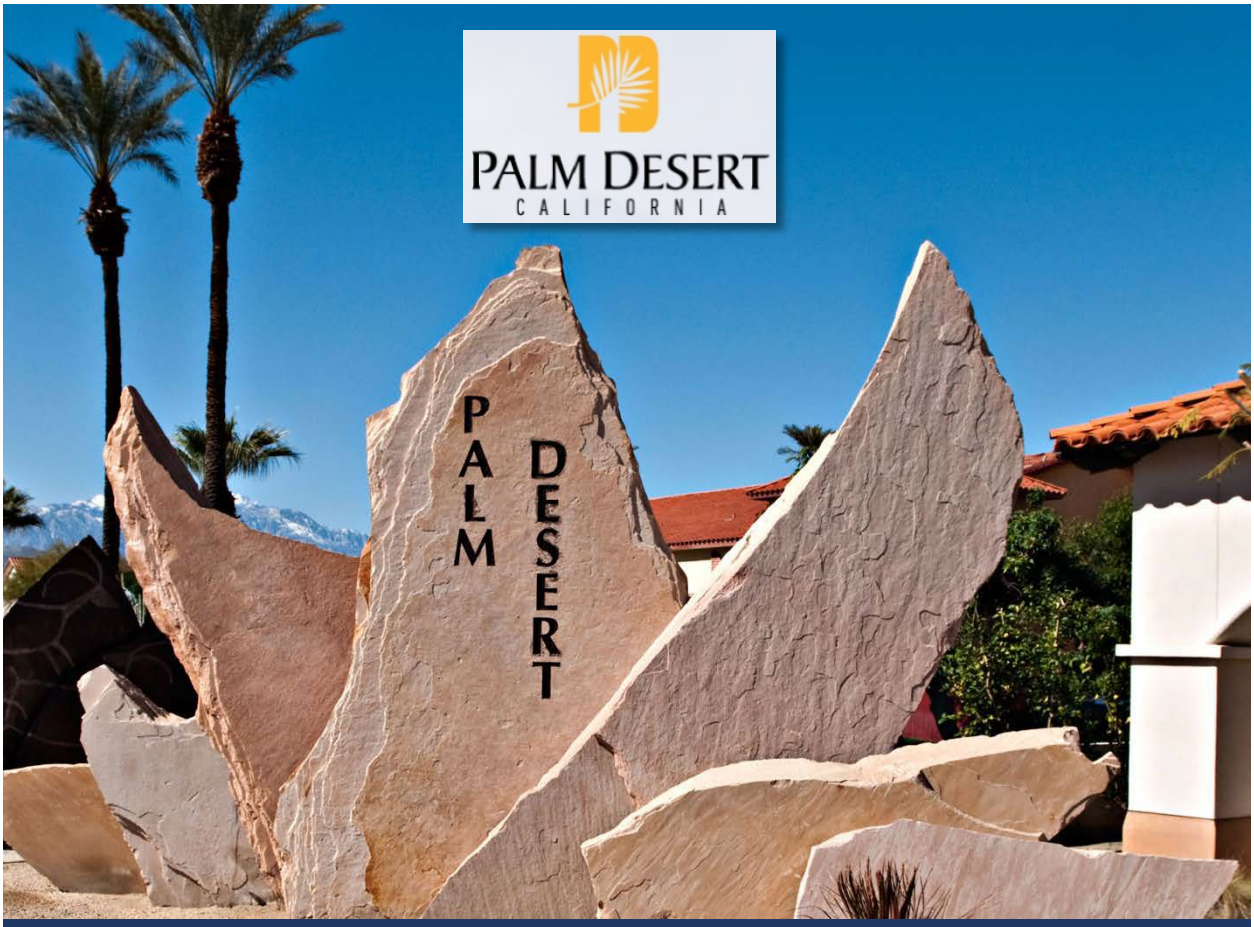

Broadband Feasibility & Master Plan Study

FEBRUARY 2, 2024

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Section 1: Executive Summary

The Palm Desert Broadband Study

Broadband has evolved from a nice thing to have, to being an important ingredient for economic development and a significant ingredient for many key components of quality of life, including education, business attraction, telemedicine, tourism, working from home, seniors staying in their homes, and young people staying in the community. No wonder a broadband master plan has been part of Palm Desert's strategic plan for many years.

The recent pandemic has drawn an even sharper focus on the impact that lack of internet access has on communities. No longer is broadband a luxury for video-on-demand and streaming services. Instead, it is a crucial part of how our residents work, gain access to medical treatment, and how our children learn, as well as a determining factor for businesses considering relocation. Effective broadband solutions are now critical to all phases of our life.

City leaders selected HR Green to complete a Broadband Feasibility and Master Plan Study designed to gather stakeholder needs, document current infrastructure and provider options, and complete modeling (costs, risks, funding, anticipated revenues) of the different options available to Palm Desert (owning and operating, partnerships, leasing, etc.). This study was conducted over several months and resulted in the delivery of this Study to the City in January 2024.

This Executive Summary provides a high-level overview of the key findings of the project, as well as the recommendations that can serve as a roadmap for the City to resolve the issues identified. Further details of the study are contained in this Report, the models, GIS tools, Standards and other deliverables that were provided to City leaders.

While the study has identified several key issues from the community, there is a positive outcome that a solution is feasible by creating a partnership with the private sector. This will entail the creation of both a core fiber ring network by the City, last-mile connectivity by private providers, and enabling funding from federal and/or state sources. The road to this solution is not easy or automatic, as funding must be developed in a competitive environment, but there is a path forward. And dramatic service improvements are within reach.

Approach

The following multi-phase approach was used to complete the development of this Study.

Phase I – Vision

- Resident and Business Survey
- Market Assessment
- Stakeholder Engagement
- Asset Inventory
- Establish Community Broadband Vision

Phase II - Planning

- Preliminary Design and Cost Estimate
- Financing - Evaluate Funding Alternatives
- Smart Application Technology Plan
- Explore Partnerships
- Complete Broadband Feasibility and Master Plan Study

Key Findings

The following are some of the Key Findings from the Vision phase of the Study.

- Major concerns with broadband services in Palm Desert seem to be availability, speed, cost, security, reliability, expandability, resiliency, and redundancy.
- Economic Development (retaining current businesses and attracting new businesses) seems to be a driving force behind improved broadband services for home based, online, and traditional brick and mortar businesses.
- There does not seem to be enough competing broadband service providers in the City to meet the needs of residents and the business community.
- Unserved and underserved communities, as well as low- and fixed-income communities seem to need improved broadband services and those services potentially need to be inexpensive or free.
- The council, residents, and businesses feel strongly that the City needs to help facilitate better broadband.
- Some cellular providers have good coverage, while others have poor coverage.
- Free public Wi-Fi is currently unavailable in downtown business areas or outdoor recreation spaces.
- Residents seem to consider the internet to be an essential public infrastructure like electricity, water, and transportation.
- CVAG is open to partnering with the City to use some of the CVAG broadband fiber.
- Caltrans in the future may design and build a fiber-based network along I-10, which could permit the City to potentially place conduit and fiber in the same trench as the Caltrans conduit and fiber.

Visioning Session

The Visioning Session with the Palm Desert City Council took place on June 22, 2023. It occurred during a study session with the Council.

The following was the agenda for the session.

- Broadband 101
- Project Background
- Project Progress Update
- Review Visioning Exercise
- Review Broadband Service Models
- Discussion & Next Steps

As indicated in the agenda above, the session started with a basic overview of Broadband. That was followed by a presentation and discussion of the materials included in the Vision phase of this Study report. This discussion included the results of the Resident and Business Survey, Market Assessment, Stakeholder Engagement, and Asset Inventory. The Vision Exercise Survey results were discussed, as well as the Business Service Models diagram shown in **Appendix A** of this report.

During the session, Council members explored various ownership and operating models to better understand the risks and potential rewards of the often challenging and sometimes conflicting values inherent in community broadband. This exercise helped the Council develop recommendations for the next steps of the Study related to improved community fiber and broadband services.

A broadband roadmap that stresses the importance of the creation of recommendations for this project was used during the session. Recommendations must be grounded by a thorough understanding of the intended goals of the project, an appreciation of the risks/rewards of various ownership and operational models and buy in from governing bodies that the path forward represents the best use of scarce community resources (time, energy, financial capital).

The discussion concluded with the following key outcomes, which drove the next phase of the Study.

Key Outcomes

The primary outcome from the Visioning Session was that the Council shared their thoughts about next steps for the Study. The Council indicated that it was probably in the best interest of the City to explore ways to improve upon the Full Private Broadband model that is currently in place in the City because it did not seem to be fully meeting the needs of the community. As shown in **Appendix A** of this report, the Full Private Broadband model is described in broadband service Model #5.

At the end of the Visioning Session, the Council decided that they wanted the next steps of the study to focus on a recommended municipal broadband model based on the data that was gathered during the Vision phase of the Study. In addition, they wanted the next steps to include a conceptual design and costs estimate of the recommended model, and an exploration of potential funding sources to cover the costs of any potential construction of a community network based on the recommended model.

Recommendations

Based on the data collected during the Vision phase of this Study, **Model 3 – Hybrid Ownership** was recommended as the model that should be explored during the Planning phase of this Study. This model is described in the chart in **Appendix A** of this report that shows the five different municipal broadband models.

The general characteristics of **Model 3** include a municipal owned, designed, and constructed middle-mile fiber ring network. Typically, the municipality explores a partnership with one or more private sector providers to construct, manage, operate, and maintain the municipal owned network, as well as to provide services over the network, and potentially own, design, construct, and manage the last mile connections to residents and businesses. When a municipality looks at potentially constructing a fiber network, it usually tries to find funding opportunities to help cover constructions costs, such as grants, and some of those opportunities require the City to have one or more private sector partners to qualify for funding.

The implementation of the recommended model should provide solutions to some of the concerns shared by residents, businesses, stakeholders, Council, etc. including:

- **Increased Availability** – The scenario described above should improve the availability of broadband service throughout the community including the unserved and underserved areas.
- **Encouraging competition** – The City-owned network could break down potential barriers to competition by allowing providers not currently in the market to utilize the City's fiber network as a foundation for their networks through the leasing of dark fibers.
- **Reducing service fees** – Fees tend to decrease with increased competition.
- **Improving speeds** – Generally, the technology used to connect users to a fiber-based network permits increased speed over traditional coax, copper, or wireless connectivity.
- **Improving cellular service** – Carriers could lease dark fibers from the City to interconnect their cell phone facilities, which means the carriers could install facilities in areas of the community where they currently do not have coverage or poor coverage.
- **Supporting Economic Development** – When businesses are looking to relocate, they often look at the availability of broadband in the area they would like to relocate to, so the City-owned network should help to attract new businesses and retain current businesses, including home based, online, and traditional brick and mortar businesses.

It is important to point out that if the City is unable to establish a partnership with one or more private sector partners to own, design, construct, and manage the last mile connections to residents and businesses, then the City and its anchor institutions that are connected to the city-owned middle-mile network would be the only beneficiaries of the improvements in broadband services created by the construction of the middle-mile fiber ring network. Also, without a private sector partner, the City would most likely not be able to qualify for many of the current federal and state last mile broadband grant opportunities.

Preliminary Design and Cost Estimate

Based upon the key outcomes and recommendations from the Vision Session with Council, the next step in the Study was to complete a fiber ring network high-level design (HLD) that can be used for costing (and possible future detail design). Some of the steps in developing the HLD included:

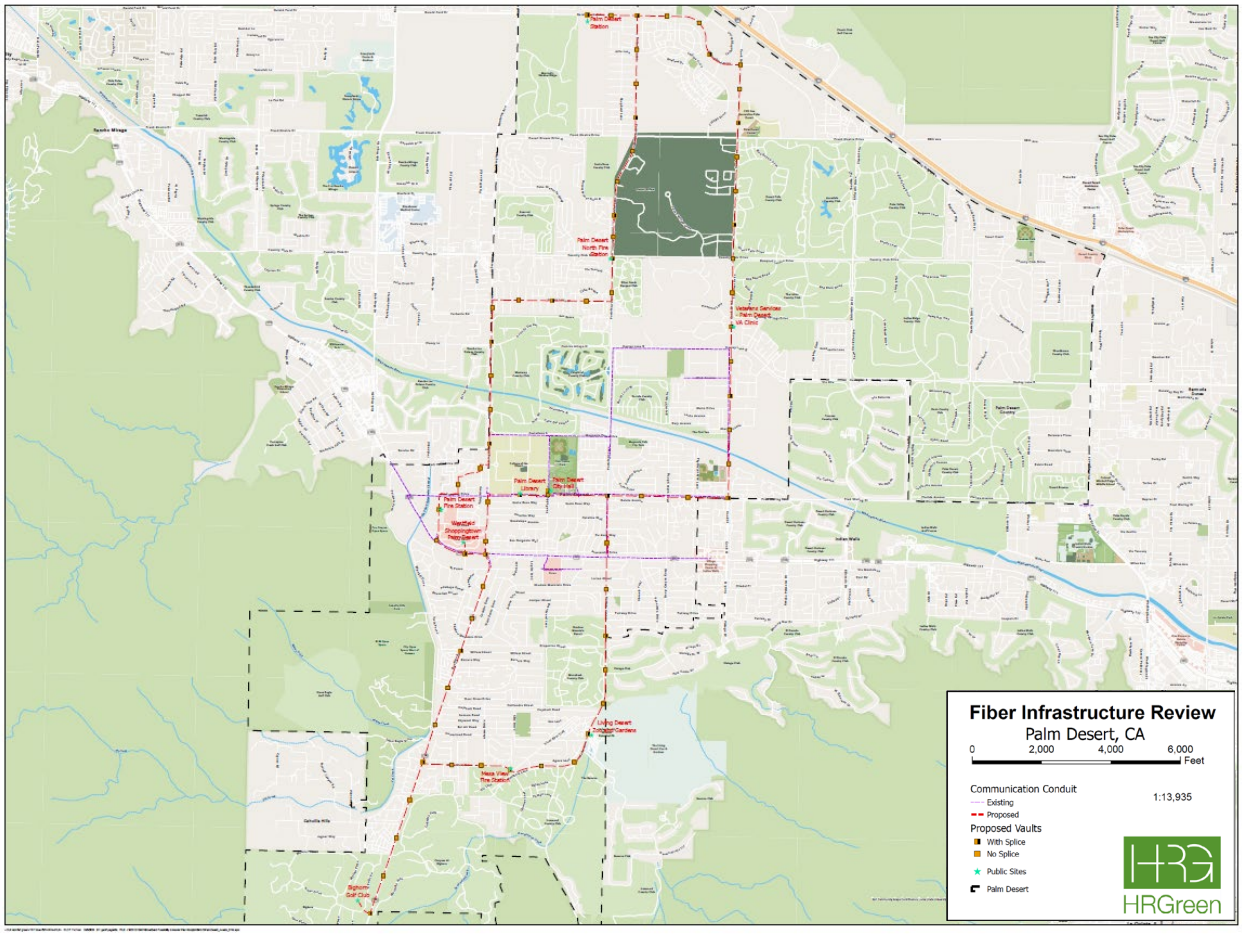
- Checking for any higher cost issues (special crossings, rural areas, etc.).
- Potential use of existing City's fiber and conduit assets (or other assets).

The HLD leveraged GIS-based tools that identify physical locations of all customer locations and other termination points.

Upon completion of the preliminary design, a cost estimate was prepared for developing the next generation fiber ring network.

Conceptual Design

Drawing on field and desk surveys, and GIS maps, the following system level design and cost estimate was prepared for developing a next generation network. In developing this approach, the focus was on creating a robust, reliable, and cost-effective approach to meeting the City's networking needs. To that end, for example, the design includes excess dark fiber to enable the implementation of smart technology solutions across the community. Information about potential smart technology solutions can be found in the Smart Application Technology Plan located in **Appendix B** of this report.



Cost Estimates

A cost estimate and supporting documentation for network deployment and interconnection, inclusive of anticipated construction labor, materials, engineering, permitting, quality control, and testing was prepared. These estimates were provided in the form of a cost range, with the lower-end estimates representing the most likely costs and the higher-end representing budgetary estimates with suitable contingencies included.

The following table shows the **estimated length** of the proposed underground conduits for each of the network segments that are part of the two network rings that make up the backbone of the network.

Segment Description	New Underground Conduit Feet	Hand Holes	Splice Points
North Ring			
Palm Desert Station - Palm Desert North Fire Station	13,502	11	5
Palm Desert North Fire Station - Palm Desert Fire Station	18,533	12	4
Palm Desert Fire Station - Westfield Shopping	3,360	2	1
Westfield Shopping - Palm Desert Library	5,019	4	2
Palm Desert Library - Palm Desert City Hall	1,547	2	1
Palm Desert City Hall - Veteran Services	15,646	9	4
Veteran Services - Palm Desert Station	17,502	11	3
South Ring			
Westfield Shopping - Bighorn	17,610	10	3
Bighorn - Mesa View Fire Station	3,905	3	1
Mesa View Fire Station - Living Desert	4,407	3	1
Living Desert - Palm Desert City Hall	10,691	5	1
Palm Desert Overview	**111,722**	**72**	**26**

The following table shows the **estimated backbone construction costs** for each of the of the network segments that are part of the two network rings based on installing a **288-fiber count sheath** within each conduit and using the **estimated length** of the proposed underground conduits shown in the previous table.

Segment Description	Estimated 288ct Material Costs	Estimated Backbone Installation Cost (no splicing)	Estimated Design Engineering and PMO Labor Cost	Estimated 288ct Total Backbone Segment w/Splicing Cost
North Ring				
Palm Desert Station - Palm Desert North Fire Station	$84,287	$1,184,801	$36,050	$1,491,091
Palm Desert North Fire Station - Palm Desert Fire Station	$115,693	$1,626,271	$49,483	$2,014,943
Palm Desert Fire Station - Westfield Shopping	$20,975	$294,840	$8,971	$368,353
Westfield Shopping - Palm Desert Library	$31,331	$440,417	$13,401	$555,840
Palm Desert Library - Palm Desert City Hall	$9,657	$135,749	$4,130	$175,579
Palm Desert City Hall - Veteran Services	$97,671	$1,372,937	$41,775	$1,707,972
Veteran Services - Palm Desert Station	$109,257	$1,535,801	$46,730	$1,894,231
South Ring				
Westfield Shopping - Bighorn	$109,931	$1,545,278	$47,019	$1,905,714
Bighorn - Mesa View Fire Station	$24,377	$342,664	$10,426	$426,302
Mesa View Fire Station - Living Desert	$27,511	$386,714	$11,767	$479,679
Living Desert - Palm Desert City Hall	$66,739	$938,135	$28,545	$1,147,849
Palm Desert Overview	**$697,429**	**$9,803,606**	**$298,298**	**$12,167,553**
Price per foot	**$6.24**	**$87.75**	**$2.67**	**$108.91**

Funding Alternatives

The ability to leverage federal, state, and regional grants and programs can substantially facilitate the cost of a network buildout. In recognizing the need for broadband support, federal and state governments provide funding in areas recognized as unserved or underserved based on public data on broadband availability and speeds in different regions across the country. Historically, this data has been criticized as poorly prepared, marginally reliable, and overly generalized. As a result, a community like the City of Palm Desert may be considered as adequately covered and served by broadband providers, whereas residents may actively experience a lack of sufficient or affordable service.

It is important to note that the FCC defines unserved areas as locations with less than 25 Mbps download and 3 Mbps upload speeds, and underserved areas as locations with less than 100 Mbps download and 20 Mbps upload speeds.

Fortunately, the City is on the cusp of a generational investment in broadband infrastructure. The federal government and state legislatures across the country have recognized the need for broadband funding support. Numerous federal and state programs are currently either being rolled out or are in various stages of legislative consideration.

Recommendations

When applications are open, it is recommended that the City of Palm Desert should consider applying for the California Last Mile Federal Funding Account (FFA). This last-mile grant would increase the probability of the City facilitating infrastructure deployment to meet the connectivity needs of un and underserved residents and businesses.

In addition, when applications are open, it is recommended that the City should consider future CASF Infrastructure Account applications through the local Broadband Consortium representative.

Lastly, the City should facilitate an information campaign to advertise eligibility in the Affordable Connectivity Program to qualify for low or no-cost broadband subscription plans and discounts on computing devices for low-income residents. The program is currently undersubscribed, generally due to a lack of awareness, but many of the City's residents could be eligible.

Explore Partnerships

Broadband service Model #3, the Hybrid Ownership model, which is the recommended model for the City, may need to leverage funding for both fiber ring network and last-mile construction available through federal, state, or other funding sources. This means that the City needed to identify one or more potential for-profit partners who are interested in leasing the core middle-mile municipal network assets, and in building and managing last-mile connectivity. Identifying interested partners, therefore, was an important step to help the City envision a path forward, and may be required by some funding sources.

The approach used to engage with potential partners included building a list of potential partners and other interested parties, developing a request for expressions of interest (RFEI), publishing the RFEI on the City's bid system, sending the RFEI to the list of potential partners, processing responses to the RFEI, and selecting potential partners based on the level of interest. This approach created a faster-moving cycle in which partners could be identified and brought to the table more quickly and with a higher likelihood of successful progress.

The RFEI that was developed and posted on the City's bid system for selecting potential partners based on the level of interest can be found in **Appendix C** of this report.

On November 8, 2023, the RFEI was posted on the City's bid system, and then the link to the RFEI was sent to the list of potential partners via email. Potential responders had until November 15, 2023, to submit questions about the RFEI, and their responses were due on December 1, 2023.

Prior to the RFEI closing at 5:00 pm on December 1, 2023, the City received one response to the RFEI.

The respondent is **Arcadis**. Information about **Arcadis** can be found in the *RFEI Responses* subsection of Section 9 of this report.

Key Findings

After reviewing the respondent's proposal and responses to the RFEI questions, the decision was made to conduct a 30-minute interview with the respondent. The following are some of the key findings from the respondent's interview.

- Public-private-partnership (P3) business plan
- Ultimately a city-owned network – including the middle-mile municipal ring and the last-mile connections to every premise
- Network will be a long-term asset for the city
- Propose to use a design-build-finance-operate-maintain model
- Full turnkey implementation, including operating it over time
- Operate on an open access basis
- Over time multiple service providers would operate on the network – they would be selling services to end user customers (residents and businesses)
- Charge a wholesale price to the service providers for access to the network – they would then sell services to the end users
- Recoup their capital investment out of the wholesale pricing on the network for a preset period time – up for negotiation
- Presuming that the municipal ring will most likely be publicly funded
- Not necessarily reliant on state or federal grants
- Respondent's public sector grant identification/application/funding/administration team will be involved
- Know the California environment regarding the availability of grants
- Explore ongoing payments that could be known as an anchor tenant payment, if the city has its own uses of the network, such as interconnecting its facilities and/or smart city types of services
- Contribution over time – common way to finance – finance the entire project upfront then receive city payments over time
- Model often does require some contribution from the public sector

Recommendation

Since it seems that the City has received interest from at least one viable partner, it is recommended that the City complete a formal Request for Proposal (RFP) to identify Partner(s).

Recommendations

The key outcomes from discussions with Council and staff, as well as the findings shared throughout this Study contributed to the following recommendations. The recommendations are the next steps for the City to consider. While the recommendations are listed in sequential order this does not necessarily mean they need to be implemented in this order.

To fully realize the benefits of improved broadband service, some recommendations should be executed concurrently, primarily due to the need for federal and/or state funding as a mechanism to drive project deployment and the complicated nature of the potential Public Private Partnership.

Recommendation #1: Complete Formal Request for Proposal (RFP) to Identify Partner(S)

The RFEI process conducted as part of this study was useful to determine interested parties but does not provide the City with enough details to fully determine a proposed partner nor the form of the partnership. It is recommended that the City of Palm Desert conduct a formal RFP to identify and select its partner(s) for the potential buildout.

Recommendation #2: Pursue Grant Funding

When applications are being accepted, the City of Palm Desert should apply for the California Last Mile Federal Funding Account (FFA). This last-mile grant would increase the probability of the City facilitating infrastructure deployment to meet the connectivity needs of un and underserved residents and businesses.

In addition, when applications are being accepted, the City should consider future CASF Infrastructure Account applications through the local Broadband Consortium representative to plan for future grant award rounds.

Formal grant applications should be submitted as soon as practical to cover final engineering design of the proposed city-owned network, as well as to fund the network construction.

It is also recommended that the selection of a private partner be timed to allow for coordination of grant requests to assist with paying for last-mile connectivity. Ideally, a coordinated approach would assure both the private sector and the City of availability of state funds to complete both the city-owned fiber middle-mile ring network and the last-mile connections due to the interdependence of funding sources for completion of the project.

Recommendation #3: Finalize Detail Designs

The first step to finalizing the design is to perform a field survey that will need to follow established standards and design requirements. The intent of the field survey is to optimize the network and reduce the overall cost. Field engineering must ensure that all possible routing alternatives are documented. The final fiber network design can only be optimized by analyzing all possible connectivity routes, the location of all service points and existing infrastructure.

As a contiguous area is surveyed and posted, the actual fiber network is designed. Once Fielding is completed, the design of the planned network Low-Level Design(s) (LLD) necessary to create associated construction and permitting plan sets will need to be completed.

If the City decides to bring in a contractor to oversee the construction of the network, then the next step is to create an RFP to select and manage the contractor. The RFP will need to include a comprehensive construction specification manual, a complete design document, and a comprehensive bill of material.

Recommendation #4: Construct Network

Once a partner is identified and funding is secured, the next step will be to begin the deployment of infrastructure to support broadband improvements. This step can be started as soon as engineering is completed through the selection of a contractor with fiber optic deployment experience. The City should work closely with its selected private sector partners to ensure that the network constructed meets its required last-mile architecture.

Section 2: Resident And Business Survey

Background

Palm Desert needed feedback and input from its citizens and businesses regarding the current state of broadband service. This information is crucial for helping the City identify areas of the greatest need, partner Internet Service Providers (ISPs) to work with for a given area, and funding opportunities to support any future initiatives. The City welcomed citizen and business participation as it looked at how the presence or lack of broadband (internet) services impact the community, and how facilitating broadband access can meet the City's goal of improving broadband services throughout the community.

Surveys of residents and business owners were used to help decision makers better understand community needs. In key economic areas, such as along El Paseo, the surveys incorporated questions around incorporating public Wi-Fi, EV charging stations, smart streetlights/poles, and other opportunities to make these business districts a point of destination and retain consumers in these areas for a longer period of time.

Resident and business surveys helped to determine the community's desire for broadband services; current market conditions and deficiencies, predicted take rate and optimum monthly cost users would be willing to pay for the service; stakeholder needs and what role the government should take in providing broadband services. One survey was developed that included two paths, one path focused on residential broadband services, and the other path focused on business broadband services. The survey would go down the appropriate path based on whether the responder selected resident or business.

The survey included a detailed list of questions to capture the data needed. The survey requested information about phone, television, and Internet services: which provider is used; at what costs; what they like and dislike today or would wish in the future; and even a bit about what they do with Internet services.

The residential survey also asked questions about the composition of their household, do they have children; do they work at home, solely or occasionally and the age of the respondent. Survey questions also included upload/download speed, general location of responding party, and their opinion on what role municipal government should take in providing these services. Additionally, the survey asked if business districts offered free public Wi-Fi, would that encourage you to stay and shop longer?

The survey was accessible via a link on the City's website. The link to the survey was also shared with residents and businesses via other sources including:

- Print version of the Palm Desert BrightSide
- Digital version of the Palm Desert BrightSide
- El Paseo Business Improvement District channels
- Palm Desert Area Chamber of Commerce (PDACC) eblasts
- PDACC business breakfast
- EngagePalmDesert.com
- Posts on the City's Facebook page
- Posts on the City's Twitter
- Desert Sands Unified School District student portal (in English and Spanish)
- Palm Desert affordable housing residents
- HOAs

It is important to note that the surveys included a link to a speed test website. Once on the speed test website, testing was conducted to determine actual upload/download speeds in a manner that could be verified and documented. To obtain the best possible speed test results, the person completing the survey was asked to complete it at their residence or business.

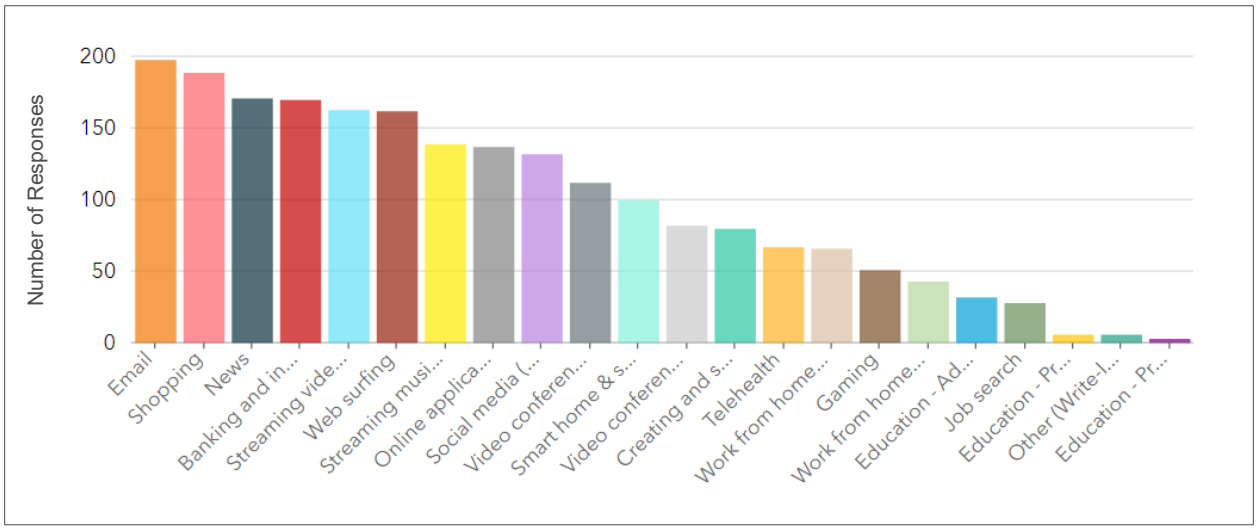
The survey took only a few minutes to complete. All responses were anonymous and confidential. Participation was limited to one person per household or business. As this was a survey to assess wired internet service, participants were encouraged to use a device that could be connected to a wired internet connection (through Wi-Fi or Ethernet) to take the survey.

Both surveys were available from February to April 2023, and then again from July to August 2023. During this five-month time frame, the City received a total of 230 responses, with 209 responses to the Resident Survey and 20 responses to the Business Survey. The is a small sample size; therefore, it is difficult to apply to the overall population of Palm Desert. Three-hundred-and-eighty-three (383) survey responses would have been needed to achieve a base statistical significance level. Due to the low number of responses to the business survey, the rest of this section focuses on the responses to the resident survey.

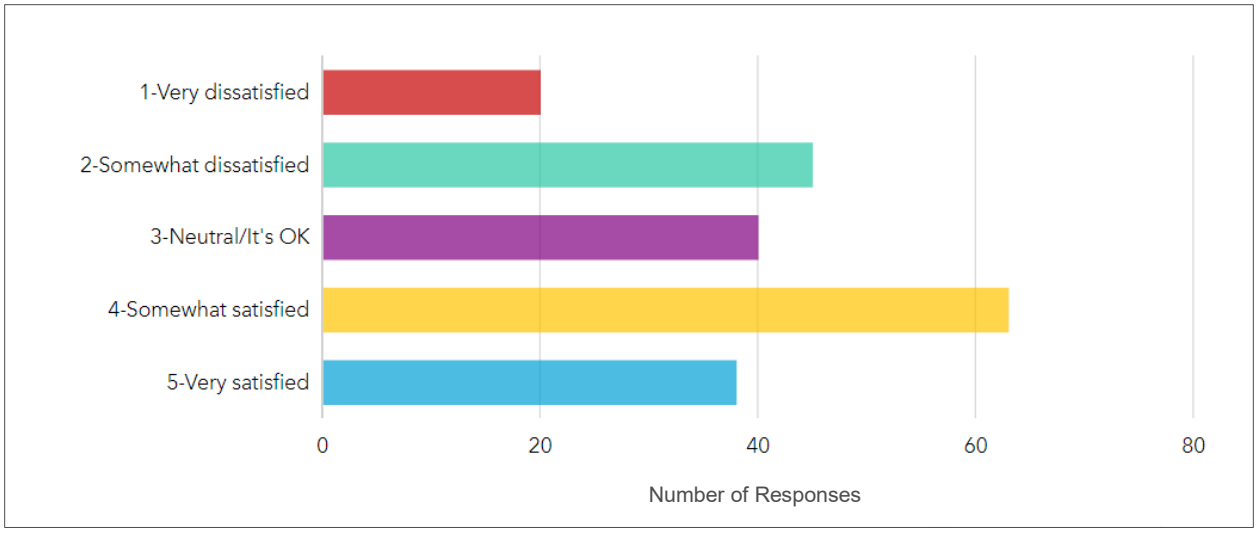
Survey data was collected via GIS-enabled tools to enable a deep understanding of conditions neighborhood by neighborhood.

Survey Questions and Responses

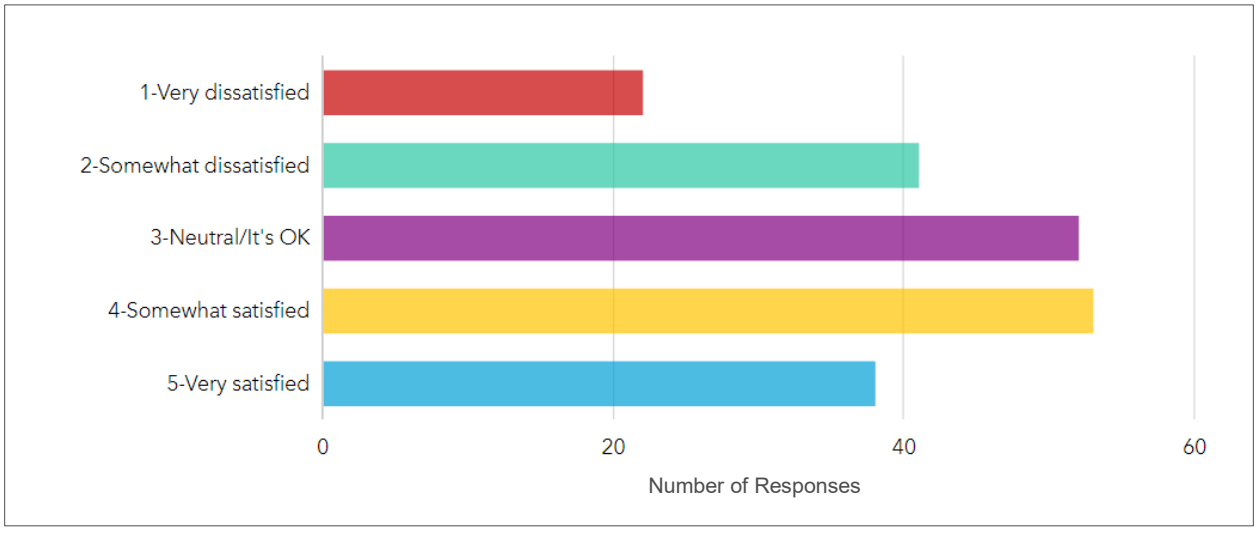
How do you use internet service at home?



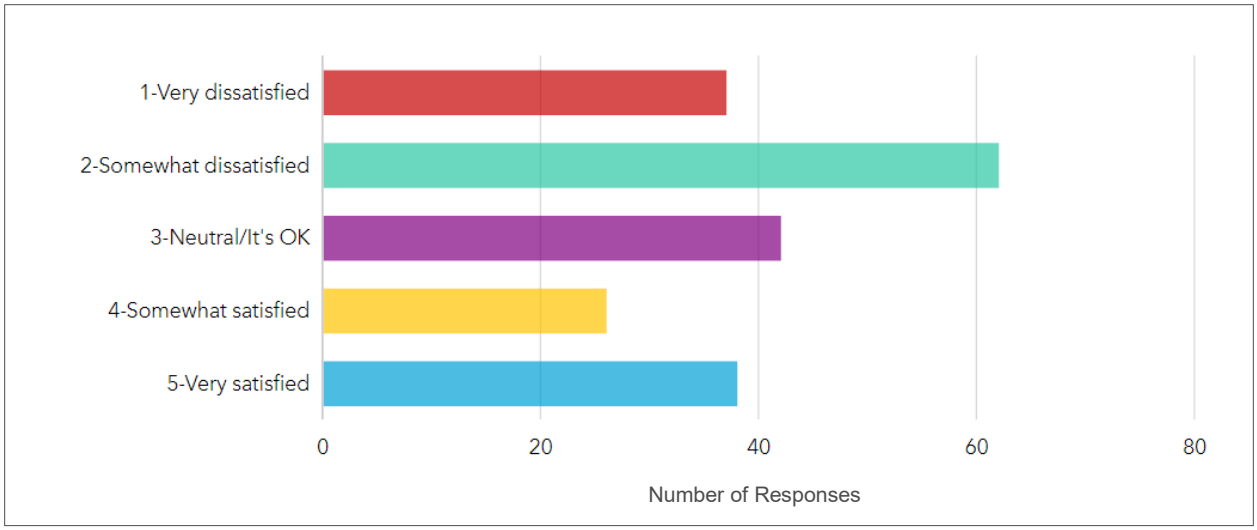
Please rate your level of satisfaction with the *Reliability* of your home internet service:



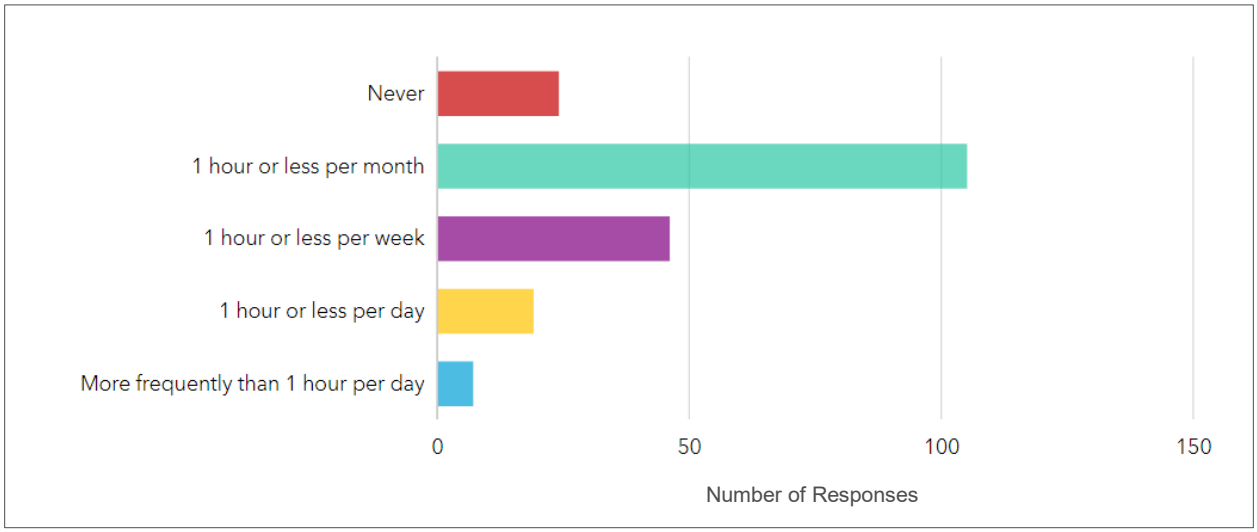
Please rate your level of satisfaction with the *Speed/Data Rate* of your home internet service:



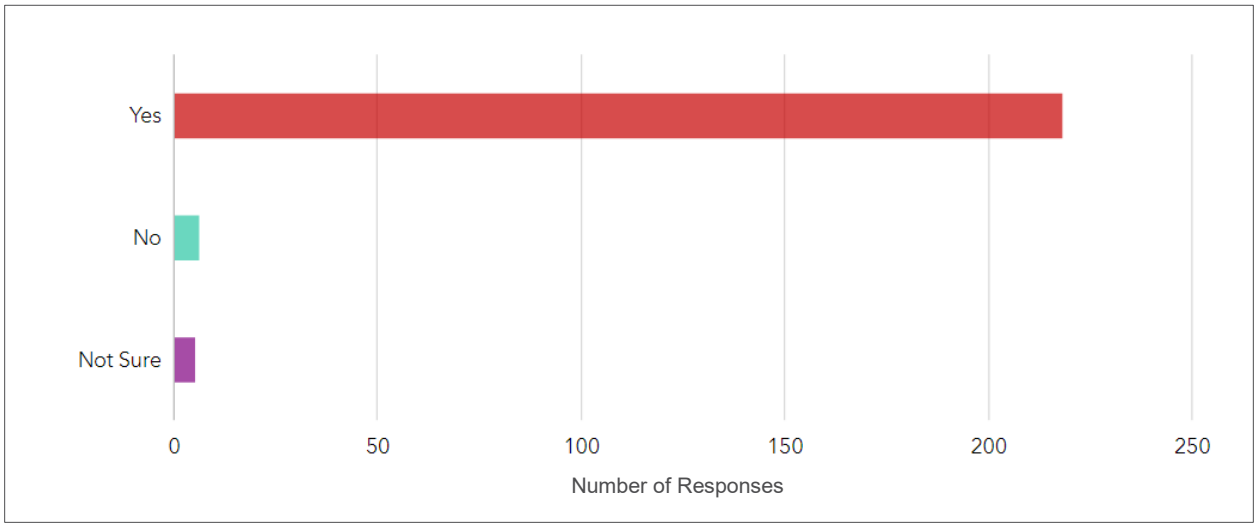
Please rate your level of satisfaction with the *Price* of your home internet service:



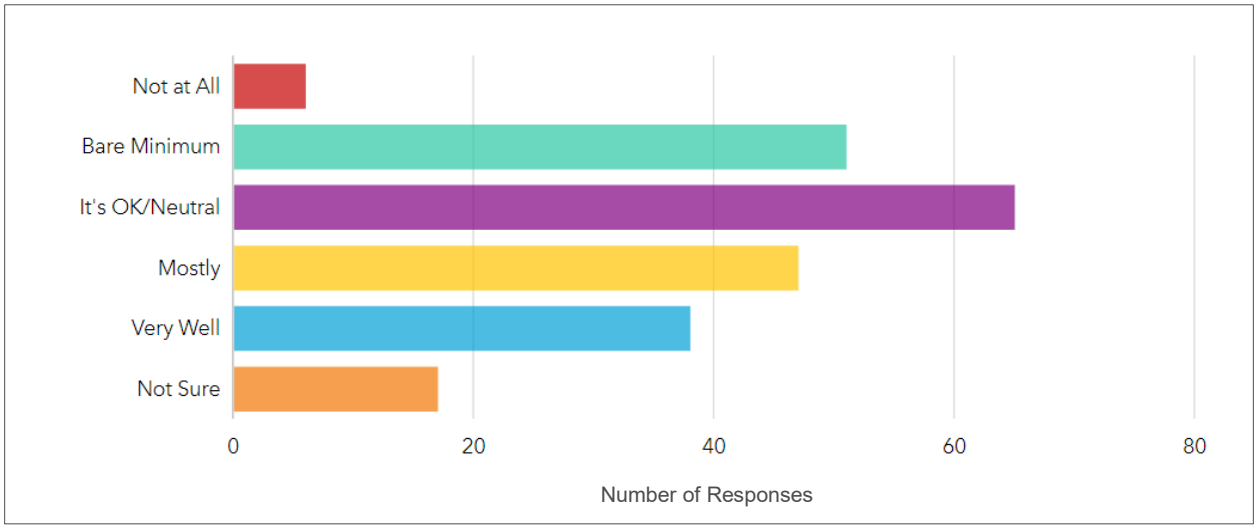
How often do you experience outages due to connection problems or slow/inoperable speeds?



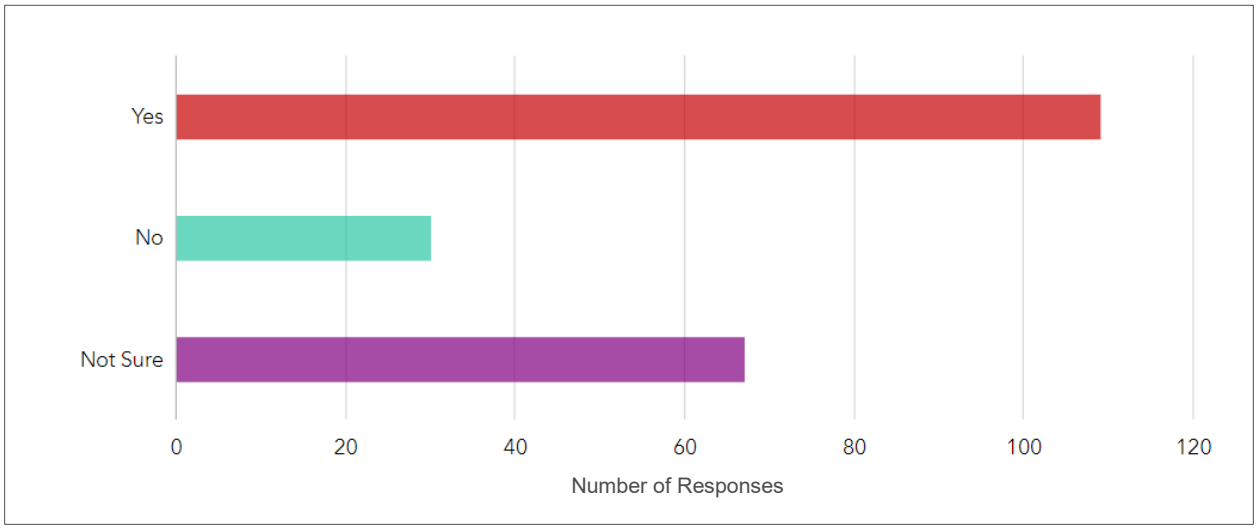
Do you consider the internet to be an essential public infrastructure like electricity, water, and transportation?



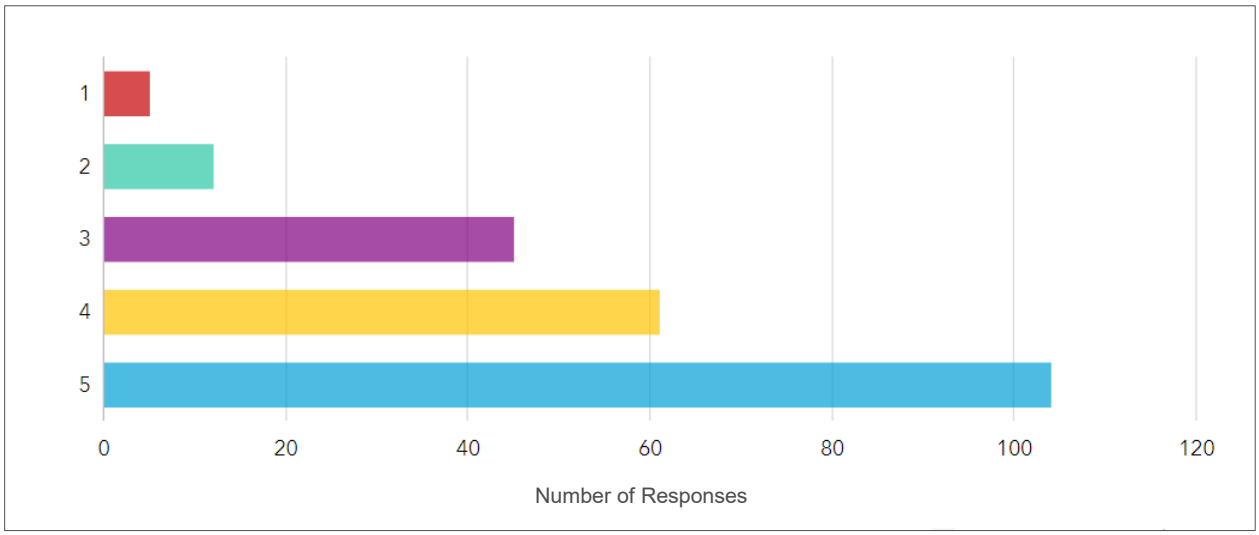
How well do you think the current providers in Palm Desert meet the needs of the community?



Would you participate in an organized effort led by your subdivision / neighborhood / HOA to improve broadband service?



How strongly do you feel that the City needs to help facilitate better broadband?



Do you have any other comments, questions, or concerns about your current home internet service?

Responses
Pleased with internet service.
Internet has been fine since fiber optic service has been delivered at home.
Competition is needed.
Price per month is ridiculously high for the service.
Cannot work from home because internet is too slow.
Speed is ok but less contention and lower latency would be better.
TV and streaming freeze a few times per night.
Waiting for fiber optics to come to the neighborhood.
Internet is unstable, unreliable, and underperforming.
Cell service is awful and has been for years.

Key Findings

- Most responders are somewhat satisfied to very satisfied with the reliability of broadband services within the City.
- Most responders are somewhat satisfied to very satisfied with the speed and data rate of broadband services within the City.
- Most responders are somewhat dissatisfied to very dissatisfied with the price of broadband service within the City.
- One of the concerns shared by responders is the perceived lack of competition.
- Most responders consider the internet to be an essential public infrastructure like electricity, water, and transportation.
- Most responders said that they would participate in an organized effort led by their subdivision / neighborhood / HOA to improve broadband service within the City.
- Most responders feel strongly that the City needs to help facilitate better broadband.

Section 3: Market Assessment

Background

Broadband coverage has changed from something nice to have, to something that is becoming incredibly important. Education, working from home, Economic Development, keeping youth in the area, telemedicine, etc. all need good connectivity. Competitive analysis of the availability of coverage is challenging due to the fluidity of market pricing, products offered, and differences in the various sectors that need to be understood. This Market Assessment is an analysis of industry data that shows what providers report their coverage to be.

To begin this analysis, service offerings of each primary provider in Palm Desert were examined and cataloged. The second step of the analysis was to verify this data. The data gathered via the Resident and Business Survey was used to shed light on the actual practice of providers and, more importantly, on pricing and satisfaction, as well as determining what needs are in demand and are not supplied by the marketplace. In addition, the providers were contacted to give them an opportunity to review and verify the data.

The residents and businesses in the City of Palm Desert can obtain internet access services from a variety of ISPs (internet service providers) and WISPs (wireless internet service providers) via DSL (over copper), cable, fiber, fixed wireless, and satellite. This assessment focused on 16 internet service options from a total of 6 providers that offer services to 5% or more of the residents and businesses within the city limits.

- 3 wired Internet Service Providers (DSL/Cable/Fiber): Spectrum, Frontier, EarthLink
- 1 fixed wireless Internet Service Providers: Pacific Lightwave
- 2 satellite Internet Service Providers: HughesNet and ViaSat

This section describes consumer internet offerings available to residents and businesses from the established ISPs and WISPs. Its goal is to draw a representative picture of the internet market in Palm Desert and include one or more providers that serve their customers via DSL, cable, fiber, fixed-wireless, and satellite.

The following statistics describe internet availability by transport medium (DSL, cable, etc.) in Palm Desert with some of the data drawn from the following dedicated websites.

- All Connect (https://www.allconnect.com/local/ca/palm-desert/zip-92260)
- Broadband Now (https://broadbandnow.com/California/Palm-Desert?zip=92260)
- Broadband Search (https://www.broadbandsearch.net/service/california/palm-desert)
- Business Internet (https://businessinternet.com/california/palm-desert)
- High Speed Internet (https://www.highspeedinternet.com/ca/palm-desert?zip=92260)
- In My Area (https://www.inmyarea.com/internet/92260/providers)

Additional data was drawn from the websites of each Internet Service Provider (ISP). A complete listing of the websites is shown at the end of this assessment.

Update Regarding Current DSL Technologies

Digital subscriber line (DSL) is a family of technologies that are used to transmit digital data over copper telephone lines. In telecommunications marketing, the term DSL is widely understood to mean asymmetric digital subscriber line (ADSL), the most installed DSL technology, for Internet access.

In ADSL, bit rates are said to be asymmetric, meaning greater toward the customer premises (downstream) than the reverse (upstream). The bit rate of consumer ADSL services typically ranges from 256 Kbps up to 25 Mbps in the downstream direction to the customer, depending on DSL technology, line conditions, and service-level implementation. The data throughput in the upstream direction (the direction to the service provider) is lower, hence the designation of asymmetric service.

As documented in this assessment, some internet service providers are offering DSL services with claims of downstream speeds up to 100 Mbps. Some service providers have deployed upgraded DSL technology known as *very high-speed digital subscriber line* (VDSL) and/or *very high-speed digital subscriber line 2* (VDSL2). These more recent DSL technologies provide data transmission faster than ADSL.

For example, VDSL offers speeds of up to 52 Mbps downstream and 16 Mbps upstream. These rates mean that VDSL can support applications such as high-definition television, as well as telephone services and general Internet access, over a single connection. Second-generation VDSL technologies (VDSL2) provide data rates exceeding 100 Mbps simultaneously in both the upstream and downstream directions. Like ADSL, VDSL and VDSL2 are deployed over copper telephone lines.

Actual download speeds have not been independently validated, but the City will have an opportunity to better understand actual download speeds for customers on this technology when speed tests are reported as part of the Resident and Business survey.

Update Regarding Current Fixed Wireless Technologies

Fixed wireless networks provide point-to-point access to single or multiple locations. Some Internet service providers included in this assessment offer fixed wireless services. These ISPs are using microwave-based technology that allows data to be sent and received between two fixed sites or locations. Unlike satellite, these signals have much lower latency and are generally not as affected by inclement weather. Fixed wireless is not mobile technology, like cellular technology. Nor is it Wi-Fi where bandwidth is shared on a “one to many” basis.

There are some advantages for fixed wireless as compared to wired services such as installation that is free from trenching and construction, scalable bandwidth, path and network diversity, and straight forward Ethernet hand-offs. Fixed wireless also has some limitations such as the service often requires line-of-sight access between two fixed sites and the cost per unit of bandwidth tends to be higher than other forms of broadband.

Fixed wireless relies on microwave signals that are used to connect customers via a dedicated wireless Internet connection to a point of presence (PoP). The fixed wireless ISPs included in this assessment claim that they provide bandwidth speeds that range from 1.5 Mbps to 1 Gbps utilizing current microwave technologies that provide low latency dedicated wireless point-to-point broadband connectivity.

Actual fixed wireless bandwidth speeds have not been independently validated. However, the City will have an opportunity to better understand actual bandwidth speeds for customers using this technology when speed tests are reported as part of the community survey.

Residential Internet Service Providers in Palm Desert

This assessment focused on 8 residential internet options in Palm Desert from 5 residential internet providers. The assessment of these residential services shows that:

- 100% of homes can get fixed-line service via cable, DSL, or fiber-optic
- 100% of homes can get cable
- 100% of homes can get satellite internet services
- 98% of homes can get DSL
- 12% of homes can get fiber-optic

The following tables list the residential Internet service providers (ISPs) in Palm Desert broken out by the type of service provided.

Cable

Provider Name	Coverage	Max Download Speed	Provider Type
Charter (Spectrum)	100%	1,000 Mbps	Cable

DSL

Provider Name	Coverage	Max Download Speed	Provider Type
EarthLink	28.5%	100 Mbps	DSL
Frontier Communications	98%	100 Mbps	DSL

Fiber

Provider Name	Coverage	Max Download Speed	Provider Type
Charter (Spectrum)	12%	1,000 Mbps	Fiber
EarthLink	10%	1,000 Mbps	Fiber
Frontier Communications	12%	5,000 Mbps	Fiber

Satellite

Provider Name	Coverage	Max Download Speed	Provider Type
HughesNet	100%	25 Mbps (100 GB cap)	Satellite
ViaSat	100%	100 Mbps (500 GB cap)	Satellite

Business Internet Service Providers in Palm Desert

This assessment focused on 7 business internet options in Palm Desert from 4 business internet providers. The assessment of these business services shows that:

- 100% of businesses can get fixed-line service via cable, DSL, or fiber-optic
- 100% of businesses can get cable
- 100% of businesses can get fixed wireless service
- 98% of businesses can get DSL
- 18% of businesses can get fiber-optic

The following tables list the business Internet service providers (ISPs) in Palm Desert broken out by the type of service provided.

Cable

Provider Name	Coverage	Max Download Speed	Provider Type
Charter (Spectrum)	100%	1,000 Mbps	Cable

DSL

Provider Name	Coverage	Max Download Speed	Provider Type
EarthLink	41%	100 Mbps	DSL
Frontier Communications	98%	100 Mbps	DSL

Fiber

Provider Name	Coverage	Max Download Speed	Provider Type
Charter (Spectrum)	18%	100 Gbps	Fiber
EarthLink	18%	1,000 Mbps	Fiber
Frontier Communications	16%	2,000 Mbps	Fiber

Fixed Wireless

Provider Name	Coverage	Max Download Speed	Provider Type
Pacific Lightwave	15%	1,000 Mbps	Fixed Wireless

Review of Internet Service Providers in Palm Desert

Charter (Spectrum)

- Spectrum provides cable-based internet services to 100% of the residents and businesses in Palm Desert.
- Spectrum provides fiber-based internet services to 18% of the businesses in Palm Desert.
- Spectrum offers Palm Desert residents download speeds up to 1,000 Mbps, and upload speeds up to 35 Mbps.
- Spectrum offers Palm Desert businesses download speeds up to 100 Gbps, and upload speeds up to 100 Gbps.

The table below shows the cost of Spectrum's plans in Palm Desert as of March 2023.

Provider	Type of Service	Business / Residential	Download Speeds (Mbps)	Upload Speeds (Mbps)	Cost/Month
Spectrum	Cable	Residential	300	10	$50
Spectrum	Cable	Residential	500	20	$70
Spectrum	Cable	Residential	1,000	35	$90
Spectrum	Cable/Fiber	Business	10	10	(Varies)*
Spectrum	Cable/Fiber	Business	20	20	(Varies)*
Spectrum	Cable/Fiber	Business	50	50	(Varies)*
Spectrum	Cable/Fiber	Business	100	100	(Varies)*
Spectrum	Cable/Fiber	Business	200	200	(Varies)*
Spectrum	Cable/Fiber	Business	500	500	(Varies)*
Spectrum	Cable/Fiber	Business	1,000	1,000	(Varies)*
Spectrum	Fiber	Business	2,000	2,000	(Varies)*
Spectrum	Fiber	Business	5,000	5,000	(Varies)*
Spectrum	Fiber	Business	10,000	10,000	(Varies)*
Spectrum	Fiber	Business	20,000	20,000	(Varies)*
Spectrum	Fiber	Business	30,000	30,000	(Varies)*
Spectrum	Fiber	Business	40,000	40,000	(Varies)*
Spectrum	Fiber	Business	50,000	50,000	(Varies)*
Spectrum	Fiber	Business	60,000	60,000	(Varies)*
Spectrum	Fiber	Business	70,000	70,000	(Varies)*
Spectrum	Fiber	Business	80,000	80,000	(Varies)*
Spectrum	Fiber	Business	90,000	90,000	(Varies)*
Spectrum	Fiber	Business	100,000	100,000	(Varies)*

* Monthly costs for business broadband services depend upon the cost of building out the broadband connection to the business location and the term of the agreement.

Charter Communications Inc., with its corporate headquarters located in Stamford, Connecticut, is an American telecommunications and mass media company that offers its services to residents and businesses under the branding of Spectrum. Providing services to over 102.7 million people in 44 states, it is the second-largest cable operator in the United States, just behind Comcast.

EarthLink

- EarthLink offers the residents in Palm Desert DSL and fiber-based internet services.
- EarthLink offers the businesses in Palm Desert fiber-based internet services.
- EarthLink provides 2 DSL internet plans and 4 fiber internet residential plans in Palm Desert.
- EarthLink provides 4 fiber internet business plans in Palm Desert.
- EarthLink DSL service in Palm Desert is available to an estimated 28.5% of residents.
- EarthLink fiber service in Palm Desert is available to an estimated 10% of residents.
- EarthLink fiber service in Palm Desert is available to an estimated 18% of businesses.
- EarthLink offers Palm Desert residents and businesses download speeds up to 1,000 Mbps.
- EarthLink does not use data limits in Palm Desert.

The table below shows the cost of EarthLink's plans in Palm Desert as of March 2023.

Provider	Type of Service	Business / Residential	Download Speeds (Mbps)	Upload Speeds (Mbps)	Cost/Month
EarthLink	DSL	Residential	50	7.5	$50
EarthLink	DSL	Residential	100	15	$80
EarthLink	Fiber	Residential	50	50	$50
EarthLink	Fiber	Residential	100	100	$80
EarthLink	Fiber	Residential	200	200	$90
EarthLink	Fiber	Residential	1000	1000	$100
EarthLink	Fiber	Business	50	50	$70
EarthLink	Fiber	Business	100	100	$85
EarthLink	Fiber	Business	200	200	$105
EarthLink	Fiber	Business	1,000	1,000	$170

EarthLink primarily provides DSL and fiber to households and businesses across 26 states. With accessibility to 99.2 million people, EarthLink is the second-largest residential DSL provider in the country. Over 33.4 million people have access to EarthLink fiber internet service, making them the third-largest fiber provider in the country.

Frontier Communications

- Frontier DSL services in Palm Desert are available to an estimated 98% of residents and businesses.
- Frontier resident and business subscribers in Palm Desert have access to 1 DSL internet plans.
- Frontier fiber services in Palm Desert are available to an estimated 10% of residents and businesses.
- Frontier provides 4 fiber plans to Palm Desert area residents and businesses.
- Frontier does not use data limits in Palm Desert.

The table below shows the cost of Frontier Communications' residential and business plans in Palm Desert as of March 2023.

Provider	Type of Service	Business / Residential	Download Speeds (Mbps)	Upload Speeds (Mbps)	Cost/Month
Frontier	DSL	Both	100	15	$50
Frontier Fiber 500	Fiber	Both	500	500	$50
Frontier Fiber 1 Gig	Fiber	Both	1,000	1,000	$70
Frontier Fiber 2 Gig	Fiber	Both	2,000	2,000	$100
Frontier Fiber 5 Gig	Fiber	Both	5,000	5,000	$155

Frontier currently offers DSL to over 30.5 million people in 25 states, making Frontier the fifth-largest provider of DSL in the U.S. In terms of fiber internet, Frontier covers more than 9.5 million people in seven states. Even with this portion of Frontier's business being relatively new, Frontier still ranks fifth in the nation for fiber access.

HughesNet

- HughesNet offers the residents in Palm Desert satellite-based Internet service.
- HughesNet in Palm Desert is available to 100% of residents.
- HughesNet offers Palm Desert residents download speeds up to 25 Mbps, and upload speeds up to 3 Mbps.

The table below shows the cost of HughesNet's plans in Palm Desert as of March 2023. Their plans have data caps in place.

Provider	Type of Service	Business / Residential	Download Speeds (Mbps)	Upload Speeds (Mbps)	Cost/Month
HughesNet	Satellite	Residential	25 (15 GB cap)	3	$65
HughesNet	Satellite	Residential	30 (30 GB cap)	3	$75

Hughes Network Systems, LLC (formerly Hughes Communications) was founded in 1971. It is a wholly owned subsidiary of EchoStar (DirecTV). Hughes Network Systems is headquartered in Germantown, Maryland and provides a high-speed satellite internet service, HughesNet.

Pacific LightWave

- Pacific LightWave offers the businesses in Palm Desert fixed wireless-based Internet services.
- Pacific LightWave in Palm Desert is available to 15% of businesses.

- Pacific LightWave offers Palm Desert businesses download speeds up to 50 Mbps, and upload speeds up to 50 Mbps.
- Pacific LightWave's actual download and uploads speeds as well as monthly costs could not be determined online.

The table below shows the cost of Pacific LightWave's plans in Palm Desert as of March 2023.

Provider	Type of Service	Business / Residential	Download Speeds (Mbps)	Upload Speeds (Mbps)	Cost/Month
Pacific LightWave	Fixed Wireless	Business	50	50	$60 to $80

Pacific LightWave Inc. is a community-based internet provider. They are a registered CLEC (competitive local exchange carrier) with the California PUC and operate under FCC regulations providing internet services within the Coachella Valley of Southern California. They presently offer business class high-speed internet access, VoIP-based hosted PBX, collocation, and managed services. Pacific LightWave presently operates multiple fiber optic and gigabit microwave rings encircling Palm Desert and Rancho Mirage.

ViaSat

- ViaSat offers the residents in Palm Desert satellite-based Internet services.
- ViaSat service is available to 100% of Palm Desert residents.
- ViaSat offers Palm Desert residents download speeds up to 100 Mbps, and upload speeds up to 3 Mbps.

The table below shows the cost of ViaSat's plans in Palm Desert as of March 2023. Their plans have data caps.

Provider	Type of Service	Business / Residential	Download Speeds (Mbps)	Upload Speeds (Mbps)	Cost/Month
ViaSat	Satellite	Residential	25 (60 GB cap)	3	$50
ViaSat	Satellite	Residential	50 (100 GB cap)	3	$70
ViaSat	Satellite	Residential	75 (150 GB cap)	3	$100
ViaSat	Satellite	Residential	100 (300 GB cap)	3	$150
ViaSat	Satellite	Residential	100 (500 GB cap)	3	$200

ViaSat uses satellites to beam internet service to 308.5 million people in all 50 states, as well as the U.S. territory of Puerto Rico. With all this coverage, ViaSat ranks as the second-largest satellite internet provider in the U.S. in terms of availability.

Key Findings

The residents and businesses in the City of Palm Desert can obtain internet access services from a variety of ISPs (internet service providers) and WISPs (wireless internet service providers) via DSL (over copper), cable, fiber, fixed wireless, and satellite. This assessment focused on 16 internet service options from a total of 6 providers that offer services to 5% or more of the residents and businesses within the city limits.

- 3 wired Internet Service Providers (DSL/Cable/Fiber): Spectrum, Frontier, EarthLink
- 1 fixed wireless Internet Service Providers: Pacific Lightwave
- 2 satellite Internet Service Providers: HughesNet and ViaSat

Residential Internet Service Providers in Palm Desert

This assessment focused on 8 residential internet options in Palm Desert from 5 residential internet providers. The assessment of these residential services shows that:

- 100% of homes can get fixed-line service via cable, DSL, or fiber-optic
- 100% of homes can get cable
- 100% of homes can get satellite internet services
- 99% of homes can get DSL
- 12% of homes can get fiber-optic

Business Internet Service Providers in Palm Desert

This assessment focused on 7 business internet options in Palm Desert from 4 business internet providers. The assessment of these business services shows that:

- 100% of businesses can get fixed-line service via cable, DSL, or fiber-optic
- 100% of businesses can get cable
- 100% of businesses can get fixed wireless service
- 98% of businesses can get DSL
- 18% of businesses can get fiber-optic

Key Findings

Here are some key findings regarding internet service providers in Palm Desert.

- Five of the 6 internet providers in Palm Desert offer residential service.
- There are 8 residential internet options in Palm Desert from 5 residential internet providers.
- Four of the 6 internet providers in Palm Desert offer business service.
- There are 7 business internet options in Palm Desert from 4 business internet providers.
- The average residential download speed in Palm Desert is 194 Mbps. This is 130% faster than the average internet download speed in California, which is 150 Mbps.
- The average residential upload speed in Palm Desert is 25 Mbps. This is 52% slower than the average internet upload speed in California, which is 48 Mbps
- Palm Desert businesses have an average of 2.88 wired providers available at their location, which is more competitive than 66% of cities in the state of California.

- Approximately 98% of households will have internet options from more than one provider.
- Those living in Palm Desert have access to cable, which covers 100% of households. DSL internet is also an option for many, offering service to 98% of the area. Fiber-optic is less available but still an internet option for roughly 12% of those living in Palm Desert.

The following table is a listing of all the providers available in the City of Palm Desert sorted alphabetically by the name of the service provider. It shows the percent of the City covered by the service provider, the type of service provided, whether it is a business or residential service, maximum download speeds, and, if available, the maximum estimated monthly cost for each service provider.

Provider Name	Coverage	Provider Type	Business / Residential	Maximum Download Speed	Maximum Estimated Cost/Month
Charter (Spectrum)	100%	Cable	Residential	1,000 Mbps	$110
Charter (Spectrum)	12%	Fiber	Residential	1,000 Mbps	UA
Charter (Spectrum)	100%	Cable	Business	1,000 Mbps	(Varies)
Charter (Spectrum)	18%	Fiber	Business	100 Gbps	(Varies)
EarthLink	10%	Fiber	Residential	1,000 Mbps	$100
EarthLink	28.5%	DSL	Residential	100 Mbps	$80
EarthLink	18%	Fiber	Business	1,000 Mbps	$170
EarthLink	41%	DSL	Business	100 Mbps	UA
Frontier Communications	12%	Fiber	Residential	5,000 Mbps	$155
Frontier Communications	98%	DSL	Residential	100 Mbps	$50
Frontier Communications	16%	Fiber	Business	2,000 Mbps	$160
Frontier Communications	98%	DSL	Business	100 Mbps	UA
HughesNet	100%	Satellite	Residential	30 Mbps (30 GB cap)	$75
Pacific Lightwave	15%	Fixed Wireless	Business	50 Mbps	$60 to $80
ViaSat	100%	Satellite	Residential	100 Mbps (500 GB cap)	$200

References

- All Connect (https://www.allconnect.com/local/ca/palm-desert/zip-92260)
- Broadband Now (https://broadbandnow.com/California/Palm-Desert?zip=92260)
- Broadband Search (https://www.broadbandsearch.net/service/california/palm-desert)
- Business Internet (https://businessinternet.com/california/palm-desert)
- High Speed Internet (https://www.highspeedinternet.com/ca/palm-desert?zip=92260)
- In My Area (https://www.inmyarea.com/internet/92260/providers)
- Earthlink (https://www.inmyarea.com/provider/earthlink)
- Charter – Spectrum – Residential (https://www.inmyarea.com/provider/spectrum)
- Charter – Spectrum – Business (https://www.spectrum.com/business/internet)
- Charter – Spectrum – Business Enterprise Services (https://enterprise.spectrum.com/services/internet-networking/internet/fiber-internet-access.html)
- Frontier (https://www.inmyarea.com/provider/frontier)
- Pacific Lightwave (https://www.paclw.com/?s1=1650474046.1458144123)
- ViaSat (https://www.inmyarea.com/provider/viasat)
- HughesNet (https://www.inmyarea.com/provider/hughesnet)
- Charter – Spectrum – Residential (https://www.allconnect.com/providers/spectrum)
- EarthLink (https://www.earthlink.net/)

Section 4: Stakeholder Engagement

Background

From November 2022 to January 2023, stakeholder engagement meetings took place with City staff, anchor institutions, regional entities, and community partners. The various goals of these meetings included identifying existing broadband needs, evaluating current broadband services, exploring future broadband expectations, and collaborating with regional entities.

The initial step in the process was to identify key stakeholders. Once completed, virtual one-on-one and stakeholder group meetings took place with policy makers, anchor institutions, and key influencers to drive visibility into community goals, and to identify how best to position and future-proof Palm Desert to maximize economic development, including retaining current businesses and attracting new businesses. These meetings also explored the impacts of the community's current and potential future broadband services on economic development.

Engagement meetings were held with the following stakeholders or stakeholder groups:

City Staff

- Assistant City Manager
- Chief Building Official
- Director of Finance
- Economic Development Director
- Information Systems Manager
- Public Affairs Manager
- Public Works Director, and both Deputy Public Works Directors
- Senior Project Manager

Anchor Institutions

- California State University, San Bernardino - Palm Desert Campus
- College of the Desert
- Desert Sands Unified School District
- Palm Springs Unified School District
- Riverside County Fire Department Palm Desert Station
- Riverside County Library System Palm Desert Branch
- Riverside County Sheriff's Palm Desert Station
- University of California, Riverside Palm Desert Campus

Regional Entities

- Caltrans - District 8
- Coachella Valley Association of Governments (CVAG)
- Coachella Valley Economic Partnership (CVEP)
- Desert Recreation District
- Joslyn Center
- Sunline Transit Agency

Community Partners

- El Paseo Business Improvement District
- Palm Desert Chamber of Commerce

Key Findings

Below is a summary of key findings that were shared during the stakeholder engagement process.

- Some of the major concerns with broadband services in Palm Desert seem to be availability, speed, cost, security, reliability, expandability, resiliency, and redundancy.
- Economic Development (retaining current businesses and attracting new businesses) seems to be a driving force behind improved broadband services for home based, online, and traditional brick and mortar businesses.
- More and more people are working from home, so reliable broadband services are important.
- Cellular coverage, including LTE (4G) and 5G, in the City seems to be fairly decent in most parts of the City, but seems to become spotty along Highway-111 and on the south end of the City.
- Some cellular providers have good coverage, while others have poor coverage.
- Free public Wi-Fi is currently unavailable in downtown business areas or outdoor recreation spaces.
- Gated communities seem to have better broadband services.
- New development areas require high-speed broadband services.
- There does not seem to be enough competing broadband service providers in the City to meet the needs of residents and the business community.
- Unserved and underserved communities, as well as low- and fixed-income communities seem to need improved broadband services and those services potentially need to be inexpensive or free.
- City staff seems to be supportive of potentially providing broadband services that could have seamless operability across the City but would like to know what municipal broadband models might look like.
- City staff seems interested in exploring the establishment of a consortium to coordinate valley-wide broadband initiatives.
- City staff indicated that policies might need to be modified to make them more fiber friendly.
- County provided public safety agencies within the city seem to be well served with fully redundant broadband services provided by Riverside County.
- County provided library is well served and utilizes the Corporation for Education Network Initiatives in California (CENIC) statewide broadband network.
- School districts seem to be well served and are also offering free district provided cellular based broadband services to district students and families, with a focus on unserved and underserved areas.
- Higher education institutions seem to be well served, are part of the CENIC network, offer workforce training in the community, and are interested in improving broadband services for their students when off-campus.
- Local transit agency is well served, provides free public Wi-Fi in their fleet of hydrogen fuel cell powered vehicles, and utilizes cellular based services to track their fleet.

- Coachella Valley Association of Governments (CVAG) is focused on improving broadband services for the unserved and underserved areas of the valley.
- CVAG is designing and building a fiber-based intelligent transportation system (ITS) network to interconnect the 550+ traffic signals throughout the valley; and at the same time, CVAG is planning to install additional conduit and fiber for broadband services in the same trench as the ITS network.
- CVAG is open to partnering with the City to use some of the CVAG broadband fiber.
- Caltrans in the future may design and build a fiber-based network along I-10, which could permit the City to potentially place conduit and fiber in the same trench as the Caltrans conduit and fiber.

The table below includes a summary of key findings broken out by the stakeholder groups that were part of the engagement process.

Stakeholder Group	Key Findings
City of Palm Desert	▪ Currently served by multiple broadband providers with no redundancy. ▪ Experiences intermittent outages. ▪ Migrating from on-premises hosted applications to cloud-based applications. ▪ Enabling accessibility to City services anytime, anywhere, and on any device. ▪ Traffic signal system is on city-owned fiber, but the current system does not include any redundant connectivity.
Riverside County Sheriff Palm Desert Station	▪ Connected to the County's secure fiber-based network, which has full hardware and routing redundancy. ▪ Uses the County's network for wireless communications and telephone communications. ▪ Moving everything to cloud-based applications. ▪ Utilize potential City network for added redundancy.
Riverside County Fire Department Palm Desert Station	▪ Current broadband services meet the department's needs today. ▪ Current cellular services within the city are sufficient. ▪ Need additional fiber broadband services to accommodate future growth, and to enhance cellular coverage for mobile units. ▪ Experiences minimal broadband service outages. ▪ Potentially use city installed broadband infrastructure to provide additional redundancy and resiliency to public safety networks. ▪ Committed to working with contracting agencies wherever possible to enhance services available to public safety agencies.

Stakeholder Group	Key Findings
Riverside County Library System Palm Desert Branch	▪ Currently using the Corporation for Education Network Initiatives in California (CENIC) network for broadband internet access. ▪ Rarely experiences broadband outages. ▪ Receives an E-rate discount on its internet services. ▪ Current level of broadband services should be sufficient for the next 5-years.
Desert Sands Unified School District	▪ Uses fiber-based provider broadband services and utilizes E-rate discounts for district facility- and school-based Internet services. ▪ Partnered with a wireless internet services provider (WISP) to design and implement a dedicated private LTE cellular network for students to access assignments, homework, etc. on school campuses, as well as from home. ▪ Dedicated private LTE cellular network was designed to provide the best possible coverage for district students and their families, particularly in unserved and underserved areas. ▪ Provides Wi-Fi hotspot devices to those families that live outside of the areas covered by their LTE network. ▪ Member of the One Future Coachella Valley Connectivity Task Force. ▪ Always looking for meaningful partnerships that could lead to positive impacts for their students.
Palm Springs Unified School District	▪ Uses fiber-based provider broadband services and utilizes E-rate discounts for district facility- and school-based Internet services. ▪ Connected to the California Department of Education K-12 High-Speed Network (K12HSN). ▪ Partnered with a WISP to design and implement a dedicated private LTE cellular network for students to access assignments, homework, etc. on school campuses, as well as from home. ▪ Dedicated private LTE cellular network was designed to provide the best possible coverage for district students and their families, particularly in unserved and underserved areas. ▪ District IT Department staff maintains the dedicated private LTE cellular network. ▪ Member of the One Future Coachella Valley Connectivity Task Force.

Stakeholder Group	Key Findings
College of the Desert	▪ Palm Desert campus, which is the district's primary campus, uses the CENIC network for broadband internet access. ▪ Using fiber-based provider broadband services, microwave wireless broadband services, and wireless point-to-point broadband services to connect to other district campuses. ▪ Bringing new campuses online that will require additional broadband services. ▪ Interested in getting 100Gbps broadband services to all campuses in the district. ▪ Member of the One Future Coachella Valley Connectivity Task Force. ▪ Interested in improving broadband services for the district through partnering with the City, and other organizations in the area, such as CVAG, SCE, CSUSB, and CENIC.
California State University San Bernardino Palm Desert Campus	▪ Uses the CENIC network for broadband internet access with redundant paths back to the CSU main campus. ▪ Rarely experience broadband outages; however, some outages are weather driven. ▪ Wi-Fi is available on campus, and it is available in a 300-foot buffer zone around the campus, which helps bridge the digital divide. ▪ Cellular services are not always good in the community, so the implementation of city-wide Wi-Fi could address this concern. ▪ Managed and secure broadband services are ongoing concerns. ▪ Interested in partnering with the City to improve broadband services for their students when off-campus.
University of California Riverside Palm Desert Campus	▪ Uses the CENIC network for broadband internet access, which is very reliable. ▪ Wi-Fi is available on campus. ▪ Cellular services are not always good in the community, so people jump on the campus Wi-Fi as soon as they arrive on campus. ▪ Palm Desert campus houses various programs, including community engagement, life-long/career learning, growers and farmers education, 4H, crop management, master gardener, etc. ▪ Interested in improving broadband services by partnering with the City. ▪ Non-competitive, cooperative environment exists between all of the higher education institutions in the City.

Stakeholder Group	Key Findings
Desert Recreation District	▪ Three facilities within the City are well served. ▪ Free public Wi-Fi available within their facilities. ▪ Public Wi-Fi is critical for bridging the digital divide especially for school students that visit their facilities. ▪ Recently launched a mobile app to enable anytime, anywhere, access to District information. ▪ Interested in improving Wi-Fi in outdoor recreational areas. ▪ Interested in engaging with the City to improve broadband services.
Joslyn Center	▪ Senior community needs more broadband service providers in the marketplace. ▪ Broadband service costs and technology are perceived barriers to the senior community. ▪ Fiber-based broadband services are not available to everyone in the senior community. ▪ Senior community is increasing its use of public Wi-Fi, but public Wi-Fi availability is limited. ▪ Cell phone coverage varies depending upon the provider, which can present challenges to the senior community.
Sunline Transit Agency	▪ Facilities are well served. ▪ Public Wi-Fi available in their facilities and their fleet of hydrogen fuel cell powered vehicles. ▪ Uses cellular based devices to track the location of their fleet. ▪ Uses fiber-based network to interconnect their facilities including transportation hubs. ▪ Security of network is an ongoing concern. ▪ Willing to provide backup power generation to the valley due to their owned and operated hydrogen powered generator.

Stakeholder Group	Key Findings
Coachella Valley Association of Governments	▪ Focused on improving broadband services in unserved and underserved areas of the valley. ▪ Designing and building CVSync, which is a fiber-based intelligent transportation system (ITS) network to interconnect the 550+ traffic signals throughout the valley. ▪ Phase 1 of CVSync, which is underway, will build out a fiber backbone ring network. ▪ Phase 2 of CVSync will interconnect all the traffic signals to the backbone ring network and will also install additional conduit and fiber for broadband services in the same trench as the ITS network. ▪ Open to partnering with the City to use some CVSync broadband fiber and/or installing City conduit/fiber in same trench. ▪ Applied to State for funds to design and build a last mile network to attach the CVSync broadband network to end users, which could be utilized by the City as an end user.
Caltrans	▪ Currently, does not have any fiber infrastructure in the valley; however, planning is underway to build it out in the future. ▪ State/Federal funds available to design and build conduit/fiber infrastructure along I-10 in the valley. ▪ Possibility for other entities to lease space along I-10 for the installation of conduit/fiber. ▪ Explored partnering with CVAG along Highway-111 to build a middle-mile loop, but too expensive, so project was not funded. ▪ Broadband services over Caltrans networks would be managed by the California Department of Technology (CDT). ▪ Local district has established a fiber/broadband team.
Palm Desert Chamber of Commerce	▪ Economic Development seems to be a driving force behind improved broadband services in the City, particularly in the downtown area. ▪ Large number of traditional brick and mortar businesses in City. ▪ Businesses utilize both telephone and broadband based point of sales system.
El Paseo Business Improvement District	▪ Economic Development seems to be a driving force behind improved broadband services in the district. ▪ Adequate cellular services within the district. ▪ Cellular and broadband services get a little worse each year as the population grows. ▪ Interested in public Wi-Fi within the district. ▪ Interested in geofencing, so information about the businesses in the district could be focused on the district shoppers.

Stakeholder Group	Key Findings
Coachella Valley Economic Partnership	▪ Innovation-Hub (I-Hub) in the City uses the CENIC network for broadband services, with wired services available for business use and Wi-Fi services available for student use. ▪ When businesses are looking to relocate, they often look at the availability of broadband in the area they would like to relocate to - currently the valley is challenged to compete in this regard. ▪ Improvements in broadband services in the valley have attracted telecommuters to the area, which increases property values and creates the need for even more broadband service improvements. ▪ Improvements in broadband services in the valley have attracted new businesses to the area, which improves the skills base in the valley. ▪ Role is to look for opportunities to leverage the broadband services in the valley to diversify the economy by attracting good paying jobs that require the use of digital technology. ▪ Improvements to broadband services need to continue in the valley for the valley to stay relevant in the digital world.

Section 5: Asset Inventory

Background

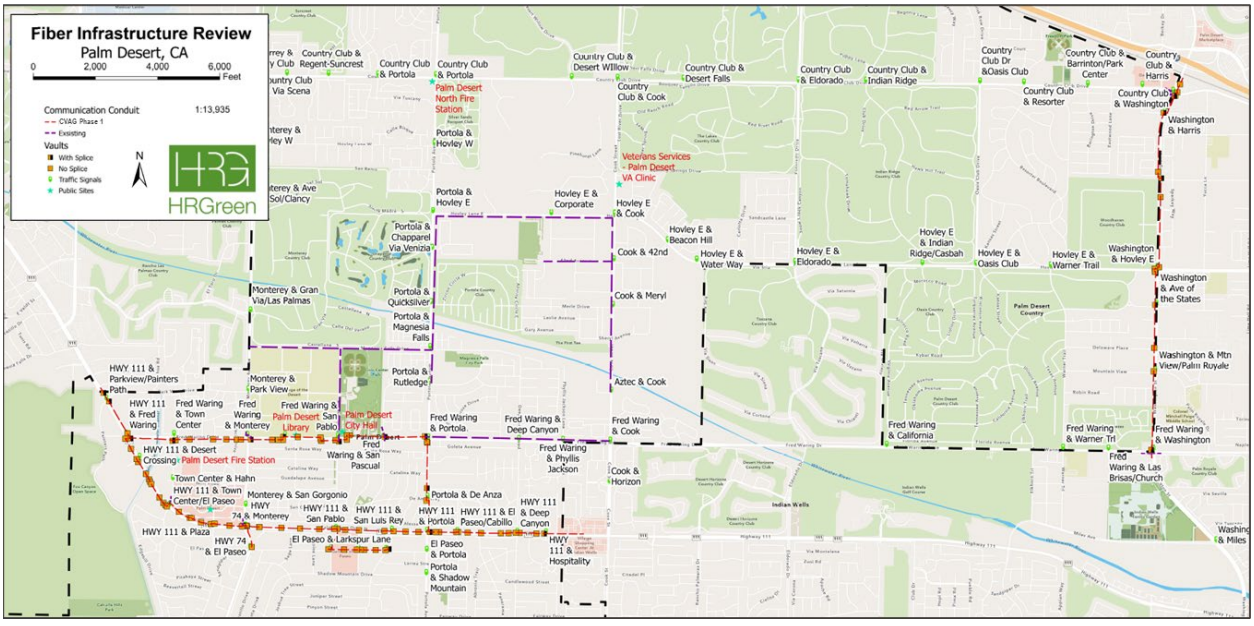
Network architecture is the basis for network design and engineering. The community's existing fiber-optic network assets and its architecture were inventoried and evaluated in order to understand its capability and how best to leverage this asset in the extension to the rest of the City. This evaluation focused on existing conduit, fiber-optic, vaults, and boxes and related outside plant infrastructure. It also focused on the existing network's capacity and usability, as well as the existing electronics and communication equipment and their appropriateness to serve the extended network.

Based upon the identified existing fiber, GIS tools were used to show existing infrastructure, and provide real-time, GIS-based information. These tools helped the city better understand what it is seeing; giving the City the ability to explore various models; and retain the information for future phases of the Study.

Additionally, the review included existing fiber network patterns for the entire City, as well as an exploration of future needs. The analysis determined the location of all fiber networks and their potential availability to be utilized for improving broadband coverage as well as future broadband expansion in Palm Desert.

Existing Fiber Network

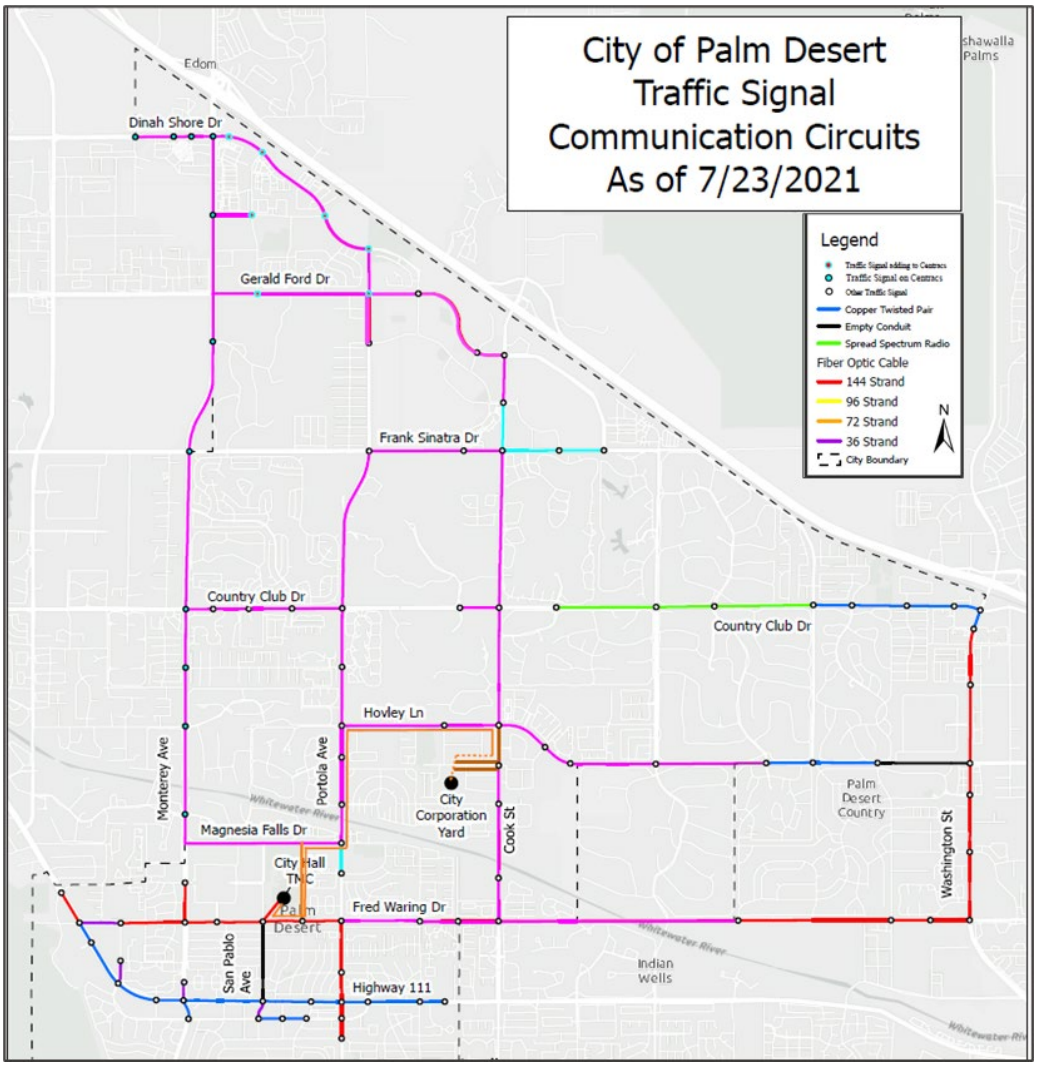
Depicted in the diagram below is the fiber and conduit that was installed within the City as part of the first phase of CVAG's traffic signal synchronization project known as CV Sync. The orange lines show that network infrastructure. Please note this infrastructure is in place today within the City.



Traffic Signal Communication Circuits

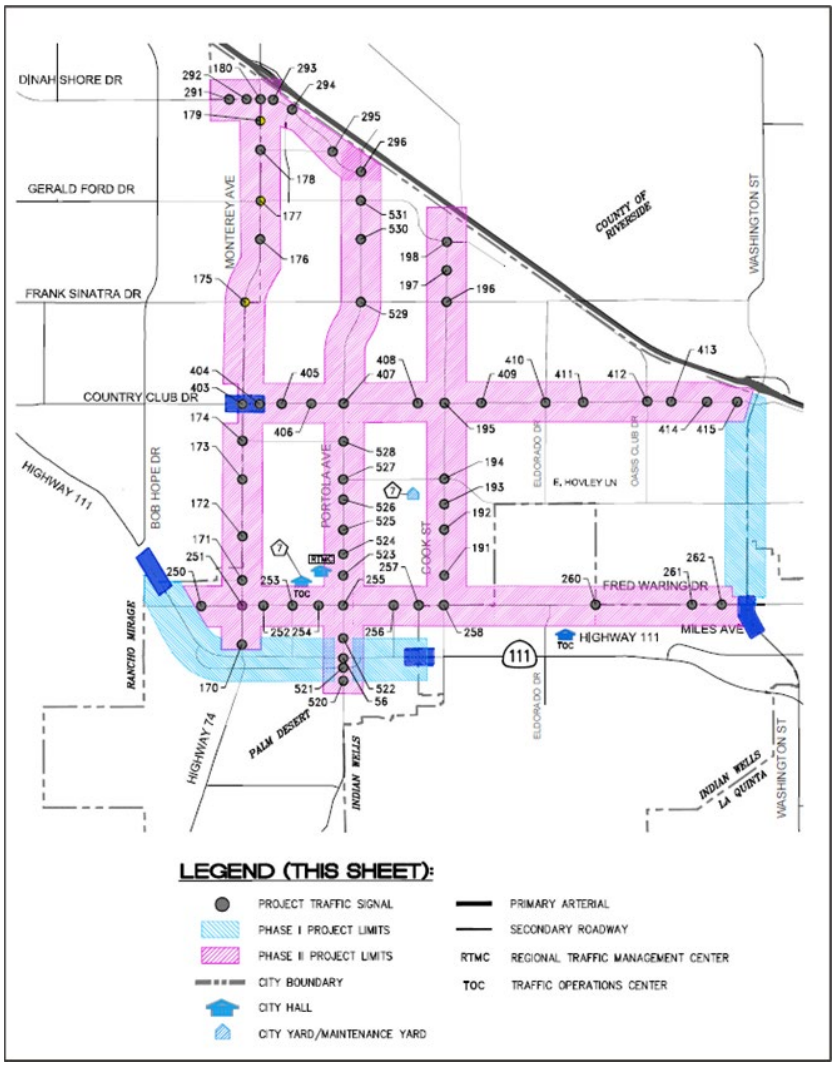
Depicted below is the fiber and conduit that was installed in 2021 within the City by the City's Public Works team to interconnect the City's traffic signals. This was part of the City's effort to implement an intelligent transportation system (ITS). It is important to point out that the City decided that this fiber network could only be used for the ITS and no other purpose. The diagram below shows the City's traffic signal fiber network.

The legend on the diagram describes what each of the lines indicates. It also describes the capacity of each of the fiber runs.



CVAG CV-Sync Network

Depicted in the diagram below is the fiber and conduit that is proposed to be installed within the City as part of the second phase of the CV Sync project. The blues lines show the already installed fiber and conduit that was part of phase one of the CV-Sync project and the pink lines show that proposed network infrastructure. The potential opportunity to utilize this infrastructure was explored during the development of the conceptual high-level design (HLD) of this Study.



Section 6: Establish Community Broadband Vision

Background

A Visioning Session was held to help City decisions makers understand the potential future planned fiber deployment throughout the city. The session investigated and provided various scenarios including all feasible public or private options or a combination of public and private options for fiber construction and implementation. The session explored various options around public and private ownership, as well as the possibility of leasing conduit and fiber. During the session the best practices in other communities that have had experience with leading a broadband effort in their communities were shared.

Based on the information obtained from the data collection tasks previously completed, a session was held with City Council that explored the vision of the City related to fiber. During the session with City Council, existing services available and the pros and cons of a City partnership with providers were identified.

Prior to the City Council Visioning Session, a multi-part Vision Exercise Survey and supporting materials were developed. A link to the survey and materials was sent to all Council Members via email.

The first part of the Vision Exercise Survey, the Vision Survey, included questions about the level of importance Council would rate statements regarding cellular and broadband services in the City.

The last part of the Vision Exercise Survey included a weblink to a white paper that presented an overview of the different municipal broadband models. There are several models for fully private and fully public broadband networks, plus a growing range of municipally enabled broadband strategies that rely on a combination of public and private investment. Despite the many ways that municipalities have gone about implementing their broadband programs, there are five main ways to do it, each requiring a different level of investment and engagement from the municipality. Although these models primarily focus on broadband, they can also be applied to the provisioning of cellular services.

The City Council Visioning Session that took place on Thursday, June 22, 2023. During the session, based upon the data that has been collected and the feedback from the public, City Council provided the input needed to draft a broadband Vision for the City. It is important to note that a Vision needed to be established prior to the network being designed, which is the next phase of this Study.

Vision Survey

Prior to the City Council Visioning Session, a multi-part Vision Exercise Survey and supporting materials were developed, which sent to all Council Members.

The first part of the Vision Exercise Survey, the Vision Survey, included questions about the level of importance Council would rate statements regarding cellular and broadband services in the City.

The following are the responses received from the Council members to the Vision Survey questions.

Question	Response
How important is that high-speed internet is **accessible**?	Very Important to Absolutely Essential
How important is that high-speed internet is **affordable**?	Important to Absolutely Essential
Cellular services are adequate in the **downtown** areas?	20% = Agree to Strongly Agree 60% = Neutral 20% = Disagree to Strongly Disagree
Cellular services are adequate in the **residential** areas?	20% = Agree to Strongly Agree 60% = Neutral 20% = Disagree to Strongly Disagree
Cellular services are adequate in **recreation** areas?	20% = Agree to Strongly Agree 80% = Neutral 0% = Disagree to Strongly Disagree
Broadband services are adequate in **downtown** areas?	20% = Agree to Strongly Agree 20% = Neutral 60% = Disagree to Strongly Disagree
Broadband services are adequate in **residential** areas?	20% = Agree to Strongly Agree 20% = Neutral 60% = Disagree to Strongly Disagree
Broadband services are adequate in **recreation** areas?	20% = Agree to Strongly Agree 60% = Neutral 20% = Disagree to Strongly Disagree
City should **encourage/enable** broadband deployment?	60% = Agree to Strongly Agree 40% = Neutral 0% = Disagree to Strongly Disagree

Do you have any comments regarding any of the previous questions?

Responses
It is important to make broadband available to all
Cost is a factor
We need input from businesses about the sufficiency of cellular and broadband service in downtown/business area
Current system works fine
Have not fielded any complaints from residents about the speed of their internet

What do you see as the biggest benefits for Palm Desert as the City considers potentially enhancing broadband services throughout the community?

Responses
Attraction and retention of diverse business enterprises, including tech-based businesses
Equal access for residents
Coachella Valley in general has become an attractive "tele-commuting" site, lack of high-speed internet limits this
Improving the quality of life for our residents

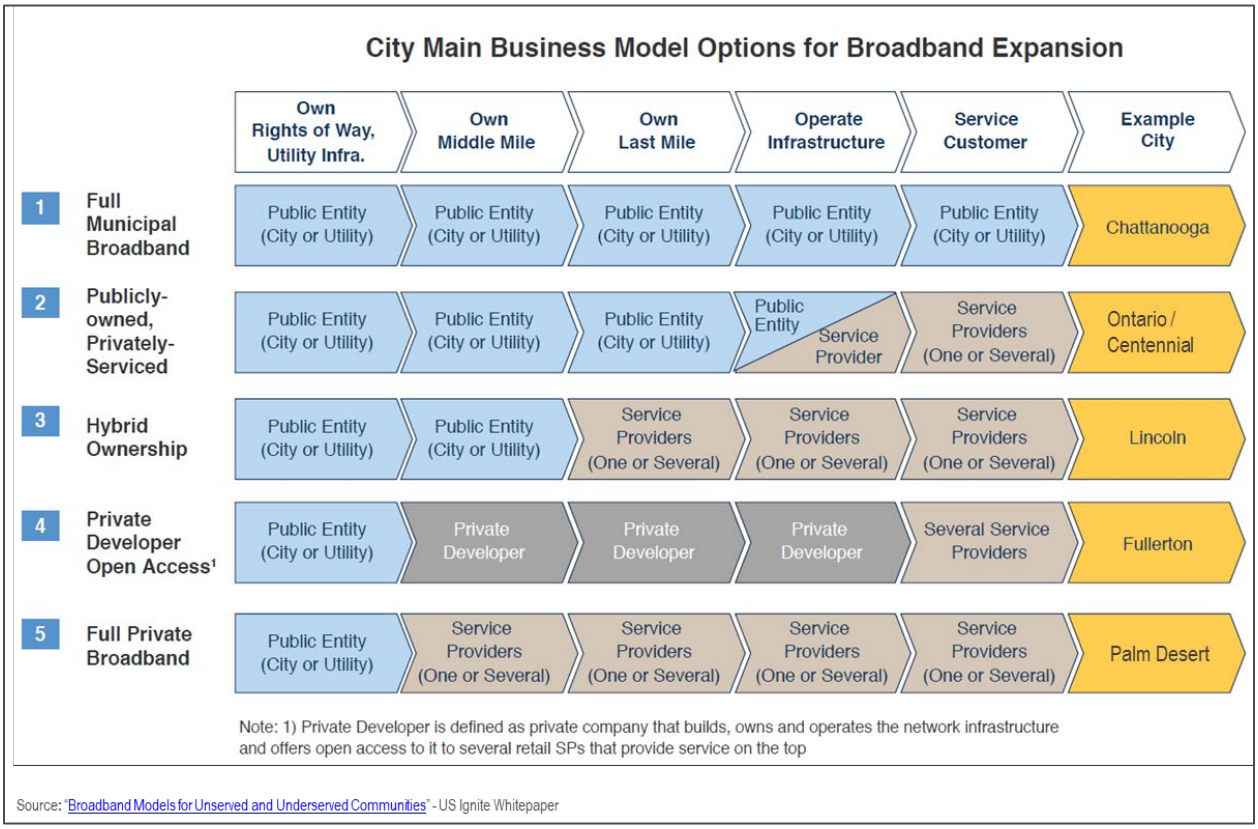
What are your biggest concerns for Pam Desert regarding the future of broadband services? And why?

Responses
Every major private provider has shown an inability to deliver good service
Competition is essential to keep private sector on their toes
Cost
We need to be good stewards of the financial dollars of our citizens and taxpayers

Municipal Broadband Service Models

The last part of the Vision Exercise Survey included a weblink to a white paper that presented an overview of the different municipal broadband models, which are shown in the chart below.

The white paper was created by *US Ignite* in July of 2020 for communities considering ways to expand broadband service. The guide, titled **Broadband Models for Unserved and Underserved Communities**, includes five models for fully private and fully public broadband networks. It is intended to help communities understand how much capital is needed for different models of deployment, what returns to expect, and finally how to avoid the most common pitfalls. Additional information from the white paper is presented in **Appendix A** of this Study report.



Key Vision Exercise Findings

- Council indicated that it is concerned about broadband services.
- Council indicated that it thinks that the City should encourage and/or enable broadband deployment.
- Council indicated that it is concerned about internet availability and costs.
- Council indicated that economic development, equal access, and improved quality of life are benefits to improved broadband services.
- Council indicated that the level of services available, costs, and being good stewards of taxpayer's dollars are the biggest concerns with the City's involvement in improving broadband services.

Visioning Session

The Visioning Session with the Palm Desert City Council took place on June 22, 2023. It occurred during a study session with the Council.

The following was the agenda for the session.

- Broadband 101
- Project Background
- Project Progress Update
- Review Visioning Exercise
- Review Broadband Service Models
- Discussion & Next Steps

As indicated in the agenda above, the session started with a basic overview of Broadband. That was followed by a presentation and discussion of the materials included in the previous sections of this Study report. This discussion included the results of the Resident and Business Survey, Market Assessment, Stakeholder Engagement, and Asset Inventory. The Vision Exercise Survey results presented previously in this section were discussed, as well as the Business Service Models diagram shown above.

During the session, Council members explored various ownership and operating models to better understand the risks and potential rewards of the often challenging and sometimes conflicting values inherent in community broadband. This exercise helped the Council develop recommendations for the next steps of the Study related to improved community fiber and broadband services.

A broadband roadmap that stresses the importance of the creation of recommendations for this project was used during the session. Recommendations must be grounded by a thorough understanding of the intended goals of the project, an appreciation of the risks/rewards of various ownership and operational models and buy in from governing bodies that the path forward represents the best use of scarce community resources (time, energy, financial capital).

The discussion concluded with the following key outcomes, which will drive the next phase of the Study.

Key Outcomes

The primary outcome from the Visioning Session was that the Council shared their thoughts about next steps for the Study. The Council indicated that it was probably in the best interest of the City to explore ways to improve upon the Full Private Broadband model that is currently in place in the City because it did not seem to be meeting the needs of the community. As shown in the chart above, the Full Private Broadband model is described in broadband service Model #5.

At the end of the Visioning Session, the Council decided that they wanted the next steps of the study to focus on a recommended municipal broadband model based on the data that was gathered during the Vision phase of the Study. In addition, they wanted the next steps to include a concept design and cost estimate of the recommended model, and an exploration of potential funding sources to cover the costs of any potential construction of a community network based on the recommended model.

Recommendations

Based on the data collected during the Vision phase of this Study, **Model 3 – Hybrid Ownership** was recommended as the model that should be explored during the Planning phase of this Study. This model is described in the chart above that shows the five different municipal broadband models.

The general characteristics of **Model 3** include a municipal owned, designed, and constructed middle-mile fiber ring network. Typically, the municipality explores a partnership with one or more private sector providers to construct, manage, operate, and maintain the municipal owned network, as well as to provide services over the network, and potentially own, design, construct, and manage the last mile connections to residents and businesses. When a municipality looks at potentially constructing a fiber network, it usually tries to find funding opportunities to help cover constructions costs, such as grants, and some of those opportunities require the City to have one or more private sector partners to qualify for funding.

The implementation of the recommended model described above should provide solutions to some of the concerns shared by residents, businesses, stakeholders, Council, etc. including:

- **Increased Availability** – The scenario described above should improve the availability of broadband service throughout the community including the unserved and underserved areas.
- **Encouraging competition** – The City-owned network could break down potential barriers to competition by allowing providers not currently in the market to utilize the City's fiber network as a foundation for their networks through the leasing of dark fibers.
- **Reducing service fees** – Fees tend to decrease with increased competition.
- **Improving speeds** – Generally, the technology used to connect users to a fiber-based network permits increased speed over traditional coax, copper, or wireless connectivity.
- **Improving cellular service** – Carriers could lease dark fibers from the City to interconnect their cell phone facilities, which means the carriers could install facilities in areas of the community where they currently do not have coverage or poor coverage.
- **Supporting Economic Development** – When businesses are looking to relocate, they often look at the availability of broadband in the area they would like to relocate to, so the City-owned network should help to attract new businesses and retain current businesses, including home based, online, and traditional brick and mortar businesses.

It is important to point out that if the City is unable to establish a partnership with one or more private sector partners to own, design, construct, and manage the last mile connections to residents and businesses, then the City and its anchor institutions that are connected to the city-owned middle-mile network would be the only beneficiaries of the improvements in broadband services created by the construction of the middle-mile fiber ring network. Also, without a private sector partner, the City would most likely not be able to qualify for many of the current federal and state last mile broadband grant opportunities.

Planning Phase – Next Steps

The Planning Phase of this Study included the following steps focused on the recommended model:

- Creating a preliminary design and cost estimates.
- Evaluating funding alternatives.
- Development of a smart city technology plan.
- Exploring potential partnerships with the private sector.
- Identifying recommendations for next steps.

Section 7: Preliminary Design & Cost Estimate

Background

Based upon the outcomes and recommendations from the Vision Session with Council, the next step in the Study was to complete a fiber ring network high-level design (HLD) that can be used for costing (and possible future detail design). Some of the steps in developing the HLD included:

- Checking for any higher cost issues (special crossings, rural areas, etc.).
- Potential use of existing City's fiber and conduit assets (or other assets).

The HLD leveraged GIS-based tools that identify physical locations of all customer locations and other termination points.

Upon completion of the preliminary design, a cost estimate was prepared for developing the next generation fiber ring network.

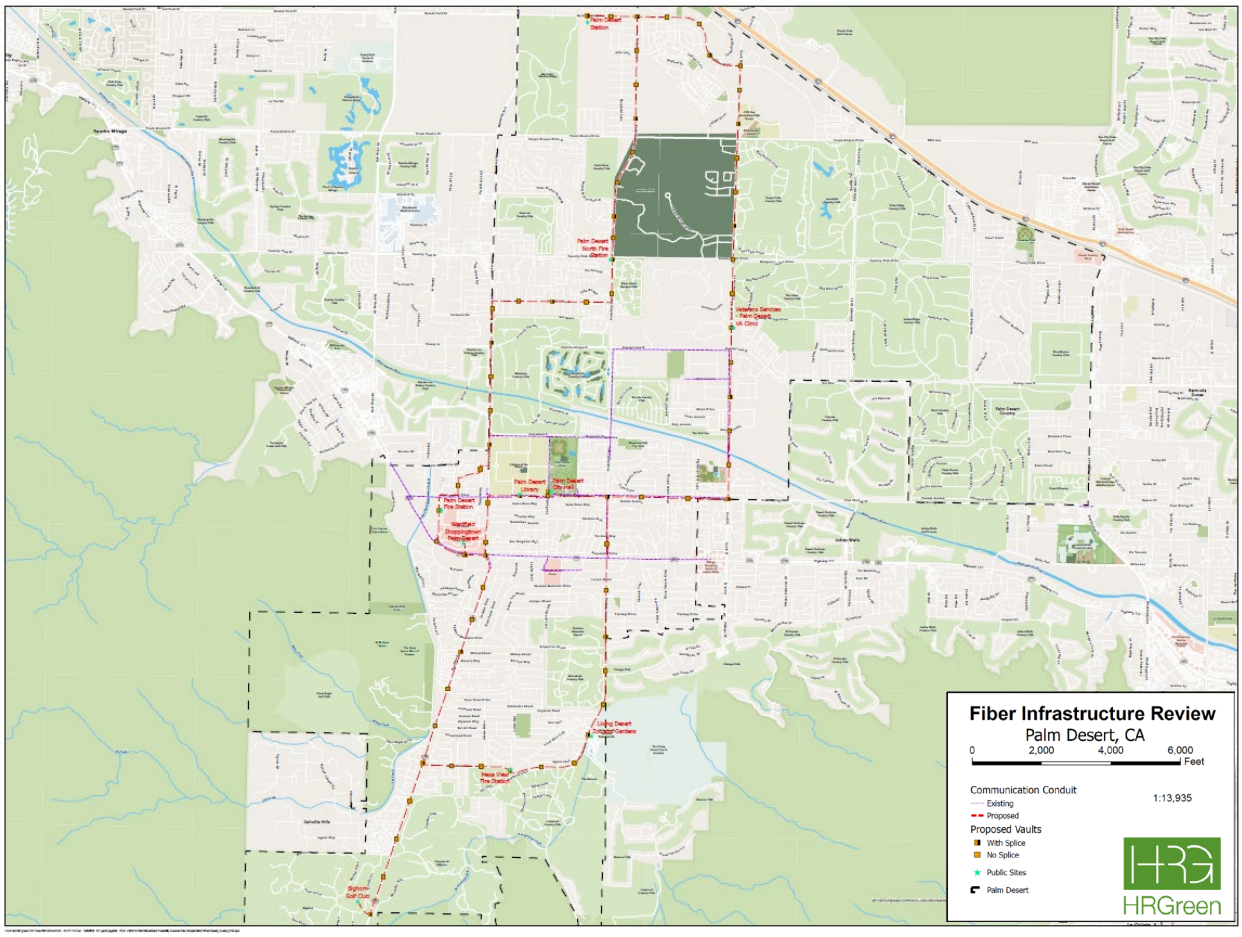
Conceptual Design

Drawing on field and desk surveys, and GIS maps, a system level design and cost estimate was prepared for developing a next generation network. In developing this approach, the focus was on creating a robust, reliable, and cost-effective approach to meeting the City's networking needs. To that end, for example, the design includes excess dark fiber to enable the implementation of smart technology solutions across the community. Information about potential smart technology solutions can be found in the Smart Application Technology Plan located in **Appendix B** of this report.

Based on an analysis of existing infrastructure, conceptual design, of high-level maps and routing, candidate specifications and a system-level overview of the potential infrastructure was provided. This analysis in turn became a roadmap for business modeling and for future decisions (potentially including detailed engineering, construction, and operations).

The conceptual design is for the development and deployment of a city-owned fiber ring network to support a fiber to the home network. It envisions the city constructing a municipal fiber to the curb network (ring design) that will create ubiquitous fiber to the home connectivity throughout the City of Palm Desert.

The diagram below shows the conceptual design of the fiber ring network for the City of Palm Desert. The network is composed of two network rings: a northern ring and a southern ring. The red dashed lines in the diagram show the paths of each of the rings.



Cost Estimates

A cost estimate and supporting documentation for network deployment and interconnection, inclusive of anticipated construction labor, materials, engineering, permitting, quality control, and testing was prepared. These estimates were provided in the form of a cost range, with the lower-end estimates representing the most likely costs and the higher-end representing budgetary estimates with suitable contingencies included.

All supporting data, spreadsheets, and assumptions were shared with City officials. A written narrative explained key construction characteristics that will impact the cost estimates.

The analysis provided guidance regarding ongoing costs, medium and long-term needs to refresh and replace equipment and potential revenue sources to support network operations.

Various data points were taken into consideration during the cost estimating process. These included: the estimated underground footage of proposed fiber conduits, total number of handholds, total number of splice points, total number of fibers, material costs breakout, and labor costs.

The following table shows the **estimated length** of the proposed conduits for each of the network segments that are part of the two network rings that make up the backbone of the network.

Segment Description	New Underground Conduit Feet	Hand Holes	Splice Points
North Ring			
Palm Desert Station - Palm Desert North Fire Station	13,502	11	5
Palm Desert North Fire Station - Palm Desert Fire Station	18,533	12	4
Palm Desert Fire Station - Westfield Shopping	3,360	2	1
Westfield Shopping - Palm Desert Library	5,019	4	2
Palm Desert Library - Palm Desert City Hall	1,547	2	1
Palm Desert City Hall - Veteran Services	15,646	9	4
Veteran Services - Palm Desert Station	17,502	11	3
South Ring			
Westfield Shopping - Bighorn	17,610	10	3
Bighorn - Mesa View Fire Station	3,905	3	1
Mesa View Fire Station - Living Desert	4,407	3	1
Living Desert - Palm Desert City Hall	10,691	5	1
Palm Desert Overview	**111,722**	**72**	**26**

The following table shows the **estimated backbone construction costs** for each of the of the network segments that are part of the two network rings based on installing a **288-fiber count sheath** within each conduit and using the **estimated length** of the proposed underground conduits shown in the previous table.

Segment Description	Estimated 288ct Material Costs	Estimated Backbone Installation Cost (no splicing)	Estimated Design Engineering and PMO Labor Cost	Estimated 288ct Total Backbone Segment w/Splicing Cost
North Ring				
Palm Desert Station - Palm Desert North Fire Station	$84,287	$1,184,801	$36,050	$1,491,091
Palm Desert North Fire Station - Palm Desert Fire Station	$115,693	$1,626,271	$49,483	$2,014,943
Palm Desert Fire Station - Westfield Shopping	$20,975	$294,840	$8,971	$368,353
Westfield Shopping - Palm Desert Library	$31,331	$440,417	$13,401	$555,840
Palm Desert Library - Palm Desert City Hall	$9,657	$135,749	$4,130	$175,579
Palm Desert City Hall - Veteran Services	$97,671	$1,372,937	$41,775	$1,707,972
Veteran Services - Palm Desert Station	$109,257	$1,535,801	$46,730	$1,894,231
South Ring				
Westfield Shopping - Bighorn	$109,931	$1,545,278	$47,019	$1,905,714
Bighorn - Mesa View Fire Station	$24,377	$342,664	$10,426	$426,302
Mesa View Fire Station - Living Desert	$27,511	$386,714	$11,767	$479,679
Living Desert - Palm Desert City Hall	$66,739	$938,135	$28,545	$1,147,849
Palm Desert Overview	**$697,429**	**$9,803,606**	**$298,298**	**$12,167,553**
Price per foot	**$6.24**	**$87.75**	**$2.67**	**$108.91**

Section 8: Funding Alternatives

Background

The ability to leverage federal, state, and regional grants and programs can substantially facilitate the cost of a network buildout. In recognizing the need for broadband support, federal and state governments provide funding in areas recognized as unserved or underserved based on public data on broadband availability and speeds in different regions across the country. Historically, this data has been criticized as poorly prepared, marginally reliable, and overly generalized. As a result, a community like those in City of Palm Desert may be considered as adequately covered and served by broadband providers, whereas residents may actively experience a lack of sufficient or affordable service. Within the context of these considerations, this section provides an overview of sources of funding that could help offset infrastructure and operational costs.

It is important to note that the FCC defines unserved areas as locations with less than 25 Mbps download and 3 Mbps upload speeds, and underserved areas as locations with less than 100 Mbps download and 20 Mbps upload speeds.

Fortunately, the City is on the cusp of a generational investment in broadband infrastructure. The federal government and state legislatures across the country have recognized the need for broadband funding support. Numerous federal and state programs are currently either being rolled out or are in various stages of legislative consideration. The availability of these sources to offset infrastructure and/or operational costs for a broadband project in City of Palm Desert depends on several factors:

- The scope of the project matches intended grant recipient profile
- The timeline for funding application and disbursement matches the anticipated schedule for the project
- Ensuring the completion of all conditions and goals of the grant
- Attaining the matching investment capital required by some grants

In addition, alternative funding sources could help offset infrastructure and operational costs. It is also important to maintain awareness of other funding sources. It is not uncommon for an agency (regional, State or Federal) to have targeted programs that can provide funding for broadband projects. These can range from utility related topics to community betterment to citizen specific needs to business attraction or retention, block grants, etc.

City of Palm Desert may be potentially eligible to benefit from broadband project financing available from several sources, including federal and state broadband grant funding for eligible unserved and underserved areas, direct financing though bonds, debt financing though bank loans, and private investment and partnerships.

California Grant Programs

In July 2021, Governor Gavin Newsom signed historic broadband legislation into law to help bridge the digital divide and provide reliable and affordable internet access to all Californians. Senate Bill 156 (Chapter 112, Statutes of 2021) expands the state's broadband fiber infrastructure and increases internet connectivity for families and businesses, and allocates $6 billion for the following programs:

- $3.25 billion for an open-access statewide broadband middle-mile network,

- $2 billion for broadband last mile infrastructure projects,
- $750 million for a loan loss reserve to support local government broadband infrastructure development, and
- $50 million for local agency technical assistance grants including funding for Tribal entities.

Following the announcement, the CPUC released the 2020 Broadband for All Action Plan, followed by a commissioned report titled Broadband Factors for Last-Mile Connectivity. These documents have since been incorporated into the recently released final initial 5-year strategic planning document on July 13th, 2023. The California Five-Year Action Plan Broadband Equity, Access, and Deployment (BEAD) Program Plan, required by the NTIA as part of the BEAD program, is a comprehensive plan to connect all Californians with high-speed broadband by 2028. The plan is based on the principles of universal access, equity, and sustainability.

The plan includes several specific initiatives to achieve these goals, such as expanding the state's middle-mile network, providing grants to local governments and nonprofits to build last-mile infrastructure, offering subsidies to help low-income Californians afford broadband service, and educating Californians about the importance of broadband access and adoption. The plan also calls for the state to work with federal, local, and tribal governments to ensure that all Californians have access to high-speed broadband.

The key goals and objectives of the plan are as follows:

- Goal 1: Connect all Californians with affordable, high-speed broadband by 2028.
    - Objective 1: Expand the state's middle-mile network to reach all unserved and underserved areas.
    - Objective 2: Provide grants to local governments and nonprofits to build last-mile infrastructure in unserved and underserved areas.
    - Objective 3: Offer subsidies to help low-income Californians afford broadband service.
    - Objective 4: Educate Californians about the importance of broadband access.
- Goal 2: Ensure that broadband access is distributed equitably, so that all Californians can participate in the digital economy.
    - Objective 1: Target broadband deployment and adoption efforts to underserved communities, such as rural areas, Tribal lands, and communities with high concentrations of low-income residents.
    - Objective 2: Work with community-based organizations and other stakeholders to ensure that broadband access is available and affordable to all Californians.
- Goal 3: Ensure that the state's broadband infrastructure is sustainable and resilient, so that it can meet the needs of Californians for years to come.
    - Objective 1: Use public-private partnerships to finance the construction and maintenance of broadband infrastructure.
    - Objective 2: Adopt policies that promote the deployment of open access broadband networks.
    - Objective 3: Work with local governments to ensure that broadband infrastructure is located in areas where it is needed most.

To address the digital divide and improve access to high-speed internet across the state, California has established several broadband grant programs aimed at expanding broadband infrastructure and connectivity in underserved and rural areas. These programs provide funding to various entities, including local governments, nonprofit organizations, and Internet Service Providers (ISPs), to deploy broadband infrastructure and deliver internet services to areas with limited or no access.

1. The California Last Mile Federal Funding Account (FFA): the FFA is funded through the Broadband Equity, Access, and Deployment (BEAD) Program, a $42.45 billion program that was created as part of the Infrastructure Investment and Jobs Act (IIJA) of 2021. The BEAD program provides funding to eligible entities to expand high-speed internet access by funding planning, infrastructure deployment, and adoption programs. It is administered on a high level by the National Telecommunications and Information Administration (NTIA) of the United States Department of Commerce, but each state is responsible for creating rules and guidelines for how the funds will be distributed. California was awarded $1.86 billion in BEAD funding combined with $540.2 million from the American Rescue Plan Act's Capital Projects Fund. The first round of funding was available to apply by the deadline of **September 29, 2023**. Areas of eligibility for grant programs are published in the CPUC's Federal Funding Account Public Map.

2. California Advanced Services Fund (CASF): CASF is a major initiative launched by the California Public Utilities Commission (CPUC) to promote broadband deployment in underserved and unserved areas. It provides $3.25 billion in grants to ISPs, local governments, and other eligible entities to build broadband infrastructure and offer internet services in areas where commercial providers have not invested. CASF grants support both last-mile and middle-mile projects. The program provides grants to broadband service providers, public housing authorities, broadband adoption entities, tribes, and regional consortia. The California Advanced Services Fund (CASF) is allocated to five CASF accounts:

    1. Broadband Adoption Account
    2. Broadband Infrastructure Grant Account
    3. Broadband Public Housing Account
    4. Rural and Urban Regional Broadband Consortia Grant Account
    5. Line Extension Pilot Program

    The Open-Access Middle-Mile Network and Last-Mile Federal Funding Account are part of the Broadband Infrastructure Deployment Proceeding Rulemaking 20-09-001 and through the California Advanced Services Fund (CASF) Rulemaking 20-08-021.

    The CPUC is reviewing recent applications for the Broadband Adoption Account, which received 91 applications for nearly $15 million for broadband access and digital inclusion, the Broadband Public Housing Account, which received 14 applications to build broadband networks offering free broadband service for residents of low-income communities, and the Infrastructure Grant Account, which received 74 applications for approximately $527 million for middle-mile and last-mile infrastructure.

    Eligibility maps for the CASF program in the City of Palm Desert are available in the Appendices of this section of this report.

3. California Emerging Technology Fund (CETF): CETF is a nonprofit organization established to accelerate broadband deployment and adoption in underserved communities. It collaborates with various stakeholders, including local governments and ISPs, to expand broadband access and digital literacy programs.

4. California Teleconnect Fund (CTF): The CTF program provides discounts on select telecommunications services to eligible schools, libraries, hospitals, and nonprofits. This program reduces the cost of connectivity for these critical community institutions, enabling them to better serve their constituents.
5. Local Agency Technical Assistance: The funding for this program has been exhausted. The $50 million grant program was designed to reimburse eligible local governments and Tribal entities for pre-project costs associated with work that facilitates broadband network deployment projects to communities lacking sufficient Internet. On February 24, 2022, the CPUC adopted the technical assistance decision and program guidelines (D. 22-02-026) as part of the California Advanced Services Fund Rulemaking 20-08-021. Separately, tribes with additional or ongoing planning needs are encouraged to consider applying for the CPUC's Tribal Technical Assistance Grant Program, which provides up to $150,000 per Tribe per fiscal year for broadband planning.

These grant programs aim to bridge the digital divide, ensure equitable access to education, healthcare, economic opportunities, and government services, and ultimately contribute to the overall socio-economic development of underserved and rural areas in California. To be eligible for these grant programs, applicants must meet certain criteria, such as being in an unserved or underserved area, having a low-income population, or being a public entity. The amount of funding that each applicant receives will depend on the specific program and the needs of the community.

In addition to these grant programs, the California government also provides other funding opportunities for broadband deployment, such as tax credits and rebates, and bond assistance programs, further addressed in the Bond and Loan Financing Section of this chapter.

Federal Grants and Loans

The federal government, through the FCC and the USDA, provides funding for broadband programs around the country.

The FCC, as mandated by the 1996 Telecom Act, implements universal service policies through the Universal Service Fund that is comprised of four programs: Connect America Fund, E-Rate, and Rural Health Care, and Lifeline (supplying mobile devices to qualified low-income households – not included as relevant to this document). As an extension of the Connect America Fund Phase II Auction, the FCC also recently adopted the Rural Digital Opportunity Fund (RDOF) to serve rural homes and businesses and close the digital divide.

Affordable Connectivity Program (ACP)

The Infrastructure Investment and Jobs Act (IIJA) of 2021 established the ACP as a $14B extension of the previous Emergency Broadband Benefit (EBB) Program initially passed as part of the December 2020 Covid-19 Relief package, after the appropriations are expended. The program will contribute $30 dollars a month (lower than the $50 a month under the EBB) towards an internet service plan for qualifying households to help low-income families offset costs of broadband connectivity. The program also helps low-income individuals pay for personal devices.

It is important to point out that in January 2024, the FCC released a statement saying that the $14.2 billion Congress initially appropriated for the ACP is approaching depletion. Without additional funding, the Commission must begin a wind-down process for the ACP.

USDA ReConnect and FCC RDOF

These two programs have cycles that are completed and may not have subsequent phases. ReConnect has been a USDA grant and loan program to bring broadband to underserved areas. The last phase of ReConnect was in 2020. RDOF has been an FCC funded grant reverse auction process. There is no open grant request period right now. In the latest RDOF process, requests were made in April 2021 and final awards are currently being worked on. Other rounds are possible.

Federal Communications Commission (FCC) Programs

A. FCC Connect America Fund (CAF)

The FCC conducted a Connect America Fund Phase II auction throughout 2018 and 2019. In their press release in August 2019, they stated:

"In total, the auction last year allocated $1.488 billion in support to expand broadband to more than 700,000 unserved rural homes and small businesses over the next 10 years. The FCC has already authorized three waves of funding in May, June, and July. Today's action brings total authorized funding to over $924 million, expanding connectivity to 342,097 homes and businesses; additional rounds will be authorized in the coming months."

There will be specific guidelines for the awarded providers. They will be required to provide annual progress reports. They will be required to offer service to 40 percent of their awarded areas by the third year. Also, they will be required to add an additional 20 percent each year, serving 100 percent of the supported locations in their accepted area by the end of year six. If carriers do not deploy infrastructure to 100 percent of the locations within a block but deploy to 95 percent of the locations for which they were awarded statewide, the carrier will be required to refund 50 percent of the support it received for the total number of unserved locations. This information (and any updates) can be found on the CAF II website: https://www.fcc.gov/connect-america-fund-phase-ii-auction-auction-903.

B. E-Rate

The Federal Communications Commission (FCC) established E-Rate to provide schools, libraries, and universities with discounts of 20-90% off the costs of telecommunications, internet networks and ongoing expenses. E-Rate is administered through the Universal Service Administrative Company (USAC) with oversight provided by the FCC.

The specific dates that determine when schools and libraries can apply for funding can change slightly from year to year but follow a mid-winter to Spring pattern. Once the application process ends in the Spring, the funding year begins for those applications.

There is a specific ID a school or library must get, then specific forms to fill out to apply. And there are competitive bid requirements (there must be an RFP and it must be open for 28 days) to be eligible for the funding. And there are different options for how this will be paid to the institution and to the vendor. Also, there are documentation requirements that need to be understood and followed.

The level of E-rate funding for schools and public libraries is based on the number of students who participate in the free or reduced cost school lunch program at all the public K-12 schools in the county. Schools and libraries might be an important part of funding strategies for infrastructure. Excess capacity can be added to these networks at substantially less cost than an independent build. If this is something that the county would like to pursue, HR Green can help walk you through the specific timeline and steps to be taken.

The County public libraries located within City of Palm Desert utilize the E-Rate program. Again, the level of funding for the libraries is based on the number of students who participate in the free or reduced cost school lunch program at all the public K-12 schools in the county.

Information about the E-Rate program can be found on the USAC website: https://www.usac.org/e-rate/

C. Healthcare Connect Fund

This fund was also created by the FCC and is administered by the Universal Service Administrative Company (USAC). It was created to give Health Care Providers (HCP) the ability to have broadband services that meet health care's capacity needs. It particularly encourages the formation of state and regional networks.

HCPs can apply individually or in a consortium. Funded applicants receive a 65% subsidy on all eligible broadband equipment and services. These dollars can be used for construction of networks. The intent of the funds is predominantly for rural healthcare providers. Urban facilities can be included if they are in a consortium that includes at least 51 percent of rural providers. If there are health care providers who could be part of a holistic strategy, this fund could be an important component of connectivity. As with E-rate, excess capacity can be added to these projects at significant savings.

More information about the HCF can be found on USAC's website at:
http://www.usac.org/rhc/healthcare-connect/default.aspx

United States Department of Agriculture (USDA) Programs

Within the USDA, the Rural Utility Services (RUS) has been an important part of the development of utility infrastructure in the United States. They offer low interest loans for telecommunications based on the treasury rate. These rates change regularly, so it is important to check with RUS to get the most current rate. They also offer low interest loans for telecommunications used in electric utilities (of which the excess capacity can be used for other broadband services). RUS offers grants, loans, and a combination of the two. RUS Programs include the ReConnect Program, the Telecommunications Infrastructure Loan Program, the Rural Broadband Access Loan, Community Connect Grants, and Distance Learning and Telemedicine Grants.

The ReConnect program, run by the United States Department of Agriculture (USDA). The program seeks to facilitate rural broadband not meeting the FCC definition of broadband.

In the first round of the ReConnect Pilot Program, the USDA invested $744 million since October 2019. In the second round, the application window for which closed on April 15, 2020, 172 applications were filed requesting $1.57 billion. The program is composed of three application types:

- LOAN: The loan program can allocate a maximum of $50 million with a fixed 2% interest rate. There is $200 million available nationwide.
- COMBO: interest rate fixed by the Treasury. There is $100 million in loan funding and $100 million in grant funding available.
- GRANT: maximum award is $25 million and requires a 25% match. There is $200 million available nationwide.

A. The Telecommunications Infrastructure Loan Program

This program provides financing for the construction, maintenance, improvement and expansion of telephone service and broadband in rural areas. Most entities that provide telecommunications in qualified rural areas including:

- State and local governmental entities
- Federally Recognized Tribes
- Non-profits, including Cooperatives, and limited dividend or mutual associations
- For-profit businesses (must be a corporation or limited liability company)

Areas that are eligible to apply include rural areas and cities with a population of 5,000 or less and areas without telecommunications facilities or areas where the applicant is the recognized telecommunications provider. The above information is available on the RUS website for this program: https://www.rd.usda.gov/programs-services/telecommunications-infrastructure-loans-loan-guarantees

B. Rural Broadband Access Loan

Stated purpose: The Rural Broadband Access Loan and Loan Guarantee Program (Broadband Program) furnishes loans and loan guarantees to provide funds for the costs of construction, improvement, or acquisition of facilities and equipment needed to provide service at the broadband lending speed in eligible rural areas. To be eligible for a broadband loan, an applicant may be either a non-profit or for-profit organization, and must take one of the following forms:

- Corporation;
- Limited liability company (LLC);
- Cooperative or mutual organization
- A state or local unit of government
- Indian tribe or tribal organization
- Individuals and Partnerships are not Eligible.

Areas that are eligible to apply:

- Proposed funded service areas must be completely contained within a rural area or composed of multiple rural areas, as defined in 7 CFR 1738
- At least 15 percent of the households in the proposed funded service area are unserved,
- No part of the proposed funded service area has three or more “incumbent service providers.”
- No part of the proposed funded service area overlaps with the service area of current RUS borrowers or the service areas of grantees that were funded by RUS
- Communities where USDA Rural Utilities Service has previously provided funding for construction of broadband infrastructure may not be eligible.

The above information is available on the RUS website for this program: https://www.rd.usda.gov/programs-services/rural-broadband-access-loan-and-loan-guarantee

C. Community Connect Grants

The stated purpose of this program is to help fund broadband deployment into rural communities where it is not yet economically viable for private sector providers to deliver service. Grants are specifically targeted to local and tribal governments for very low-income rural communities (under 20,000 residents) with completely unserved and very low-income populations. Rural areas that lack any existing broadband speed of at least 10 Mbps downstream and 1 Mbps upstream are eligible. Within the area, 15% must be unserved and there cannot be three or more current providers. Because they are funding rural utilities, the municipal population must be less than 20,000 and not adjacent to a City of over 50,000.

The recipients must provide at least 4 Mbps Down/1 Mbps Up with free service to all households and community institutions for two years to a community center. One key with this grant is that the service area does not have to be uniform, but any areas that will be served must be contiguous.

With interest rates being as low as they are currently, if broadband construction is part of the adopted strategy, there should be an analysis of available loan providers and their interest rates. If RUS rates are not at least a point lower (and possibly more than that), then the filing and ongoing requirements might not be worth the difference in rate. Depending on the application requirements, RUS has typically taken 12 to 18 months to approve loans.

Depending on the strategy that the county pursues, if it includes building telecommunications infrastructure, RUS should be considered. The above information is available on the RUS website for this program: https://www.rd.usda.gov/programs-services/community-connect-grants

D. Distance Learning and Telemedicine Grants

The program helps rural communities become remotely connected to teachers and medical service providers. This program is particularly important during the time of the pandemic and has been provided an additional $25 million through the CARES Act. Relatedly, there are other funds made available by the CARES Act specifically for telehealth ($200m to FCC, $180m to HHS, and $2.15b to the VA). City of Palm Desert may potentially leverage this funding to extend the residential broadband network to its hospitals and other medical institutions. In addition, $13.5b was made available in Education Stabilization Funding to invest in technology supporting distance education, making school districts another eligible anchor tenant with potential support for expansion of the municipal broadband network.

For more information, please visit the program page at https://www.rd.usda.gov/programs-services/distance-learning-telemedicine-grants.

Economic Development Administration

Within the United States Department of Commerce is the Economic Development Administration, which oversees Economic Development Assistance grants. Information about these grants can be found on the EDA website: https://www.eda.gov/programs/eda-programs/

Typically, these grants have been based on job creation. There are different categories of grants, but they all focus on how many jobs can be created. Broadband does appear to be fundable infrastructure, although there have not been a lot of broadband projects funded. Having said that, with broadband infrastructure being eligible and some projects having been funded, it should be considered.

The key questions seem to be: how many jobs can be created and how will this project directly impact job creation?

The EDA recommends contacting one of their regional Economic Development Representatives (EDR) to discuss projects and to have them review grant applications before they are submitted. If this is a grant that could apply to your strategy, then it is strongly recommended that the City contact its EDR. Their typical timetable to submit applications is that they will receive applications at any time – although that is subject to available funds from year to year.

Housing and Urban Development (HUD)

HUD administers the Community Development Block Grant Program (CDBG). It was established to help communities address various community development needs. Based on a national formula relying primarily on census data, CDBG provides annual grants to more than 1,200 local and state governmental entities. Although CDBG grants have been utilized very little for broadband programs, HUD has confirmed that broadband programs can be eligible for CDBG dollars.

There are two main categories of grant eligibility: Entitlement and non-entitlement. Entitlement grants are awarded to larger cities and urban counties (greater than 50,000). Non-entitlement areas are for smaller cities and administered by states. Also, there are Section 108 loan funds which could be available. Grants can be used as security for Section 108 loans, leveraging the grant dollars for more impact. Non-entitlement areas can also use their grants in this way, but since they are administered by the State, the State would have to agree to leverage those funds.

Information about the CDBG program can be found on the HUD website:
https://www.hud.gov/program_offices/comm_planning/communitydevelopment

Bond and Loan Financing

Additional sources of potential funding include municipal bonds such as general obligation bonds, and revenue bonds, as well as bank loans or private investment financing.

The City of Palm Desert has the option of issuing general obligation bonds or revenue bonds. General obligation bonds are guaranteed repayment by issuers by any means necessary, including increased taxes. Revenue bonds are repaid using the revenues from the bonds that the project facilitated in funding. Repayment is not guaranteed if the project potentially does not collect enough in revenue to pay back investors. These types of municipal bonds are not subject to income tax at the state or federal level if the investor is a resident of the state, although not all of Iowa's municipal bonds are tax free.

Often, the investor may be a local bank, mutual fund brokerage, or other type of financial institution. The City of Palm Desert can also pursue infrastructure project-based bank loans and private investment. The terms and conditions of these loans can vary based on continuous changes in state banking laws. It is recommended that these loans are combined with state grants and tax abatement programs to the maximum extent possible.

Loan Loss Reserve

California has established an $750 million Broadband Loan Loss Reserve Fund administered by the California Department of Community Services and Development (CSD) to support costs related to the financing of local broadband infrastructure development. The reserve fund expands local governments' ability to secure financing for building last-mile projects, with an emphasis on public broadband networks. The CPUC's procedural schedule for establishing the program is outlined in a ruling in the California Advanced Services Fund Rulemaking 20-08-021. The program provides loans and loan guarantees up to $25 million.

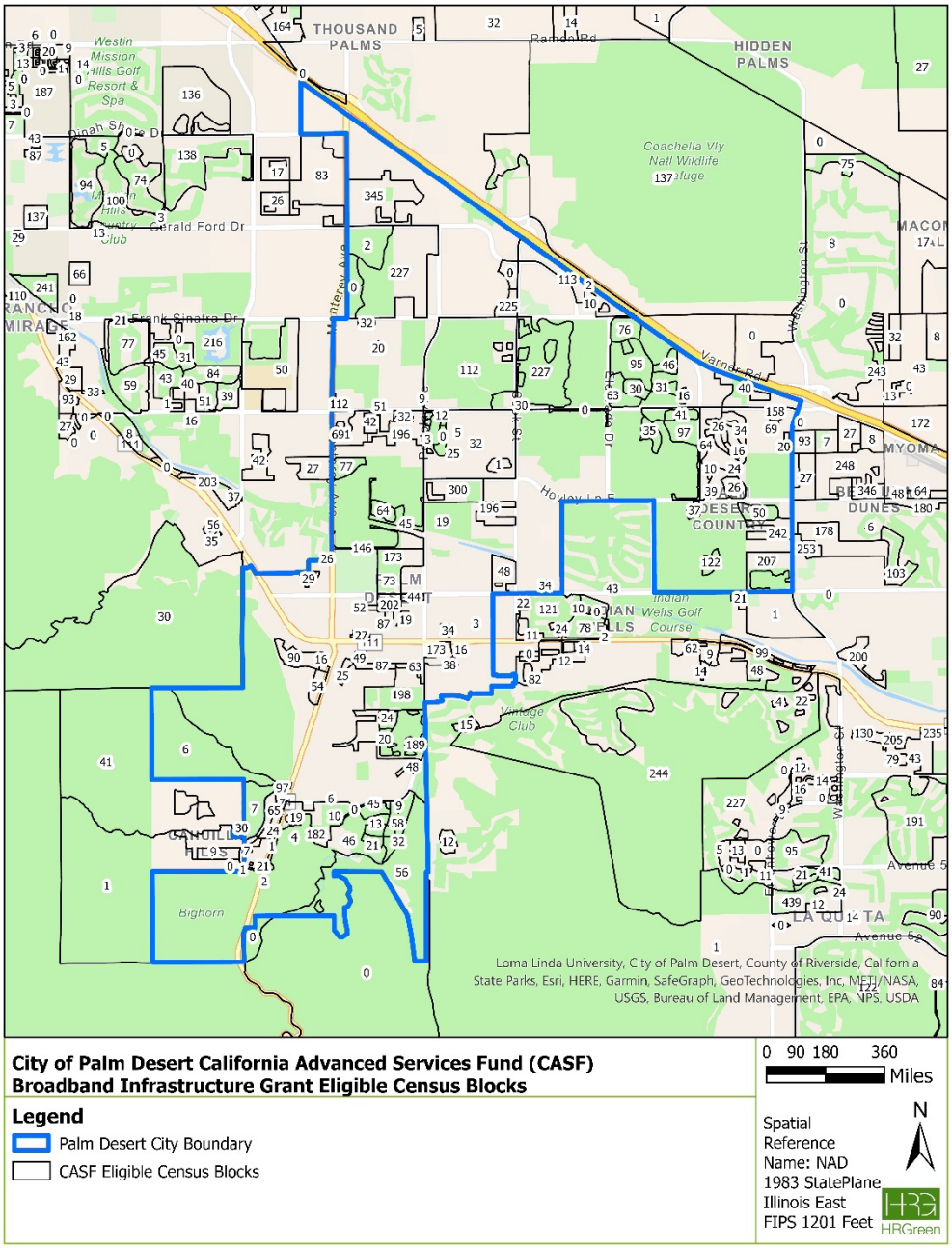
Recommendations

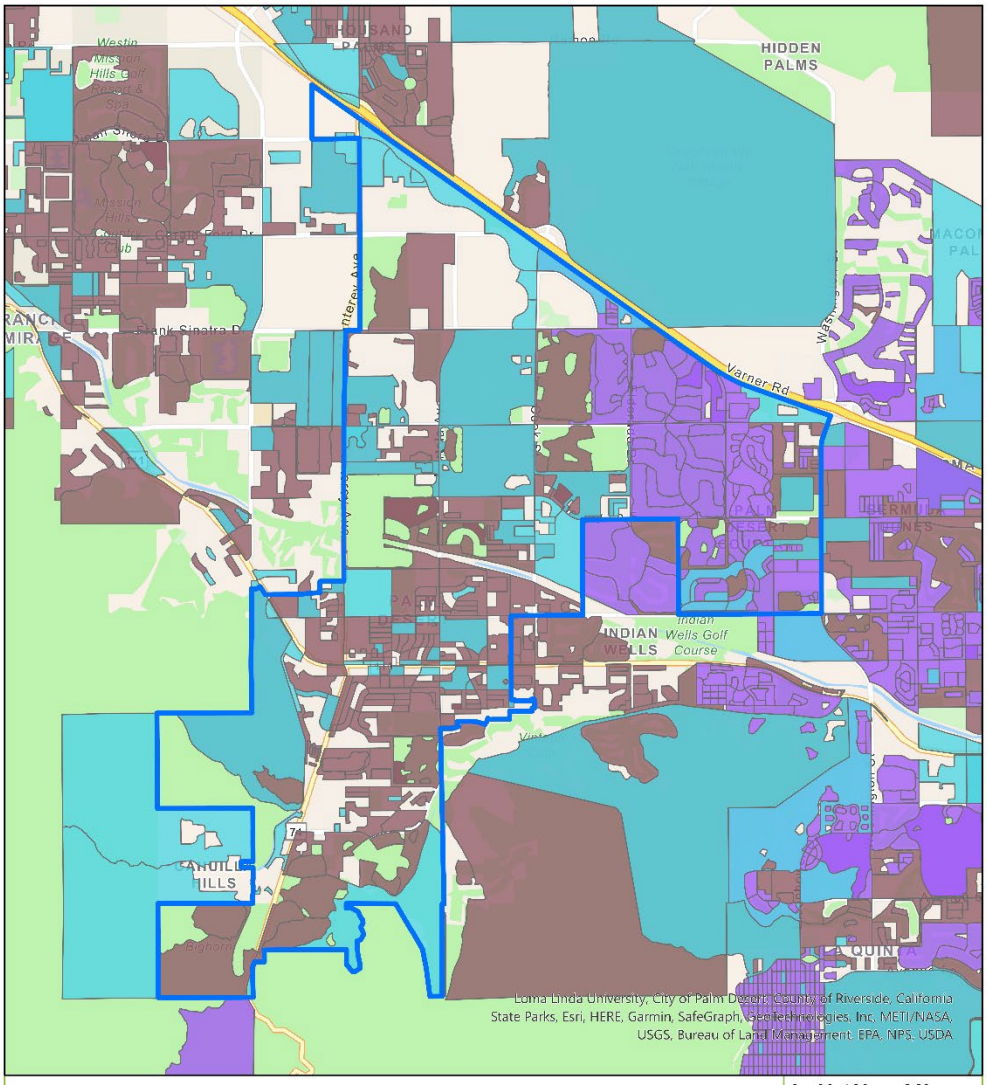
The City of Palm Desert should consider applying for the California Last Mile Federal Funding Account (FFA) when applications are open. This last-mile grant would increase the probability of the City facilitating infrastructure deployment to meet the connectivity needs of un and underserved residents and businesses.

In addition, while the application is currently closed, the City should consider future CASF Infrastructure Account applications through the local Broadband Consortium representative to plan for future grant award rounds.

Lastly, the City should facilitate an information campaign to advertise eligibility in the Affordable Connectivity Program to qualify for low or no-cost broadband subscription plans and discounts on computing devices for low-income residents. The program is currently undersubscribed, generally due to a lack of awareness, but many of the City's residents could be eligible. The internet service companies currently offering subsidies can be found at this link: https://cnm.universalservice.org/, and applications are available here: https://www.affordableconnectivity.gov/

Appendices


THOUSAND PALMS
HIDDEN PALMS
Westin Mission Hills Golf Resort & Spa
Gerald Ford Dr
Coachella Vly Natl Wildlife Refuge
Frank Sinatra Dr
Varner Rd
Monterey Ave
Washington St
Hovley Ln E
Indian Wells Golf Course
Vintage Club
Bighorn
Avenue 52
Loma Linda University, City of Palm Desert, County of Riverside, California State Parks, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA
City of Palm Desert California Advanced Services Fund (CASF)
Broadband Infrastructure Grant Eligible Census Blocks
Legend
Palm Desert City Boundary
CASF Eligible Census Blocks
0 90 180 360
Miles
N
Spatial Reference Name: NAD 1983 StatePlane Illinois East FIPS 1201 Feet
HRGreen



City of Palm Desert California Advanced Services Fund (CASF) by Technology

Legend

CASF Fixed Consumer Deployment — Palm Desert City Boundary

Technology of Transmission

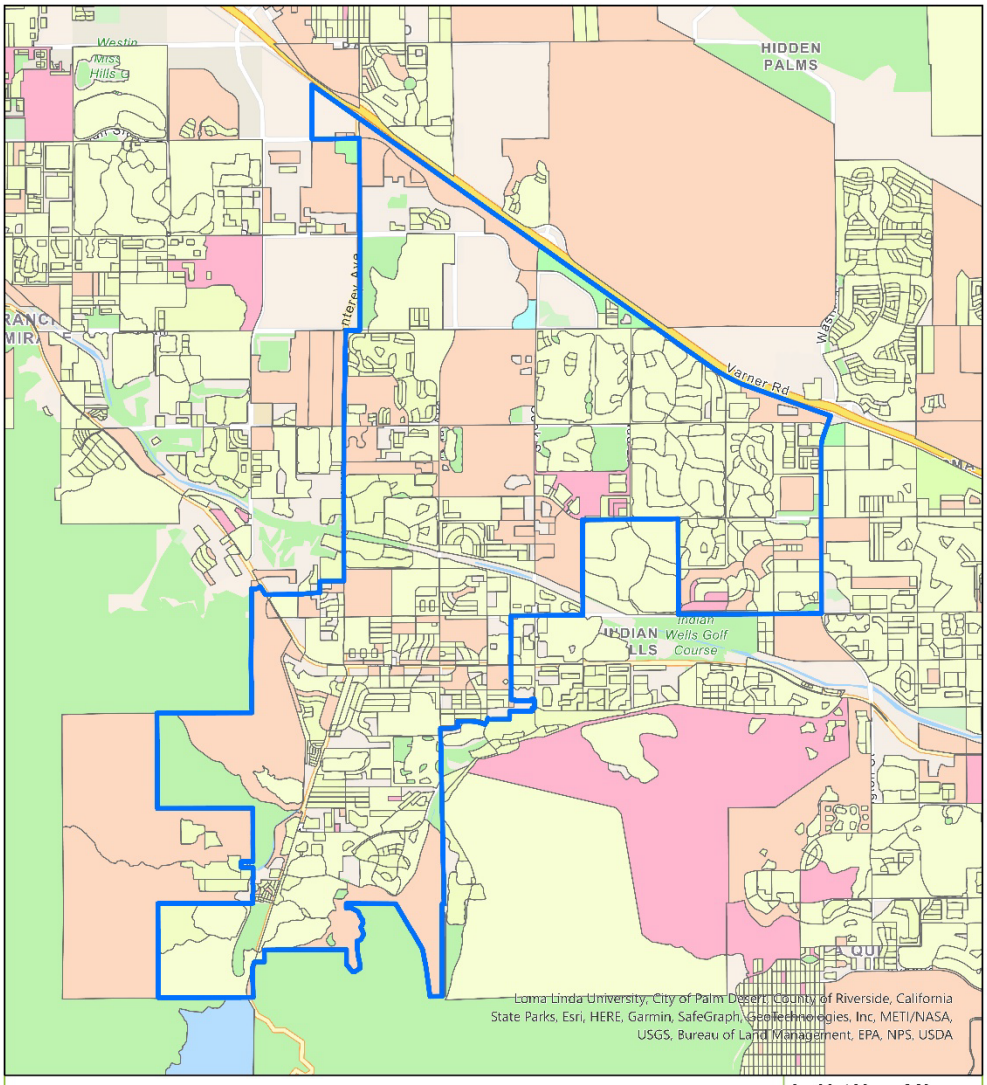
- Copper Wire
- Optical Carrier / FTTP
- Fixed Wireless

0 90 180 360 Miles

N

Spatial Reference Name: NAD 1983 StatePlane Illinois East FIPS 1201 Feet

HRGreen



City of Palm Desert California Advanced Services Fund (CASF) by Provider

Legend

CASF Fixed Consumer Deployment by Provider

Doing Business As (DBA) Name

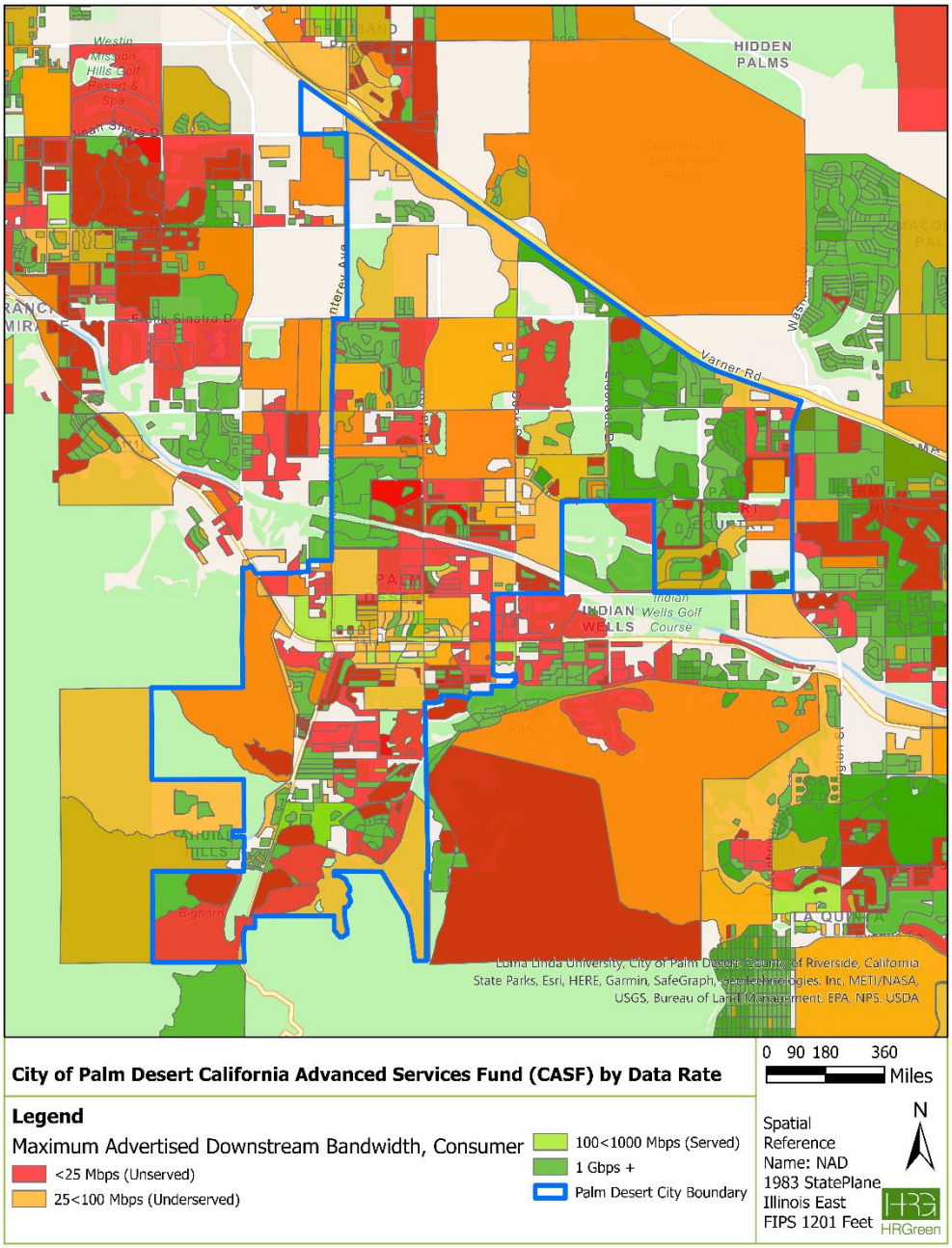
- Charter Communications Inc
- ConnectAnza
- Frontier California Inc.
- GeoLinks
- Pacific Lightwave, Inc.
- Single Digits
- Verizon Wireless
- WaveDivision Holdings, LLC
- Palm Desert City Boundary

0 90 180 360 Miles

N

Spatial Reference Name: NAD 1983 StatePlane Illinois East FIPS 1201 Feet

HRGreen


HIDDEN PALMS
Varner Rd
Monterey Ave
Frank Sinaha Dr
INDIAN WELLS
Indian Wells Golf Course
LA QUINTA
Loma Linda University, City of Palm Desert, County of Riverside, California State Parks, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA
City of Palm Desert California Advanced Services Fund (CASF) by Data Rate
Legend
Maximum Advertised Downstream Bandwidth, Consumer
<25 Mbps (Unserved)
25<100 Mbps (Underserved)
100<1000 Mbps (Served)
1 Gbps +
Palm Desert City Boundary
0 90 180 360
Miles
N
Spatial Reference Name: NAD 1983 StatePlane Illinois East FIPS 1201 Feet
HRGreen

Section 9: Explore Partnerships

Background

Broadband service Model #3, the Hybrid Ownership model, which is the recommended model for the City, may need to leverage funding for both fiber ring network and last-mile construction available through federal, state, or other funding sources. This means that the City needed to identify one or more potential for-profit partners who are interested in leasing the core middle-mile municipal network assets, and in building and managing last-mile connectivity. Identifying interested partners, therefore, was an important step to help the City envision a path forward and may be required by some funding sources.

The approach used to engage with potential partners included building a list of potential partners and other interested parties, developing a request for expressions of interest (RFEI), publishing the RFEI on the City's bid system, sending the RFEI to the list of potential partners, processing responses to the RFEI, and selecting potential partners based on the level of interest. This approach created a faster-moving cycle in which partners could be identified and brought to the table more quickly and with a higher likelihood of successful progress.

The RFEI process was useful to determine interested parties but did not provide the City with enough details to fully determine a proposed partner nor the form of the partnership. It is recommended that the City conduct a formal request for proposal (RFP) to identify and select its partner(s) for the potential buildout.

The list of current internet service providers (ISP) for the City of Palm Desert, which was developed during the *Market Assessment* for this Study, was used as a starting point for identifying potential partners for the potential buildout of the City's fiber ring network. Other providers that were not currently providing services to the community were added to the list of potential partners. Here is the list of ISPs who were identified as potential partners (in alphabetic order):

- Charter (Spectrum)
- Comcast
- Cox
- Crown Castle
- Frontier
- Google Fiber
- Lumen (formerly CenturyLink)
- Pacific Lightwave
- TDS Telecom
- Underline
- Zayo

Request for Expressions of Interest

The RFEI that was developed and posted on the City's bid system for selecting potential partners based on the level of interest can be found in **Appendix C** of this report.

On November 8, 2023, the RFEI was posted on the City's bid system, and then the link to the RFEI was sent to the list of potential partners via email. Potential responders had until November 15, 2023, to submit questions about the RFEI, and their responses were due on December 1, 2023.

RFEI Responses

Prior to the RFEI closing at 5:00 pm on December 1, 2023, the City received one response to the RFEI.

The respondent is **Arcadis**.

According to their proposal:

Arcadis is one of the world's largest architecture and engineering companies, delivering technology-driven sustainable design, engineering, and consultancy solutions for natural and built assets. Now bringing together the digital capabilities, products, and solutions of "Arcadis IBI Group" and "ArcadisGen" under a single Arcadis umbrella. Arcadis is on a mission to empower our projects and our clients with the data-driven insights they need to navigate today's challenges and address tomorrow's uncertainties with confidence and agility. Collectively, Arcadis brings an enhanced commitment to supporting infrastructure developments and digital transformation across every industry in which we operate. To meet this demand Arcadis has created a unique range of Digital Product and Services.

The Arcadis services for broadband development projects is branded as "Woven" with the intention that we provide the solutions for broadband networks to become the "digital fabric of the community."

Woven was founded from decades of consulting experience in developing community networks. Woven's services and technology platform is a cradle to grave solution for community broadband networks.

Using the world's best demand aggregation tools, open-access networking, and automated service provisioning, combined with fiber, and network asset management solutions, Woven establishes connected communities and assists with maintaining and managing all aspects of broadband investments. The Arcadis Woven solution mitigates risks, drives increased network utilization, and enhances the value of broadband assets.

Plenary is North America's leading developer, equity investor, and asset manager of complex and critical public infrastructure assets, specializing in public-private partnerships ("P3"). Since its inception in 2005, Plenary has achieved unrivalled success in North America, closing, managing, and investing in 60 infrastructure projects worth over $15 billion. Plenary's approach is centered on value-driven solutions, applying lessons learned from across our portfolio and balancing proven approaches with new and creative ideas that provide the best long-term performance outcomes for our public sector partners.

Through long-term active, hands-on management, Plenary adopts a holistic approach and embraces the financing, planning, design, and construction, commercialization, and ongoing management and operation of each project (as applicable). Notably, over the past three years, Plenary was awarded both first two long-term fiber optic middle-mile operations, maintenance, and commercialization ("OMC") contracts that have come to market in North America. Located in North Carolina and Pennsylvania, each of these networks is publicly owned, with the Plenary-led team responsible for core network operations and maintenance, as well as equity-funded capital expansion to support revenue generation. Importantly, both of these middle-mile projects will support last mile connectivity to unserved and underserved areas. As such, Plenary is directly responsible for managing an interdisciplinary team of contractors and operators, understands the business model and requirements of retail service providers, and has a proven track record of assessing fiber network capital investment decisions and deploying its own equity capital to support growth and generate revenues that are shared with its public sector partners.

More recently, Plenary has been awarded three FTTH connectivity projects: (1) West Hollywood, CA; (2) Destination Crenshaw development district in Los Angeles, CA; and (3) Centennial, CO. Each of these projects involves a public sector client that is looking to utilize a P3 framework to deliver new fiber networks that will expand and improve telecommunications services for households and businesses. Plenary, as the lead developer and sole equity provider, is working collaboratively with the public stakeholders and currently developing the technical, commercial, and financial elements of the projects with a view to enter into a long-term P3 project agreement in 2024.

Key Findings

After reviewing the respondent's proposal and responses to the RFEI questions, the decision was made to conduct a 30-minute interview with the respondent. The following are the questions and key findings from the respondent's interview.

a. Can you provide us with more information on your business plan?

- Public-private-partnership (P3) business plan
- Ultimately a city-owned network – including the middle-mile municipal ring and the last-mile connections to every premise
- Network will be a long-term asset for the city
- Propose to use a design-build-finance-operate-maintain model
- Full turnkey implementation, including operating it over time
- Provide whatever remaining financing that does not come from the public sector
- Operate on an open access basis
- Over time multiple service providers would operate on the network – they would be selling services to end user customers (residents and businesses)
- Charge a wholesale price to the service providers for access to the network – they would then sell services to the end users
- Recoup their capital investment out of the wholesale pricing on the network for a preset period time – up for negotiation
- Maximize the amount that can be done with private financing
- Presuming that the municipal ring will most likely be publicly funded
- Remainder of the funding based on a feasibility analysis that is part of the next steps from the city such as an RFP, etc.
- Response to RFP will provide more costs and market analysis
- Flexible on what the model looks like
- How much of the capital comes from what sources is subject to market dynamics

b. Do you expect to rely on Federal Grants (BEAD or others) to partially fund this project.

- Not necessarily reliant on state or federal grants
- Respondent's public sector grant identification/application/funding/administration team will be involved
- Consulting to other clients in the California market on grant funding applications and use of grants
- Know the California environment in terms of what is available
- Willing to dig deep and identify all the possible grants
- Can bring the expertise in term of the network planning stage and apply it as early as possible to ensure grants are maximized

c. What density and percentage of the market do you need to make for a successful project?

- Preference is to do a citywide ubiquitous build
- Feed costs and revenue data into their model and then there may be a requirement that comes out of that for city funding or anchor tenant payments from the city
- If there are some high costs areas, then have a conversation with the city about how those areas get covered rather than setting a density requirement
- Target a 40% to 50% take rate for a successful project – feasible on an open access project due to more than one service provider – need more competitive analysis on this market to determine if that is achievable

d. Are you requesting any revenue guarantees?

- Determine what is required through a feasibility analysis
- Discuss what form that would take whether there is city, state, or federal funding as a partial contribution to the construction
- Explore ongoing payments that could be framed as a revenue guarantee, also known as an anchor tenant payment, if the city has its own uses of the network, such as interconnecting its facilities and/or smart city types of services
- Contribution over time – common way to finance – finance the entire project upfront then receive city payments over time
- Model often does require some contribution from the public sector
- Benefits that go with that – it would be a city-owned network
- Arcadis would have a right to operate it over time – at the end of that period of time it is handed back to the city – city entitled to all the revenues from it
- Along the way explore a revenue sharing structure
- If the network is successful more quickly than there could be some sharing of the upside revenue

e. Elaborate on what you would need from the City, i.e. revenue guarantees, free leasing space, ordinances to be passed, etc.

- In-kind assets such as use of city space for central office locations for equipment
- Access to public right-of-way
- Streamlined permitting process

f. Elaborate on your financing.

- Base assumption is that Arcadis' capital investment partner, Plenary has the capability to provide all of the financing as equity from Arcadis sources, which is the primary approach to project
- Explore in parallel bond issuance or other forms of debt, if that is more cost effective, which depends on market conditions, so they do not rely on this

g. Can you outline your marketing plan i.e. pre-registration, zone launch schedule, service is available?

- Do not have a detailed marketing plan at this point
- Plan to perform a community survey of residents and businesses to understand needs, where those needs are, and willingness to procure services
- Plan to perform a detailed construction cost estimate and schedule
- Plan to pursue proposals from multiple construction contractors

- Overlay the survey results and construction schedule to determine where construction may be able to happen quickly and where demand is the highest
- Create construction zones for the city
- Turn the zones up sequentially to try to bring some revenue onto the network before it is fully completed
- Software partner COS Systems provides a system that focuses on online marketing, pre-registration, fiber zone launch, social media engagement, etc.
- System can be used to highlight where demand is the highest and where the build schedule can be adjusted to meet community demands
- Uses boots on the ground including door knockers, as well as other approaches

h. Can you provide your micro-trench design specs / architecture for Palm Desert to review?

- Willing to provide micro-trench design specs
- Sensitive to not degrading the roadbed or pavement through the process of micro-trenching
- Proposing the use of micro-trenching to accelerate the construction process
- Ultimately the network is a city asset, so the city needs to be comfortable with the micro-trenching approach
- Open to modifications of the micro-trench design specifications

i. In your response, you talked about setting up 2 core Points of Presence (POPs) on City property and they would negotiate connecting these onto other existing service provider's fiber networks.

- Typical design to provide high reliability and survivability
- Fiber rings interconnecting the POPs
- Carriers connect to each of the POPs for backhaul to the internet
- Strategically located on, in, or adjacent to city property
- POPs will be owned by the city
- City will be involved in getting long term agreement to get connectivity to the POPs and the facilities connected to them

j. Will you commit to a Service Level Agreement (SLA) of 5 - 9s of reliability (99.999%) for enterprise service and 4 – 9s of reliability (99.99%) for residential service?

- Understands enterprise requirements of 99.999% reliability
- Ring designs allows for this level of reliability depending upon where the enterprise client is located
- Diverse fiber routes in the design makes it possible to bring enterprise clients back into each POP, which leads to meeting enterprise service levels
- Design for residential service is industry standard
- Confident in being able to achieve 99.99% reliability for residential service when measured over an entire subscriber base
- Design does not include redundancy down to the individual subscriber connection at the residential level – it is not cost effective
- Residential service level ranges from a four-hour business day response to a next business day response depending upon the level of service the residential customer is subscribing to - this is negotiable
- Service levels are a direct result of the design and costs of the network – willing to work with the city on determining service levels

k. What is your service outage Mean-Time-To-Repair (MTTR) expectation for the fiber network (using a micro-trench design)?

- Processes designed to support four-hour response to repair
- Seven days a week by 24-hours a day response

l. Will you have a fiber restoration team in the market, or do you plan on sub-contracting that out?

- Will have a local fiber restoration team in the market
- Could be subcontracted and/or utilize their own employees
- Determined by what the base load is in the community in the long term
- Usually, a blend of both to ensure they are an efficient network operator and have the right number of employees

m. Who are the service providers in Palm Desert, you expect to work with under the Open Access model?

- Too early to reach out to ISPs in the market
- Performed a scan to determine which ISPs are in the market and what the competition could look like
- Model allows the network owner (City) to choose who they would like to be the service providers on the network
- Set up a stable of service providers
- Bring service providers from other areas
- Three service providers are willing to come onto the network and are working in the California market and are part of their stable of service providers that are working near the community
- Intend to bring availability to any providers in the area that are interested in being on the network
- Offer the same business model pricing to all providers
- Transparency to all the providers is extremely important
- Open access network encourages competition
- Minimum of three service providers leads to a successful open access network environment
- Best for the network to have as many providers as possible come onto the network
- Six competitors on the network seems to be where most networks end up in a mature steady state environment
- Will bring letters of intent to the table from the three providers as part of the RFP process

n. Do you plan on deploying the end point equipment and the provider's equipment?

- Once the drop connection to the home is done the end point equipment is deployed at initial service turn up
- Need for ongoing field technician visits to do service configuration changes is greatly minimized beyond the initial construction phase
- Service delivery and self-serve models are driven off of an online web portal
- Residential subscribers can activate/deactivate/change/cancel/order service at their convenience
- Sensitive to subscriber experience based on how well or poor Wi-Fi works in their homes
- Tuned into providing the best subscriber experience
- Ensuring that the right in-home experience is achieved using the equipment
- Flexible regarding deployment configuration

- Work closely with the retail providers in terms of the actual deployment configuration that will work for the providers, as well as the network owners and operators

o. **How many local support staff do you expect will be in the area for service outage support after the deployment contractors leave?**

- Local support staff are key to operating efficiently
- Choosing a number right now is a bit premature
- See the value in terms of having local staff

Recommendation

Since it seems that the City has received interest from at least one viable partner, it is recommended that the City complete a formal Request for Proposal (RFP) to identify Partner(s).

Section 10: Recommendations

Background

The key outcomes from discussions with Council and staff, as well as the findings shared throughout this Study contributed to the following recommendations. The recommendations are the next steps for the City to consider. While the recommendations are listed in sequential order this does not necessarily mean they need to be implemented in this order.

To fully realize the benefits of improved broadband service, some recommendations should be executed concurrently, primarily due to the need for federal and/or state funding as a mechanism to drive project deployment and the complicated nature of the potential Public Private Partnership.

Recommendations

Recommendation #1: Complete Formal Request for Proposal (RFP) to Identify Partner(S)

The RFEI process conducted as part of this study was useful to determine interested parties but does not provide the City with enough details to fully determine a proposed partner nor the form of the partnership. It is recommended that the City of Palm Desert conduct a formal RFP to identify and select its partner(s) for the potential buildout.

Recommendation #2: Pursue Grant Funding

When applications are being accepted, the City of Palm Desert should apply for the California Last Mile Federal Funding Account (FFA). This last-mile grant would increase the probability of the City facilitating infrastructure deployment to meet the connectivity needs of un and underserved residents and businesses.

In addition, when applications are being accepted, the City should consider future CASF Infrastructure Account applications through the local Broadband Consortium representative to plan for future grant award rounds.

Formal grant applications should be submitted as soon as practical to cover final engineering design of the proposed city-owned network, as well as to fund the network construction.

It is also recommended that the selection of a private partner be timed to allow for coordination of grant requests to assist with paying for last-mile connectivity. Ideally, a coordinated approach would assure both the private sector and the City of availability of state funds to complete both the city-owned fiber middle-mile ring network and the last-mile connections due to the interdependence of funding sources for completion of the project.

Recommendation #3: Finalize Detail Designs

The first step to finalizing the design is to perform a field survey that will need to follow established standards and design requirements. The intent of the field survey is to optimize the network and reduce the overall cost. Field engineering must ensure that all possible routing alternatives are documented. The final fiber network design can only be optimized by analyzing all possible connectivity routes, the location of all service points and existing infrastructure.

As a contiguous area is surveyed and posted, the actual fiber network is designed. Once Fielding is completed, the design of the planned network Low-Level Design(s) (LLD) necessary to create associated construction and permitting plan sets will need to be completed.

If the City decides to bring in a contractor to oversee the construction of the network, then the next step is to create an RFP to select and manage the contractor. The RFP will include a comprehensive construction specification manual, a complete design document, and a comprehensive bill of material.

Recommendation #4: Construct Network

Once a partner is identified and funding is secured, the next step will be to begin the deployment of infrastructure to support broadband improvements. This step can be started as soon as engineering is completed through the selection of a contractor with fiber optic deployment experience. The City should work closely with its selected private sector partners to ensure that the network constructed meets its required last-mile architecture.

Appendix A: Broadband Service Models

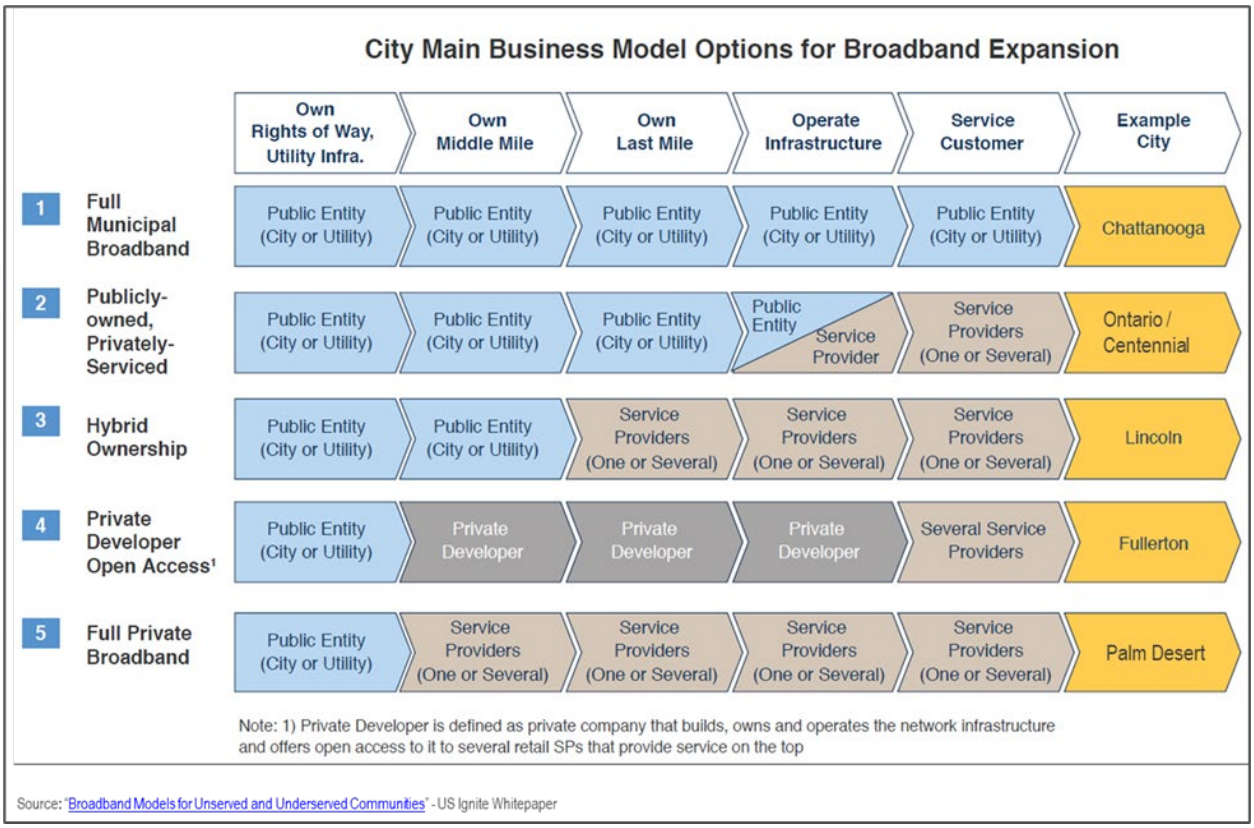
Background

The following information is from a guide created by *US Ignite* in July of 2020 for communities considering ways to expand broadband service. The guide, titled **Broadband Models for Unserved and Underserved Communities**, includes models for fully private and fully public broadband networks, but also covers a growing range of municipally enabled broadband strategies that rely on a combination of public and private investment. It is intended to help communities understand how much capital is needed for different models of deployment, what returns to expect, and finally how to avoid the most common pitfalls.

Five Models

There are several models for fully private and fully public broadband networks, plus a growing range of municipally enabled broadband strategies that rely on a combination of public and private investment. Despite the many ways that municipalities have gone about implementing their broadband programs, there are five main ways to do it, each requiring a different level of investment and engagement from the municipality.

The five models are shown in the following chart.



Four Key Factors

Generally, there are four key factors that municipalities should consider when making decisions on which municipal broadband model to pursue:

Key Decision Factors	Options	Definition	Impact on City's Decision
Capital Availability	**Good Access to Capital / Funding**	There are sufficient financing sources to fund a significant part of the build	Good capital availability should push the municipality to own / fund a larger part of the project without bringing in private ISPs
	Poor Access to Capital / Funding	There is limited capital / funding availability, so seeking commercial capital will be required to fund the build	
Existing Infrastructure	**Good Existing Infrastructure / Capabilities**	There is an existing public utility with conduit / infrastructure and operating capabilities	Presence of existing infrastructure and/or capabilities should push the municipality to take more control over the project, which provides a "bargaining" chip with ISPs
	Poor Existing Infrastructure / Capabilities	There is no existing utility or there is, but infrastructure and operating capabilities are poor	
Partnership Options	**Viable ISP Partner(s)**	The municipality has attractive demographics or a good value proposition for a third-party ISP	Lack of viable ISP partnerships limits the municipality's options to those models that require a significant involvement from the ISP
	No Partner Options	The municipality is too small, too remote, or otherwise unattractive for a third-party ISP	
Objective and Risk Tolerance	**Community Benefit**	Using the broadband infrastructure to create innovation and benefit the community in non-financial ways	Strong public support towards anchoring the project around community benefits should push the municipality to seek more control / ownership over the infrastructure
	Meeting Financial Goals (High Risk)	Using the broadband infrastructure to meet measurable financial goals while maximizing broadband availability	Focusing on meeting financial goals / targets should push the municipality to more predictable financial models (e.g., third-party driven)
	Meeting Financial Goals (Low Risk)		

Decision Tree

Depending on where municipalities fall on the criteria for the four key factors, there may be a business model that is a more optimal choice for them. To steer municipalities in the right direction the choices have been distilled into the following decision tree that could help communities to develop the best strategy.

Capital Availability	Existing Infrastructure	Partnership Options	Objective and Risk Tolerance	Optimal Business Model
Good Access to Capital / Funding	Good Existing Infrastructure / Capabilities	Viable ISP Partner(s)	Community Benefits	**Full Municipal Broadband** – maximizes community benefits when capital / infrastructure are available 1
			Meeting Financial Goals	**Publicly-owned, Privately Serviced** – reduces risk when full control over service not as important 2
		No Partner Options	Community Benefits	**Full Municipal Broadband** – maximizes community benefits when capital / infrastructure are available 1
			Meeting Financial Goals	**Full Municipal Broadband** – is the only option when no ISPs will partner 1
	Limited Existing Infrastructure / Capabilities	Viable ISP Partner(s)	Community Benefits	**Publicly-owned, Privately Serviced** – reduces risk in absence of operational capabilities 2
			Meeting Financial Goals, High Risk	**Publicly-owned, Privately Serviced** – maximizes return potential while leveraging ISP partnership 2
			Meeting Financial Goals, Low Risk	**Private Developer Open Access** – limits risk to the municipality but maximizes chances of success w/ISP partner 4
		No Partner Options	Community Benefits	**Full Municipal Broadband** – is the only option when no ISPs will partner but there's capital 1
			Meeting Financial Goals	
Limited Access to Capital / Funding	Good Existing Infrastructure / Capabilities	*Does not matter*		**Hybrid Ownership** – hybrid models are optimal when capital is limited but there's existing infrastructure, regardless of other factors 3
	Limited Existing Infrastructure / Capabilities	Viable ISP Partner(s)	Community Benefits	**Private Developer Open Access** – maximizes municipal control in light of limited funding / infrastructure 4
			Meeting Financial Goals	**Full Private Broadband** – maximizes chances of success while ensuring goals are met 5
		No Partner Options	*Does not matter*	*Limited options, have to go back and seek more capital, likely government funding / subsidies*

While a decision tree like this may suggest that picking a business model is easy, it is quite the contrary. A decision tree is a good "rule of thumb"; however, there are unique circumstances that each municipality faces and doing a thorough diligence across all potential options should always be the starting point. To do that analysis accurately, a municipality first needs to understand how much capital is required and what the financial returns of the program may be.

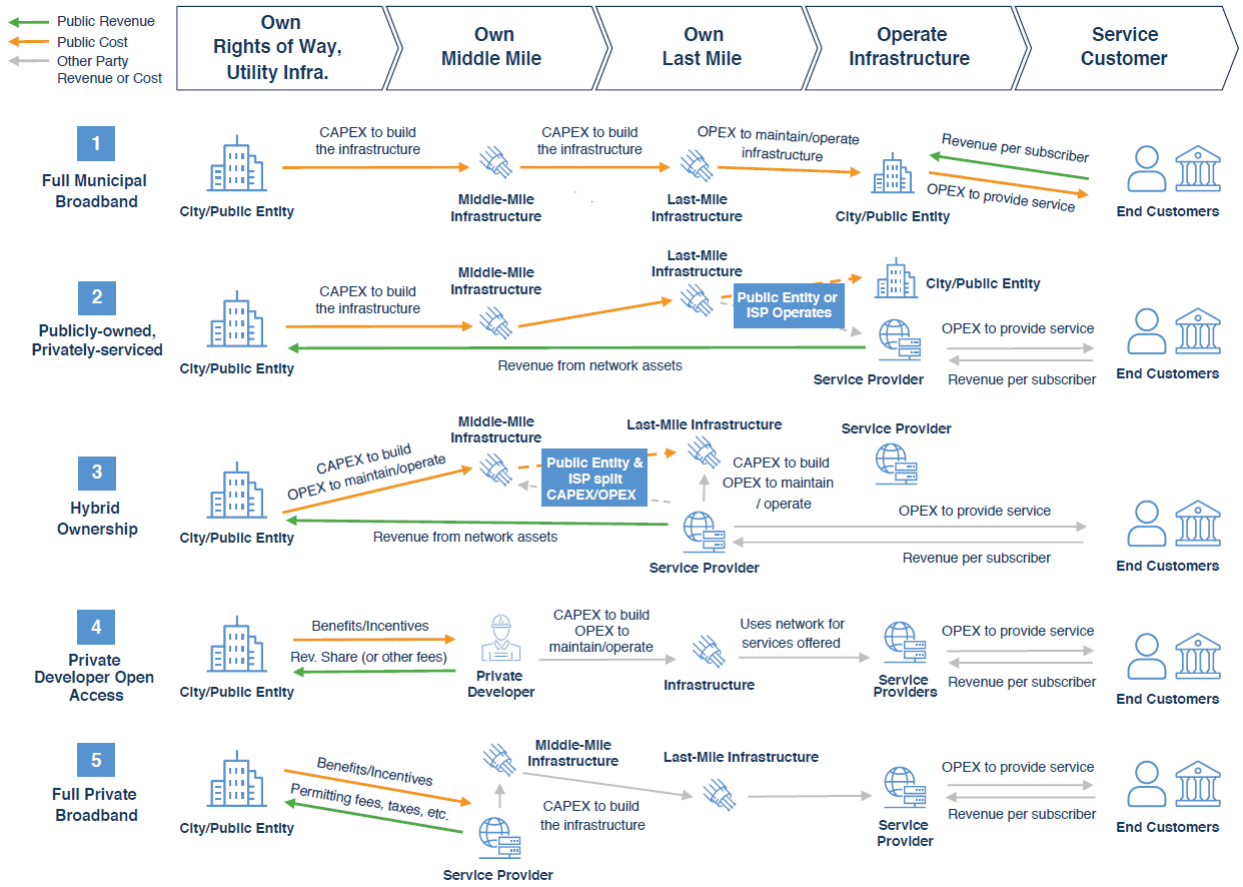
Financial Considerations

Municipal broadband programs are long-term investments, and these projects can take up to five to ten years to complete. Fiber is a resilient and future-proof piece of telecom infrastructure, but it is also expensive to deploy. This means investment in fiber is hardly a "no-brainer" for all municipalities. Those looking to invest to close the digital divide in their communities should prepare for payback periods of 15+ years, particularly across smaller and/or rural communities. These paybacks have often deterred interest from the private sector and make careful planning and business analysis critically important for any municipal broadband program.

The capital expenditures (CAPEX) associated with building a fiber-to-the-home network include a range of fixed and variable costs. These include the cost of laying the initial network infrastructure, which could range from $500 to $4,000 per home largely depending on the density of the municipality, as well incremental costs to connect each customer. Costs to connect each customer can include the cable drop to the home, the modem at the home, and the labor cost of the installation. Those could add up to $1,000 for each incremental customer. All-in, capital requirements for a broadband program in a municipality with 100,000 residents could end up around $150M.

Operating costs can vary greatly as well, and those depend on the experience and efficiency of the broadband provider, number of synergies with the core municipal staff (if any), and types of services delivered to the customers. Municipalities that want or need to offer TV to its residents must prepare for lower margins given high and rising content costs (although this can be mitigated with Over-The-Top offers). Most often municipalities budget between $40 and $100 of OPEX monthly for each residential subscriber they sign up.

Not all municipalities will have to cover all these costs. Those that bring in a private ISP or developer to help service the customers and/or build the network can split operating costs, capital costs, or both with that third party. In return they would most typically offer free or low-cost access to municipal infrastructure, fixed payments, or some variable revenue share typically tied to the number of subscribers in the municipal broadband program.



In addition to impacting share of required costs, the business model also dictates the amount of revenue that municipalities can generate from the program. On the high-end, municipalities that deploy and operate Full Municipal Broadband themselves could generate direct revenues of up to $140 per residential customer every month, without considering additional revenue streams from businesses and other anchor institutions. On the low-end, municipalities that choose Full Private Broadband models would generate limited revenues, aside from permitting and tax fees, which could even be waived in many cases to entice private engagement.

It should be clear by the broad ranges quoted above that the financial performance varies greatly not only by the model, but even from municipality to municipality. Using an “average” set of assumptions for a municipality of 100K residents, typical Investment Rate of Returns (IRRs) can be between 9% and 16% for Models 1 and 2, with a significant amount of capital required but also significant cash flow potential once the program is mature. Municipalities that are not ready to take on this amount of risk could pursue hybrid models or fully give up network ownership to third parties – those investments will be relatively low risk, result in high IRRs but also (typically) more limited cash flow upside.

While financial performance varies from municipality to municipality, the inability to budget appropriately is a main reason some programs fail, reinforcing the need to develop a detailed business case as the first step in any municipality’s implementation plan.

Four Key Challenges

There are four key challenges common to most municipalities pursuing a municipal broadband program: in addition to poor budgeting, some choose the wrong business model due to a "one-size-fits-all" mentality, struggle to secure adequate funding, or fail to maximize their program's value.

1. **Budgeting**: Detailed budgeting is critical to success. A detailed analysis— including designing a full network plan —is essential during the planning phase. It is also important not to overlook any major sources of costs. Those most typically include labor for delivering the service, managing, and maintaining the network, but also costs to support any debt and interest payments. As costs increase, it is also important to be clear-eyed and consider private sector involvement; many private ISPs have much lower operating costs due to their scale and experience, while having private developers build and operate the network can significantly reduce the cost associated with network operations and maintenance.
2. **Funding**: Especially when the total budget is high, securing the right funding may become a roadblock. More "traditional" funding options include soliciting contributions from anchor institutions, selling bonds, enlisting local utility involvement, securing federal and state grants, or asking private partners to co-fund the builds. When those are not an option and/or are not enough, municipalities often get creative. For example, some had their residents contribute money to the program, by either paying for several months of service upfront, or pooling money across neighborhoods and buying bonds from the municipality. Creative approaches like this may work for certain municipalities when securing more traditional funding is not an option.
3. **Diligence**: Even when budgets are finalized and capital secured, it is also tempting to just copy a "success story" from another municipality. Skipping the diligence on evaluating which business model to pursue, however, can lead municipalities down the wrong path. There are numerous examples of municipalities ultimately having to pivot from the initially selected business model because they "dove-in" too quickly.
4. **Related Benefits**: Lastly, when the path is chosen and business model is selected, municipalities should think holistically about how else they can use the program to serve their communities and ensure the network has the architecture to support that plan. For example, while residential service is often the primary motivation, municipalities should not forget about enabling internet access to the commercial sector, which can spur job and value creation. Additionally, while few municipalities have thus far used their municipal fiber to enable "Smart City" solutions, these solutions can spread digital literacy to more residents. And, while the municipality's focus has been on fiber services thus far, there are also scenarios where mobile or fixed wireless broadband are more appropriate for last mile connectivity. Communities should consider where fiber investment is valuable and how it can be tied to other network technologies as needed.

While these challenges are common regardless of the selected business model, Municipalities pursuing models with more municipal involvement are more prone to many of these. To maximize chances of success, special attention should be paid to budgeting and costing, and revenue generation should be prioritized and accelerated to the extent possible. For example, targeting the densest business and residential areas first or starting with commercial-only services is one way to generate a steady inflow of cash to help cover program costs.

Working with the private sector avoids many of the budgeting and costing issues mentioned above, but it brings about a different set of challenges. First, attracting the attention of private ISPs, particularly for smaller municipalities, could be a challenge. Municipalities should be persistent in soliciting private engagement and think creatively about how to entice private cooperation. For example, streamlining permitting and rights-of-way, enabling access to backhaul and middle mile infrastructure (if such exists or can be leased), becoming the anchor institution for the private ISP, or co-sponsoring an "Open Access" network and enlisting a private developer to sign up the ISPs (Model #4) all can improve chances of finding a partner. Once a partner is identified, it is also important to clearly define rules and goals for the program to maintain some degree of control and ensure municipal objectives are met. This is especially true for the "Open Access" programs which require participation of a private developer and one or several ISP partners. These models have been relatively rare in the U.S., but "Open Access" has proven successful in Europe and should be considered as an option for any municipality considering a municipal broadband program today, particularly as it strikes a good balance between providing a municipality the control it needs while also de-risking the investment and operations.

Appendix B: Smart Application Technology Plan

Background

Palm Desert is analyzing its options to position itself for future "Smart City" applications. The City's goal is to look at what it might take to establish "future-proof" solutions that deliver a premium operational experience for guests and residents, ideally while creating long-term revenue streams for the City of Palm Desert to help offset, at least in part, the costs of implementing these initiatives.

This analysis includes use cases, an overview of the available and emerging technologies, provides a high-level overview of smart cities and summarizes both findings and recommendations.

Within the scope of this analysis, the smart city-related tasks included:

- Reviewing the current technology base
- Providing recommendations on how the City can increase access to smart services for all citizens.
- A prioritized overview of the types of smart city applications and infrastructure that could be most impactful.
- Performing a high-level cost-benefit assessment of various infrastructure and smart application options, and exploring in more depth the prioritized list of Smart City technologies identified

A Future-Proofed Technology Base for the City of Palm Desert

The development of the technology base is founded upon the unique aspects of wireline (fiber optic) and particularly, gigabit wireless (5G) networks that make it perfectly suited to help advance many of the stated goals of the City of Palm Desert. While deeper exploration of deep technical foundations will be considered, at its core, 5G is more than just a faster wireless network. This technology is the new standard that is effectively replacing all existing fixed and wireless networks. Likewise, expanding the city's fiber optic backbone to support both gigabit 5G and wireline connections is a crucial foundational element of this smart city plan. Without a robust telecommunications backbone, achieving many of these benefits may become cost prohibitive.

The Case for Smart City Technologies

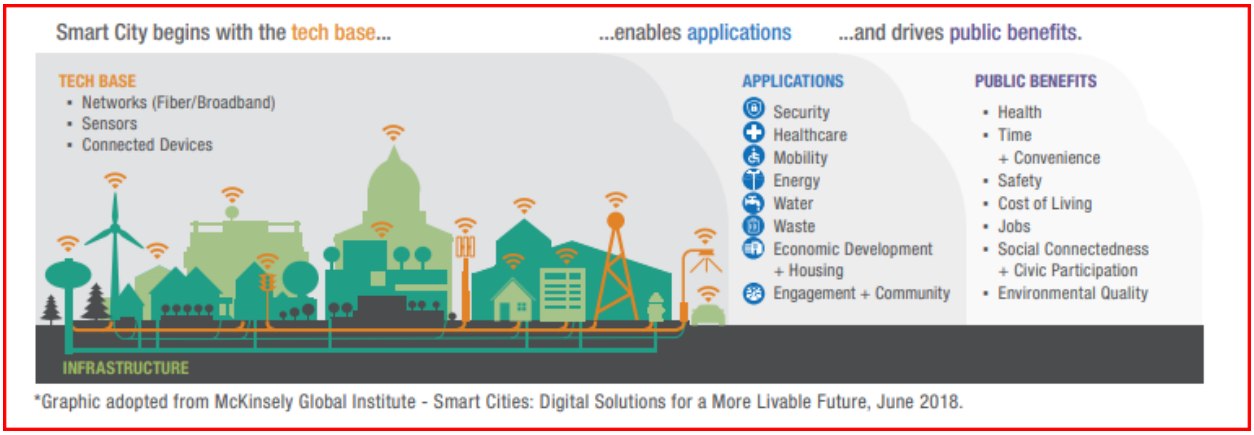
While there is no universally accepted definition of smart cities, the term is most often associated with a community vision to **integrate data and technology to improve the efficiency of services and manage city assets.**

In other words, properly applied, a smart city of the future can, for example, instantly sense human behavior and guide disabled pedestrians, trigger the need for refuse collection, amplify emergency services, and protect people against environmental and health threats. These technologies can also help address unmet needs in public safety, enhance traffic efficiency, assistive technologies especially considering "hyper-local" factors such as outdoor work in the summer heat, and small-scale environmental sensing.

With the desire to advance a smart city program in mind, three critical, common elements often comprise these initiatives:

1. **Sensing** and data collection
2. Real-time data **analysis** and automation
3. Real-time service delivery modifications or "**action**" resulting from the sensing and analysis of data.

At the risk of over-simplifying this concept, the graphic below highlights the flow of data from ***sensing*** (via a technology base) through ***analysis*** (via dashboarding and applications) to achieving **action** for the community's benefit:



*Graphic adopted from McKinsely Global Institute - Smart Cities: Digital Solutions for a More Livable Future, June 2018.

Perhaps even simpler, this graphic can be used illustrate this concept:

Popular Smart City Application Categories

Nationwide, there are dozens of smart city applications in use currently. Although some cities are deploying applications related to health care, higher education, and non-municipal services, there are generally five broad topical areas which may be of specific interest to Palm Desert. While some are inter-related, these five categories are:

1. **Security** and "Movement analytics" to help track who – and what are moving through the city.
2. **Energy** – initiatives to reduce the greenhouse gas (GHG) footprint of their buildings and vehicles.
3. **Utilities** – reducing costs and energy consumption while enhancing municipal utility service delivery.
4. **Transportation –** travel related, including fleet electrification, **c**onnected vehicle infrastructure, congestion mitigation, mass transit, micro-mobility.
5. **Navigation,** Tourism, Wayfinding and Citizen Engagement (public awareness and acceptance)

Execution Essentials

Common to all these categories, and essential to program execution is a robust **telecommunications backbone** as a foundation to enable all the above categories. **In most cases, gigabit wireless and symmetrical wireline (fiber optic) infrastructure is regarded as crucial.**

Likewise operating a successful smart city program execution will involve:

- **Smart & Big Data Synthesis** from a wide variety of sources.
- **Data Visualization** (situational awareness).
- **Leadership** & **Vision** (action and execution in real time in response to the above).

In short, the intent is to forge a livable, safe, and inclusive Palm Desert community by using technologies built on advances in a telecommunications backbone that promote privacy and security while balancing community-defined benefits[1].

Floods, Fires and Earthquakes

Flooding and disruptions to the city's infrastructure resulting from the mid-August 2023 Hurricane Hilary, as well as other emergency operations often serve to highlight the potential value realize by engaging these technologies. In addition to flooding and earthquakes, one emerging threat is now more commonly related to wildland fires which in some cases, including Paradise, California; Superior, Louisville, and Colorado Springs, Colorado and Lahaina, Maui, Hawaii have, combined, consumed more than 2,000 homes in largely suburban settings. In these situations, high winds have ignited flammable yard materials and residential rooftops and overwhelmed local fire departments' ability to respond.

Unfortunately, it seems that short-notice mass evacuations have, in some cities, caused critical evacuation routes to get clogged with fleeing residents uncertain of safe routes, overwhelming the capacity of the transportation networks to accommodate tens of thousands of people and vehicles. In many of those situations, smart city technologies could have reduced or mitigated the potential tragic end results and are worth a high-level consideration for Palm Desert.

Emerging Technologies

Ideally, taking a comprehensive approach to these technologies can leverage advances in wireless/optical communications, edge/cloud computing, situational awareness, privacy, and security, while balancing public sphere data collection requirements with community-defined benefits. That is, emphasis should be placed on delivering innovations across five areas[4]:

1. **"Wi-Edge"** – the integration of high-speed wireless-optical networking, high-performance edge-cloud computing, and software-defined radios and networking.
2. **Situational Awareness** – fine-scale, real-time observation, modeling, and forecasting of human behavior over variable time horizons at streetscape scales.
3. **Security, Privacy, and Fairness** – addressing socio-technical barriers of privacy and security within locally intelligent streetscapes, yielding a software pipeline for streetscape applications that gives community-configurable guarantees of privacy, fairness, and transparency.
4. **Public Interest Technology** – understanding how smart city technologies, applications, and security/privacy policies impact the social landscape and promote regional economic development.
5. **Streetscape Applications** – incorporating the distinct ways in which individual the Palm Desert community reads, interprets, and responds to local intelligence within the design process to optimize community-specific benefits.

One Capital Investment – Multiple Solutions

The answer to meeting the City of Palm Desert's current and future needs is predicated on a platform that enables the City of Palm Desert to:

- Build a Shared Infrastructure Network consisting of wireless transmitter sites, often as a network of small poles, known as "masts," connected to a city fiber optic backbone.
- Encourage public applications and partnering with the private sector, largely local developers, HOAs, public agencies/utilities and the major telecommunications carriers to share infrastructure and if necessary, be able to rent telecommunications assets such as conduits and fiber strands, masts, space and deploy on public infrastructure.

- Create a technology base upon which carriers deploying their fiber wireline and wireless 5G infrastructure will be able to support the requested and futuristic use cases.

Smart City Remote Sensing – Data Sources

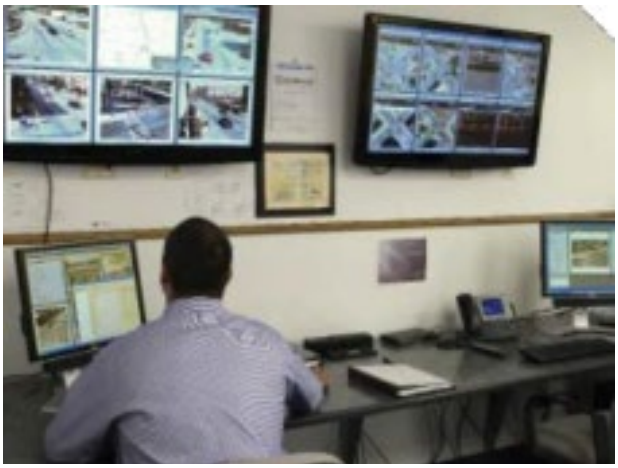
With the demand for smart applications increasing, the city would be well served to consider several possibilities for expanding both the *sources* of data and the *uses,* or application of that data to better serve the community.

Today, there are dozens of smart technology systems in use by various cities – and to varying degrees. Many of these systems involve proprietary technologies, require on-going fees or revenue sharing with vendors and can be very specific in their use and application. Many of these smart city applications may be easy to implement in "full service" cities, however, in Palm Desert, many of these are likely to involve multiple agencies, HOA's and may be both expensive and difficult to implement.

With respect to Palm Desert specifically, there are several smart city applications that may be worth consideration. As noted above this assessment will offer both a high-level cost-benefit assessment of various infrastructure and smart application options, and a prioritized list of Smart Community technologies identified. Before offering either of these assessments, a brief overview of the technologies and data sources needed to support these smart city applications may be worth offering to better under the applications and possibilities, as noted:

Available Data Sources – As noted above, remote sensing and data collection is the first of three crucial, "common elements" to lay the foundation for successful smart city applications. In Palm Desert, there are a few **existing – or potential sources** of data that could be useful for future smart applications which include:

- **Cell phone data aggregation** ("People as Sensors" and "footfall" data) – This is data already being collected via individual cell phones and may easily be shared with Palm Desert, usually for modest fees from certain cellular providers and in some cases, third-party data aggregators and telecommunications companies. This data relies on the cellular devices GPS chips and requires the cellular companies to calculate position by a combination of GPS data and/or triangulation from a minimum of three cell tower reception to pinpoint where the device is. Based on the need and end users, often Personally Identifiable Information (PII) is stripped out to ensure a level of privacy and, if desired, anonymity.
- **Cellular Device Bluetooth and Wi-Fi based systems** - This data source requires cell phone owners to have their phones' Bluetooth and/or Wi-Fi systems switched on. While this requirement reduces the number of devices available, the resolution of the data is usually much better than available from cell towers and GPS systems. From this source, the raw data is available for no charge, but the analytics is usually done on a fee basis by third-party providers. The value of this data, for example, includes "footfall" data and travel-time analytics (e.g., BlueTOAD and other Vehicle-to-Infrastructure, V2I systems). Is usually available free of charge. which provide actionable Origin & Destination (O&D) data,
- **Overhead / Microwave / Optical detection systems** - These data sources involve traffic-corridor-related sensors, usually fed into traffic management systems that often require some level staffing (see below).



Typical Traffic Management Center for a city of about 50,000 population

Other agencies, notably, Caltrans has sensors using overhead microwave detectors, in-pavement "hockey pucks," "induction" loops and even optical detection on many of their major corridors to detect volumes and speeds of traffic. Additional detectors in use include **Weigh-in-motion** ("WIM") to ensure truck weights are within standards, and windshield toll **transponder** devices.

Further, many law enforcement agencies are also deploying **License Plate Reading** (LPR) technologies to help in spotting and tracking, for example, stolen vehicles. All these technologies are gathered and held by the agencies and may or may not be available to Palm Desert, depending on the uses and levels of privacy required.

- **Connected Vehicle-to-Infrastructure (CV2I) systems.**
  - **GM OnStar -** Many car manufacturers are now collecting, and even selling data provided by their own on-board systems. For example, General Motors Vehicles offers OnStar as an option for many owners www.onstar.com/ , and then aggregates and makes much of the data available for a fee.

    Since older GM vehicles were using 2G and 3G (CDMA) cellular technology, the company is "sunsetting" the older systems. Still, their C-V2I data is available for cars newer than 2015 model years and is used by, for example, WAZE to help determine points of traffic congestion for its users.
  - **Audi TLI** - Perhaps one of the most interesting C-V2I systems is the Audi Traffic Light Information ("TLI") system. This system is proprietary to Audi vehicles and connects an on-board display to a local governments' traffic signal master. This system in effect allows the vehicle to not only predict when a certain traffic will change indication from red to green but calculate the speed necessary to flow through the intersection without slowing down.

According to Audi (Audi Newsroom - audiusa.com) **the system is operational** in the Palm Desert area at the **I-10/Cook, Jackson, and Jefferson interchanges**. While the traffic signal master system is being upgraded by CVAG, this could easily be connected to the system, improving traffic flow in the region, including all of Palm Desert's traffic signals for those driving Audi vehicles. Again, although the system is limited to Audi vehicles, it has been shown adding a single "smart" V2I vehicle into a platoon of non-connected vehicles can "smoothen" the flow overall along smart corridors - since a single Audi can limit the speeds of, say, a dozen cars behind it approaching the same intersection.

- **Aggregated traffic data** – this is data publicly available by various vendors including Google Maps/WAZE, TomTom, Apple Maps, etc. While this data is used by motorists, many municipalities are finding this data can easily be used, for example, by their traffic operations staff to determine the location of various real-time traffic jams along major corridors. These technicians can then adjust traffic signal timing according to pre-planned "scenarios" based on the location of the lane restriction or traffic incident. One good low-cost example is the city of Amsterdam (population 900,000) monitors these free data sources along with their own sophisticated technology 24/7 to predict and mitigate traffic jams.

Amsterdam's Traffic Operations Center *– Note four screens visualize free (e.g., Google Maps) public-sourced traffic data blended with surveillance cameras and municipal traffic signal data. (photo by Dave Zelenok, September 2023)*

- **Fiber Sensing** - is a form of acoustic detection requiring two dedicated fiber strands. This technology is described in detail below.

- **Big Data Sources –** often used in conjunction with the Internet of Things (IoT), this term refers in general to aggregating very large, often disparate data sources and analyzing them for the benefit of specific users. For example, analyzing utility consumption data may be used to predict future traffic and pedestrian movements. Since most of the applications are offered via specific vendors for their off-the-shelf products, Palm Desert may find requests for new proprietary applications have their origins based on "big data" sources and the city would be well served to understand the sources of the data before engaging systems.
- **Small Data Sources** – many of these technologies rely on dedicated individual sensors, for example in irrigated park areas or even inside small sidewalk refuse cans.

Top 20 Smart Application Technologies

While far from complete, and acknowledging that many of these applications will not be easy to deploy in Palm Desert, they are worth mentioning, if only to provide a high-level overview of the possibilities of robust detection, analysis, and actionable capabilities:

1. **Traffic congestion** and transportation related incidents
    a. Planned construction zone lane restriction notification ("tomorrow's cone zones").
    b. Unplanned incident and debris notification.
    c. Parametrically adaptive **alternative traffic management** controllers including pedestrian, cycling, transit and vehicular detection and management systems.
2. **Fiber Sensing / leak detection -** this emerging technology works by measuring small data changes in an optical fiber strand when it encounters vibration, strain, or temperature changes. It can often be deployed for about $20,000 to continuously monitor vehicle movement in a street, human traffic near high security areas, digging activity, seismic activity, the health of structures and assets, temperatures, liquid and gas leaks in pipes, and to monitor smart infrastructure.
3. **Air quality sensors** (e.g., Ozone/carbon monoxide, indicating health concerns or smoke).
4. **Water Quantity and Quality Management**
    a. **Flooding** (water quantity management systems).
    b. **Stormwater** and effluent management.
    c. **Sensors in rain gardens** and detention/retention/irrigation/recycling systems to manage stormwater flows and help enhance stormwater quality.
5. **Security** including:
    a. Acoustics (e.g., gunshots, used by law enforcement).
    b. Crowds (event management and law enforcement).
    c. Noise.
6. **Weather** events (wind, rain, fog, dust, etc.)
7. **Earthquakes –** instant notification of seismically damaged municipal infrastructure.
8. **Accident avoidance** – such as red-light running sensors triggering "all red" indications on traffic signal until vehicle clears.
9. **Curb Management** (Uber, Lyft, micro-mobility such as scooters and bike share pickup zones) on "complete streets".

10. **Parking Management** (free space, overtime, obstructed) **-** Although Palm Desert does not have an active parking management system, future use cases might employ vacant parking space detectors and integrated parking kiosks and variable message signage/cell phone applications to inform the public of the availability and location of parking.
11. **Pedestrian Movement Detection** (aka, "footfall" on El Paseo and during events).
12. **Environmental** and energy management (active/passive **heating**/**cooling** and **irrigation**) system management and monitoring.
13. Advanced Operational **Communications** including:
    a. Manual and automated system coordination with Caltrans, Sunline Transit and Paratransit, and emergency responders.
    b. Citizen Broadband Radio Service (**CBRS**) – expanding the "cutting edge" application of CBRS technology in the Coachella Valley educational agencies (e.g., School Districts) to shared public and municipal uses by Palm Desert.
    c. Gigabit-speed **Wi-Fi,** and millimeter wave ("True 5G") mesh transmitters integrated into Palm Desert's fiber optic backbone (incorporating aesthetics, health, and safe monitored RF levels).
14. Variable Smart **Lighting** and centrally controlled RF transmitter sites and sensing platforms including:
    a. Brightening and dimming features.
    b. Knockdown and outage notification.
    c. Note: using the streetlight masts would require municipalizing the SCE streetlights throughout Palm Desert, they could be acquired through the next "**Southern California Edison Community Choice Aggregation" (SCE CCA)** cycle. The ROIs from the numerous Riverside County and Southern California cities participating in the 2020 cycle were in the 5–10-year range.
15. Major **event management** - adjusting pedestrian flows and directing large groups, for example to locations where queues are short during events.
16. **Irrigation** control systems through advanced metering infrastructure (AMI) of Coachella Water District infrastructure.
17. **Public Refuse** containers that notify staff on cue.
18. **Micro-grids** and shared energy systems – inter-connected solar panels, renewable energy or wind-powered devices using demand-side and supply-side management technologies, load-sharing energy during peak periods in coordination with Southern California Edison (SCE) and the California Public Utility Commission (CPUC) $200MM Microgrid Incentive Program (MIP).
19. **Coordinated payment** systems for rideshare, bike share affording "seamless" personal micro-transportation and "last mile" logistics and including features for Sunline transit, micro-transportation (scooters/bikeshare) and rideshare operators.
20. **Wayfinding**, variable message signing and interpretive kiosks/displays at key "touchpoints" to guide and educate along with integrated-area wide **audio** and video system(s) with the ability to control each speaker/displays in high density pedestrian areas like the El Paseo.

Limiting Factors

With respect specifically to Palm Desert, the city's streetscapes – including urban, public neighborhood and private gated/HOA streets, sidewalks, and public spaces are at the center of public and commercial activities. Still, some might argue that the area may be facing long-term challenges that threaten livability, safety, and inclusion. Clearly, Palm Desert's public spaces is where smart technologies and data sensing, analysis can be harnessed for actions resulting in achieving public good.

Beyond this "lofty" statement though is the reality that any smart city plan must contain elements which are achievable, and measurable either quantifiably or subjectively.

Realistically, Palm Desert is unique in that its population is predictable, but highly variable, and its summer environment presents specific challenges. Moreover, a significant portion of the infrastructure within the city limits is controlled largely by its many Homeowners Associations (HOAs), each with its own sets of neighborhood priorities and need for cost-benefit calculations on any smart technology advancements. Further, the city government in Palm Desert is largely not responsible for many services seen in other communities, notably K-12 education, health care, mass transit or public utilities are the responsibility of other independent governing bodies and agencies, again with their own priorities.

Addressing the City of Palm Desert Requisite Use Cases

For Palm Desert, it's important to note that the city provides limited services and coordinates heavily with other agencies. For example, Sunline Transit Agency, Caltrans, Southern California Edison, Coachella Valley Water District, SoCalGas all provide services to the public in Palm Desert.

Although each agency is responsible for their own operations, Palm Desert may wish to anticipate future coordination strategies with any number of these entities to possibly improve service, enhance sustainability programs or jointly share in specific future technologies. While Palm Desert should not be expected to install systems at city's full cost for the benefit of these agencies, future resource sharing and smart city use cases may be worth consideration.

Recommendations

The following are the recommended top 5 prioritized smart application technologies for the City of Palm Desert.

1 - Middle Mile Fiber Ring Core Network

Much of this Study details the costs and benefits of Palm Desert building a middle mile fiber ring core network. Additional revenue for Palm Desert from fiber leasing can be highly lucrative but is highly variable and is based on local demand. An in-depth exploration of current estimated costs is available in Section 7, *Preliminary Design and Costs* of this report.

2 – Advanced Traffic Management systems

Transportation technologies are evolving at an unprecedented pace and will have profound effects. Engineers and public officials must start preparing today for an inevitable, vastly different future. "Big data," high-speed communications, and transportation options such as autonomous vehicles and micro-transit are just a few disruptive technologies that will affect how people live, work, and play.

Although the primary impacts of these changes are becoming better understood, the secondary consequences have been largely uncharted. Facing the largest modal shift seen since the invention of the automobile, cities like Palm Desert should expect to be challenged to change the ways in which it plans and develops its future roads, parking, transportation networks, and entire urban fabric.

For the past decade, industry has been researching and testing vehicles that can sense the environment around them and communicate with other vehicles and infrastructure. The key to vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications is a robust communications network—which is still somewhat lacking in Palm Desert.

While fiber-optic-based telecommunications are highly regarded for their speed (megabytes downloaded per second) and reliability, their real value will come from their near-zero latency, or ability to communicate in virtual real-time with the networks. Moreover, vehicles "platooning" in tightly spaced and interconnected groups will require the ability to locate themselves and others to an accuracy of less than perhaps three centimeters. This technology will require vehicles moving at 60 mph to communicate with their networks in less than one millisecond, a speed which requires a fiber optic backbone.

Many transportation futurists expect "totally managed systems," interconnected systems often using big data, will be able to reduce accidents and congestion by predicting and avoiding traffic jams—changing traffic routes, speeds, and signal coordination in time to harmonize traffic flows.

In Palm Desert, for example, the Sunline mass transit system is now incorporating a state-of-the art, real-time GPS-based bus location system using the General Transit Feed Specification (GTFS). This advanced system broadcasts predicted arrival times and delays to passengers using, for example, Google Maps for enhanced trip planning. This data would be relatively easy to incorporate into a dashboard system or traffic signal master allowing, for example, traffic signal pre-emption or priority (e.g., holding green indications at traffic signals for approaching Sunline busses) in Palm Desert.

Likewise, with a fiber optic-based Vehicle-to-Infrastructure system in Palm Desert, connected Autonomous Vehicles (AVs) driving in platoons mere inches from each other may also reduce traffic congestion and reduce the need to capacity improvement (e.g., road widening) projects since the existing infrastructure would be able to handle the demand more efficiently. Similarly, car ownership will likely decrease as people opt for different modes of transportation. These modal shifts will all drive changes in the ways that Palm Desert will develop and plan its future infrastructure.

Technologies showing the most promise now include:

- Autonomous vehicles such as self-driving Teslas, with steering wheels. (Here today)
- Personal rapid transit systems. Driverless low-cost-per-mile vehicles on fixed guideways or dedicated street networks in certain urban settings. (Here today)
- "Scootermania" - Shared, hyperlocal, micro-transportation providing "last half-mile" trips. (Here today, often lacking regulation)
- Driverless cars. Vehicles and ride share systems without steering wheels (Emerging technologies).
- Transportation as a service in which people purchase only the transportation you need; car ownership, driveways, wide streets, and three-car garages become unnecessary. (Coming soon)

Regardless of the long-term modal shifts and technological changes, CVAG and Palm Desert now should continue and expand their current efforts to develop their traffic management technologies. To that end, building a middle mile fiber core ring, sensors and dashboards should all be elements of a coordinated smart city strategy.

Traffic management center costs often involve substantial grant support from the state government while benefits are often measured and predicted in terms of vehicle miles travelled (VMT) and congestion delay hours and injury accidents avoided.

3 - Smart Kiosks

As Palm Desert continues to grow in population, it is important to help make information available to not only new residents but to the city's many visitors as well and smart kiosks may assist in enhancing visitor experience. Often-used benefits include wayfinding for visitors, emergency notification, citizen engagement, revenue streams through third party signage, economic development and promotion of local events, attractions, and other visitor opportunities.

The concept is to bring relevant information in a self-service format to various locations around the city. For example, on a college campus, smart kiosks could help students navigate attractions, keep track of important updates, create personalized emergency alerts, and view third party information such as off-campus restaurants. This concept can be applied to highly visited areas with the data being shared in a variety of mobile phone applications as well.

Costs for these kiosks vary based on applications installed and hardware systems employed, but can often be shared with, for example, retailers in exchange for highlighting their businesses.

4 - Smart Security Solutions

Improving security and safety in Palm Desert is an ongoing priority. An integrated safety and security system in which public entities and private stakeholders work together is one smart security solution. The idea is to proactively create a voluntary relationship with camera owners providing information about cameras, the camera locations, and the area each camera covers. For cities with high-value retail, such as El Paseo, concerned about deterring, for example "smash and grab" raids, these coordinated, smart video systems have been shown to enhance the chances of both deterring and, if necessary, apprehending suspects quickly.

For example, Project Green Light Detroit is a program in which the Detroit Police Department partnered with eight gas stations to leverage real-time video surveillance to deter, identify and solve crime[2]. The idea behind such a concept in Palm Desert, is to improve the community through partnerships aimed at improving neighborhood safety, promoting the revitalization and growth of local businesses, and aiding in the Riverside County Sherriff Department's efforts in the fight against crime.

Since smart cameras can often be dual-purposed – for example, used by both law enforcement and traffic managers, their costs can be shared and matching grant funds are often available, reducing the city's "out of pocket costs." Benefits are likely to be subjective since it is difficult to quantify increased economic development or a sense of security from reducing the likelihood of potential criminal activity.

5- Pedestrian Movement Detection

Several technologies have been developed which can track an individual by, for example, detecting and characterizing a specific cell phone identified by specific information tagged to its Bluetooth or Wi-Fi being left on. The advent of 5G also presents the ability to detect and track individual phones with a high degree of precision.

Known as Footfall, systems are now available to measure how many people enter a facility, or a geo-fenced area, such as a major event, a shopping district or tourist area. As such, footfall analytics is one method for counting people and developing insights from that information.

Footfall traffic data is developed in a variety of ways. For example, one popular method of collecting footfall data about people and how they navigate relies on gathering data from Wi-Fi and Bluetooth-enabled devices: smartphones, tablets, and laptops. These types of devices emit a ping while they try to find a device or router they can connect to. Certain footfall analytic hardware can pick up these pings and track pedestrians as they make their way through a defined area.

Monetization of footfall data

Footfall technology can measure a range of metrics, including unique vs. repeat customers, how many people walk by stores without entering, time spent in stores, at traffic signals, bus stops, etc. and where people tend to gravitate within a defined area. By counting footfall, businesses can identify, for example, purchasing opportunities they have and crucially, by incorporating that with retail, marketing and even sales data. This information in turn may assist merchants by offering "an edge" to help target peak hours, convert browsers into customers and ultimately optimize business performance.

While the use of these technologies may have excellent applications – for example, in defining what some now refer to as "Breadcrumbs" in which a pedestrian's activity exact times may be tracked and shared with others as an excellent and valuable feature. However, the information displayed may present privacy concerns. As a result, a key policy discussion within Palm Desert may be worthwhile about the extent to which PII - Personally Identifiable Information – should and may be used with/without a pedestrian's knowledge and consent.

By gaining a better understanding of in-store pedestrian/shopper movement, retailers can better allocate staff throughout their stores. This can range from what time certain stores are busiest to which areas of larger stores need more assistance. Creating a more efficient employee to customer balance enhances the shopping experience as well as improving employee engagement and creates marketing opportunities.

Limit Occupancy or Enforce Social Distancing

Crowd management technologies provide real-time headcounts of how many people are occupying space at a given time and some retailers including Kroger (Ralph's in California) use this technology.

Analyze Customer Behavior

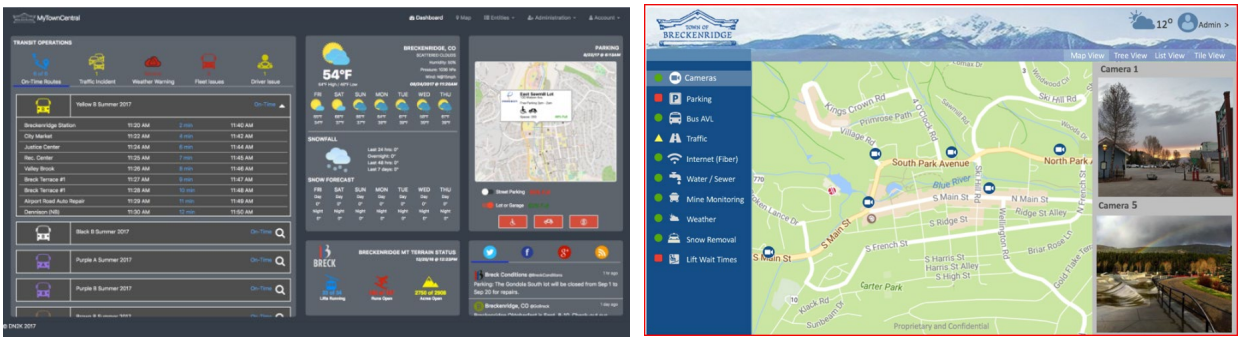
Behavior analysis can indicate how much time individuals spend in specific locations, define popular foot routes, and identify long wait times or queues. Understanding pedestrian behavior can assist with product placement, staff allocation, marketing, and sales conversion. These systems are often developed "quietly" with retailers (like Ralphs) reluctant to share their costs and benefits.

Back Office Applications

Dashboards

While mountains of data can be collected, the data is only as valuable as the actions taken in response to real-time conditions. A comprehensive "dashboarding" initiative should be considered following the selection of desirable technologies. In other words, if Palm Desert desires to generate footfall traffic along El Paseo, a dashboard may be developed to monitor and convey critical real-time information about, for example, long queues or a crowd forming in certain areas which may require law enforcement attention or even traffic congestion mitigation actions like extending a certain southbound green traffic signal indication in response to a traffic incident.

A dashboard could illustrate real-time status of buses (including next arrivals), weather, available parking or any needed information gathered by sensors could be compiled into a singular "control center". Dashboards could be easily customized, for example, to display data important to weather, data related to crowd management, restaurant data, etc.



Example of a "dashboard" system highlighting parking, transit, traffic, and related real-time data

Location-Based Apps

Applications today use location features to improve performance. It is important to note that geolocation functionality takes effect only after a user clicks on the 'Allow' or 'Enable' option.

Location-based apps can detect objects, buildings, services, and businesses. Geolocation is also an integral component of apps that are focused on logistics, delivery, and other service industries.

Location-based apps can only function with up-to-date maps and location services. Several technologies need to be implemented to ensure more accurate geolocation. Here are some of those geolocation technologies.

GPS module

The Global Positioning System (GPS) provides data on geolocation and time. The most recent GPS technology offers accurate geolocation data within a few meters. Most navigation apps include built-in real-time GPS coordinates.

Cell ID

Cellular ID (identification) is unique for every device and is an important component of geolocation. This means that even in the absence of live data from the mobile device, information from cell towers can provide an approximate location.

Assisted GPS

Assisted or Augmented GPS (A-GPS) is a system that can be used to improve the general performance of GPS positioning technology. More accurate location tracking that supersedes the performance of standard GPS can be provided by a combination of the Cell ID and A-GPS.

Geofencing

A geo-fence is a virtual boundary within which an app performs pre-programmed simple or complex actions. Uber, for example, uses a geofencing technique. Another example is child-monitoring software that could be used by parents to track the movement of young children have implemented an adapted version of geofencing.

Geofencing Applications could include:

- Out of Bounds, which would require:
  - A determination of the level to which granular data someday may be needed.
- Breadcrumbs, which would have two benefits:
  - Allowing each pedestrian to track their own activity with a high level of precision.
  - Allowing pedestrian behavior to be monitored by law enforcement if desired.

iBeacon and Eddystone

iBeacon is a Bluetooth-based low energy proximity sensor that transmits a signal from a beacon to a receiver that is usually an app. Google's version of the iBeacon is called Eddystone, which is named after a lighthouse in England.

Geolocation for IoT

Route tracking using geolocation coordinates can be performed by IoT-enabled devices. An IoT device can collect data (signals) from device sensors that are like radio antennas. The data can then be used to identify the device's location coordinates.

The following are some mobile apps that utilize some of the geolocation technologies.

Life360

This is known as a family safety app. It provides driving, digital, and location safety features. The Life360 app is compatible with iOS and Android devices. A free 7-day trial version is available, as well as three different membership plans that include different features and have an annual subscription cost.

Dark Sky

Dark Sky offers hyperlocal weather information with down-to-the-minute forecasts based on the user's current geolocation. The Dark Sky app is compatible with iOS and Android devices and can be downloaded for free from the Apple Store or Google Play Store.

GasBuddy

The GasBuddy app can be used to find the cheapest gas stations near the user and then it can be used to save on the cost of each gallon of gas by upgrading to a GasBuddy fuel rewards program. The GasBuddy app is compatible with iOS and Android devices and can be downloaded for free from the Apple Store or Google Play Store.

Artificial Intelligence (AI)

Artificial Intelligence (AI) applications include advanced web search engines, recommendation systems, understanding human speech, self-driving cars, automated decision-making and competing at the highest level in strategic game systems. The various sub-fields of AI research are centered around particular goals and the use of particular tools. The traditional goals of AI research include reasoning, knowledge representation, planning, learning, natural language processing, perception, and the ability to move and manipulate objects.

It is seemingly apparent that from this analysis of smart application technologies that the City of Palm Desert can develop a technically-sound and financially viable plan to achieve its long-sought goal to improve its resident, business, and visitor experience. Critically, the timing of this Study coincides perfectly with the carriers' goals to deploy and fully-leverage their 5G spectrum. This creates a tremendous opportunity to deploy technology capable of meeting not only the goals for improving resident, business, and visitor experiences but true operational improvements.

Appendix C: Request for Expressions of Interest

REQUEST FOR INFORMATION

INVITATION FOR BIDS

2023-RFI-222

BROADBAND PARTNERSHIP

City of Palm Desert

73-510 Fred Waring Drive

Palm Desert, CA 92260

RELEASE DATE: November 8, 2023

DEADLINE FOR QUESTIONS: November 15, 2023

RESPONSE DEADLINE: December 1, 2023, 5:00 pm

RESPONSES MUST BE SUBMITTED ELECTRONICALLY TO:

https://procurement.opengov.com/portal/cityofpalmdesert

City of Palm Desert

REQUEST FOR INFORMATION

Broadband Partnership

Attachments:

A - Proposed City Fiber Ring Network Map

1. Introduction

1.1. Summary

The City is considering the development and deployment of a fiber network in partnership with potential private sector partners. The partnership envisions the City leveraging funding to construct a municipal fiber ring network and identifying a partner willing to assist in creating ubiquitous fiber to the premises (residents and businesses) connectivity throughout Palm Desert. In this model, the partner would be responsible for completing the drop construction to each demand location, which includes homes and businesses, as part of providing the services, and ongoing operations.

1.2. Background

The City of Palm Desert, California, incorporated November 26, 1973, is centered in the heart of the Coachella Valley in eastern Riverside County, part of the low desert region of Southern California. Often referred to as the cultural, educational, and retail hub of the desert communities, Palm Desert offers a unique blend of amenities and a safe, family-friendly environment.

The City is a charter city in the State of California. It is a thriving community of approximately 50,000 full-time and an additional 32,000 seasonal residents.

Palm Desert is rated one of the safest cities in Southern California. The Police Department is contracted through the Riverside County Sheriff's Department and its fire and paramedic services are similarly contracted with Riverside County Fire.

An ideally situated resort community, Palm Desert offers a small-town feel with big-city amenities. Its character is upscale yet comfortable and family friendly. A place of relaxation and escape, the City also offers countless pursuits for active lifestyles including exciting outdoor activities in a beautiful, natural environment. Convenient access to world-class shopping, recreation, culture, and the arts combined with 350 days of predictable sunshine each year make Palm Desert one of the world's premier destinations.

1.3. Contact Information

Project Contact
Deborah Glickman
Management Analyst
73510 Fred Waring Dr
City of Palm Desert, CA 92260

Procurement Contact
John Ramont
Deputy Director, Finance
73-510 Fred Waring Drive
Palm Desert, CA 92260

Department:
Economic Development

1.4. Timeline

Release Project Date	November 8, 2023
Question Submission Deadline	November 15, 2023, 5:00pm
Question Response Deadline	November 22, 2023, 5:00pm
Proposal Submission Deadline	December 1, 2023, 5:00pm

2. Project Details

2.1. Project Overview

Palm Desert is considering the development and deployment of a fiber network in partnership with potential private sector partners. The partnership envisions the city leveraging funding to construct a municipal fiber ring network and identifying a partner willing to assist in creating ubiquitous fiber to the premises (residents and businesses) connectivity throughout Palm Desert. In this model, the partner would be responsible for completing the drop construction to each demand location, which includes homes and businesses, as part of providing the services, and ongoing operations.

Please refer to Appendix A for a map of the proposed fiber ring network.

This Request for Expressions of Interest (EOI) has been initiated by the City of Palm Desert to enable it to identify one or more partners that would be interested in providing improved network services within the City limits *using City-built fiber infrastructure*. The City seeks input from interested potential partners regarding the terms and conditions under which partners would operate and manage Internet and other network services to homes and businesses over City-owned fiber.

Palm Desert is particularly interested in providers who will use the fiber to provide ultra-high-speed network access defined as being in the multiple-hundred mega-bit-per-second (Mbps) to giga-bit-per-second (Gbps) range.

One of Palm Desert's primary goals of this network is economic development. With the Internet as a driving vehicle many businesses can locate anywhere if there is enough bandwidth at affordable prices. Companies that rely on high-speed connections will go where they can flourish. Responses to this EOI should state how the respondent's approach will further the City's goals of attracting businesses and residents and encouraging economic retention in the City.

Palm Desert seeks to make the City a more desirable place for firms and residents, who see the quality-of-life benefits of broadband both directly through home connections and through enhanced services provided to the business community.

Because this network is an important part of the City, Palm Desert seeks a wired service provider or multiple providers who are interested in providing services to the residents and businesses in the community.

Wired services include the provision of one or more of the following services to end customers in the community: voice, video, and data/broadband content, but services proposed must include at a minimum a fiber to the premise broadband connection. Wired services may include other ancillary services typically provided by broadband or cable providers.

3. Instructions to Respondents

3.1. Instructions to Respondents

Interested vendors may respond by submitting answers found in Section 5, "Vendor Questionnaire." Vendors are encouraged to attach relevant supporting information at the end of the Vendor Questionnaire.

3.2. Questions and Clarifications

All questions, requests for interpretations or clarifications, either administrative or technical must be requested in writing VIA the "Q&A" tab through the City's online bid management provider ("OpenGov-Procurement").

All written questions, if answered, will be answered in writing, conveyed to all interested firms, and posted through OpenGov-Procurement. Oral statements regarding this RFP by any persons should be considered unverified information unless confirmed in writing. To ensure a response, questions must be received in writing by 5:00 pm (local time) on Wednesday, November 15, 2023.

3.3. Process

Upon the closing of this EOI the City shall review responses and determine next steps.

4. Response Items

4.1. Response Requirements

Interested parties shall respond to the EOI according to the schedule and shall provide responses to the Vendor Questionnaire to follow.

4.2. Requested Information

There are several central goals to the City's municipal fiber ring network undertaking. Respondents to this EOI and any possible subsequent RFP should indicate whether and how their proposal serves these goals:

A. Offer service to any customer connected to or any customer that could be connected to the City fiber network; serving only limited areas of the City or specific types of customers is less desirable.

B. Offer unique services and speeds and network performance better than that provided by the incumbent networks in the City. For example, providing hundreds of megabits or gigabit speeds, providing symmetrical services, providing services that continue operating when commercial power fails, providing service level agreements, and providing direct connectivity between locations on the City fiber.

C. Propose connectivity services to the City's business community and other locations where a provider can cost-effectively and competitively connect to commodity Internet and secure cloud services.

D. Respond to the needs of health care providers and patients.

E. Respond to the needs of the large and small businesses connected to the City fiber.

F. Provide cost-effective services for price-sensitive customers and flexible pricing plans, including the unserved (less than 25 Mbps download and 3 Mbps upload speeds) and underserved (less than 100 Mbps download and 20 Mbps upload speeds).

The City seeks an uninhibited network, where Service Providers may offer a range of services, and network operators are neutral with respect to Service Providers, applications, websites, type of use, and type of connection device.

The City seeks Service Providers who would be interested in offering lit broadband services and partners who would be interested in handling maintenance and operations of the network. The City also seeks partners who will be interested in extending the City fiber, if expansion is needed.

For the network to have the intended economic and quality of life impacts, Palm Desert considers both cost and availability of service to be important. The City encourages responses from interested partners that address both to maximize adoption of service.

5. Vendor Questionnaire

5.1. Affirm that you are interested in this partnership.*

☐ Yes
☐ No

*Response required

5.2. Provide a statement of experience discussing past performance, capabilities, and qualifications. *

Identify other networks your firm has designed, built, maintained, or operated; include the levels of broadband speed, availability, and adoption among different categories of end-users and unique capabilities or attributes. Discuss other partnerships with other service providers, government, or non-profit entities you have undertaken, particularly any involving dark fiber leasing. Describe the nature of the projects and your firm's role. Explain how your firm is a suitable partner for this project.

*Response required

5.3. Please refer to Appendix A to review the map of the City's proposed fiber ring network. Do you support this network design? If so, please explain why you support it. If not, please share your thoughts about how you would design the network.*

*Response required

5.4. At a very high level, summarize the technological and operational approach you would use for this project. *

*Response required

5.5. At a very high level, summarize the technological and operational approach you would use for this project. *

How would you use technology to meet the City's goals? What approach would you use to interconnect with the Internet and other public networks? How would you perform network management? Under what scenarios would you require route diversity or other special features in the City fiber? At what sort of facility (or facilities) would you place network electronics? Would you require direct, dedicated fiber connectivity to all premises, or would a passive optical network be suitable in some cases?

*Response required

5.6. Summarize the business approach you would use for the project. How would your business plan help meet the City's goals? What are the key assumptions? What are your main areas of risk, and how can the City help reduce the risks?*

*Response required

5.7. Describe your previous experience/successes with projects funded from local, state, or federal government sources.*

*Response required

5.8. What is your proposed schedule for implementing service? Offer a timeline with key milestones. Would you be able to begin service before the entire City was constructed? Are there areas of the City you would recommend be constructed first? *

*Response required

5.9. What are your requirements for the City to meet in order for you to partner with the City on this project? What, if any, are the financial requirements you have of the City to enter into a partnership? If you do not address this question as to financial requirements, it will be assumed that you are interested in the partnership but have no financial requirements whatsoever of the City.*

*Response required

5.10. What service options would you plan to offer over this network (for example, data only, voice and data, a triple play of voice, data, and cable television, etc.)? What download/upload or symmetrical speeds would you offer and guarantee to end-users? How will your residential and business offerings differ? Please propose planned pricing for 100 Mbps, 500 Mbps and 1 Gbps service for residential and business customers.*

*Response required

5.11. Provide a statement of how your proposed participation would help the City's economic development goals. *

Describe your interests and plans to hire local contractors and providers in Palm Desert, and how your participation would help local job creation. Describe your relationships with local businesses in Palm Desert as well as your interest and plans to engage them in this project. Describe your relationships with socially and economically disadvantaged small businesses in Palm Desert as well as your interest and plans to engage them in this project.

*Response required

5.12. Provide three (3) references, including contact information, from previous contracts or partnerships.*

*Response required

5.13. Additional Materials

Upload any relevant documentation you would like to be included in your submission.

APPENDIX A – Proposed City Fiber Ring Network Map (Subject to Change)