February 25, 2020

Redmond Smart City Project- Report for Phase I

Redmond, Washington City Hall

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1. Executive Summary

Redmond Mayor, Angela Birney, has a vision for Redmond; *"A connected community that enhances livability and sustains the environment, and that places Redmond as a leader locally, regionally and nationally"*.[1] The Mayor and City Council have both expressed interest in examining the potential for a Smart City future for Redmond.

Like other communities across the country, the City is seeking a clear path to becoming a Smart City through broadband expansion. This requires identifying existing vertical City assets that providers can utilize for current and future technology initiatives, doing an inventory of those assets (which is in process), creating a data base, streamlining regulations to facilitate providers' "speed to market" and implementing a strategy for future technology growth and revenue generation.

If the City would like to facilitate broadband investment, it will need to address the current fiber gaps to reduce leased line costs which savings can generate new revenue streams to further fund the deployment of Smart City initiatives. There will be challenges to efficiently address the connectivity infrastructure demands of a growing City population.

Fortunately, there are opportunities to leverage experience, seek strategic partners and develop mapping platforms to categorize City assets, streamline the wireless siting application process, implement the deployment of fiber, manage and lease City assets, deploy Smart City infrastructure and benefit public safety, education, healthcare, public services and transportation -- all of which can drive a smart economy.

Smart Cities are based on the concept that technology (data) can provide mechanisms to modernize infrastructure, improve efficiencies, encourage citizen engagement, bolster inclusion and increase the overall quality of life through the efforts of interested Stakeholders. Cities must further learn to utilize technology to more effectively deliver essential city services to its citizens.

Building a Smart City requires investment in infrastructure. Internet of Things (IoT) technologies can provide sensors that create data insights that can help City leadership make better decisions and take real-time actions to more effectively deliver services to citizens, businesses and visitors alike.

The Smart City program intersects well with the **goals of the Mayor-Community-Livability-Environment and the City's Comprehensive Plan**. With respect to the process that's involved, our Team will take the information which has been provided by the City in the Inventory, assimilate it, and identify **Redmond centric priorities** for the Smart City roll-out.

[1] A message from Angela Birney, January 2, 2020

Our Team and this Report are responsive to Smart City Needs and Interests expressed by the Community and Redmond City Staff.

We envision that Public-Private Partnerships will be explored between the City, corporations and other organizations -- potentially such as Microsoft, General Electric, Redmond Town Center, Comcast, Verizon, Frontier, and CenturyLink. The Smart City program will require a large number of sensors, a significant amount of fiber, as well as hardware and software from an IT standpoint.

We could also explore the possibility of obtaining federal or state grants which could assist with potential funding. River Oaks has worked for several years with Logistic Specialties, Inc., based in the Salt Lake City Area, which has identified and captured funding from the federal government for a wide variety of programs. Additionally, we will look at Smart City partners such as One- Redmond, the Lake Washington School District and non-profits.

As of 2018, more than half the world's population live in cities. Each week nearly 1.5 million people become urban dwellers and by 2050, urban population will account for more than two-thirds of the world's population. Moreover, this urbanization will only consume 2% of the Earth's surface.

Ever increasing urban population, deteriorating infrastructure, and stretched public treasuries are challenging cities world-wide. In most cities, limited essential resources (electricity, water, transportation, funding, and broadband) create an urbanization stress which affects the daily lives of people and quality of local infrastructure. This same stress pressures local governments to make trade-off decisions to support the ever-growing needs of citizens, businesses and visitors. Unfortunately, these trade-offs perpetuate the decline in local infrastructure.

To overcome this strain, cities must learn to employ technology to more effectively deliver essential city services to its citizens. Smart Cities are based on the concept that technology can provide mechanisms to modernize infrastructure, improve efficiencies, enhance citizen engagement, boost inclusion and increase the overall quality of life. This is accomplished through a combination of technology, connectivity, data and artificial intelligence. According to McKinsey Global Institute (MGI)[2], Smart City applications are being used to improve quality of life indicators by 10 to 30%.

- In the MGI study, the three sample cities that were running Smart City applications were able to reduce fatalities by 8 to 10%, accelerate emergency response times by 20 to 35%, shave the average commute by 15 to 20%, lower the disease burden by 8 to 15%, reduce crime incidents by 30-40%, reduce the liters of water used by a citizen by 25-80 liters per day and cut greenhouse gas emissions by 10 to 15%.

[2] Smart cities: Digital solutions for a more livable future

- According to this research, success requires public-private partnerships. The public sector would be the owner of approximately 70% of the applications in this study. But 60% of the initial investment required to implement these applications could come from the private sector.

This Smart City road map highlights concepts and actual success stories that will assist the City of Redmond in identifying and advancing Smart City initiatives that align with the long-term goals of the City and its neighbors. Rapid technological innovation and adoption will define and drive quality of life, the efficient delivery of government services and end-user experiences for residents, businesses and visitors to the City of Redmond.

Redmond has an exciting road ahead as it seeks to identify relevant applications and methodologies before it can realize these benefits as the City must first overcome at least the following challenges:

- Identifying urgent and long-term needs
- Selecting technologies from a growing number of options
- Managing complexities of deploying multiple technologies on multiple networks
- Defining, implementing and safeguarding data security policies
- Overhauling existing services with innovative technologies
- Collecting and analyzing large amounts of data for insights that lead to smarter decisions and better end-user experiences
- In order to be responsive to the Needs and Interests of the Community and City Leadership and Staff, it is important to keep the Smart City Phase I momentum moving forward, and work toward the implementation of Pilot Projects. We recommend that the City build upon Phase I work done to date and proceed with Phase II of the Smart City Initiatives in 2020.

2. The City of Redmond, Washington

By the 1920's, heavy logging caused lumber mills to shut down. Fortunately, the deforested land was suitable for farming and agriculture became Redmond's primary business. After World War II, Redmond's expansion began in earnest as the City expanded over thirty times larger in area through annexations between 1951 and 1967. The completion of the Evergreen Point Floating Bridge across Lake Washington in 1963 allowed Redmond to flourish as a suburb of Seattle.

In recent years the City has been experiencing growing pains as a result of its rapid expansion, particularly in the areas of urban sprawl and traffic congestion. During rush hour it can take upwards of 1-2 hours to travel from the beginning of SR-520 at Avondale Road to downtown Seattle, a mere 16 miles (26 km) away.

Redmond's high-tech industrial growth began slowly in the 1970s with sector growth accelerating in the mid-1980s. Redmond is the home of tech giants Microsoft and Nintendo of America.

The population of Redmond was 54,144 at the 2010 census and estimated at 67,678 in 2018.

3. Redmond Smart City Work-Phase I

The purpose of this report is to provide a roadmap for the City of Redmond as it focuses on being a smarter and more sustainable community through alliances with private, public and academic partners.

The following were the Deliverables in Phase I of the Smart City Project on which our Team worked:

- **Identify strategies to help make Smart City attributes abundant, redundant, affordable and accessible in the areas targeted by the community's broader goals and policies recognizing that many residents commute to Seattle or telecommute and over 50,000 people from other jurisdictions have jobs centered in Redmond.**
- **Identify Key Stakeholders and Service Providers to include in the Needs Assessment Process. Engage Stakeholders and Service Providers in an ongoing dialogue to identify opportunities for collaboration.**
- **Provide initial market research on existing Service Providers, their service offerings and pricing information.**
- **Identify and inventory public assets in place.**
- **Identify gaps in services offered (knowing this could be a concern to City residents and City Council) and provide a road map and strategies to ensure that public and private investments have the most impact, especially from an economic development and jobs attraction and retention perspective.**
- **Increase the opportunities for Redmond to attract, grow and retain businesses by having the right Smart City infrastructure to complement the excellent quality of life and scenic beauty of the area.**
- **Address sustainability, scalability, aesthetics and maintenance of a Smart City network taking into account the Goals and Policies of the City.**
- **Provide general guidance on governance, structure, management, and service delivery models.**
- **Provide initial input on risks vs. rewards, identifying from a high-level standpoint both technological and financial considerations to foster successful Smart City deployment.**

- **Work with the City to identify the required Meetings, Workshops, and Tasks necessary to complete the Initial Smart City Project.**
- **Attend Meetings with the City and Key Stakeholders.**
- **Facilitate Community Specific Meetings and Workshops as necessary which could include both City and Regional Stakeholders-the Smart City Symposium.**

Many North American cities are already deploying Smart City applications to tackle real-world problems. These applications include LED lighting projects, installing digital kiosks, environmental and weather sensors and other important infrastructure investments that are unlocking the value of energy savings, water savings, and increasing efficiency by providing data insights which drive key decisions.

But what does a Smart City really do? A review of Smart City projects worldwide showed initiatives generally fall into one of the following Smart City applications:

- Government Efficiency
- Transportation
- Sustainability
- Economic Development
- Health & Wellness
- Public Safety
- Mobility
- Quality of Life

The uniqueness of each community drives priorities proportional to their distinctive community needs. Some communities may find a greater focus on education, technology or environmental concerns. However, the categories listed above are the primary initiatives that cities initially focus on when strategizing about Smart City trials or city-wide technology deployments. Let's take transportation as an example, especially since this is an important topic in the Redmond area as discussed at the Symposium.

Transportation can include numerous sub-topics, such as mass transit, autonomous vehicles, Intelligent Transportation Systems (ITS), bike lanes, pedestrian enhancements, Drones, and even smart parking, as shown in the diagram. This type of smart parking can be managed via a streetlight controller network.

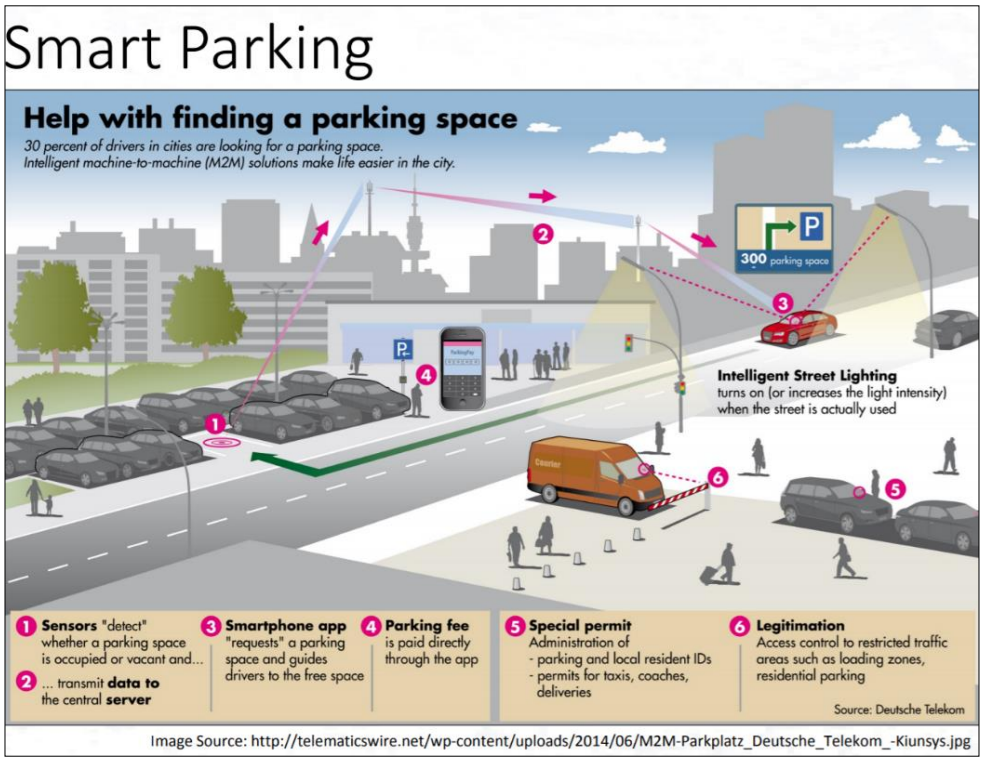
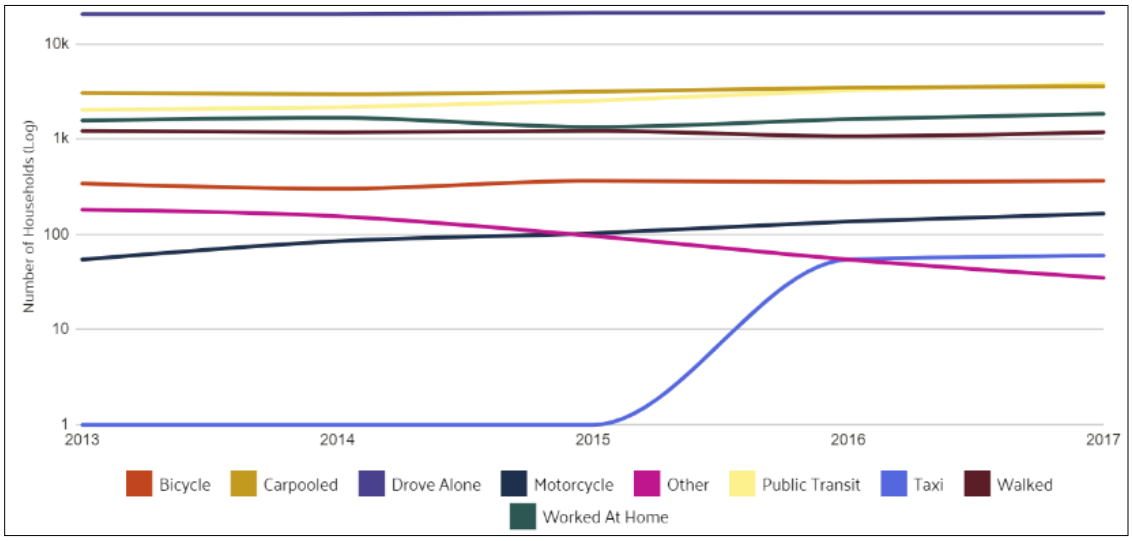


Image Source: http://telematicswire.net/wp-content/uploads/2014/06/M2M-Parkplatz_Deutsche_Telekom_-Kiunsys.jpg

As reported in 2017, the most common method of travel for workers in Redmond, WA was Drove Alone (65.9%), followed by those who use Public Transit (11.7%) and those who Carpooled (11.1%).



4. Smart City: Key Issues

Below are some of the key issues to consider when developing a Smart City plan:

Funding - There are several options that cities can use to finance Smart City initiatives:

- Performance-based contracting model for various assets such as LED lighting, wastewater treatment and municipal building heating and cooling is a well-demonstrated method for decreasing City expenses and can naturally extend to other applications.
- Public-private partnership (P3) models can be a financially, socially and technically innovative way to decrease City expenses while increasing revenue.
- Asset privatization (buildings, water/waste treatment, streetlights, bridges etc.) is a recognized methodology for cities to upgrade outdated or failing infrastructure with funding from private investments groups that develop long-term relationships.
- Although it may not be germane in Redmond, Opportunity Zones[3], established by the 2017 Tax Reform Act, were created to revitalize economically distressed neighborhoods using private investments rather than taxpayer dollars. Investors are incentivized to invest long-term for preferential tax treatment. A recent example of Opportunity Zone investment of Smart City initiatives can be found in Erie, Ohio[4] with the intent to make those areas safer and more attractive for investment.

Data Policy - Smart cities collect and analyze immense amounts of data from a vast array of sensors, devices and applications. Policies must be aligned to identify what data will be made available while maintaining citizens privacy protections, public and private usage, storage and access. Knowing that technology, data and policies change dynamically it is critical to ensure policies remain cutting-edge which is only possible though ongoing education for all Stakeholders.

Infrastructure Modernization - Cities must create dependable, modern and efficient infrastructure that remains in compliance with their policies, applications, categories and Smart City focuses. Infrastructure improvements are normally associated with the traditional essentials such as streets, water, sewer, gas and electric services; however, a common omission when determining critical infrastructure upgrades is broadband connectivity. **Fiber and wireless networks are critical for data flow to and from Smart City sensors and devices**. A city can

[3]The Opportunity of Opportunity Zones, Smart Cities, and Public-Private Partnerships https://medium.com/@sfdecordova/the-opportunity-of-opportunity-zones-smart-cities-and-public-private-partnerships-d13ef3702248

[4] Smart-city technology eyed for Erie's Opportunity Zones, March 3, 2019, https://www.goerie.com/news/20190303/smart-city-technology-eyed-for-eries-opportunity-zones

rely on the local telephone company, cable company or wireless carriers for sensitive data connectivity; but the city can also deploy private networks for more control of its critical data.

Smart City Champion - Cities clearly benefit from designating a Smart City champion with appropriate authority on the City's leadership team. If possible, this person will serve as the Smart City director and drive the direction, results and governance of the program while delivering a cross-departmental perspective on future Smart City decisions. Ideally, this person would also serve on regional, multidisciplinary committees and Boards.

Develop Metrics - Cities that identify metrics to evaluate all Smart City related programs for financial, social and environmental impact have a much greater ability to encourage growth opportunities while holding vendors and/or partners responsible for their activities. Creating dashboards that reveal key performance indicators (KPIs) for every Smart City opportunity is one method of measuring these metrics.

Citizen Engagement - One of the primary goals of Smart Cities proponents is to create an interactive social fabric with citizens, making it vital to adopt a proactive approach in engaging with citizens, their neighborhoods and local non-profits to gain long-term support for Smart City initiatives; thereby fulfilling one of the primary goals of Smart Cities: creating an interactive social dynamic.

Phased-Based Approach and Alternatives - Cities are encouraged to utilize a phase-based approach when initiating any component of a Smart City plan. **It is recommended that cities identify short-term projects which provide quick, measurable wins while long-term projects should seek incremental and multi-stakeholder support.**

Basically, the City has 4 choices: (1) The City can own the Smart City infrastructure and Fiber; or (2) The City can enter into Public-Private Partnerships with Providers or ; (3) The City can be dependent upon and pay Providers to carry and transfer Smart City Data and Information or; (4) The City can do a combination of these alternatives.

Sustainability - A sustainable city is designed to take into consideration the environmental impact of humanity by monitoring and minimizing the required use of energy, water and food, and waste output of heat, greenhouse gases and water pollution.

5. Grassroots Effort

Understanding what a Smart City is can be daunting, but the experiences of other jurisdictions will provide answers and analogies. Understanding what your particular needs are as a community requires a community effort. It is important to include all constituencies in initial

discussions, meetings, polling and committees. The striving goal is to always enhance the social fabric of the community with technology and intelligence.

Identify Stakeholders - In developing a Smart City strategy, it is important to identify and include all relevant Stakeholders in the formative process. Stakeholders will include, but are not limited to, members of these groups:

- Public sector
- Private business
- Public safety
- Transportation
- Energy
- Education
- Healthcare
- Non-profits
- Broadband providers
- Economic development

This list contains Stakeholders that represent private, local, regional, state, and federal interests. Developing a Smart City strategy requires a high degree of collaboration to ensure solutions for goals and objectives that benefit all. A list of potential Stakeholders specifically relevant to the Redmond area has been drafted for review and revisions.

Approach - Becoming a Smart City is a long-term, multi-faceted and fluid process. Priorities, goals and objectives will continuously change as influencers adjust. The path will be filled with setting project goals, running trials, gathering data and analyzing results. Redmond is fortunate in that the region has a long history of local and regional groups already that are already engaged in many of the important discussions and activities the City seeks to identify in its Smart City strategy. These groups will become important Stakeholders and the City will be able to leverage much of the work in progress, completed or discarded over the years to better streamline its strategic foundation.

Bring Them Together - The City benefitted by first inviting all initially identified Stakeholders to a Symposium for the purpose of generating creative ideas, establishing goals and objectives, determining priorities by consensus and identifying resources and leadership. The City may find that subsequent meetings are necessary simply to get organized. Spending time early in the process to set the agenda will aid in reducing the number and duration of required meetings. Including testimonials from those currently working with Smart City technologies will aid in creating thought-provoking experiences. The Symposium invite included a questionnaire seeking speakers, their experiences and additional Smart City methodologies.

Additional questions seeking data on Smart City programs that are under consideration, in trial or full implementation will aid the City in understanding the current Smart City foundation. Next, the City can host smaller, category-based break-out sessions such as transportation, infrastructure, technology, environment and citizen engagement. These focus groups will strive to appoint leadership who convey their interest in subsequent meetings as the City's goals and objectives are further refined. **To assist these leaders, all attendees were encouraged to contribute their thoughts at the Symposium and in a Survey/ Questionnaire. The results of**

this Survey/Questionnaire are available for review. This initial meeting resulted in interested Stakeholders, a refined categories list and next steps.

Analyze the Data - Data from the initial email survey was used to formulate topics of discussion, speakers, vendors and a potential Steering Committee. As the topics were refined, a list of relevant speakers was created for the Symposium. The Symposium itself yielded informative data requiring analysis to determine next steps. These may include joining existing committees, creating new committees, and developing a Smart City outline that provides the community with the greatest efficiencies and the most relevant benefits.

Priorities, Create Committees and Research Opportunities - As the City begins to narrow down its focus on select priorities, your committees will begin researching their assigned topic(s). There are multiple vendors who are anxious to talk to you about their products and services; and you should actively engage with them. You can conduct individual meetings, or you can issue a Request For Information ("RFI") or Request For Proposal ("RFP"). Similar processes may be in order when considering legal, security, privacy, governance, financial and political strategies.

6. Quick Impact Initiatives

The activities discussed to this point took time to research and implement, and now there are numerous items that can be foundational to your Smart City goals that you can initiate. Smart City activities that may quickly provide high impact results include:

Inventory Assets - Assets owned by the City or others that can be leveraged to implement or accelerate Smart City initiatives including sensors, cameras, and small wireless facilities that can be mounted on streetlight poles, traffic signals and towers are viable possibilities. Digital kiosks can be integrated with bus shelters and new train stations. City-owned fiber can be used for backhauling City data from sensors and devices. It is important to understand what the City owns and what role these assets can play in designing and efficiently deploying Smart City services.

The goal is to collect and cross-reference data on select municipal assets to determine asset availability, fiber counts and usefulness in accommodating broadband needs. This single activity has proven critical to cities becoming more efficient and effective through smart management of assets while also unlocking the full value of these assets, both for the City and others who may have interest in leasing such assets.

The City of Redmond controls numerous municipal infrastructure assets that can be leveraged to expand broadband coverage and capacity: streetlights, fiber, conduit, land, buildings, etc. Smart asset management is powered by data-current, accurate data that tells you exactly what assets you have, where they are located and their inherent value.

Collecting accurate data is crucial to making good decisions and implementing a productive asset management strategy. Over the past few months, multiple conference calls with City Staff were held to discuss potential assets, develop a checklist and ascertain availability of data. The Redmond GIS department provided current GIS data, associated spreadsheets, documents and emails that allowed our Team to analyze existing City-owned assets. Next, we reviewed multiple asset layers on Google Earth to determine multi-asset leasing opportunities such as streetlight poles with fiber backhaul.

The chart below summarizes the status of each asset data request.

Asset	KMZ	PDF	Xcel	Email	Not Received
Streetlights			X		
Traffic Signal Poles			X		N/A
Fiber-Current & Future	X		X		
Conduits	X				
Buildings			X		N/A
Vacant Land					X
Communications Towers				X	N/A
Water Tanks			X		
Signposts				X	N/A
Security Camera Towers		X			
Leased Towers				X	N/A
Bus Shelters				X	N/A

N/A=Not Applicable or Not Available as a leased asset

Upgrading to LED Street Lights with Smart Network Controllers - Cities can realize significant and immediate cost savings by retrofitting streetlights with LED lighting systems and controls. Energy costs are typically reduced 50-70% and dimming features can add an additional 20-30% savings. Controller networks can facilitate 5G deployments, public Wi-Fi, Smart parking, automated utility meter reading, environmental sensors, public safety devices, Smart utility grids, and much more. **Redmond owns approximately 1,700 streetlights and supporting poles. Over 80% of these poles are 30', or taller, providing ample room for small cell and Wi-Fi attachments**. The City has confirmed it currently does not lease any of these poles to providers, but they could generate revenue from that process. The City has converted all streetlights to LED luminaires with a controller network to monitor lighting activities. More research is needed to understand the functionality of the current controller network. Perhaps the existing streetlight assets can facilitate a wireless network for municipal use.

Fiber and Conduit Assets - Beginning in the early 2000s, Redmond started deploying conduit and fiber assets in support of traffic signaling, asset monitoring and government communications. The City continues to deploy additional fiber and spare conduit; however, the

fiber strand count is typically 12-48 strands with limited excess for future demand and/or provider lease opportunities. Going forward, the City should consider higher strand fiber counts and at least one additional conduit than previous practices. Overall, the City has done an admirable job of laying conduits in open trenches and has existing conduit throughout the periphery of the City limits.

Deploying Digital Kiosks - Digital kiosks create revenue streams while enhancing citizen engagement. Kiosk vendors typically deploy at no charge to the City and provide a negotiated advertising revenue share to the City. Additionally, these vendors work with cities to highlight current events, train/bus schedules and other important citizen notices. Digital kiosks are a recognized Smart City improvement and can be used for wayfinding, brand identity, digital divide access, emergency communications, job searches, local business advertisements and more. Kiosks are designed with multiple cameras viewable by public safety personnel with some units utilizing LiDAR technology to assist in mapping, data collection and surveillance. Digital policies for data ownership, retention and use need to accompany every Agreement with the kiosk owners.

Implementing a "Dig Once" Policy - "Dig Once", also referred to as "Smart Dig" or "Open Trench", policies should be an integral part of any communities' telecommunications master plan. A Dig Once policy generally refers to requirements designed to reduce the number and scale of repeated excavations for the installation and maintenance of future underground facilities in the public rights of way (telecom, gas, water and sewer lines, etc.). In conjunction with this policy, communities should also consider deploying conduit(s) on a case-by-case basis in any open trench for future use or lease.

Redmond should consider a more holistic approach that is inclusive of all Public Rights-of-Way ("PROW" or "ROW") users. The examples below serve to demonstrate the immediate success other cities have realized from effecting various iterations of Dig Once policies:

> **Santa Monica, CA:** Santa Monica had a vision for its internal fiber network and subsequent expansion in the 1990's and created a Telecommunications Master Plan in 1998. An important part of that overall plan was standardizing the procedure that we now call "dig once." Careful mapping and foresight laid the foundation for the growth of their fiber network. Money that could have been spent on leasing slower, less reliable connections from existing providers has instead been used to expand public infrastructure and other public amenities. Free Wi-Fi, public safety video cameras, and real-time parking information are just a few of the benefits that enhance the quality of life in Santa Monica[5].
>
> **Boston, MA:** The cost of excavating and installing fiber-optic cable in an urban environment is an expensive endeavor, far more so than anywhere else in the U.S.

[5] Santa Monica City Net Case Study, March 5, 2014, http://muninetworks.org/reports/santa-monica-city-net-case-study

Boston's Dig Once policy, adopted in 1994, is a "joint build" policy that requires all telecoms to install their cable in shared underground conduits on a shared-cost basis. This policy also designates a "lead company" that is tasked with coordinating efforts among all telecoms involved in the installation process, planning and implementing of the installation[6].

San Francisco, CA: Another approach that has been implemented at the municipal level is called "Trench Once," which is used in San Francisco. This approach allows for a roadside trench to be left open after construction ends. This trench is later used to bury conduit and is shared among broadband providers, if possible, to avoid the costs associated with additional excavation in areas where the entire right of way is paved. According to San Francisco's Dig Once Specification, this policy reduces the cost of conduit installed from $128,000 per street mile for the first installation (including excavation of the trench) to $71,000 for the second. This decrease is largely attributable to a reduction in excavation costs. San Francisco is also recognized as having a 5-year moratorium that is placed on opening a roadbed once a trench along that roadbed has been closed.

Establish a Right of Way Forecasting Process - With deregulation of the telecommunications, electric and gas industries and the need to upgrade aging water, sewer and drainage facilities, coupled with enhanced environmental requirements, it is vital that local governments and other public agencies retain authority to execute their statutory obligations and duties related to the public rights-of-way. In this fiduciary capacity the responsible public agency must have the authority to regulate and manage public rights-of-way to ensure its efficient use through the development and implementation of effective policies, practices and regulations[7].

A PROW forecasting program would require all users to submit plans that reveal opportunities for coordination, cost sharing, location apportionments, equipment type(s), construction timelines, restoration and on-going maintenance.
Such a program will establish notice provisions that will improve efficiency of existing planning processes across governmental departments, provide broadband companies with a cost-efficient way to deploy telecommunications infrastructure, reduce barriers of entry for new providers and provide comprehensive tracking of all opportunities available in the ROW. An additional benefit to Redmond is the opportunity to evaluate the possibility of deploying government-owned fiber infrastructure in excavation projects where Redmond has determined that it is both financially feasible and consistent with Redmond's long-term strategy to develop Smart City opportunities.

The recent proliferation of small cells, distributed antenna systems (DAS), and outdoor Wi-Fi facilities has brought with it a number of challenges, and potential opportunities, for local governments. In reviewing, negotiating and approving the siting of wireless facilities within the

[6] The Council of State Governments, e-Newsletter, March 2016, http://www.csg.org/pubs/capitolideas/enews/cs41_1.aspx
[7] American Public Works Association, Public Rights-of-Way Management, http://www.apwa.net/technical_committees/Utility-and-Public-Right-of-Way/Position-Statements

ROW, Redmond must navigate the sometimes-competing interests of 1) obtaining fair compensation for use of the ROW, 2) obtaining fair compensation for attachments to Redmond facilities (if any), 3) accommodating reasonable access and entry to the market for service providers that may be entitled to them under federal and state law, 4) facilitating (and encouraging) the efficient deployment of valuable broadband services for local residents and businesses, 5) recognizing and exploring opportunities for beneficial public-private partnerships, and 6) satisfying Redmond's obligations with regard to public safety and welfare.[8]

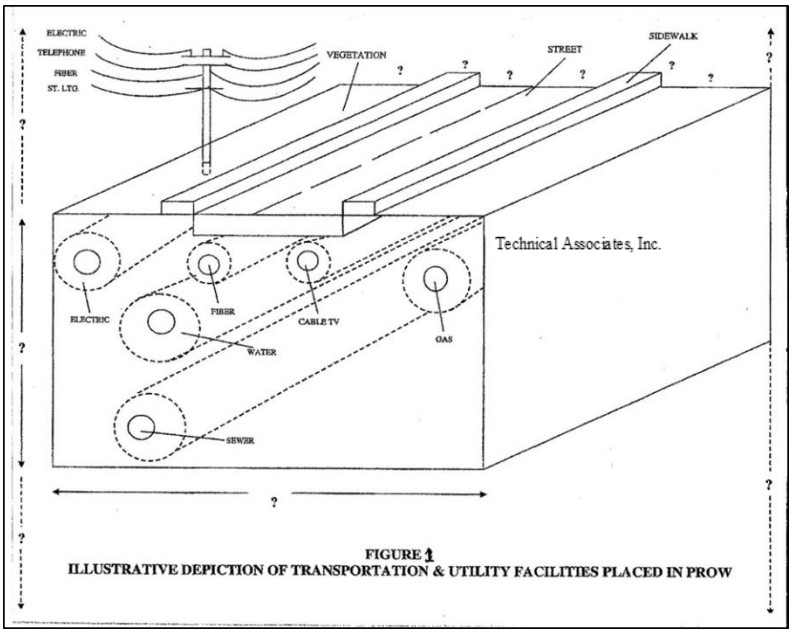


FIGURE 1
ILLUSTRATIVE DEPICTION OF TRANSPORTATION & UTILITY FACILITIES PLACED IN PROW

The public ROW is a finite space. It is important to recognize that private use of the ROW asset affects the useful life of the asset and creates an ongoing cost to local government. As more users request access to the ROW, the space is quickly filling up, subsequently driving up the cost of oversight and maintenance. New broadband entrants, telecommunications companies requesting pole settings within the ROW, cellular densification for small cells, the transition to 5G and the emerging myriad of sensors that will be required for the Internet of Things (IoT) will quickly utilize a significant portion of any remaining space. Competently manage the ROW to properly allocate space will ensure safe placement and reserve space for future services.

Annual or semi-annual meetings should be scheduled with all current users of the ROW to provide a forum that represents the interest of local governments, utilities and telecommunications providers. A forum that facilitates a transfer of knowledge, information and best practices affecting ROW users along with presenting their plans for the next 1-5 years for any anticipated work within the ROW would be very beneficial. Though Redmond's franchise ordinance already requires telecommunications providers to submit as-built drawings (these may be considered confidential) of all facilities that currently exist in the ROW, a forecasting plan would call for all ROW users to map all assets into a single database to maximize planning and deployment efficiencies. Redmond needs to be advised of mergers and acquisitions that have occurred over the prior years and can then update records accordingly. Two immediate matters Redmond can derive as a result of these meetings are to gain a full understanding of the current

[8] Baller Herbst Stokes & Lide, Small Cell, DAS and Wi-Fi Facilities Siting in the Public Right of Way: Practical Considerations for Local Governments, July 21, 2015, http://www.baller.com/wp-content/uploads/BHSL-DAS-memo-FINAL-7-21-15.pdf

utilization of existing ROW and, to create a long-term, running plan for future strategy, usage and monetization.

Establish a Community Fiber Expansion Plan - An incremental approach to creating and expanding a fiber network in Redmond provides nearly all the benefits generally associated with successful Government Owned Networks (GON), while minimizing the risks associated with substantial financial investment by municipal entities.

The benefits of a strategic, incremental fiber expansion plan include significant cost savings in network service charges from outside network providers, reduced network construction costs, increased availability of fiber to institutional users and creation of a new economic development incentive through additional fiber availability across Redmond. Another less traditional benefit is narrowing the digital divide and expansion of educational opportunities that are enabled when a critical mass of Redmond fiber is established and available for community anchor institution use.

Coordination between Redmond Departments either through a Dig Once policy or an ROW forecasting program would result in a reduction of costs of fiber deployment. Those cost reductions could be further amplified by additional collaboration with other municipal partners such as County, State or Federal agencies. In addition to utilizing a growing fiber network for its own purposes, Redmond would be able to generate revenue from leasing dark fiber to other commercial and institutional users if it were interested in doing so.

Collaborative models between municipal entities to expand fiber connectivity have proven difficult to achieve, but highly rewarding when executed correctly. Networks like GAATN in Austin, TX produce savings of millions of dollars between its institutional users.[9] These "public-public partnership" collaborative approaches can be achieved.

There are generally five fiber expansion models to consider when investing in government owned networks.

1. **Infrastructure Owner Model** - Redmond could incrementally expand its own fiber network at an economically realistic pace and offer dark fiber, or conduit (though the City is not interested in conduit leases to date). Lease opportunities to interested parties can help recover some of the cost of investment. The single biggest benefit is the cost reduction from replacing private connectivity needs with City owned fiber and infrastructure;

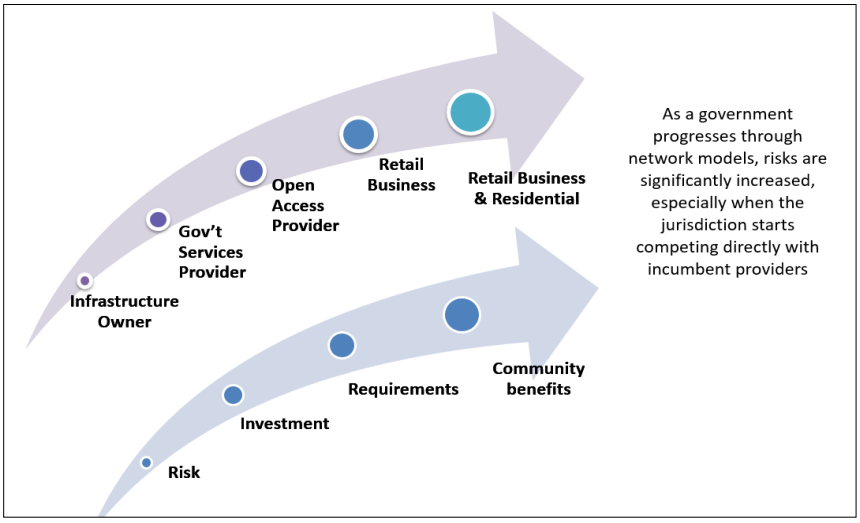
[9] GAATN (Greater Austin Area Telecommunications Network) is a collaboration between 7 institutional users started in 1997. The network covers over 371 miles of up to 114 strands. It provides connectivity for the County, City of Austin, State agencies, and educational institutions like the Austin Independent School District. https://www.gaatn.org/

2. **Government Services Provider** - Redmond could provide voice and data services to community anchor institutions over its expanding fiber network (if fiber was not provided by 3rd party companies). This provides cost savings to these institutions and creates new revenue streams to deploy additional fiber.

3. **Open Access Provider** - Redmond could lease access on a per mile basis, or in exchange for a percentage of revenue (or both). This is a wholesale model where local service providers provide retail services to business and residential end users over a government-owned and operated network;

4. **Retail Fiber/Service Provider** - Redmond could offer lit fiber access, and possibly voice services to business, industry and Community Anchor Institutions;

5. **Triple Play** - Redmond could provide the triple play of services (data, voice and possibly video) to businesses and residents and compete directly with incumbent providers (although this has significant economic and political implications).



Perhaps the most advantageous benefit of the incremental approach to GON development is that with the right vision, an Infrastructure Owner Model can quickly develop into any of the above referenced models as future needs may dictate. [10] The City of Santa Monica, CA has progressed through all five of these business models and today it is providing FTTP solutions to directly impact the digital divide that exists in their community by offering high-bandwidth, low-cost Internet access to disadvantaged households. Santa Monica, who has been planning and deploying their fiber network since 1998, offers four key steps to success:

- **Establish a concrete and viable vision** - A vision needs to identify the *potential benefit(s),* both quantitative and qualitative, and a reasonably concise *assessment of the problem(s).* A

[10] The City of Santa Monica, CA is arguably one of the most successful early adopters of such an incremental approach. A city of only 90,000, they transformed an initial $450,000 investment into an annual cost savings on network services of $700,000. Substantial economic development resulted along the way, commercial users, and FTTH are noteworthy, as well as $5M in dark fiber lease revenues. http://muninetworks.org/reports/santa-monica-city-net-case-study

common problem is a lack of local control over essential infrastructure. Gaining control over the infrastructure is one piece, but what will that allow the community to do? Hope is a valuable part of vision. The community must be resolved that it can do better and find ways of bringing the community together to create (or maintain) a good place to live and work.

- **Find a Champion** - From the beginning Redmond will need to be a champion which understands the issues, the technology and the possibilities. What is important is, someone with the commitment to stay the course. A champion must earn the respect of others and be singularly focused on getting the network built. A champion should be ready to rapidly respond to the claims of opponents.

  Without cities being and having a champion, they often fail to proceed further. Without commitment, studies gather dust and citizen task forces temporarily get excited just to see their expectations dashed. It seems simple, but it is critical.

- **Build Commitment** - Redmond must gather key groups: wireless carriers, utility companies, education, healthcare, public safety, broadband providers, an intercultural advisory council, chamber of commerce and economic development organizations. These discussions will create the inclusivity needed for the vision. This demonstration of support is important in gaining approval by governing authorities, the business community and area residents. The presence and active participation of OneRedmond at the Smart City Symposium reflected that enthusiasm.

  Market surveys are often performed to evaluate public support. This can be valuable, but it is not the primary aim of commitment building. After all, it was six years before Santa Monica began City Net with fiber in the ground. Two key ingredients were obvious in Santa Monica as it built commitment: The first is building an inclusive vision while understanding the political environment – creating a realistic dream. The second, and most important, is patience and persistence. In the beginning, this process is called education and building a vision; it is later called marketing and promotion. They are part of the same short-term and long-term process.

- **Allow Sufficient Flexibility** - to take advantage of opportunities. The vision must be adaptable to opportunities when they arise.

With the proper planning and support program, Redmond can accelerate the pace of this change or adjust its model to match its current priorities and funding as required. An incremental approach will allow Redmond to incorporate other collaborative Stakeholders as the GON becomes more substantial and available for outside use.

Finally, in considering the financial requirements of long-term fiber expansion, it is important to recognize that other asset access revenue sources previously mentioned in this Report will support ongoing fiber expansion. Revenues from currently unutilized Redmond assets can be designated for fiber expansion projects in support of fiber expansion objectives. As that fiber footprint continues to grow, it also becomes its own revenue generating asset.

Appoint a Community Broadband Infrastructure Coordinator - While the Redmond City Council will determine which of this Report's recommendations may be suitable for implementation, it is imperative that a single point of contact be established within the ranks of Redmond government to serve as the Broadband Infrastructure Coordinator.

Such a Coordinator would oversee the implementation of this Report's recommendations, facilitating collaboration across all relevant Redmond Departments and serve as the liaison for third-party implementation as well as engagement with broadband infrastructure entities. Among other responsibilities, the Broadband Infrastructure Coordinator would:

- Coordinate Right-of-Way needs;
- Ensure safe and efficient accommodation of broadband infrastructure in Redmond's public Right of Way or attachment to other community infrastructure;
- Include broadband Stakeholders in the infrastructure planning process;
- Coordinate City-wide construction plans with other interested parties, including broadband infrastructure entities to improve efficiencies and maintain adherence to Dig Once policies.[11]

7. Understanding Connectivity Options

As communities begin planning for their Smart City transitions to Internet of Things (IoT) and other Smart City applications, they are quickly recognizing their need for connectivity. City services, healthcare, education, workforce development, economic growth and public safety all require, or soon will, gigabit-speed wireless and fiber networks that can transport the data traffic which is necessary to optimize and gain efficiencies across all segments of our lives.

At this juncture, Redmond should consider its future connectivity needs and determine if it wants to invest the time, money and resources into further deploying network facilities that can satisfy municipal connectivity and Smart City needs for years to come. The only other viable option is a reliance on current providers. Deciphering the infrastructure investment drivers and plans of private sector broadband providers is a difficult proposition and providers will rarely share their immediate and long-term deployment plans. The communications technology market moves so rapidly that companies are in a constant state of reevaluating and shifting investment decisions. With mixed results, the public sector, at all levels, is grappling with the right mix of policy and practice to create the right environment for broadband to thrive. For all of these reasons and more, communities of all sizes should make the effort to own a significant, yet fiscally, prudent part of their broadband future.

[11] See S. 2555, (Section 8), the MOBILE NOW Act of the U.S. Congress, 2016, https://www.govtrack.us/congress/bills/114/s2555/text/rs

8. Current Broadband Providers

Summary of Residential Internet Service Providers in Redmond, WA

Provider	Coverage	Max Download Speed	Max Upload Speed	Typical Download Speed	Typical Upload Speed
DSL Providers					
Platinum Equity, LLC	55.63%	50 mbps	50 mbps	6 mbps	6 mbps
Frontier Communications Corporation	98.00%	100 mbps	25 mbps	50 mbps	6 mbps
Integra Telecom Holdings, Inc.	44.77%	50 mbps	3 mbps	6 mbps	3 mbps
CenturyLink, Inc.	5.83%	50 mbps	25 mbps	3 mbps	1.5 mbps
Cable Providers					
Frontier Communications Corporation	98.00%	100 mbps	25 mbps	50 mbps	6 mbps
Comcast Corporation	98.82%	1 gbps	25 mbps	1 gbps	25 mbps
Wave Division Holdings	0.20%	1 gbps	25 mbps	1 gbps	25 mbps
Fiber Internet Providers					
Frontier Communications Corporation	79.56%	100 mbps	25 mbps	50 mbps	6 mbps
Comcast Corporation	98.82%	1 gbps	25 mbps	1 gbps	25 mbps
CenturyLink, Inc.	1.61%	> 1 gbps	> 1 gbps	> 1 gbps	> 1 gbps
Mobile Wireless Providers					
AT&T Inc.	100.00%	25 mbps	6 mbps	25 mbps	6 mbps
T-Mobile	100.00%	25 mbps	10 mbps	25 mbps	10 mbps
Sprint Nextel Corporation	100.00%	10 mbps	3 mbps	10 mbps	3 mbps
Verizon Communications Inc.	100.00%	25 mbps	6 mbps	25 mbps	6 mbps

Source: https://broadbandnow.com/Washington/Redmond?zip=98052

8.1 Fixed Wireless Providers

Wireless Internet Service Providers (WISPs), also known as Fixed Wireless Providers, typically provide wireless broadband connections by mounting a transceiver antenna on the outside of a subscribing premise. A wire is then run from the antenna to an indoor modem/router to allow Internet access. Research was conducted to identify all WISP providers serving the Redmond area, and none were located as of yet.

8.2 Wireless Providers

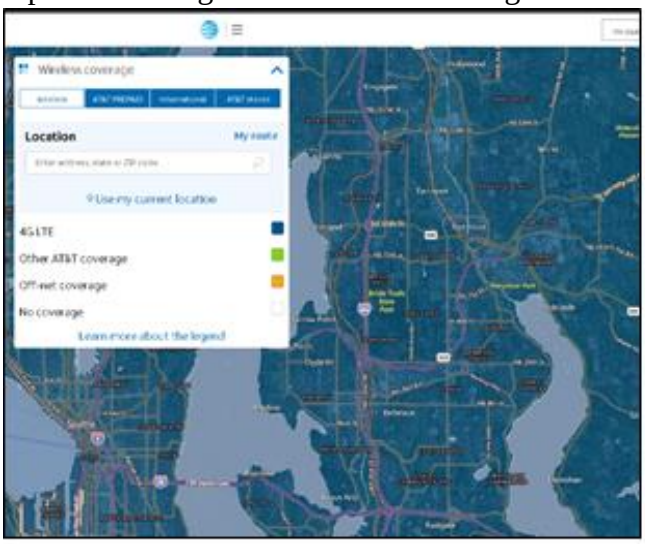
Dramatically increasing demand for broadband connectivity is driven by basic market dynamics: a fast-growing number of users of broadband services using multiple devices require more

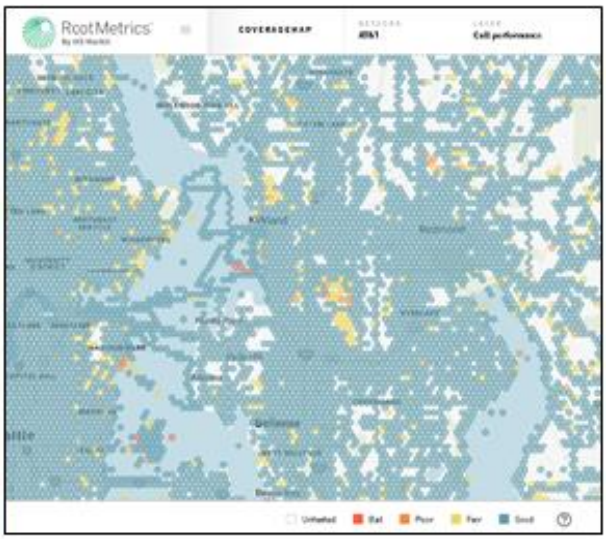
bandwidth as new video and data-intensive applications become available. Demand for data access is outpacing supply at increasing rates on a yearly basis.

The cellular industry is undergoing a metamorphic change in architecture called densification, whereby cell sites are becoming smaller, often referred to as "small cells", and installed on utility poles, streetlights and traffic lights. Such design allows re-use of valuable spectrum resulting in more capacity per cell. Wireless broadband service providers will also continue to develop more traditional "Macro cell sites", the large tower sites which have traditionally been constructed along highways and throughout urban areas. However, there will be a substantial increased reliance on "small cell technologies" going forward. Small wireless facilities offer increased capacity for mobile devices (for example, for data/email usage) rather than coverage as provided by traditional macro cell towers.

It is expensive to modernize architectures with fiber to the premise infrastructure. Moreover, the increase in the availability of data-rich applications and content creates an expectation of ubiquitous accessibility from broadband users across all segments of the local economy. The chart below shows the immense increase of data usage on wireless networks as a result of two primary factors; 1) an ever-growing reliance on wireless devices and the resultant disassociation of home telephones, and, 2) the increase of connected devices per person.

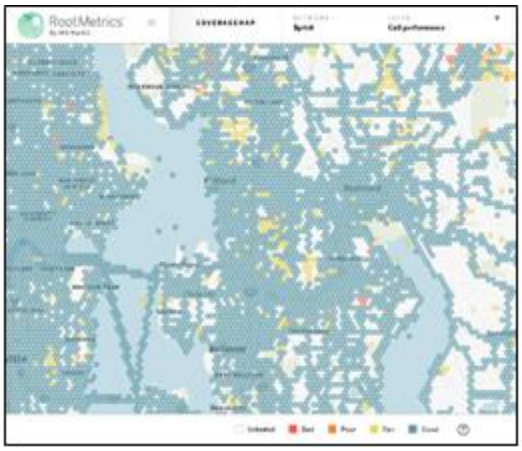
The following coverage maps compare the wireless call performance as depicted on each wireless provider's website with recent reporting by Root Metrics[12], a company that conducts physical drive testing of cellular networks and that also amasses actual performance measurements using consumer cell phones. The Root Metrics tests are performed on a six-month cycle with map results updated on a rolling basis. The coverage map images below represent testing results collected during the 2nd half of 2019.



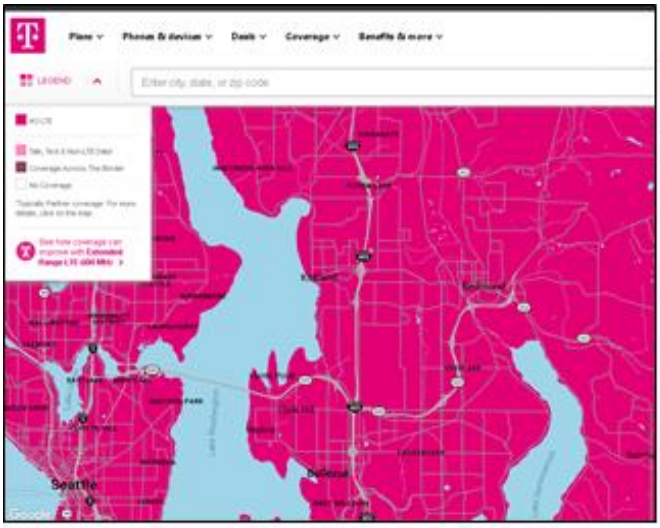


AT&T - https://www.att.com/maps/wireless-coverage.html

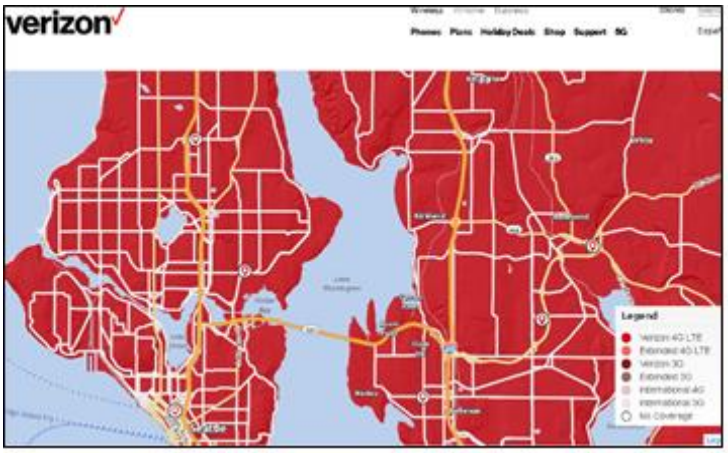
[12] http://webcoveragemap.rootmetrics.com/en-US

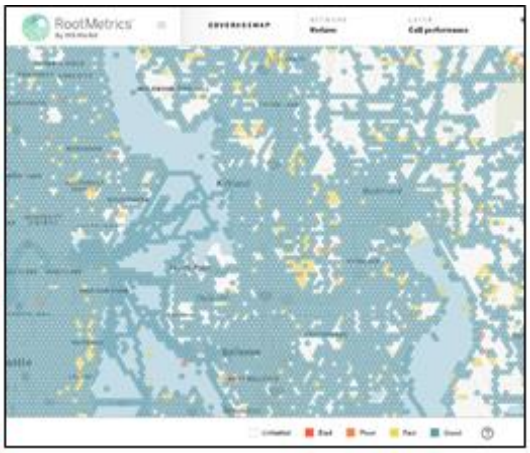


Sprint - https://coverage.sprint.com/IMPACT.jsp



T-Mobile - https://www.t-mobile.com/coverage/coverage-map





Verizon - https://www.verizonwireless.com/featured/better-matters/?map=4glte#maps

As one can immediately determine when comparing the maps; the provider website maps portray nearly 100% coverage throughout the Redmond region, though the Root Metrics performance maps tell a story that is developed from actual cell phone usage.

Even if the providers did have ubiquitous coverage, it would do little to alleviate the underlying issues with current wireless networks; limited capacity and inadequate backhaul networks. Current data demands are straining wireless networks. Having invested billions on these networks, today's broadband providers are finding it expensive to modernize their architectures with fiber to the premise/cell site infrastructure.

9. Smart City Symposium Results

Invitations were sent to more than 65 potential Attendees including Redmond Department Directors and Staff, regional personnel from cities such as Bellevue and Kirkland, private industry such as Microsoft, Amazon, SpaceX, Comcast, Frontier and CenturyLink. There was a significant turnout of approximately 30 Attendees at the Symposium and Invitees were given the opportunity to respond to a questionnaire. The list of Invitees and a copy of the Power Point Presentation will be furnished upon request.

The Mayor welcomed everyone to the Symposium and provided her opening remarks as well as her vision for Redmond as a Smart City. The Mayor is very focused on Connectivity, Livability, Transportation, Parking and the Environment.

Jonny Chambers, Technology & Information Services Director, then provided a summary of work which has been done to date in Phase I of the Smart City Program. He emphasized that we are looking for feedback from the Attendees as to what constitutes a Smart City as well as their experiences in Redmond and elsewhere.

As we shared during the Symposium, incorporating Smart City Best Practices from other cities such as Austin, San Antonio, Dallas, Coral Gables and even Barcelona will benefit the City. From an overview standpoint, and building upon the Symposium, several Topics and Potential Smart City Applications can be addressed including:

- **Government Efficiency**
- **Sustainability**
- **Economic Development**
- **Health and Wellness**
- **Public Safety**
- **Mobility**
- **Quality of Life**

Some Specific Potential Smart City Applications:

- **Carbon monitoring**
- **Public safety – crime prevention and monitoring**
- **Parking information regarding available spaces**

- **Autonomous vehicles**
- **Energy conservation- LED lighting and dimming**
- **Real-time transit information**
- **Public Wi-Fi**
- **Meter reading and water leak detection**
- **Reduction in traffic congestion**

Surveys conducted prior to the Symposium identified the following as some of the most important areas of Smart City concerns:

1. Affordable Housing and Homelessness

2. Transportation, Commuting and Traffic Congestion

3. Urbanization

4. Climate Change

5. Light Rail and Regional Population Growth

6. Smart Kiosks

7. Public Safety (Police, Fire and Emergency Management) and City-wide Connectivity

8. Faster and Higher Capacity Internet Service, Climate Change, Aging Infrastructure and Sustainability

The following are some of the **Issues** which were raised by Attendees who spoke during the Symposium:

1. Synchronizing Traffic Lights to save time for Fire Trucks and First Responders
2. Ability to utilize cash instead of just credit cards while keeping in mind consumer privacy
3. Being mindful of Smart Parking Adaptations which are inclusive of those with physical and mental challenges and those who are colorblind while implementing technology
4. Working with existing businesses so that the City is not dependent upon just Microsoft for vitality as well as being mindful of charitable entities
5. Addressing whether free parking should be replaced by paid parking to increase City revenues
6. Tangible ways to share information with out-of-state companies interested in locating in Redmond
7. Bridging the technology gap while improving Environmental Quality
8. Ability of City Inspectors to send pictures from the field in order to reduce travel time
9. Building in Communications as an essential component of Infrastructure
10. Long range planning to include Smart Parking and to address issues in the Comprehensive Plan with its 2023 update with a technology focus

11. Considering Smart Trucks and Autonomous Cars in a futuristic city while enhancing Humanity
12. Coordinating between Departments in the City so that Smart City Projects are not in separate silos
13. Building in public safety while being mindful of facial recognition issues and privacy concerns
14. Bringing in new businesses with better alternatives for parking such as what has already been done by Microsoft
15. Potentially utilizing CenturyLink technology with fingerprint and retina recognition
16. Utilizing Smart City Technology which takes into account adults with special needs and being inclusive of others with physical and mental challenges and those who do not speak English as their first language
17. Linking Cities and Schools for Safety concerns and GIS mapping
18. Instituting Innovation Zones
19. Providing availability for bikes to reduce traffic congestion
20. Availability of public funding for infrastructure
21. Using Google Maps to look at upcoming intersections and the ability to then expedite getting to a destination rather than focusing on just one problematic intersection
22. Working with OneRedmond in its Public-Private Partnerships which includes partners such as Microsoft, Google and Facebook
23. Potential liability concerns with respect to who owns parking lots
24. Further developing Redmond to make it a Smart City, a Livable City and Trustworthy City
25. Creating a Steering Committee to help establish direction and priorities for the City in its Smart City Program

Several Attendees contributed to, participated in and shared experiences in the discussion. Based upon the Symposium and Survey Results, the following are several **Redmond Smart City Centric Priorities** which were identified:

1. Making Redmond a more Connected City and the fiber/wireless foundation for being a Smart City

2. Transportation, Traffic Congestion and Parking

3. Being mindful of the Environment and utilizing Smart City Technology to improve Livability and Quality of Life for the Community

4. Making Redmond innovative in Communications and address the possibility of the City increasing its own Fiber Network

Overall, given the supportive and enthusiastic interest shown by the City and other Attendees at the Symposium, our recommendation is that the City proceed with Phase II of the Smart City Project.

Here are some pertinent considerations:

1. Phase II provides alignment with the Policy Goals of the Mayor and City and the Comprehensive Plan.
2. The proposed work with respect to Smart City Phase II provides opportunities for streamlined governance, reduction in traffic congestion and pollution, smart parking and sensors to improve crime prevention and decrease homelessness.
3. The proposed work with respect to Smart City Phase II provides more opportunities for energy conservation through LED lighting (dimming capabilities).
4. The proposed work with respect to Smart City Phase II provides opportunities for the City for real-time transit notification and alternative modes of transportation (shared bicycling).
5. The proposed work with respect to Smart City Phase II provides opportunities for Public-Private (P3) Partnerships to enhance fiber deployment and faster broadband (Internet service).
6. The proposed work with respect to Smart City Phase II provides opportunities for the City for Revenue Enhancement through the providers' installation of small wireless facilities.

In Phase II, we would take the results of the assimilated data and this Report generated by our Team to create a Steering Committee, work with and interview Stakeholders and begin to conduct 3 Pilot Projects, which possibly might be funded in part by Industry. We would work with City Departments and other community partners such as civic leaders, OneRedmond and the Lake Washington School District.

Specifically - the overall Tasks in Phase II could be:

A. Incorporate the results and begin to implement the Redmond Centric Priorities identified from the Symposium and Phase I.

B. Set up a Smart City Steering Committee which would be very involved in strategy development, the implementation tasks in Phase II, and the identification and designation of potential Innovation Zones for the 3 Pilot Projects. The Steering Committee with whom our Team would work closely, along with the Mayor, City Council and Planning Commission, all are vital to this cohesive effort.

C. Hold a Vendor Tech Symposium in the City (all interested Providers and Stakeholders who could demonstrate what equipment and services they might offer).

D. Do RFPs for Pilot Projects which requests proposals from Providers including what equipment they will provide at the Provider's cost and expense.

E. Develop, Draft and Negotiate Agreements between the City and Providers for 3 Pilot Projects.

F. Implement the 3 Pilot Projects in anticipation of full-scale deployment.

On a getting-started basis, some Pilot Projects might initially include but not be limited to (A) Continue Smart LED Lighting, (B) Smart Parking (C) Smart Transportation (D) Kiosks which could provide transit information and crowd monitoring along with potentially generating advertising revenue. (E) Public Wi-Fi, (F) Security Cameras for Public Safety and Crime Prevention. From this list, the City could select the 3 Projects with the most imminent needs and also do preliminary work on the other Pilot Projects. Our thinking is that this would provide a good base from which the City could then decide if it wants to proceed with Phase III.

10. Conclusion

The Mayor and City Council have both expressed interest in examining the potential for a Smart City future for Redmond. Our Team and this Report are attuned to the Smart City Needs and Interests expressed by the Community, Redmond City Leadership and Staff.

Redmond needs to build upon its existing infrastructure and the services provided by existing broadband companies. The digital economy is upon us and those communities that fail to act now, may one day, be unduly dependent upon others to deliver the connectivity necessary for Smart City applications already available elsewhere. As an alternative, by adding to its own Fiber Infrastructure and Conduit and working with Broadband Providers in Public-Private Partnerships, the City, Private Industry, Residents, Educational Institutions and other Stakeholders can all benefit.

Some of the recommendations within this Report cost more than others to implement, while some are relatively not as expensive, but can be transformative in making Redmond a Smart City and even more broadband friendly, and thereby fostering an environment for greater Smart City innovation. In order to be responsive to the Needs and Interests of the Community, Redmond Leadership and City Staff, we encourage you to keep the Smart City Phase I momentum moving forward, and work toward the implementation of Pilot Projects. Thus, we recommend that the City build upon the Phase I work done to date and proceed with Phase II of the Smart City Initiative in 2020.

Additional Materials for Review Upon Request:

1 - List of Smart City Symposium Invitees
2 - Power Point Presentation
3 - Results of Smart City Symposium Survey/Questionnaire