sup> “Residential Fixed Internet Access Service Connections per 1000 Households by Census Tract,” Federal Communications Commission, <https://www.fcc.gov/maps/residential-fixed-internet-access-service-connections-per-1000-households-by-census-tract/> (accessed April 2018).

Figure 3: Yearly Household Income by Census Tract<sup>12</sup>



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<sup>12</sup> "2016 Planning Database Data and Documentation," United States Census Bureau, [https://www.census.gov/research/data/planning\\_database/2016/](https://www.census.gov/research/data/planning_database/2016/) (accessed April 2018).

### **3 Lessons Learned from the Connecting Madison Pilot Project**

The Connecting Madison pilot project was designed to make affordable internet access available to vulnerable populations who may never previously have had access to broadband service—either because no service was available in their area, or because they could not afford it. The pilot was also intended to provide real-world data that would inform any future broadband deployment efforts by the City.

The City released an RFP in June 2015 for a two-year pilot program that would provide low-cost internet service to residents in the Allied Drive, Brentwood, Darbo-Worthington, and Kennedy Heights neighborhoods. In October 2015, the City awarded a contract to ResTech, a local ISP.

ResTech proposed an FTTP network to serve customers in MDUs of various sizes in the pilot areas; the MDUs ranged from two units to more than 100 units, totaling over 1,000 units in 161 buildings.

ResTech offered various levels of internet service starting at \$9.99 per month for 10 Mbps speed and going up to \$44.99 per month for 100 Mbps. ResTech also offered phone and television services.<sup>13</sup> The resulting product was called “Connecting Madison.” When the contract was terminated in January 2018, the pilot program had made service available in 86 buildings and had 19 active customers, or less than one customer for every four buildings, on average.

#### **3.1 Large MDUs Present a Challenge for New Service Providers**

During the course of the pilot program, ResTech and the City encountered unanticipated barriers to providing access to many apartment buildings in the pilot areas. These issues largely centered around obtaining the right of access required for ResTech to construct connections to individual units within the apartments buildings. In some cases, ResTech was unable to obtain permission because landlords had granted exclusive access to their buildings to other ISPs. In other cases, landlords were not responsive to communications from ResTech or the City. These issues consumed a significant amount of time during the pilot project and resulted in a lower than anticipated number of potential customers in the pilot areas.

#### **3.2 Factors Beyond Availability and Affordability Are Affecting the Digital Divide**

While access issues limited the number of potential customers for the pilot program, the percentage of potential customers who signed up to receive service was still relatively low. Although there are likely multiple reasons for the low number of subscribers, this indicates that a lack of access to affordable internet services is not the sole driving factor in the digital divide in

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<sup>13</sup> “Low-Cost Internet Service,” City of Madison, <https://www.cityofmadison.com/information-technology/initiatives/low-cost-internet-service> (accessed April 2018).

Madison. Residents who have access to a low-cost service may still lack knowledge of how to use internet services, may not know what benefits home broadband service can provide, or may lack the basic equipment required to make use of broadband services (namely a home computer).

Residents in the areas targeted by the pilot may also have little interest in paying for a home broadband connection despite its availability and low cost. Residents who have never had home internet access before, or who have grown accustomed to accessing the internet through their smartphones, may not see the value or relevancy of a home internet connection.

These issues illustrate the importance of a multi-faceted approach to addressing the digital divide and the City's RESJ objectives. In addition to making services available, the City may need to adopt more proactive approaches to tackling the digital divide, including a robust marketing effort designed to advertise the City's broadband service in a targeted way and to demonstrate what broadband might enable residents to do.

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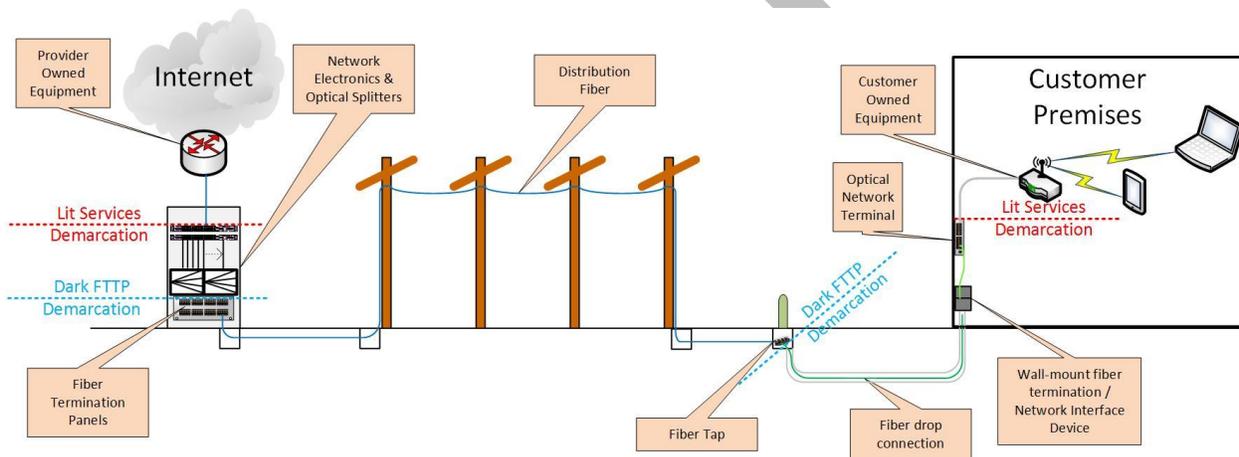
## 4 The City’s Request for Proposals: Process and Outcomes

On August 30, 2017, the City issued an RFP for a partnership to bring gigabit-class broadband to the entire City of Madison. The RFP explicitly stated certain goals the City seeks to achieve through a partnership, and requested detailed information on how each respondent would help the City meet those goals.

### 4.1 The City Required a Shared-Risk Business Model

The City opted to require a shared-risk business model—similar to the agreement between the city of Huntsville, Alabama, and Google Fiber—in which the City will construct and maintain ubiquitous FTTP infrastructure to every residence and business and lease the fiber backbone and distribution fiber to a private partner that will construct the service drop cable into each subscriber’s home or business. This demarcation is illustrated in Figure 4. The private partner will also be responsible for all network electronics and customer premises equipment (CPE)—as well as network sales, marketing, and operations.

**Figure 4: Demarcation Between Madison and Partner Network Elements (Huntsville Model)**



Since the last-mile connection will be funded by the private partner, fiber lease payments to the City under this model will be based solely on the number of passings in the network.

### 4.2 The RFP Presented Clear City Goals and Objectives

The purpose of the City’s RFP was to seek a long-term, creative partnership that would meet the City’s current connectivity needs and anticipate potential future needs for fast, affordable broadband internet and data services. As noted above, proposals were to assume a City-owned and -operated fiber infrastructure that would pass every home, business, and anchor institution in Madison.

The City specified that its preferred business model was one similar to the Huntsville Model in which the City would construct and own the dark FTTP infrastructure. The City’s partner would

lease this infrastructure and provide lit services over the network and be responsible for installing the necessary network electronics and fiber drop cables. The City also allowed respondents to propose alternative business models.

The RFP outlined the following principles guiding the City's initiative:

1. **Equity:** Make fast and affordable broadband connectivity available to every resident and business in Madison with priority placed on providing service to traditionally underserved populations.
2. **Jobs, Innovation, Growth:** Invest in new infrastructure to encourage increased local employment and provide economic development advantages for the entire City.
3. **Investing in the Future:** Offer affordable choices with stable rates for high-quality connectivity at speeds faster than broadband services offered today with the aim of sustaining and continuing to grow educational, economic and cultural opportunities.
4. **Furthering the City's Racial Equity & Social Justice (RESJ) Objectives:** Provide all residents with truly equitable and affordable access to service—regardless of race, ethnicity, gender, sexual orientation, disability, age, income, place of birth, place of residence, or other group status.
5. **Promoting a Competitive Local Broadband Marketplace:** Facilitate a local broadband marketplace that is as competitive as reasonably possible.
6. **Supporting Unfettered Access:** Provide internet service that does not impose caps or usage limits on one use of data over another.

RESJ objectives are among the City's key priorities. The RFP required respondents to provide service throughout the City with no selective targeting so that all members of the community have access to robust, affordable broadband service; in other words, a partner cannot build only to the most affluent areas of the community where there is a higher likelihood of obtaining subscribers willing to pay for service (and, thus, a quicker return on the capital investment).

The City also asked that respondents be willing to work with the City to develop creative solutions for supporting all members of the community with equitable services. For the network to have the intended economic and quality-of-life impacts, the City considers both cost and availability of service to be important.

### 4.3 The City Developed a “Short List” of Potential Partners for Further Consideration

The City received four responses to the RFP prior to the October 20 deadline. Proposals were submitted in two separate parts, one addressing the respondent’s proposed business plan and the other including pricing information. City procurement rules required the RFP evaluation committee to evaluate the business plan proposals before reviewing the financial details; during the response review process, evaluation of the pricing proposals was conducted by separate CTC staff members who did not exchange information with members of the evaluation committee until after initial evaluations were complete. At that time, CTC presented an overview of the pricing proposals to the committee.

Each proposal was evaluated by the RFP evaluation committee based on the proposal’s compliance with the RFP requirements and how well the proposed partnership model would fit with the City’s stated objectives.

To guide the review process, CTC created an evaluation matrix that assigned a numerical score to basic elements outlined in the RFP to establish the validity of each response. The evaluation matrix was designed to quantify some of the respondents’ strengths and weaknesses, and to drive the discussion between the City and CTC. Each area was assigned a maximum number of points (adding up to a total of 700) based on its relative importance to the overall response:

1. Proposal structure (maximum possible points: 250)
2. Business model (maximum possible points: 80)
3. Respondent's experience and track record (maximum possible points: 30)
4. Local presence (maximum possible points: 40)
5. Market experience (maximum possible points: 40)
6. Technical experience (maximum possible points: 40)
7. Project goals – high level (maximum possible points: 50)
8. Project goals – furthers the City’s RESJ objectives (maximum possible points: 50)
9. Project goals – market (maximum possible points: 50)
10. Schedule (maximum possible points: 30)
11. References (maximum possible points: 40)

CTC also summarized each proposal and presented the synopses to City staff, to ensure that all reviewers had a shared understanding of each respondent’s proposed business model.

The RFP evaluation committee members reviewed each proposal and assigned a preliminary score based on the evaluation matrix. One response was deemed incompatible with the City’s

goals and requirements during the scoring process; that respondent was eliminated from consideration.

The RFP evaluation committee then held interviews with the three remaining respondents to discuss their proposals in detail. Incorporating the information gained during the interviews, the committee scored each qualifying response based on the requirements laid out in the RFP.

Through this process, the RFP evaluation committee narrowed its search to two respondents that the committee members felt were well positioned to execute a successful FTTP program in Madison. The committee then selected a lead respondent based on the score its proposal received.

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## 5 Financial Implications of Building the FTTP Network

This section examines the financial implications of the City constructing a ubiquitous FTTP network infrastructure to every residence and business and leasing the fiber backbone and distribution fiber to a private partner. Our updated model uses the fee structure from the proposal scored highest by the RFP evaluation committee. This 20-year financial analysis is based on several assumptions (outlined below).

Please note that we used a “flat” model in the analysis (i.e., we did not include inflation and salary cost increases because we assume that these operating cost increases will be offset and passed on to subscribers in the form of increased prices). Models that add an inflation factor to both revenues and expenses typically greatly overstate future cash flow because net revenues are unlikely to increase as quickly as inflation. At best, the provider will be able to match expense increases with a dollar-for-dollar rate increase, which is what the flat model represents.

The model assumes that subscribership for data services will ramp up over years one through four, and then remain steady.

### 5.1 Cost Estimate and Financing Requirements

In this model, we estimate that building the fiber infrastructure to support a ubiquitous FTTP network will cost the City approximately \$150 million over a four-year construction period. In our model, the project would be funded by payments from the selected private partner and other funding provided by the City.

We assume the City would finance the project through two types of 20-year bonds totaling \$173.2 million:<sup>14</sup>

1. A “net revenue” general obligation (GO) bond to be repaid by the private partner’s payments (less the City’s operations and maintenance expenses). We estimate the bond would total \$52 million based on proposed fees from the private partner and an estimated take rate of 30 percent (i.e., we assume 30 percent of potential customers passed by the network infrastructure will choose to buy service). That bond would be issued at 6 percent and require a debt service coverage ratio (DSCR) of 1.0.
2. A \$121.2 million GO bond to be repaid through a special assessment on each household and business passed by the City-built network infrastructure.<sup>15</sup> That bond, which would

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<sup>14</sup> The City and CTC conferred with Springsted, the City’s financial consultants, regarding terms the City might be able to obtain for the bonds; we applied these assumptions to our financial model.

<sup>15</sup> A special assessment is a process by which the City can assess a fee on properties that benefit from improvements made by the City.

be issued at 8 percent in years two, three, and four of the build-out, would require a debt service coverage ratio (DSCR) of 1.4.<sup>16</sup>

Because the “net revenue” bond would be based on revenues from the City’s partner, the total bond amount the City could issue depends on the number of network subscribers over the course of bond repayment. Table 2 shows the City’s estimated bonding capacity for the net revenue bond according to our financial model; the calculations are based on the estimated annual revenue the City would receive from the partner at various take rates. Based on data we have seen in other markets, 30 percent is within the range of penetration rate that may exist in a market where both the cable and telephone companies also provide broadband service. In our model, the network would require a take rate of approximately 75 percent in order for the City to cover the cost of constructing the network using only revenues from the City’s partner. A 75 take rate is well outside the range of likely outcomes.

**Table 2: Net Revenue Bond Potential by Take Rate**

Take Rate	Revenue (Annual)	Expenses (Annual)	Net Revenue (Partner Payments Less O&M Expenses)	Bond Potential with DSCR of 1.0 (Based on EBITDA)
20%	\$4,722,670	\$(2,068,620)	\$2,654,050	\$30,442,000
25%	\$5,903,340	\$(2,068,620)	\$3,834,720	\$43,987,000
<b>30%</b>	<b>\$7,084,010</b>	<b>\$(2,068,620)</b>	<b>\$5,015,390</b>	<b>\$57,522,000</b>
35%	\$8,264,680	\$(2,068,620)	\$6,196,060	\$71,068,000
40%	\$9,445,340	\$(2,068,620)	\$7,376,720	\$84,614,000
<b>75%</b>	<b>\$17,710,020</b>	<b>\$(2,068,620)</b>	<b>\$15,641,400</b>	<b>\$179,401,000</b>

The \$173.2 million in total bonding represents the amount needed to maintain positive cash flow in the early years of network deployment, including operations and implementation costs. The resulting principal and interest (P&I) payments will be the major factor in determining the City’s long-term financial requirements.

We project that the bond issuance costs will be equal to 1 percent of the principal borrowed. We assume a 10 percent debt service reserve will need to be maintained for the lifetime of the bond. Principal repayment on the special assessment bond will start in the second year after issuance; principal repayment on the net revenue bond will start in year 3.

<sup>16</sup> The DSCR requirement significantly increases the amount of financing required for the City to maintain debt service coverage. Our model uses accelerated principal payments because the City is required to use funds collected from a special assessment on improvements already made to the areas assessed and cannot allow the funds to accumulate.

Table 3 is a financial summary for our base case model, using the assumptions above and a 30 percent take rate.

**Table 3: FTTP Financial Summary**

<b>Income Statement</b>	<b>Year 1</b>	<b>Year 5</b>	<b>Year 10</b>	<b>Year 15</b>	<b>Year 20</b>
Total Revenues	-	\$25,183,960	\$25,183,960	\$25,183,960	\$7,084,320
Total Cash Expenses	(626,930)	(2,068,620)	(2,068,620)	(2,068,620)	(2,068,620)
Depreciation	(1,528,600)	(7,494,600)	(7,494,600)	(7,494,600)	(7,494,600)
Interest Expense	(3,120,000)	(12,478,440)	(8,487,750)	(2,415,210)	(257,740)
Taxes	-	-	-	-	-
Net Income	<u>\$(5,275,530)</u>	<u>\$3,142,300</u>	<u>\$7,132,990</u>	<u>\$13,205,530</u>	<u>\$(2,736,640)</u>

<b>Cash Flow Statement</b>	<b>Year 1</b>	<b>Year 5</b>	<b>Year 10</b>	<b>Year 15</b>	<b>Year 20</b>
Unrestricted Cash Balance	\$12,522,070	\$6,188,960	\$6,364,410	\$16,157,770	\$27,739,340
Depreciation Reserve	-	119,920	226,720	333,520	440,320
Interest Reserve	-	-	-	-	-
Debt Service Reserve	<u>5,200,000</u>	<u>17,320,000</u>	<u>17,320,000</u>	<u>17,320,000</u>	<u>5,200,000</u>
Total Cash Balance	\$17,722,070	\$23,628,880	\$23,911,130	\$33,811,290	\$33,379,660

## 5.2 Financing Considerations

CTC and the City discussed several options for raising the funds necessary for this project. We assume the City will use a special assessment to raise the funds for this project; however, a special assessment may present some challenges for the City.

In terms of scale, a special assessment is typically done in small areas of the City, generally covering only two or three blocks. The City has never issued a special assessment for a citywide project before. City staff estimate they would need to create 10 to 20 assessment areas that would need to match construction phases, because the assessment can only be performed after the improvement has been made to the homes and businesses in the area. A special assessment of this scale would also require the commitment of significant administration staff time and costs, which would stretch existing staffing resources.

A citywide special assessment may also prove to be challenging because the assessment would be applied to all households and businesses regardless of whether they acquire service through the City's network. The impact of such an assessment should be considered alongside the cost of service to subscribers. In addition, the City would need to show the value provided by the project to each household and business assessed. The assessment would require a public hearing and public notice and may require referendum because of the bonds that would be issued.

Furthermore, the total bonding amount of \$173.2 million represents a significant portion of the City's bonding capacity. Issuing these bonds may have an impact on the City's credit rating and therefore increase the cost of borrowing for the City over the next several years.

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## 6 “Beyond the Balance Sheet” Benefits of a Citywide FTTP Network

As the City considers how best to address broadband availability gaps for residential and business users, it is easy to focus solely on financial factors. While it is crucial to evaluate financial and other risks, it is also important for these aspects to be weighed against the potential benefits of increased broadband availability, including the subjective benefits that cannot be found on a balance sheet or easily quantified in financial statements. Potential benefits such as increased economic activity, support for an entrepreneurial ecosystem, and greater access to advanced training, healthcare, and job opportunities should not be overlooked.

In this section, we consider at a high level some of these potential benefits of access to an affordable high-speed broadband connection.

### 6.1 New Broadband Competition Can Potentially Create Benefits for Digital Inclusion and Affordability

Residents who do not use broadband often face one or more of the following issues:

1. Lack of access to service
2. Inability to afford service
3. Lack of knowledge of how to use computers, devices, or broadband

With those causes in mind, new broadband competition can have a significant positive impact on efforts to close the digital divide. The City’s initiative to bridge broadband connectivity and availability gaps may address the second, and often most pressing concern—affordability—by fostering competition in the market.

Increased broadband competition may lead to lower prices and service enhancements. A new provider or one that is expanding its territory may offer some low-cost products and, even if such a provider does not offer low-cost products, incumbents are likely to lower their pricing on some products in response to the increased competition. We have seen this in other markets and have no reason to doubt that the same scenario may play out in Madison.

To be clear, this does not mean that high-end products will necessarily be available at low prices, or affordable to every resident. It may be that only lower-bandwidth products are available at low prices. For example, in some markets we have seen the incumbent telephone companies compete for price-sensitive customers by offering low-price, low-bandwidth services.

A more robust market environment will lead to competitive pricing that benefits low-income consumers in ways that simply do not happen in monopoly and duopoly environments. Further, some private companies may offer lower-cost digital inclusion products and actively participate

in the Federal Communications Commission's (FCC) Lifeline program, which offers broadband subsidies to low-income Americans.

## **6.2 Meeting the Need for Better Services to Small and Medium Businesses May Promote Economic Vitality and Innovation**

Many markets lack high-end broadband services for small and medium-sized businesses. While larger business and institutions may be relatively well-served by the incumbents and the competitive providers that are already present in the market, small and medium-sized businesses outside the major fiber corridors struggle to get affordable high-end services.

There may be a gap, too, when it comes to home-based businesses and teleworkers. Many teleworkers are very sophisticated telecommunications users and must depend on the reliability and capacity of the consumer-based broadband connections they have from the phone and cable companies that currently offer service in Madison.

These gaps represent a real need in the City, and a business opportunity for private sector retail service providers. A growing body of evidence demonstrates that high-speed fiber connections facilitate an innovation ecosystem and enable small businesses and start-ups to thrive.

Robust internet connections provide entrepreneurs, freelancers, and small-business owners with a variety of new tools that allow them to compete as never before. A growing portion of the U.S. workforce can do much of their work from wherever they find a robust internet connection. While a basic broadband connection is sufficient for certain tasks, gigabit speeds enable richer collaboration tools, such as vivid telepresence.<sup>17</sup> As bandwidth-hungry collaboration tools continue to improve, the physical location of people becomes less important.<sup>18</sup> Small business owners and entrepreneurs with access to abundant bandwidth can draw on talent from across the globe, forming short-lived teams that complete specific tasks without ever needing to meet in person. Although contractors and freelancers are generally free to roam as they please, they will gravitate to areas with abundant bandwidth.

Higher-speed connections have the potential to improve the flow of goods and services in every sector of the economy. Many entrepreneurs with a desire to create new services based on high-

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<sup>17</sup> "Killer Apps in the Gigabit Age," Pew Research Center, October 9, 2014,

<http://www.pewinternet.org/2014/10/09/killer-apps-in-the-gigabit-age/> (accessed November 2017).

<sup>18</sup> According to the New Jersey Institute of Technology, 45 percent of U.S. employees already work from home at least part of the time. See: <http://betanews.com/2015/09/11/the-rise-of-telecommuting-45-percent-of-us-employees-work-from-home/> (accessed November 2017).

capacity connections have flocked to the first few Gig cities to build and test their products.<sup>19</sup> Although a robust two-way connection has the potential to improve everything from how we exercise<sup>20</sup> to how we react to weather emergencies,<sup>21</sup> there are a number of emerging fields that are entirely dependent on extremely high-speed connections. Virtual and augmented reality and precise 3D modeling require data flows far beyond the average home or small business connection speed today. The new businesses that emerge in these sectors will undoubtedly be based in communities that have abundant, affordable bandwidth.

Robust internet connections will be particularly important for the entrepreneurs that seek to create value through the analysis of large data sets. As sensors proliferate and the cost of memory plummets, more data is being collected than ever before in history. In the past, only large companies would be able to afford the computing power necessary to make sense of such huge data sets, but now any savvy statistician with a laptop and a gigabit internet connection can run these analyses. Big data stands to improve productivity and efficiency in every sector of the economy,<sup>22</sup> but the companies and individuals that will conduct the analysis will be located in areas with abundant bandwidth.

Innovation is possible everywhere, but individuals living in a place with affordable high-speed connections have an advantage in many sectors. Abundant bandwidth gives people the freedom to tinker and figure out how symmetrical high-speed connections can improve our daily lives. As William Gibson once said, “The future is already here, it’s just not evenly distributed.” People living in the first few cities with super-high-speed broadband have the chance to create the future for everyone else.

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<sup>19</sup> “Innovation Districts Report,” National League of Cities, <https://www.nlc.org/Documents/Find%20City%20Solutions/City-Solutions-and-Applied-Research/Innovation%20Districts%20Report.pdf> (accessed May 2018).

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<sup>20</sup> Aaron Dubrow and Robert Summers, “Fitness App Connects Exercisers to Experts,” National Science Foundation, [https://www.nsf.gov/mobile/discoveries/disc\\_summ.jsp?cntn\\_id=134550&org=NSF](https://www.nsf.gov/mobile/discoveries/disc_summ.jsp?cntn_id=134550&org=NSF) (accessed May 2018).

<sup>21</sup> “Next Generation, Resilient Warning Systems for Tornadoes and Flash Floods (North Central Texas),” US Ignite, <https://www.us-ignite.org/globalcityteams/actioncluster/zjiQHYzZoXrZJthAHwcN5F/> (accessed May 2018).

<sup>22</sup> James Manyika et al., “Big Data: The Next Frontier for Innovation, Competition, and Productivity,” McKinsey & Company, <http://www.mckinsey.com/business-functions/business-technology/our-insights/big-data-the-next-frontier-for-innovation> (accessed May 2018).