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DRAFT Broadband Master Plan & Digital Equity Strategy
Prepared for the City of Vallejo, California
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Columbia Telecommunications Corporation

10613 Concord Street • Kensington, MD 20895 • Tel: 301-933-1488 • Fax: 301-933-3340 • www.ctcnet.us

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1 Executive summary

The City of Vallejo has actively sought to enhance high-speed broadband internet connectivity by using municipal dark fiber to serve local businesses downtown and on Mare Island. A five-year partnership with the telecommunications company Inyo Networks was a concrete effort to use this dark fiber in a targeted way to deliver general economic benefits to the community.

But the Covid-19 pandemic exposed a host of community needs beyond economic development that stem from a lack of access to reliable, affordable high-speed internet. During the pandemic, residents' need for broadband suddenly became clear, whether it was remote workers or students trying to participate in online educational activities, the limitations of existing broadband infrastructure became apparent. The impact of the pandemic and the intensified reliance on digital connectivity has been uneven within California, mostly falling along predictable socioeconomic and demographic lines.

Throughout the country, this digital divide manifests in many ways such as limited availability of broadband¹ infrastructure, or lack of devices to connect to that infrastructure. Digital equity is not a single issue but rather a series of challenges. In an effort to surmount these challenges since the start of the Covid pandemic, State and federal policy makers have been working over the past two years to provide policy, definitions, and funding to enable localities to better serve their residents.

This update to the City of Vallejo's Broadband Master Plan (originally prepared in 2016 by the City's independent broadband consultants, CTC Technology & Energy) addresses broadband in the City of Vallejo through the lens of digital equity. To prepare this update, CTC analyzed the current state of reliable high-speed internet connections in the City in terms of access to infrastructure, affordability, access to devices, digital literacy, and training. Those data and insights informed the development of actionable recommendations, including identification of potential federal and State funding sources that might enable Vallejo to address its community's needs.

¹ The FCC has long defined a broadband internet connection as an always-on connection achieving speeds of at least 25 Mbps download and 3 Mbps upload (25/3). The Infrastructure Investment and Jobs Act defines a location as "unserved" if it cannot access broadband service of at least 25/3 (Section 60102 – Grants for Broadband Deployment). The Digital Equity Act of 2021, which was part of the Infrastructure Investment and Jobs Act, considers any speeds less than 100 Mbps download/20 Mbps upload as "underserved" (Section 60302 – Definitions). IIJA, <https://www.congress.gov/117/plaws/publ58/PLAW-117publ58.pdf> (accessed April 14, 2022).

1.1 Project goals and objectives

Based on input from City Council members, City staff, and local stakeholders, the overall goals for this project encompass the following:

- **Closing the digital divide:** recommending opportunities to develop community resources to help all Vallejo residents connect to the internet via comparable, high-speed connections.
- **Increasing competition:** helping the City to utilize existing resources and encourage new partnerships to bring more ISPs' networks and services to the City.
- **Maximizing the use of City assets:** recognizing the work the City has already accomplished over the past five years and building on that work to ensure that City assets (e.g., data connections to municipal facilities, municipal fiber locations, and existing conduit) are part of a comprehensive connectivity strategy.

1.2 State and federal funding opportunities

Historically, most efforts by local governments to develop broadband infrastructure—including efforts by the City of Vallejo—have primarily focused on business opportunities and economic development with an eye toward General Fund revenues. The needs of the broader community were often secondary to these considerations as public agencies were largely dependent on investment by the private sector to build new broadband infrastructure: ISPs developed new projects based on their projected return on investment (within a truncated time horizon) rather than on community needs, and these considerations led to improved connectivity in areas where residents could afford the high costs of services necessary for such returns.

Recently, an emerging focus on public sector funding has enabled governments to consider broadband infrastructure projects in areas where residents' needs are the greatest. For example, in early 2021, Congress passed the American Rescue Plan Act (ARPA)² which, via the Coronavirus State and Local Fiscal Recovery Fund (SLFRF), will provide state and local governments with funding to develop or improve access to high-speed internet (among other functions).

² American Rescue Plan Act of 2021, Public Law 117-2, Title IX, Subtitle M, § 9901 (March 11, 2021) (adding State and Local Fiscal Recovery Funds and Capital Projects Fund), <https://www.congress.gov/117/plaws/publ2/PLAW-117publ2.pdf> (accessed April 13, 2022).

In late 2021 Congress went a step further with passage of the Infrastructure Investment and Jobs Act (IIJA)³ which specifically defines the problems encompassed by the digital divide along the following axes:

- Access
- Affordability
- Devices
- Digital literacy
- Training

The IIJA refers to efforts to surmount these obstacles as “digital inclusion” with the goal being “digital equity” throughout the community. While the City of Vallejo has had a Broadband Master Plan, the national broadband conversation has shifted since it was first adopted: Rather than focusing on General Fund revenues or economic development, it is now largely a conversation about digital equity for all residents.

The Digital Equity Act of 2021 (part of the IIJA) directly discusses the nuances of digital equity and equips jurisdictions to address their needs by funding digital skills training and data collection initiatives.⁴ In the IIJA, too, Congress established a series of funding programs to address equity through deployment of infrastructure to areas that are unserved or underserved.⁵ These programs include the Broadband Equity, Access, and Deployment (BEAD) Program, which will invest an unprecedented \$42 billion toward closing the digital divide.⁶ These new sources of funding are discussed in detail in Section 9.1.

The State of California has similarly addressed issues relating to broadband access by allocating a portion of the State’s share of SLFRF funding to support infrastructure development in areas of need. As part of the State’s 2021/22 spending plan, the administration and the Legislature agreed to spend \$6 billion (\$1.7 billion General Fund) over three fiscal years (starting in 2021) on

³ Infrastructure Investment and Jobs Act of 2021, Public Law 117-58, Division F – Broadband (November 15, 2021), <https://www.congress.gov/117/plaws/publ58/PLAW-117publ58.pdf> (accessed April 13, 2022).

⁴ Infrastructure Investment and Jobs Act, Public Law 117-58, Division F, Title III §§ 60301 *et seq.*, (Digital Equity Act of 2021), <https://www.congress.gov/117/plaws/publ58/PLAW-117publ58.pdf> (accessed April 13, 2022).

⁵ The Digital Equity Act of 2021 defines unserved communities as those with connections slower than the FCC standard of 25 Mbps download and 3 Mbps upload. Further, it defines underserved communities as those with connections slower than 100 Mbps download and 25 Mbps upload.

⁶ Infrastructure Investment and Jobs Act, Division F, Title I, §§ 60101-60105 (Broadband, Equity and Access Deployment program), 2021, <https://www.congress.gov/117/plaws/publ58/PLAW-117publ58.pdf> (accessed April 13, 2022).

broadband infrastructure.⁷ This funding has been directed to support statewide investment in middle-mile and last-mile infrastructure.

To ensure that the benefits of this investment are effectively distributed to support unserved areas statewide, last-mile funding is being earmarked specifically for eligible broadband projects in each county.⁸ The California Public Utilities Commission (CPUC) is currently considering draft rules to implement this statutory distribution and has proposed that it will distribute just over \$17 million for projects in Solano County that meet the State's criteria (see Section 9.2.1 for further discussion).⁹ The City of Vallejo allocated \$2.5 million of its initial SLFRF funding to broadband projects such as public Wi-Fi and various fiber projects.

This abundance of funding coincides with the expiration of the City's contract with Inyo Networks to provide enterprise internet services. The City will be initiating an RFP process to continue provision of services on the municipal network and to further new goals that reflect the progress made over the past six years, the new funding environment, and the fundamental community value of widely accessible broadband. In addition to making recommendations based on best practices for process and programmatic improvements, this report makes recommendations for a project to be considered in the upcoming RFP.

1.3 Recommendations on infrastructure, policy, and programs

This report makes the following recommendations based on the goals established by City officials and the data and analysis developed during this project. The recommendations relate to the following categories:

- **Broadband infrastructure:** The City should consider connecting all municipal facilities to fiber; completing a fiber loop for redundancy and network stability; installing public Wi-Fi in select locations; and extending municipal fiber assets to new parts of the community, including a fiber to the premises (FTTP) network. These recommendations are discussed in detail in Section **Error! Reference source not found..**
- **Policy:** The City should consider adopting a Dig Once ordinance and various permit process improvements to facilitate broadband infrastructure project development in the

⁷ California Legislative Analyst's Office, "The 2021-22 Budget: Overview of the Spending Plan," August 2021, page 15, <https://lao.ca.gov/reports/2021/4448/2021-Spending-Plan-102721.pdf> (accessed March 30, 2022).

⁸ See, SB4, Chapter 671 (October 8, 2021), revising Pub. Util. Code Section 281, https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=PUC§ionNum=281 (accessed March 31, 2022).

⁹ California Public Utilities Commission, Docket R.20-09-001, Proposed Decision of Commissioner Alice Reynolds Adopting Federal Funding Account Rules, issued March 2, 2022, <https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M466/K763/466763362.PDF>.

City. Additionally, the City should consider expanding collection of geospatial data related to current infrastructure assets and improving internal and external communication. See Section 7 for more details.

- **Programs:** Digital inclusion encompasses a host of efforts that are not directly related to infrastructure. The City should consider broadening its efforts to help residents who are facing barriers to adopting broadband. These approaches include offering digital literacy training and enrolling eligible households in device or internet subscription subsidy programs. These programmatic recommendations would best be designed and implemented with community partners. See Section 8 for specific recommendations on programs and potential partners.

1.4 Implementation status of previous recommendations

The City's 2016 Broadband Master Plan¹⁰ made a series of recommendations, including that the City consider using its existing traffic signal fiber network to deliver high-speed internet to promote economic development. That plan also included recommendations to improve network stability and to incorporate best practices into the City's fiber management operations.

Following the delivery of that report, the City initiated an RFP process to identify a vendor that would deliver and expand service on the municipal dark fiber network; the City entered into an agreement with Inyo Networks. While the City considered the other recommendations in the 2016 plan, no formal action was taken and most of those recommendations have not been implemented.

The following sections summarize the status of the 2016 plan's recommendations.

1.4.1 Complete backbone loops

The 2016 Broadband Master Plan estimated that approximately 2.7 miles of conduit would be needed—at a total estimated cost of \$470,000—to complete a fully diverse ring around the City. Such rings would minimize single points of failure on the network. The City should consider completing diverse routes to increase reliability of City services and offer robust connectivity to potential institutional and enterprise users. The City has not implemented this project; this recommendation is addressed in Section 5.

¹⁰ The 2016 Broadband Master Plan is available on the City's website:
<https://www.myvallejo.com/broadband/widgets/40763/documents> (accessed April 13, 2022).

1.4.2 Build network extensions to high-value facilities and interconnect with outside networks

The 2016 Broadband Master Plan recommended connecting to a few City locations that were not connected to fiber by extending the current City fiber network if justified by the business case. Some of these sites appear to have been subsequently connected with what the City calls “air fiber” (i.e., a point-to-point wireless connection supported by the municipal dark fiber).

As part of that prior process, the City also identified several potential users and had discussions and received questionnaire responses. The City should consider connecting to institutions and enterprises that require services and that can provide funding to connect their locations to conduit and subscribe to a high-value service (1 Gbps symmetrical or greater). Our recommendation was that the City could potentially maintain and operate a small-scale network with an upgrade of its City Hall facility and by contracting out monitoring and repair to a network manager. We suggested an alternate approach that would have been to provide dark fiber to a private partner, which in turn would provide services. As discussed, the City has not expanded its fiber facilities, but it has worked with a private partner to use the infrastructure for its own service delivery.

1.4.3 Develop pilot projects

The 2016 Broadband Master Plan recommended the City consider pilot projects to demonstrate the feasibility of providing services to City agencies over fiber, as well as to other institutions, and to potential grant funders. Further, the plan recommended the City focus these efforts on the most enthusiastic potential customers.

Representatives of Touro University California, a private nonprofit graduate university on Mare Island in Vallejo, stated that the University would be interested in connecting immediately. Although this connection was not provided, the University remains interested in a partnership. However, they are currently contracted with another ISP and any future agreements would need to be discussed after the conclusion of that contract.

We further recommended continued discussions with Integra Telecom regarding the cost and terms of a connection through a PG&E substation and other potential connections to the internet backbone. The City has since connected to the internet backbone via a Zayo circuit, which resolved this gap in the network.

1.4.4 Continue discussions with potential partners

The 2016 Broadband Master Plan recommended continuing discussions with commercial ISPs (including Integra Telecom) to determine the cost and feasibility of connections within and outside of Vallejo and determining options for partnership and monetization of the conduit resources. We are unaware of these conversations having transpired.

We also recommended continuing discussions with Island Energy to gain access to conduit on Mare Island and commencing discussions with Lennar to gain access to its conduit on Mare Island. The City currently has an agreement with Mare Island Energy to utilize conduit on Mare Island for dark fiber.

1.4.5 Develop a joint trench rights-of-way management ordinance

The 2016 Broadband Master Plan recommended the City modify its right-of-way ordinance to provide the City with the option of placing conduit on routes where utilities are performing excavation. We further recommended the ordinance include all excavators, including non-communications and City utilities. To our knowledge the City has a policy in place to notify interested parties of upcoming right-of-way work, but a so-called Dig Once *ordinance* was not enacted. We discuss this recommendation further in Section 7.1.

1.4.6 Previously recommended partnerships

The 2016 Broadband Master Plan recommended the City engage with Integra Telecom and Sonic to explore the possibility of developing public-private partnerships. A subsequent RFP released by the City resulted in the selection of Inyo Networks, which proceeded under contract with the City to provide internet service to 72 businesses utilizing the City's dark fiber network.

1.4.6.1 Integra Telecom

The 2016 Broadband Master Plan recommended that pursuing a partnership with Integra should include the following:

- The City should explore locations where a carrier distribution and aggregation PoP could be established (City Hall and the Emergency Operations Center were identified as possibilities).
- The City should discuss Integra's regional plans with neighboring cities.
- CTC could work with the City to coordinate grant opportunities with CENIC and CA Telehealth as a potential cross-constituent demonstration project, given Kaiser Permanente's interest.

This recommendation was not pursued by the City.

1.4.6.2 Sonic

Sonic indicated in 2016 that the absence of extensive last-mile conduit to residential areas in Vallejo made it unlikely that Sonic would be interested in a partnership with the City. However, the 2016 Broadband Master Plan recommended that the City stay in contact with Sonic in the event that the company became interested in selling services to customers over City fiber, as it does currently over AT&T copper lines.

To our knowledge these conversations did not occur, although CTC recognizes that the City's subsequent contract with Inyo Networks may have impacted any opportunity to work with Sonic in this capacity.

2 What is digital equity?

Digital equity is “the condition in which individuals and communities have the information technology capacity that is needed for full participation in the society and economy of the United States.”¹¹ Broadly speaking, it means all residents have broadband services sufficient for their daily needs.

The Covid-19 pandemic—and particularly the need to adapt to remote education and, for many, online work—highlighted gaps in digital equity nationwide. These gaps are often referred to as the “digital divide,” which is most pronounced among “households with low income, people living with disabilities, people in rural areas, and older adults.”¹² Data and insights gathered during the preparation of this report (including input from City Council members, stakeholders, and community organizations) indicate that the City of Vallejo has a digital divide. The need for better access to high-speed internet has remained a prominent community concern in Vallejo.

The recent passage of the IIJA has codified a definition of digital equity,¹³ giving it specific features that can be used to evaluate communities and identify specific impediments. This definition informs the recommendations discussed below. Further, the federal statute defines a path to digital equity, which includes the process and activities necessary to achieve digital equity.

Under the IIJA, digital inclusion encompasses the following features.¹⁴

1. **Access:** the availability of infrastructure capable of reliably delivering data sufficient for participation in common online activities such as bill paying and streaming video
2. **Affordability:** where infrastructure exists, ensuring that users can pay for the service
3. **Devices:** an internet-enabled device that meets the needs of the user
4. **Digital literacy:** skills necessary to navigate the internet successfully and safely
5. **Training and technical support:** technical training for using devices and support for maintaining those devices

The law further stipulates the populations that should be considered when developing strategies to achieve digital equity:

¹¹ Infrastructure Investment and Jobs Act, Title III USC § 60301 *et seq.*, 2021, <https://www.congress.gov/117/plaws/publ58/PLAW-117publ58.pdf> (accessed April 13, 2022).

¹² National Digital Inclusion Alliance, “Definitions,” www.digitalinclusion.org/definitions (accessed April 13, 2022).

¹³ Infrastructure Investment and Jobs Act, Title III USC § 60301 *et seq.*, 2021,

<https://www.congress.gov/117/plaws/publ58/PLAW-117publ58.pdf> (accessed April 13, 2022).

¹⁴ Infrastructure Investment and Jobs Act.

- Seniors
- English language learners and individuals who struggle with literacy
- People living with disabilities
- People living below 150 percent of the federal poverty level
- Incarcerated individuals
- People living in predominantly rural areas
- Members of a racial or ethnic minority group
- Veterans

This Broadband Master Plan maps community needs along these axes and makes recommendations to achieve digital equity in the community—in part by aligning the City’s efforts with future funding opportunities. For example, the IIJA allocated more than \$2 billion for states to develop and implement digital equity plans (see Section 9); by defining its needs and developing strategies for addressing those barriers, Vallejo will be better positioned to use those funds.

3 Assessment of local broadband environment

As directed by the City, this report focuses on the residential broadband market. Due to the equity focus of both federal and State funding opportunities, this analysis is intended to direct the City's efforts to improve access for the broader community based on unmet needs. The discussion of enterprise services from the 2016 Broadband Master Plan is included in Appendix A; an additional overview of small business broadband services is in Appendix B.

3.1 Residential broadband assessment

This market assessment process involves several streams of data collection and analysis to understand where fiber, cable, digital subscriber line (DSL), and wireless networks exist; what services and pricing are available to consumers; and how those factors correlate with demographic patterns.

The Federal Communications Commission's (FCC) Form 477 data is the foundation of the analysis of residential network footprints within the City—with the understanding that Form 477 data represent a best-case scenario. ISPs self-report to the FCC biannually. These data are presented at the census block level, and the FCC considers a census block served by broadband if just one of the premises in the block could be served. The data thus tend to overestimate service availability, especially in less populated areas where one census block can span many square miles.

FCC service data are also inconsistent for unpopulated areas such as parks or wildlife reserves. For example, if an ISP has extended service to a single visitors' center or building, FCC data may show a large unserved area around that location as being served.

While the data's flaws are significant, Form 477 represents the most comprehensive national data set for understanding broadband availability and investment patterns. It is important to note, too, that the FCC recognizes these flaws and is in the process of updating its mapping methodologies.¹⁵ Federal broadband mapping should thus more closely reflect the "on-the-ground" situation within the next nine to 12 months.

In addition, to understand the current service offerings available to Vallejo residents, a market assessment was conducted between December 2021 and January 2022. This process of researching the service offerings of ISPs operating in Vallejo included online and phone

¹⁵ See December 8, 2021, letter from FCC Chairwoman Rosenworcel to Representative Spatz regarding implementation of the Broadband DATA Act, <https://docs.fcc.gov/public/attachments/DOC-378743A1.pdf> (accessed April 13, 2022); see also statements made by Chairwoman Rosenworcel at her November 17, 2021, Senate confirmation hearing acknowledging the work to be done to create more reliable mapping and data on served households, <https://www.commerce.senate.gov/2021/11/executive-session-and-nominations-hearing> (accessed April 13, 2022).

conversations with representatives of ISPs to collect market data on residential broadband pricing, availability, and level of competition in the area. Leaving aside satellite providers, which do not provide consistent or adequate residential broadband speeds or service quality, there are four main residential broadband ISPs in the City:

- **AT&T** offers DSL services through almost all of Vallejo, as well as fiber services in select areas.
- **Comcast** is the dominant cable provider and serves nearly the entire City.
- **Sonic** provides DSL services in scattered areas of downtown Vallejo.
- **T-Mobile** offers its wireless Home 5G service throughout some of the City.

CTC randomly selected residential addresses in respective providers' service areas to determine available service offerings and advertised pricing and terms.

3.1.1 Fiber availability and pricing

Fiber cables have enormous bandwidth capacity, which enables operators to offer symmetrical download and upload speeds. Once a premises is connected to fiber, there is no need for significant outside plant infrastructure investment for decades. If more bandwidth is needed, the operator need only upgrade the network electronics,¹⁶ rather than having to replace the cables. This makes fiber networks significantly more scalable and future-proof than alternative infrastructures.

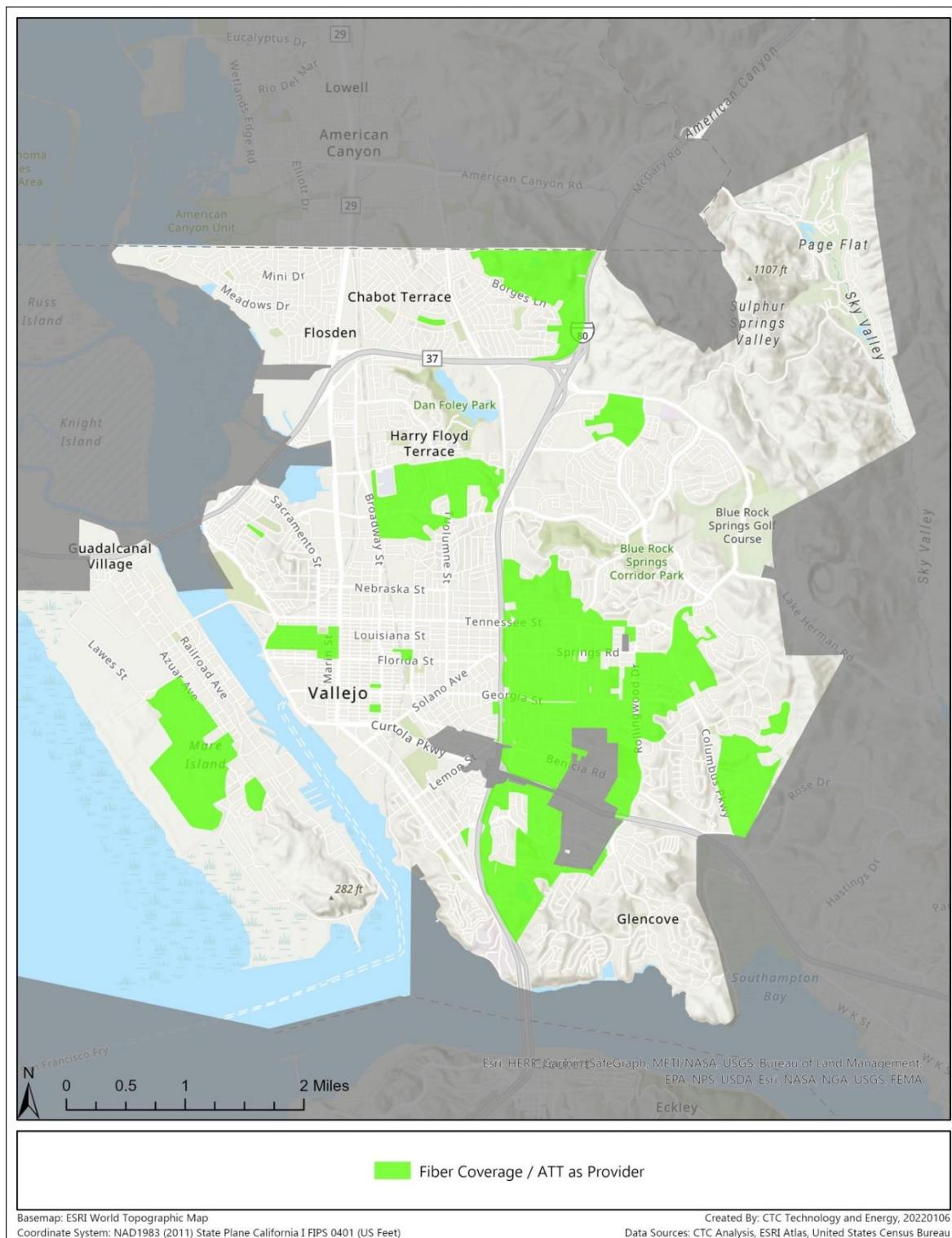
The initial data showed three fiber providers in Vallejo: AT&T, Inyo Networks, and Valley Internet. Valley Internet customer service representatives stated that the company does not currently offer residential broadband services in Vallejo. Valley may have been represented in the Form 477 data because ISPs are asked to indicate areas where they do or *could* offer service.¹⁷ This can sometimes result in an ISP indicating a small area where they may have assets as "served," despite not actively providing services. Form 477 data show that Inyo Networks has a small and scattered service area in Vallejo, and serves enterprise customers rather than residents..

The remaining fiber provider is AT&T, which reports residential fiber services in significant areas of Vallejo, including a large portion of the southeastern part of the City and other scattered pockets. AT&T's residential fiber service area can be seen in Figure 1.

¹⁶ Note that high-speed network electronics are already relatively affordable, and the prices continue to rapidly decrease.

¹⁷ Federal Communications Commission, "Fixed Broadband Deployment Data from FCC Form 477," <https://www.fcc.gov/general/broadband-deployment-data-fcc-form-477> (accessed January 6, 2022).

Figure 1: Fiber Coverage (AT&T)



Research finds that AT&T offers three fiber broadband products in addition to Access from AT&T, its low-cost program that is only open to qualifying customers and may be either a fiber or DSL service depending on the customer's location.

For its typical plans, AT&T reported that there is no contract term and no rate increase after an initial 12-month period. A \$5 monthly discount is available if the customer enrolls in both paperless billing and autopay.

Table 1: Fiber services offered by AT&T in Vallejo

Service	Advertised upload/download speeds	Monthly price (non-promotional)	Notes
Access from AT&T	10 Mbps (temporary upgrades to 25 Mbps available)	Up to \$10	Equipment included; data cap may apply
Access from AT&T	100 Mbps	\$30	Unlimited data allowance; only available in limited parts of AT&T territory.
Internet 300	300/300 Mbps	\$60	Equipment included; installation fee may apply
Internet 500	500/500 Mbps	\$70	Equipment included; installation fee may apply
Internet 1000	940/880 Mbps	\$85	Equipment included; installation fee may apply

Access from AT&T provides residential wireline service up to 100 Mbps for up to \$30 per month, depending on the level of service available at the home. In some locations, plans can be as low as \$10 for 10 Mbps download. There are no advertised minimum upload speeds. AT&T is currently offering temporary upgrades to 25 Mbps where available. The program includes free installation and equipment and does not require a contract or deposit. Depending on the type of service available at the address, households are limited to a monthly data allowance of either 150 gigabytes or 1 terabyte and are charged \$10 per 50 GB overage.¹⁸

Households are eligible if they participate in the Affordable Care Program, Supplemental Nutrition Assistance Program (SNAP) or Supplemental Security Income (SSI) for California households only. AT&T also extends eligibility to include households at 200 percent or less of the federal poverty line, and those participating in the National School Lunch Program (NSLP).¹⁹

¹⁸ AT&T, “Access from AT&T,” <https://www.att.com/internet/access/> (accessed April 4, 2022).

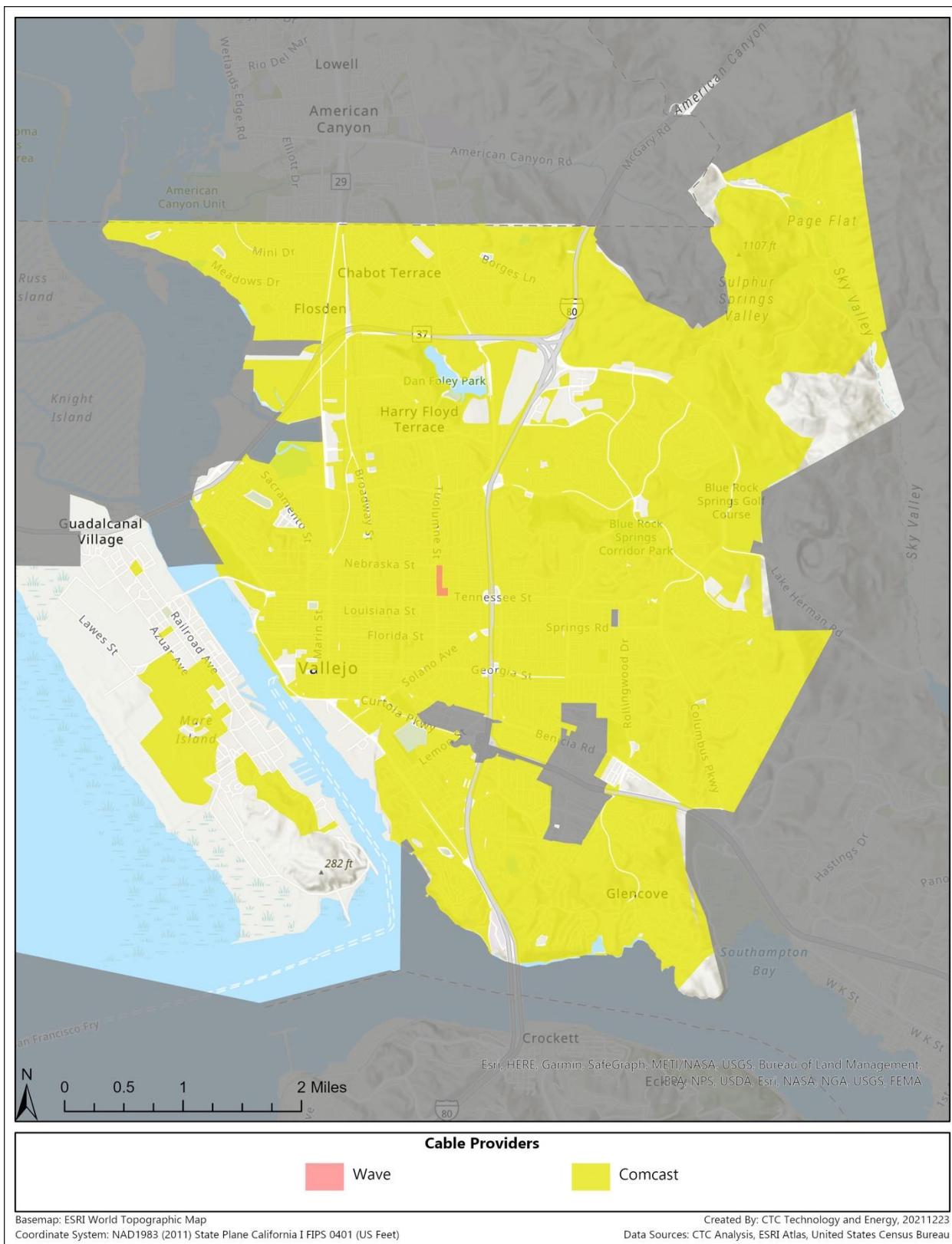
¹⁹ AT&T, “AT&T Access,” <https://www.att.com/internet/access/> and “New ‘Access from AT&T’ Plan + New Federal Benefit = Free Internet,” <https://about.att.com/story/2022/new-access-plan-plus-new-federal-benefit.html> (accessed April 4, 2022.)

3.1.2 Cable availability and pricing

Cable broadband technology is a primary means of providing broadband services to homes and businesses in most of the United States. Coaxial cables were originally designed to provide video services and were sufficient in the early years of data communications when usage was low. However, as demand for data capacity increased, coaxial networks became insufficient to support high-speed services forcing cable companies to upgrade their networks to fiber.

As seen in Figure 2, Comcast is the dominant cable provider in Vallejo, serving nearly the entire City. Wave also reports serving a single block; that claim could not be verified, and it is unlikely given the size of their reported service area.

Figure 2: Residential cable providers in Vallejo



Comcast offers seven plans, plus two options for their low-cost Internet Essentials service. Gigabit Pro is the only plan for which Comcast requires a contract, however lower monthly prices are available with a contract commitment for each plan. Additionally, Comcast offers lower introductory prices that are scheduled to increase following 12 months of service. Even lower first-year prices are offered with a one-year contract. Equipment prices are not included in the monthly service charge, and customers may face a fee to have equipment shipped to them when they begin service.

Table 2: Cable services offered by Comcast in Vallejo

Service	Advertised Upload/Download Speeds	Monthly Price (non-promotional)	Notes
Internet Essentials	50/5 Mbps	\$9.95	See information below for more about this program
Connect	50/10 Mbps	\$60	\$29.99/month for the first 12 months and \$44.99/month for the next 12 months
Internet Essentials Plus	100/10 Mbps	\$29.99	See information below for more about this program
Connect More	100/10 Mbps	\$70	\$49.99/ month for the first 12 months
Fast	300/10 Mbps	\$80	\$59.99/ month for the first 12 months
Superfast	600/20 Mbps	\$90	\$60/ month for the first 24 months
Ultrafast	900/20 Mbps	\$100	\$70/ month for the first 24 months
Gigabit	1200/35 Mbps	\$110	\$80/ month for the first 24 months
Gigabit Pro	3000/3000 Mbps	\$299.95	No promotional rate

Comcast's offerings include Internet Essentials, a low-cost program for eligible households.²⁰ Eligible low-income customers pay \$9.95 per month for a wired internet connection with equipment included. In early 2021, Comcast announced it was increasing the speed of this service to 50 Mbps download, 5 Mbps upload.²¹ And it now offers "Internet Essentials Plus" – a 100 Mbps download, 10 Mbps upload product for \$29.99, which is designed to maximize the subsidy offered by the FCC's Affordable Connectivity Program.²²

²⁰ Comcast, "Internet Essentials," <https://www.internetessentials.com/> (accessed April 13, 2022).

²¹ Comcast, <https://www.internetessentials.com/covid19> (accessed March 30, 2022).

²² Comcast, <https://www.internetessentials.com/> (accessed April 13, 2022); see also, Comcast's information regarding the ACP available at <https://www.xfinity.com/learn/internet-service/ebb> (accessed April 4, 2022).

Comcast has gradually expanded eligibility for its Internet Essential programs to the following groups:²³

1. Families that have a child who qualifies for the National School Lunch Program (NSLP)
2. Families that receive HUD housing assistance
3. Low-income veterans who receive federal or state public assistance
4. Families who qualify for Medicaid or Supplemental Nutrition Assistance Program (SNAP) benefits
5. Families who are eligible for Temporary Assistance for Needy Families (TANF), the Low-Income Home Energy Assistance Program (LIHEAP), the Women, Infants, and Children (WIC) program, or Tribal assistance
6. Families who have a family member who qualifies for Supplemental Security Income (SSI)

Even with the expanded eligibility requirements, however, Comcast stipulates that a customer of the Internet Essentials program must not have received service from Comcast within the past 90 days.²⁴ This makes it difficult for people who were already paying for service to switch to the more affordable Internet Essentials plan (for example, if a job loss means that a customer now qualifies for the lower-cost service).

3.1.3 DSL availability and pricing

During the last century, phone companies connected virtually every home and business in the U.S. to a strand of copper wire. Copper has a fraction of the bandwidth capacity of coaxial cable and suffers from greater signal loss and interference—but because of the ubiquity of copper, DSL technology that provides broadband service over copper phone lines has been an important way for people to connect to the internet.

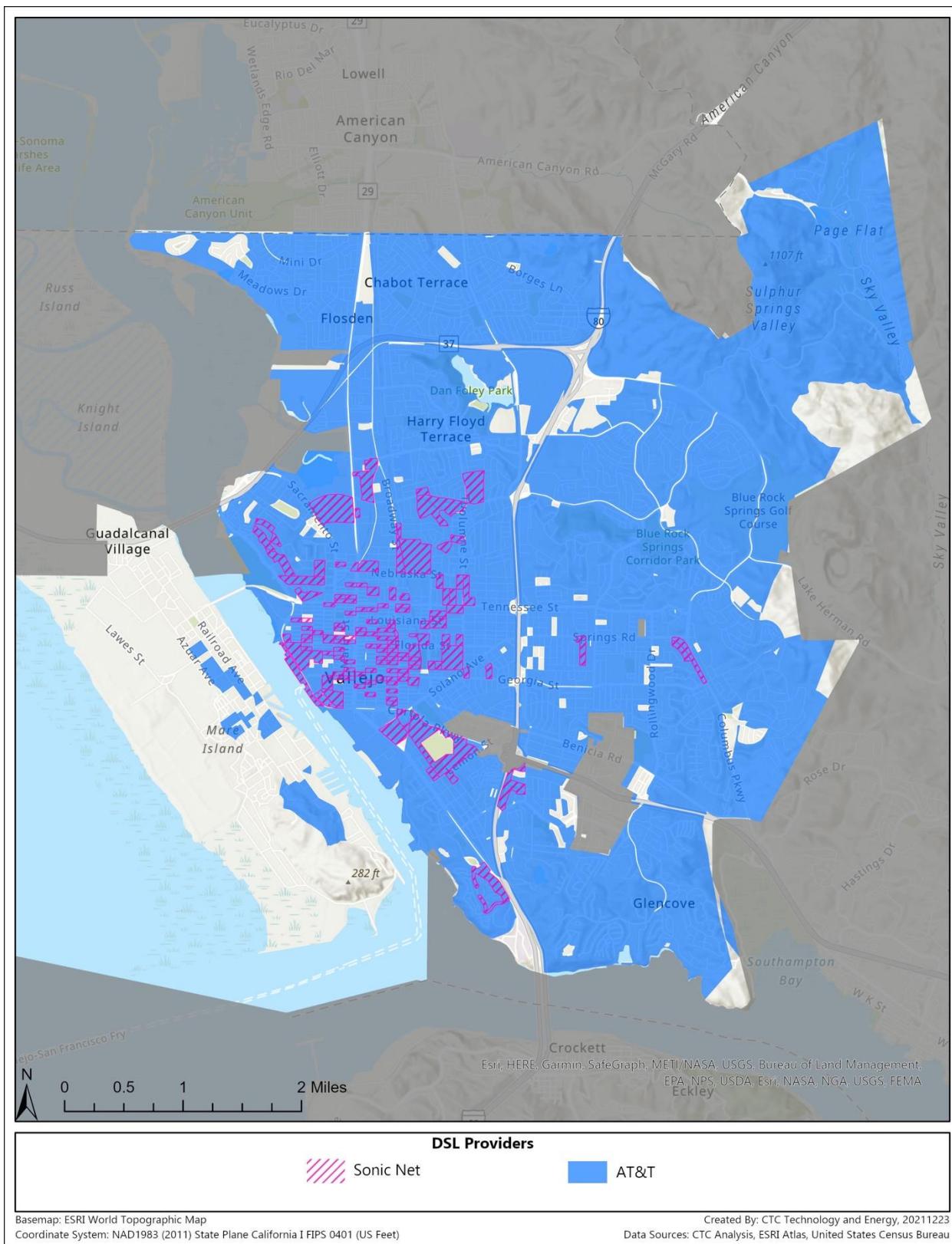
In some scenarios, DSL operators can offer speeds that fit the FCC's definition of broadband. However, while DSL has been an impressive retrofit of existing infrastructure, copper cable is reaching its physical limitations as a broadband medium and will not be able to meet future bandwidth needs.

Both AT&T and Sonic offer DSL services in Vallejo, as seen in Figure 3. AT&T claims to cover nearly the entire City, while Sonic offers services in scattered areas throughout downtown Vallejo.

²³ Comcast, "Internet Essentials," <https://www.internetessentials.com/> (accessed September 2021).

²⁴ Comcast, "Internet Essentials: Things to Know," https://www.internetessentials.com/covid19#thingstoknow&all_AmleligibleforIE (accessed March 30, 2022).

Figure 3: Residential DSL services in Vallejo



In addition to the fiber-based services discussed above, AT&T offers its AT&T Internet DSL product in Vallejo, which is a hybrid copper-fiber service.²⁵ This product is slightly different than the cable and fiber products discussed previously, as AT&T offers only a single speed and rate for its AT&T Internet service that reflects the technical capabilities available to that premises. The pricing and terms for this service are consistent throughout the City, but the advertised speeds vary on an address-level based on the distance of the premises from an aggregation point within AT&T's network. Table 3 offers a sample of the service speeds offered at a variety of Vallejo addresses. Most plans also include a data cap of one terabyte per month, with a \$10 charge per 50 gigabyte overage.

Table 3: DSL services offered by AT&T in Vallejo

Service	Advertised upload/download speeds	Monthly price (non-promotional)	Notes
Internet 18	18/1.5	\$60	Equipment included; installation costs may apply; data cap may apply
Internet 25	25/2-5	\$60	Equipment included; installation costs may apply; data cap may apply
Internet 50	50/10	\$60	Equipment included; installation costs may apply; data cap may apply
Internet 75	75/8-20	\$60	Equipment included; installation costs may apply; data cap may apply
Internet 100	100/20	\$60	Equipment included; installation costs may apply; data cap may apply

Similarly, Sonic's DSL service is a copper-fiber hybrid that offers either fiber-to-the-node or, in some cases where gigabit service is offered, fiber-to-the-home. This product also has the same pricing for each plan despite variation in advertised upload speeds on an address-level. Table 4 summarizes a sample of services offered at a variety of Vallejo addresses. Sonic was unable to confirm estimated upload speeds for these services.

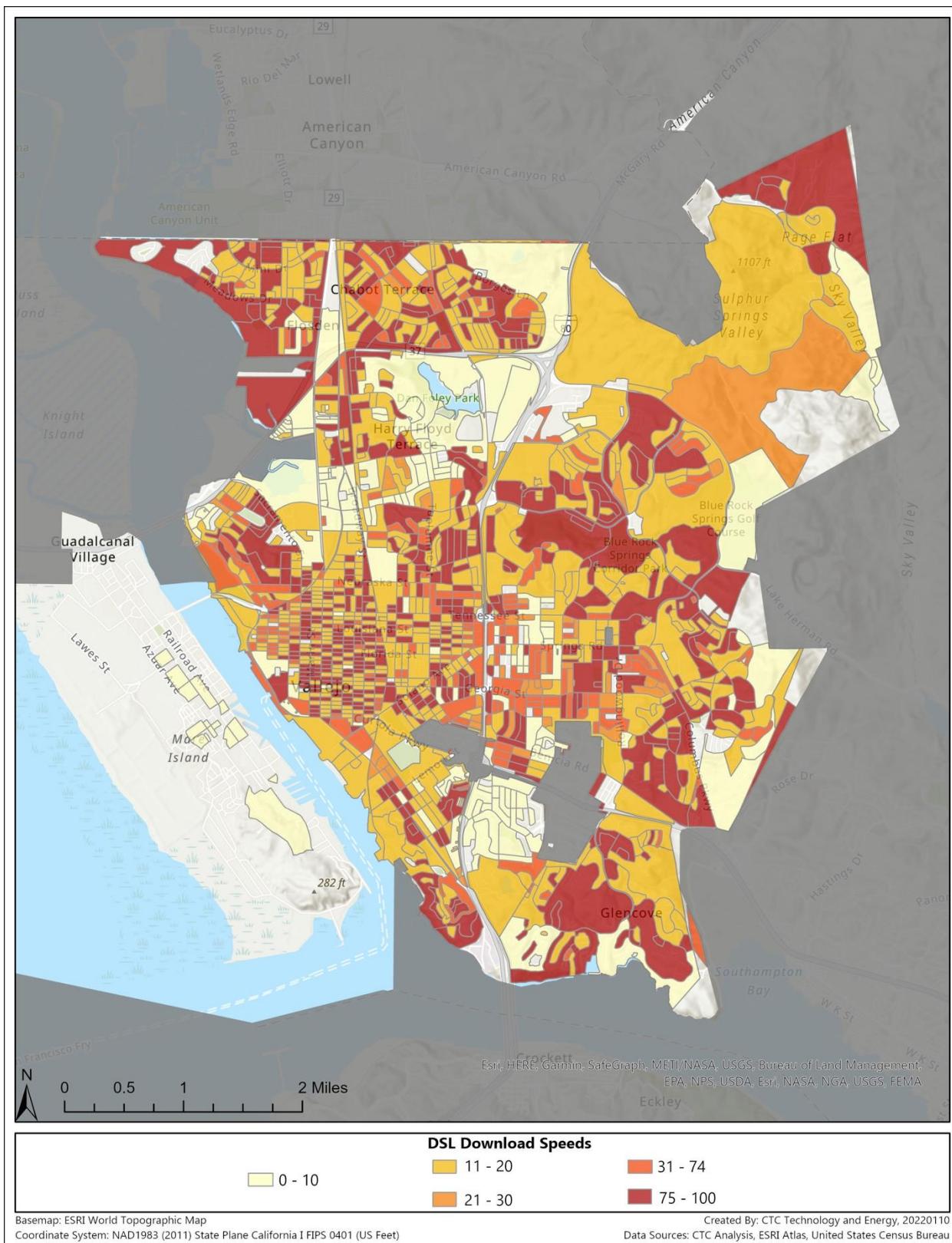
²⁵ AT&T, "Understanding internet speeds," <https://www.att.com/support/article/u-verse-high-speed-internet/KM1010095> (accessed December 28, 2021).

Table 4: DSL services offered by Sonic in Vallejo

Service	Advertised Upload/Download Speeds	Monthly Price (non-promotional)	Notes
Fusion IPBB-C	50 Mbps download	\$49.99	Includes home phone line; one year contract required; equipment cost not included
Fusion IPBB-C	75 Mbps download	\$49.99	Includes home phone line; one year contract required; equipment cost not included
Fusion IPBB-F	1000 Mbps download	\$69.99	Includes home phone line; one year contract required; equipment cost not included

Both AT&T and Sonic's DSL products vary in speed offered depending on the location of the customer. Figure 4 shows the varying speeds available across Vallejo. As the map demonstrates, robust DSL speeds that could meet the current needs of Vallejo residents are only scattered in pockets across the City. More troubling, DSL speeds that barely meet the definition of an "unserved" area at 25/3 Mbps cover a significant portion of the map, making DSL an unsatisfactory alternative for adequate broadband service for many of Vallejo's residents.

Figure 4: Advertised DSL download speeds



3.1.4 Fixed wireless availability and pricing

Cellular wireless carriers have been consistently increasing their data speeds with the rollout of faster and higher capacity technologies, such as “5G.” Over the past few years, they have advertised data plans with speeds comparable to many residential customers’ internet service using a fixed wireless service. This service requires placement of a small antenna or gateway at the premises that will access new 5G equipment at nearby cell towers to create a closer range and faster data transmission than using a cell phone and the cellular network, especially for indoor uses. Nationally, home 5G services are a relatively new addition to the residential broadband market, and it remains to be seen whether they will provide reliable, high-speed services that can compete with wireline services for everyday consumers.

Both T-Mobile and Valley Internet claim on Form 477 to provide fixed wireless services in Vallejo. However, during preparation of this report, Valley confirmed that they do not actually offer wireless residential broadband services in the City.

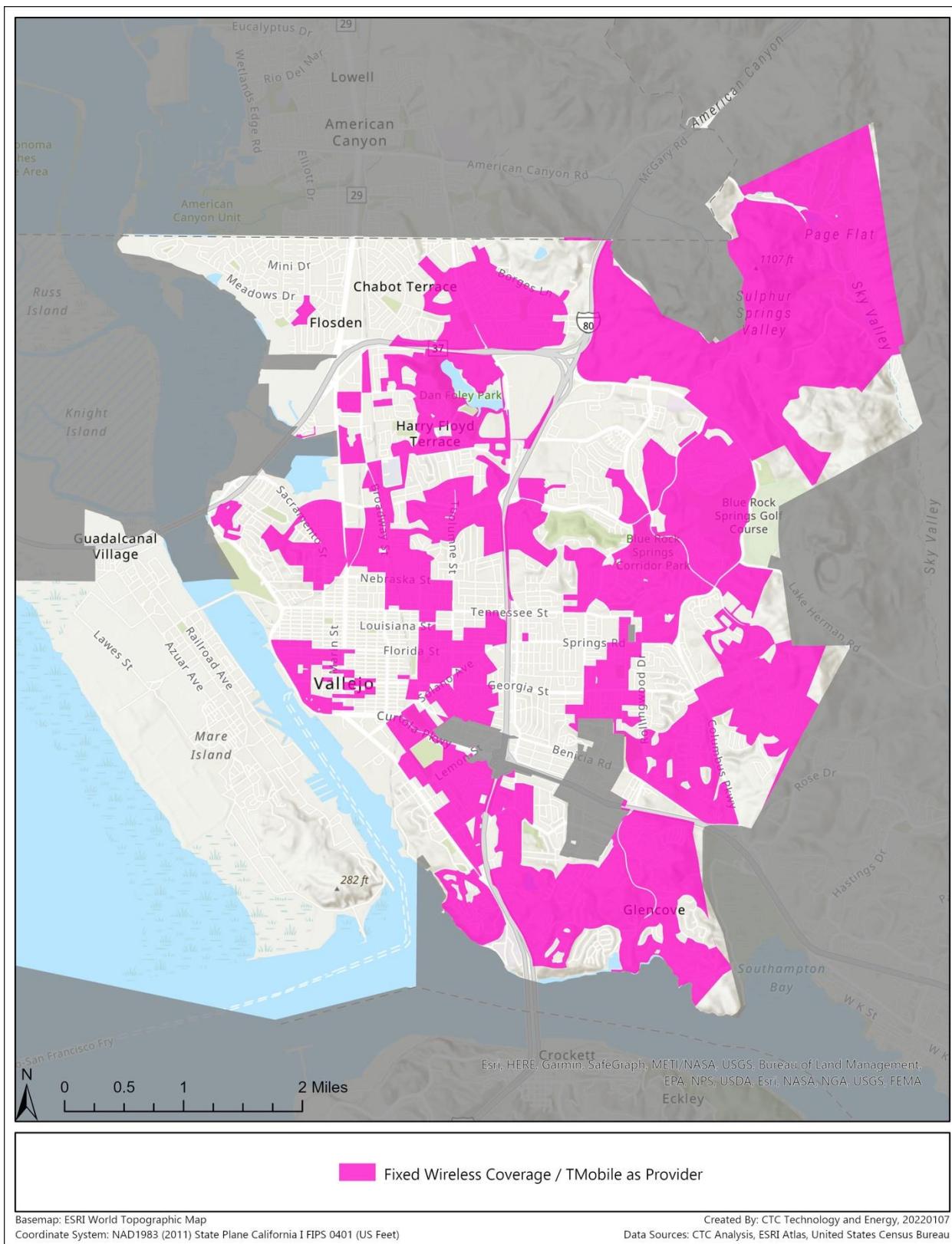
T-Mobile does offer its new 5G Home Internet service throughout much of Vallejo, as seen in Figure 5. This product uses T-Mobile’s wireless network to offer residential broadband services.

T-Mobile’s 5G Home Internet service is currently a single product, with national pricing at \$55 per month, including equipment. A cellular voice line is not required.

Table 5: Wireless services offered by T-Mobile in Vallejo

Service	Advertised Upload/Download Speeds	Monthly Price (non-promotional)	Notes
5G Home Internet	115/24 Mbps	\$55	Credit approval required; no data cap; no voice line required; equipment included

Figure 5: Residential fixed wireless coverage (TMobile)



3.2 Market assessment

While nearly all of Vallejo has access to some form of residential broadband service,²⁶ analysis found that investment in networks—specifically, fiber networks—has not occurred consistently throughout Vallejo. The near ubiquity of cable and DSL means that most residents have connectivity, but only select areas of the City have fiber as a competitive wireline broadband option. This lack of competitive alternatives for high-speed broadband is increasingly impactful as symmetrical 100/100 Mbps wireline service, offered most reliably over a fiber network, emerges as a de facto standard to fully participate in today's digital world.

Analysis of fiber, cable, wireless, and DSL coverage identifies low-competition areas in Vallejo. For these purposes, we define “low-investment areas” as those that have cable, wireless, DSL, or some combination of the three available—but no fiber. While portions of the low-competition areas could potentially have three options for service, these areas have no high-capacity wireline service as a competitive alternative to cable.

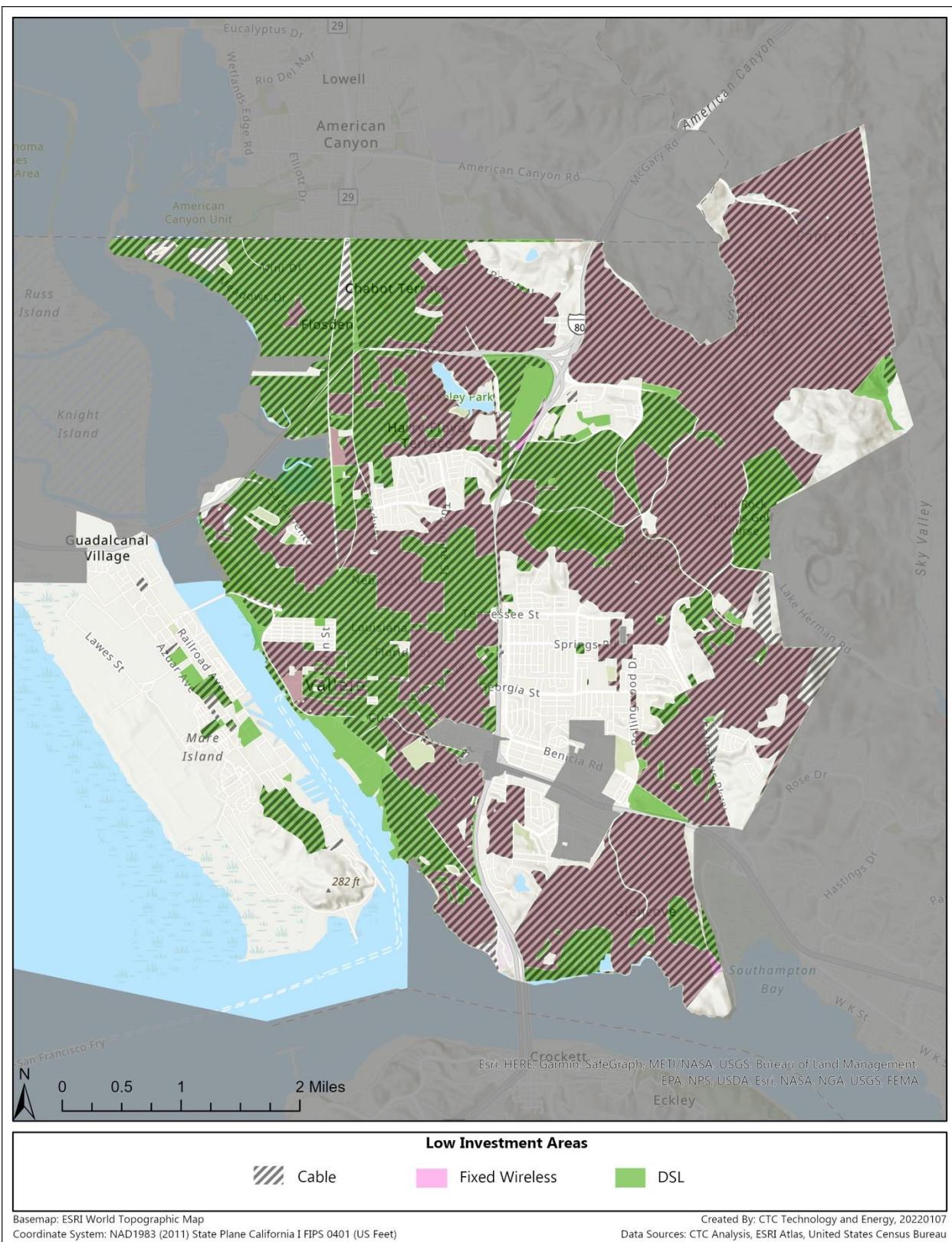
This analysis only included AT&T’s fiber footprint. While there are City fiber assets available throughout some parts of Vallejo, Inyo’s recent decision to stop offering services over that network means that there is not currently a sustainable fiber option for residents within that footprint. However, these City assets offer an opportunity to introduce a new competitive option for service over fiber, which is discussed elsewhere in this report.

Figure 6 depicts the low-competition areas of Vallejo. In this map, DSL and cable service are available in nearly the entire low-competition area, with wireless service being offered in select areas. The wireless areas appear a darker purple than in the key because DSL’s green-shaded areas are layered under nearly all of its service area. Note that cable service is also almost ubiquitous throughout this area.

The map shows that the low-competition areas include much of downtown west of I-80, the northwest and northeast quadrants of the City, and the farther perimeter of the southeast quadrant of the City. There are also portions of Mare Island that have only DSL service, or a choice between DSL and cable.

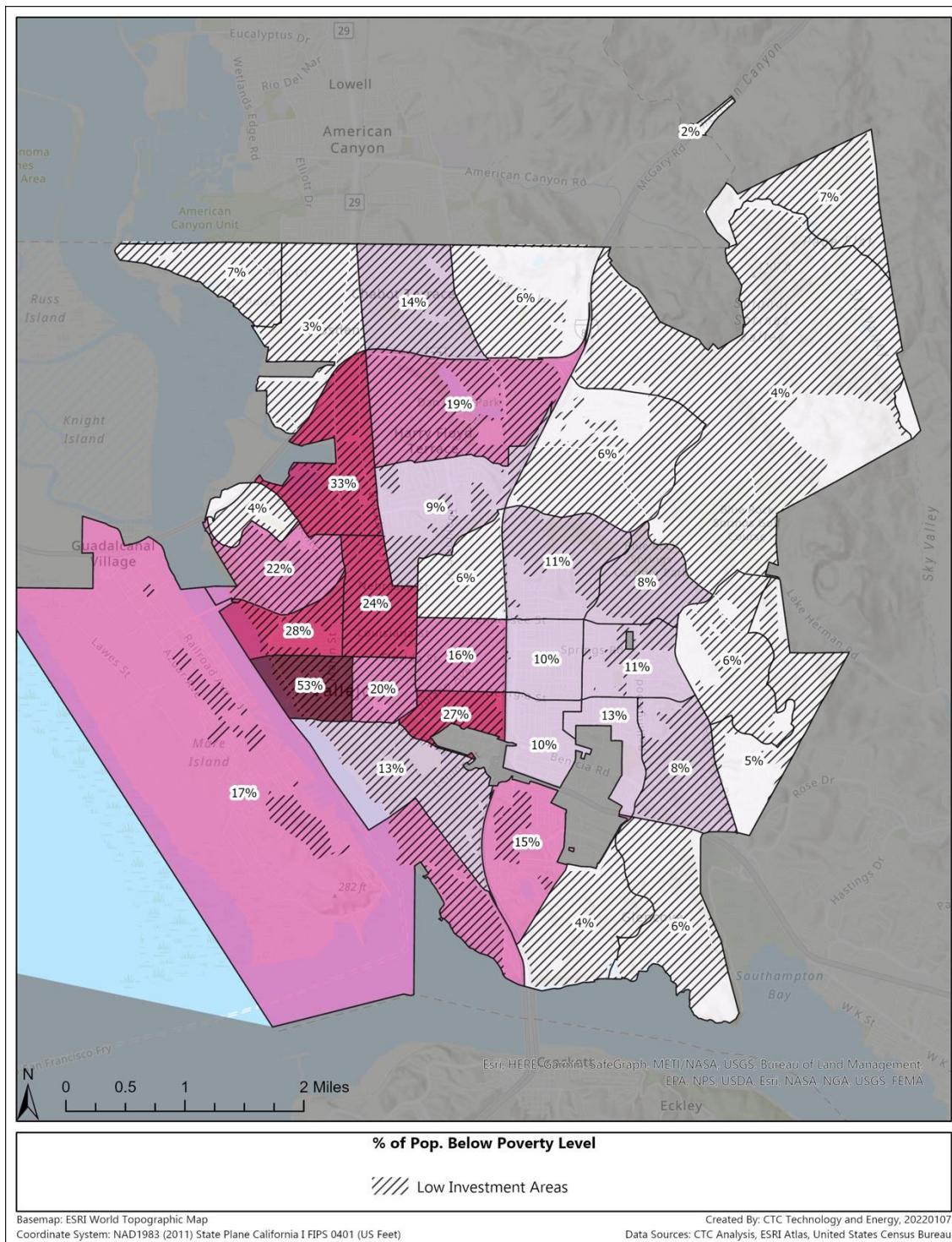
²⁶ This analysis identified the residential areas within Vallejo in which no broadband service is currently available. These areas are primarily concentrated on Mare Island. While the data show that these areas are zoned residentially, they may not actually be inhabited. Many of the areas identified on Mare Island appear to be without homes. Additionally, the northernmost area, just east of I-80, is a shopping center, and the eastern area south of the Blue Rock Springs Golf Course is a small road off of Ascot Parkway that leads to an industrial area.

Figure 6: Low-investment areas



Combining data on these low-investment areas with data on poverty levels in Vallejo (Figure 7) illustrates the lack of significant alignment between these two measures, which indicates that other factors have limited investment in the City.

Figure 7: Low-investment areas and poverty levels in Vallejo



However, the western parts of the City see both lower rates of computer ownership (as seen in Figure 8) and higher overall participation in the Emergency Broadband Benefit Program (as seen in Figure 9). Not surprisingly, there is a loose correlation between these areas and the areas with higher rates of poverty, as seen in Figure 7. It is important for the City to recognize that even in areas with three or four choices for broadband service—cable, fixed wireless, DSL, and in some instances fiber—these neighborhoods and communities are not adequately connected due to affordability and device access concerns. It is also likely that these same communities are lacking in digital literacy skills and the comfort with the technology to support online learning and telemedicine for example. These data inform the recommendations to focus the City's digital equity efforts.

Figure 8: Percentage of population with a computer

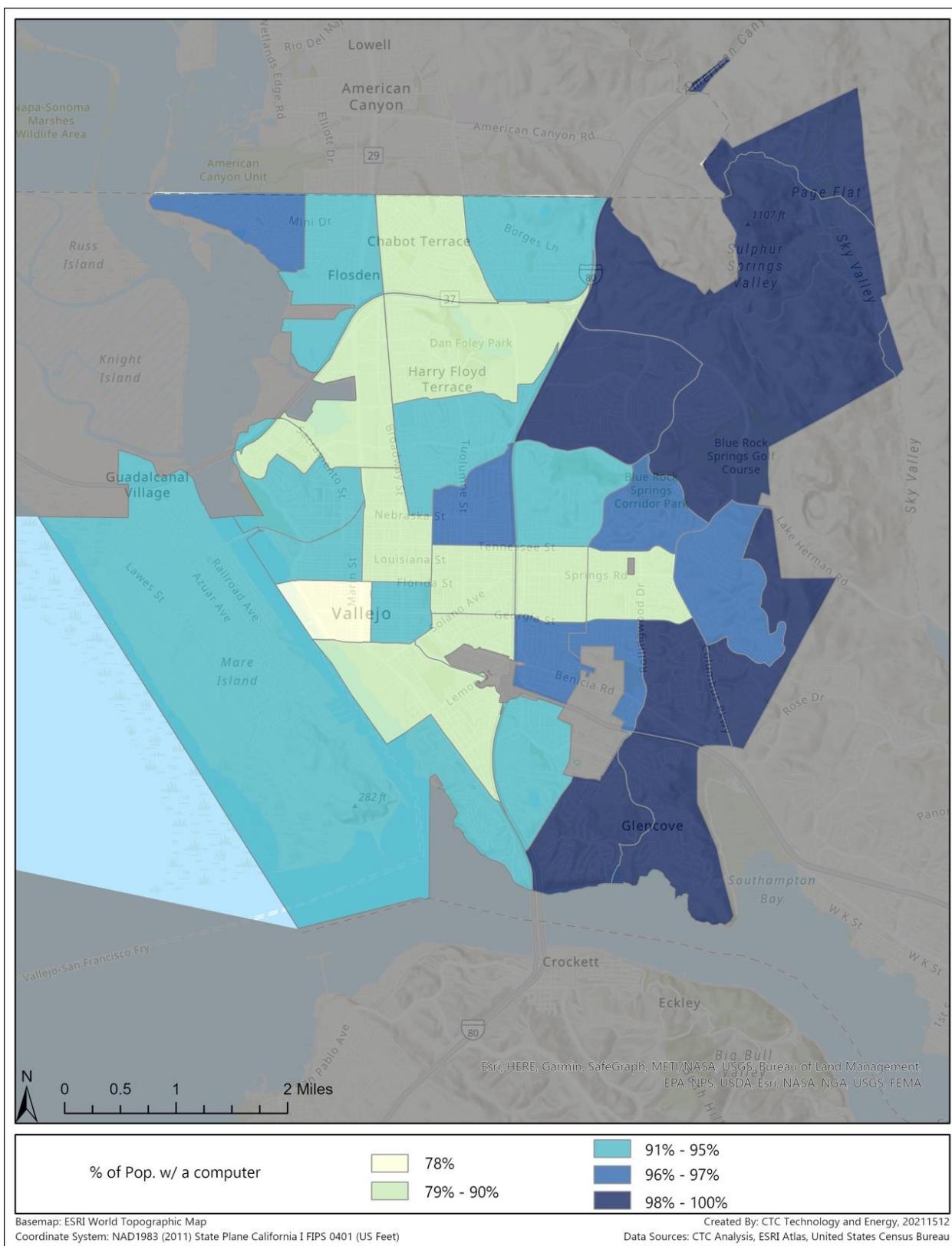
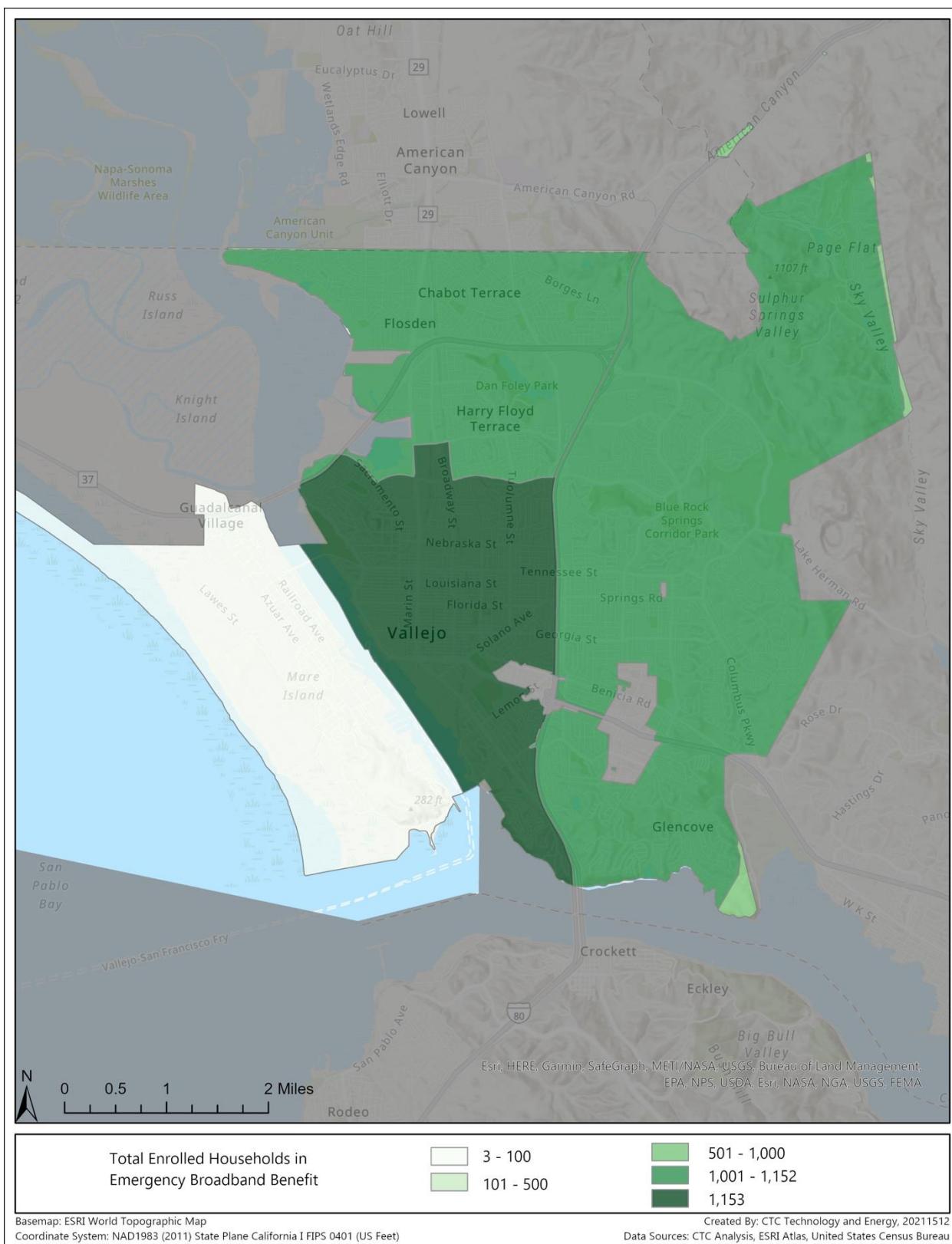


Figure 9: Total enrolled households in the Emergency Broadband Benefit Program



4 Inventory of City's conduit and fiber

This report updates and expands on the representative inventory of Vallejo's broadband assets developed for the City's 2016 Broadband Master Plan. To develop this updated Broadband Master Plan, CTC reviewed relevant maps, studies, documents, and data provided by the City for this project. CTC also reviewed the extensive maps and data compiled for the 2016 Broadband Master Plan.

For example, the City's 2016 documentation described the routes of most of the City's existing conduit and fiber (e.g., traffic signal fiber, empty conduit, and dark fiber) and utility conduit (e.g., gas, electric, telecom, fire alarm, unused water/sewer lines).

At that time, a CTC outside plant engineer conducted an extensive desk survey using the City's existing GIS maps, Google Earth imagery, and other relevant sources, and aggregated all collected data to develop a GIS database that informed the current project. The CTC outside plant engineer—accompanied by City staff in the field—then conducted three days of field verification and site surveys of representative portions of the City. This work included evaluation of selected City sites, with field survey work focusing on critical routes intended for economic development efforts, based on discussions with the City. Through this field survey, CTC's engineer established a high-level understanding of the scale of the network, and the City's existing documentation and practices.

Recent interviews with City staff, and a review of current City-provided maps and data regarding conduit and fiber, comprise the foundation of our current analysis. As the City is planning a comprehensive infrastructure audit in fall 2022, it was determined that this upcoming investigation would best inform future infrastructure decision-making and should be used to guide the implementation of this Broadband Master Plan.

We are also aware that the City is planning an upgrade to all municipal traffic signal infrastructure from copper to fiber, which will provide a new opportunity for fully integrated traffic signaling. This upgrade should also be viewed as an opportunity to expand the City's fiber assets to include dark fiber or shadow conduit to support future needs.

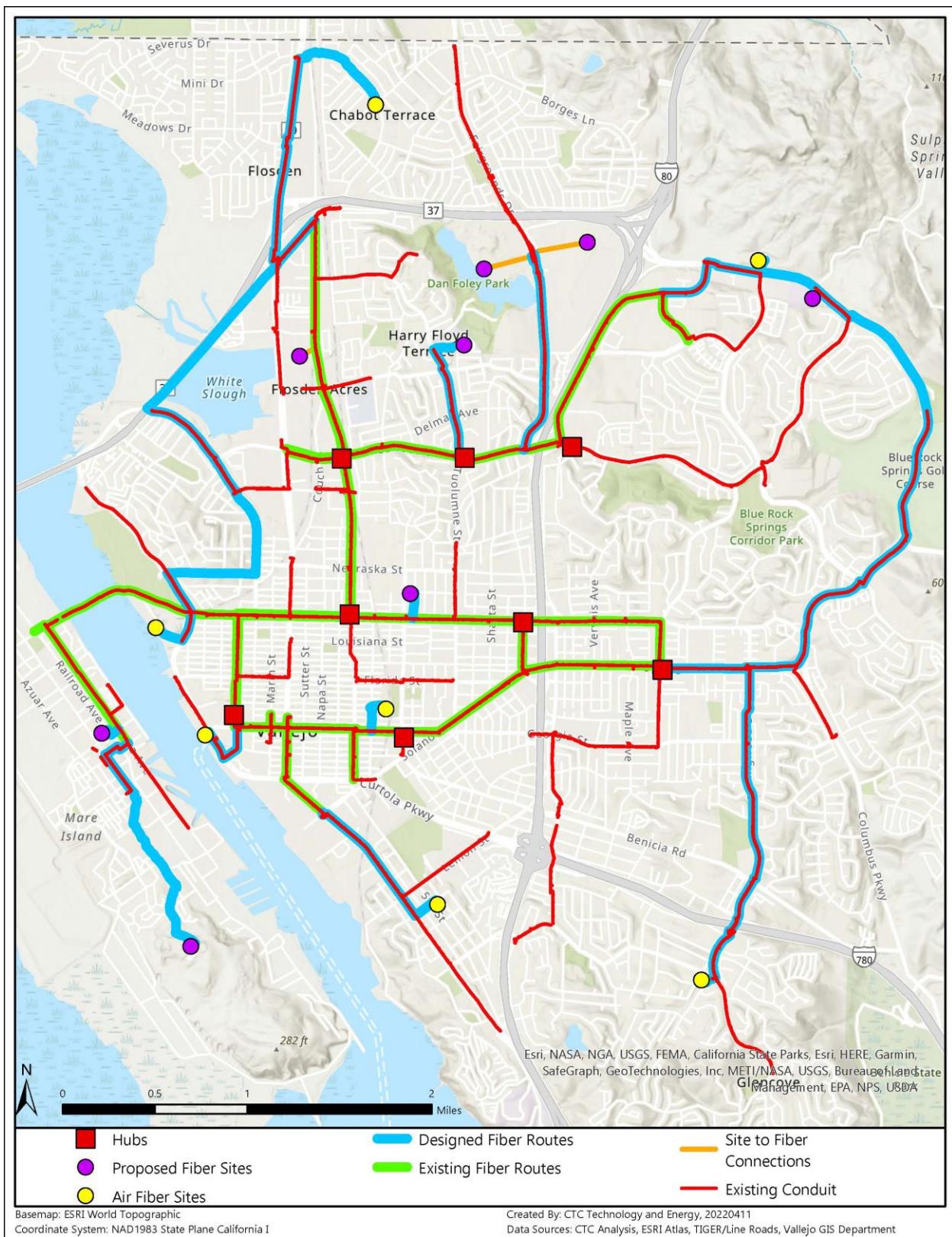
Based on discussion with City staff, the following locations are not connected to the municipal network with fiber and are instead using wireless connections ("air fiber") to the City-owned fiber. These sites should be the focus of the City's infrastructure investments to provide the stability and capacity of fiber connectivity:

1. Fire Station 22
2. Fire Station 25

3. Fire Station 26
4. Fire Station 27
5. CRT Building
6. Ferry Terminal
7. Marina Building

The City owns and operates approximately 36 miles of 3-inch conduit. The majority of the conduit was built for traffic communications. The existing fiber and conduit routes are shown in Figure 10, alongside potential future fiber routes discussed in Section **Error! Reference source not found..**

Figure 10: Existing fiber and conduit routes



5 Public-private partnership models

The 2016 Broadband Master Plan recommended that Vallejo explore partnerships with ISPs that serve the City. That report discussed the value of tailoring partnerships to meet the needs of the community while also ensuring that the parameters of the partnership directly benefit both the community and the private partner.

While the City issued an RFP and engaged Inyo Networks to provide service over the City's fiber infrastructure, the City has not engaged in detailed discussions with other potential partner ISPs. The City should continue to consider different collaboration approaches—particularly given the current broadband funding landscape. As discussed below, partnerships are valuable to infrastructure funding (i.e., grant applications) and delivering services to end users and we describe several potential models that could be considered. Our recommended model is based on the City's desire to close the digital divide, improve market competition for broadband, and maximize the use of public assets. Our recommendation is further designed to take advantage of upcoming federal and State grant programs that might support the deployment of infrastructure to areas of low investment (as described in Section 3.2 above).

When developing a public-private partnership, the City should focus on risks, benefits, and control. Although it would be ideal for the City to gain all the benefits it seeks while controlling the new assets and risking little to no capital, the three factors frequently exist in tradeoffs. For example, the higher the public investment, the higher the City's risk. Aside from communities that attract a private partner willing to invest its own capital, most public–private partnerships will require some public investment, which involves risk for a community. But as public funding increases, so should public control over the project itself, including the ability to focus on specific outcomes.

Contrast this with a private investment model where the public sector may be focused solely on engagement and planning. Such a model entails lower public cost and reduced public risk, but it also means the City's benefits are more modest and the private sector partner(s) completely control infrastructure deployment.

Finally, a model designed around shared investment and risk can yield opportunity and benefits both for the City and its partner(s). In such a model, each side of the public–private partnership focuses on its unique strengths while relinquishing other responsibilities and duties to the other partner. For example, the City may opt to fund the construction and deployment of the physical network and preliminary messaging to the public while the partner(s) is tasked with service deployment and eventual operation overseeing the relationship with end users.

The following is a brief discussion of a range of potential infrastructure strategies for the City's efforts to address the digital divide.

5.1 Model 1: Smart City Model

City funding used to deploy infrastructure citywide for Smart City purposes with additional capacity placed by the private deployer for citywide broadband services to the public: In this scenario, the City's funds would be awarded to the lowest-cost bidder that meets technical, financial, and management qualifications and that agrees to provide to the City, either for a specified term or in perpetuity, a specified number of dark fiber strands on a citywide basis for the non-commercial purposes of Smart City needs, including those that have not yet emerged.

Ideally, the City's funds would also serve as an inducement to the private partner to invest in the City, deploy bundles of fiber with hundreds of strands of fiber, and offer commercial services to residential, business, and institutional customers.

5.2 Model 1A: Limited Smart City Model

City funding used to deploy infrastructure citywide for Smart City purposes in select high-priority areas: In this variation on Model 1, the same kind of procurement would be undertaken—but for a more limited area of the City, to limit the City's required funding outlay. The areas prioritized for the competitive procurement would be identified with input from the City Council and stakeholder groups, but our initial assessment based on our interviews with the City indicates that infrastructure could be prioritized in North Vallejo. The City would make an award to the lowest-bidding qualified bidder, assuming adequate financial, technical, and managerial qualifications.

5.3 Model 2 (Recommended): Citywide Commitment Model

City funding used to deploy infrastructure in priority areas for private operations in return for commitments to citywide fiber investment by a private partner: In this scenario, fiber-to-the-premises would be deployed on a citywide basis with a priority to areas of low investment considered in Section 6 of this report. The City would provide funding to a private partner to build infrastructure to be owned by the City—but only in those areas where a private sector business case does not exist because of insufficient return on investment.

The City's contribution would be calculated to bridge the private sector business case in those areas, and the private party would lease the City-owned infrastructure and provide services based on its contractual arrangement with the City, which would include residential and enterprise service in addition to maintaining and managing the open-access municipal network. The private partner would also commit to building infrastructure in all areas where it has a business case to do so, thus resulting in a citywide deployment with only partial City funding.

Through this shared investment strategy, the City would invest in those neighborhoods where the need is greatest—and attract private capital to the neighborhoods where City funds are not necessary or available. In those areas where the fiber is built with City funds, the City would own

the broadband infrastructure, and would lease access to its private partner and other internet service providers, with the private sector providing network maintenance, operations, and service.

Additionally, the private partner would commit to completing a fiber ring for the City and providing fiber to the remaining City facilities that are currently connected via “air fiber.” Similar to the FTTP deployment model, the private party would lease the City-owned infrastructure and the City would lease any private funded infrastructure for City needs. The private party would also commit to providing services to businesses and other community anchor institutions in addition to maintaining and managing the open-access network.

Finally, the private partner would be responsible for providing free public Wi-Fi at certain public locations such as parts of downtown along Georgia Street, Waterfront Park, River Park, the Ferry Building, and Blue Rock Springs Park—depending on financial viability. The City has allocated a portion of State and Local Fiscal Recovery (ARPA) funding to help implement this strategy, and any City-financed infrastructure utilizing federal and State funding would be owned by the City with the partner entity providing service.

CTC recommends this model as the most appropriate way to deploy infrastructure in the city utilizing new federal and State funding specifically available to public entities and leveraging that support to facilitate private investment in the City. In this model the public and private partners are equally invested in the success of the project and risks are shared.

5.4 Model 3: Neighborhood Model

City funding used to deploy infrastructure in priority areas for private sector operations: This model is more incremental and focuses the City’s efforts on select, limited areas of high priority. In partnership with one or more private partners, the City would contract a vendor to build fiber infrastructure in select target areas where affordability is most challenging.

Under this model, the City would own the infrastructure and the private sector provider would lease the infrastructure and deliver services to the public based on contractual obligations negotiated with the City. Stated otherwise, the City would make a capital investment to construct the fiber, and a partner would have responsibility for operations. This partnership approach would minimize the City’s costs and risks while achieving the City’s goals for the selected neighborhoods.

5.5 Model 4: Subsidy Model

City funding used to secure a long-term subsidy for low-income residents of the City: In this scenario, the City’s funds would not go toward construction of infrastructure to be owned by the

City, but rather to pre-purchase free or reduced-cost services over a negotiated period of time for lower-income residents.

This model is akin to recent efforts in other cities. The city of Chattanooga, Tenn., for example, used federal CARES Act funds to pre-pay a regional broadband provider for a decade of service to lower-income members of the community who struggle to afford adequate connectivity services.

As with the options above, one benefit of this approach would be attracting private capital to the City because the guaranteed revenues, particularly in the form of an upfront payment, could increase the attractiveness of a private sector investment. In such a scenario, the extent and scope of the private sector deployment would be dependent on negotiations and private investment considerations, particularly in light of the amount the City can commit.

6 System-level design and cost estimate for a City network

We present here our network design and cost estimate to inform the upcoming RFP the City will be releasing based on City Council input on this report. In our interviews with ISPs, we learned there are some infrastructure challenges the City faces in expanding the municipal network to include FTTP. One of the challenges is underground utilities, which limit available utility poles for aerial fiber deployment, the other is rear easements in parts of North Vallejo where the utilities are behind homes and make access to utility poles challenging for ISPs.

CTC recommends that the City consider a design that builds incrementally on the existing City conduit and fiber network that scales according to the needs of potential new fiber users. The existing conduit and fiber provide a starting point, but we recommend the following additional elements:

- Complete a network ring to provide network resilience and scalability
- City-wide FTTP
- Extend fiber to city institutions, schools, anchor businesses, and provide a means of connectivity to future fiber developments and;
- Augmenting fiber count and replacing undersized handholes where necessary.

These steps can be taken by the City of Vallejo to not only provide a stable and robust fiber optic network to its existing institutions, but to also pave the way for more opportunities like providing Wi-Fi access in public gathering places. Places like Vallejo waterfront, major city parks, and Vallejo Downtown just to name a few could benefit from WIFI connectivity. With the City providing direct service, or by a private partner interested in connecting Vallejo institutions and enterprises, this fiber network could serve the community in many ways.

While the City's existing conduit has significant value and capabilities, there is considerable cost in the next steps, due to the high cost of construction. Although the incremental construction is generally not on a large scale (most segments are less than one mile), the unit cost of labor and materials for smaller "piece work" is generally higher than for larger projects, as with any construction. Therefore, it is important that next steps be taken strategically, with a clear picture of the commitment of potential network users and partners.

In the following sections, CTC has provided a high-level cost analysis that estimates of the cost for a proposed phased approach to this strategic fiber and conduit construction.

6.1 Expanding the City's fiber network to create a resilient ring would cost approximately \$700,000

The City's existing network has two significant gaps. Instead of a ring with the capability of fail-over in each direction, the network in those locations is physically a spur, with only one path to serve the site. These gaps are between hubs 7 and 8 in the northeastern part of the network and between City Hall and hub 10 to the north of City Hall (Figure 11).

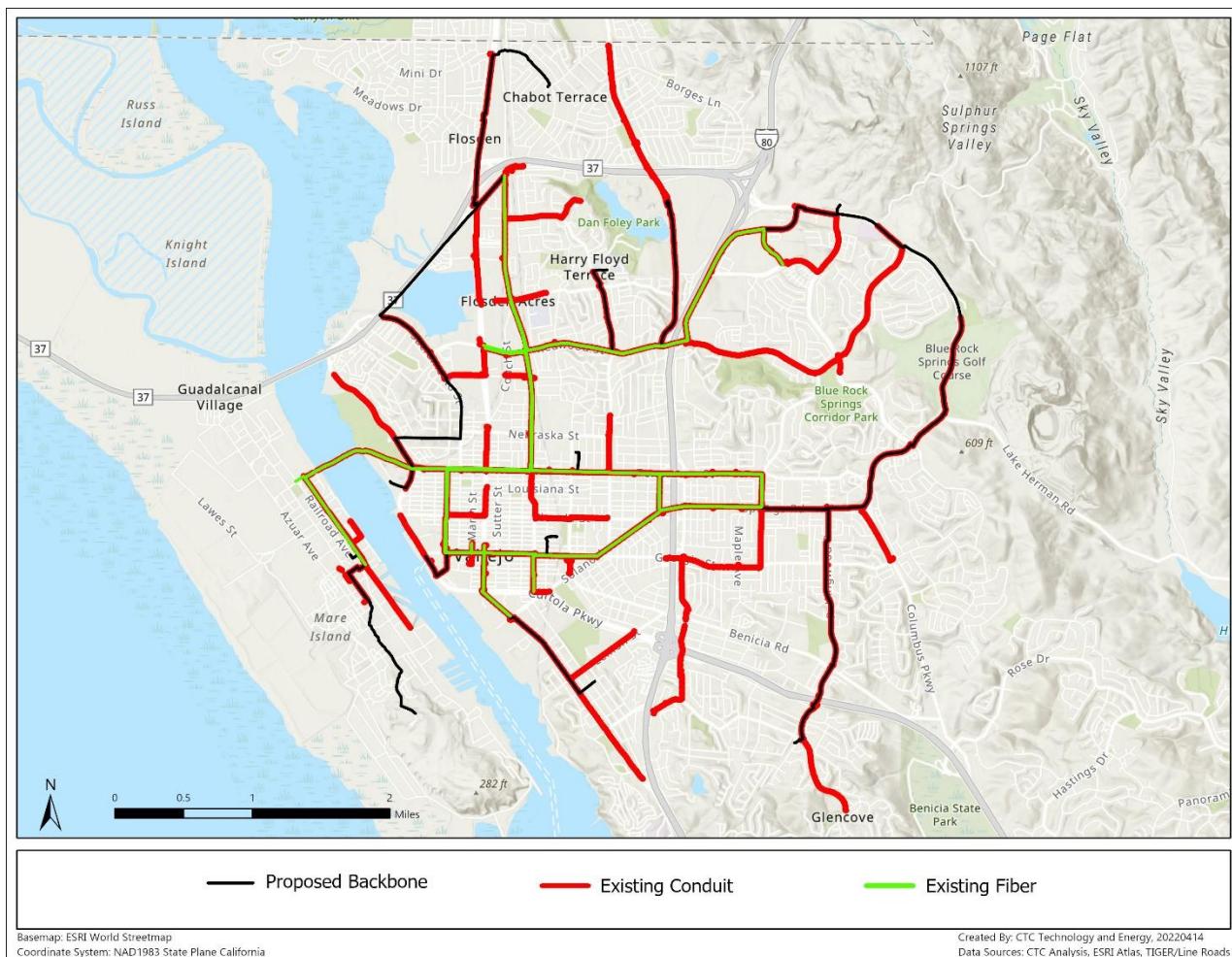
With the completion of the ring, the path of fiber where a single point of failure can create a long-term outage is reduced to the distance from the site to the ring, generally less than one mile.

For the backbone, we chose the closest feasible routes to existing conduit—avoiding State roads, particularly Route 29. For the sites, we chose the closest feasible route from the site to a fiber splice enclosure connecting it to the backbone using the existing conduit system where available ultimately creating a path back to City Hall.

CTC recommends installing two 2-inch conduits for all new conduit sections as well as installing a greater fiber count (288-count) for future growth; this higher fiber count would also require the use of larger vaults (24 by 36 by 36 inches).

The estimated labor and materials cost of completing the missing conduit connections and installing a 288-count fiber optic cable throughout the entirety of the ring is approximately \$700,000. The image below shows the proposed backbone segments in relation to the existing conduit.

Figure 11: Candidate backbone fiber segments



6.2 Connecting key City Locations to fiber would cost approximately \$461,400

The City has identified a handful of City locations not connected with fiber where the business case may exist for extending service.

We recommend connecting new locations using construction techniques and specifications like those used for the current network. We recommend constructing conduit from these locations to the nearest existing City manhole or handhole and interconnecting the service drop to the City fiber in a splice enclosure ultimately forming a path to City Hall.

Our cost estimate is for running conduit and fiber cable in areas not yet built as well as utilizing conduit already in the ground. This approach is suitable for adding the 7 sites we envision below.

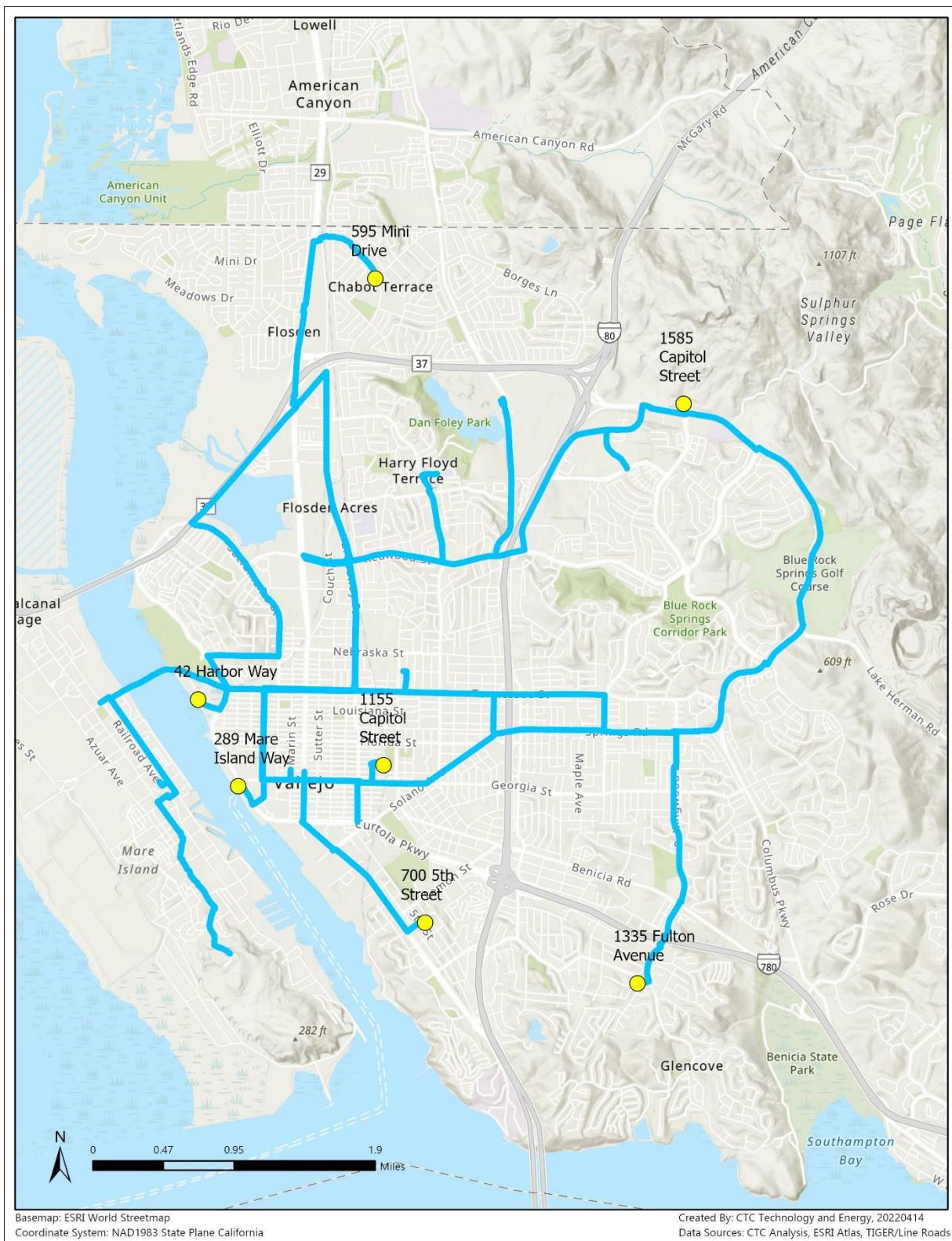
We estimate the cost of these connections as follows:

Table 6: Estimated capital cost to build fiber to 12 City-owned locations

City Locations	Cost
1155 Capitol Street	\$52,100
1335 Fulton Avenue	\$88,900
1585 Ascot Court	\$32,700
595 Mini Drive	\$141,100
700 5 th Street	\$67,000
Ferry Terminal	\$34,000
Marina Building	\$45,600
Total for City locations	\$461,400

The image below shows each site's connection to the backbone ring.

Figure 12: City Locations



The cost estimates assume connectivity on an individual basis. Because some of these sites are in proximity to each other and/or have overlap in the construction routes there may be substantial savings in constructing to groups of sites. (i.e., to feed multiple buildings from a single tap). The more buildings on that block, the less it will cost the City to connect each building

6.3 Connecting businesses and institutions seeking service would cost an estimated \$TBD (pending final analysis)

In addition to connecting City institutions, there has been several business facilities that have shown an interest in utilizing these fiber services. Like the connections of City institutions, the methods of connectivity would take a similar approach. The difference with these sites versus the city site would be the business and maintenance aspect. Unlike the city sites, these private institutions will require a different form of service deployment.

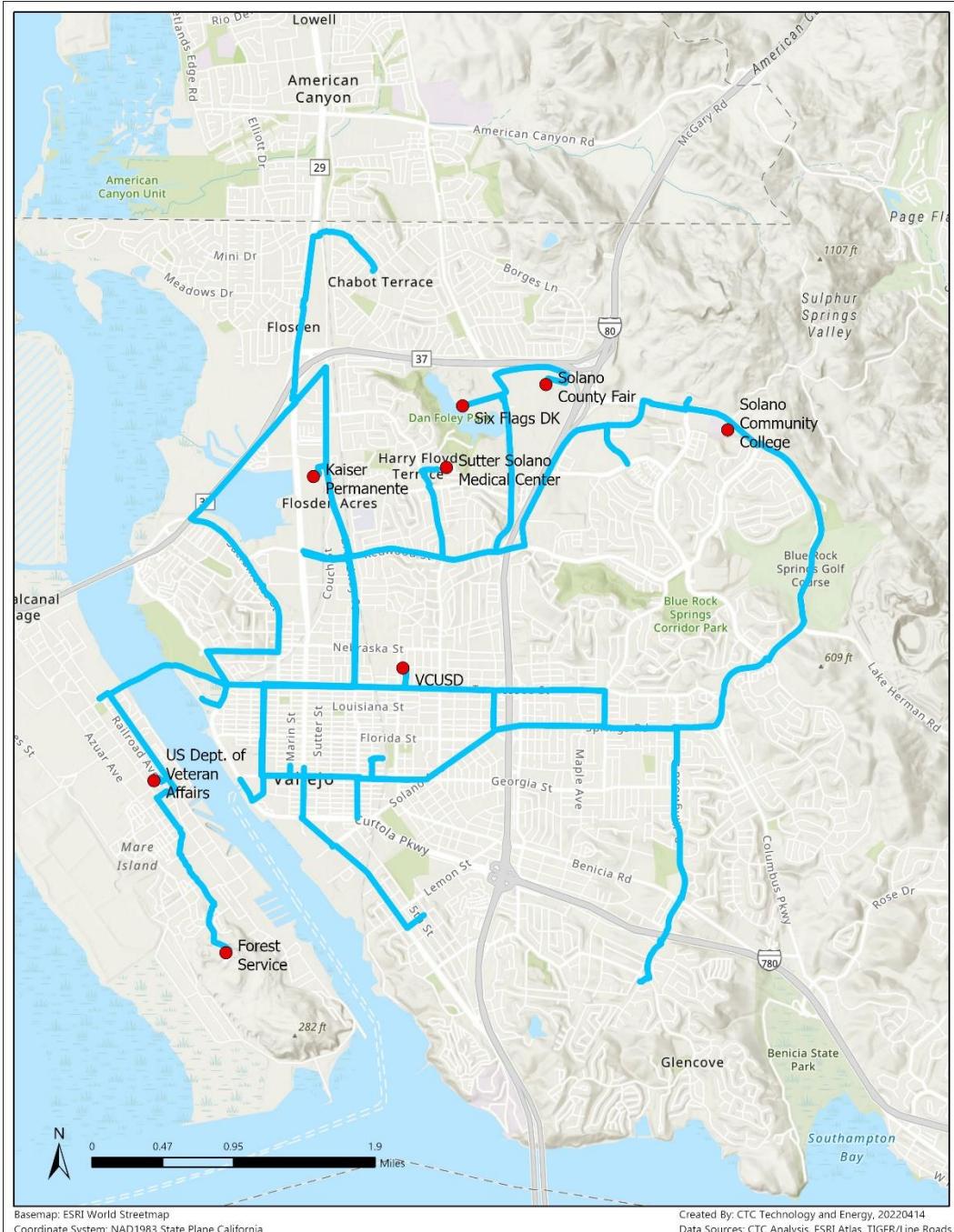
From an operational perspective, these sites will require the City to contract out the operations and maintenance to a third party that will perform according to the customer service level agreement (SLA) regarding service delivery and repair. Below is the DRAFT estimated cost associated with bringing fiber to these facilities, pending further internal review:

Table 7: DRAFT Estimated cost to connect facilities to fiber

Facilities Seeking Connection	DRAFT Cost
Forest Service	\$179,800
Kaiser Permanente	\$25,900
Six Flags DK	\$70,500
Solano Community College	\$24,200
Solano County Fair	\$46,900
Sutter Solano Medical Center	\$59,100
US Dept of Veteran Affairs	\$34,200
VCUSD	\$209,900

The image below shows each site's connection to the backbone ring Image Needed

Figure 13: Candidate fiber connections



6.4 A citywide fiber-to-the-premises network would cost an estimated \$64 million to \$112 million

CTC engineers developed a conceptual, high-level fiber-to-the-premises outside plant network design and cost model for the City that is aligned with best practices in the industry and able to support a variety of electronic architecture options and business plans. This design is based on our recommended business model (see Section 5.3, above), which envisions the City investing public funding (from Federal and State grant programs) for infrastructure deployments to areas

for which a business case cannot be made by ISPs, and the remaining infrastructure to be financed by a private partner.

The cost of building a fiber-to-the-premises network will depend on what percentage of the network infrastructure is built on aerial poles as opposed to inside underground conduit. We present two designs with differing fiber attachment assumptions to compare the cost of prioritizing underground versus aerial fiber.

The first design assumes that the builder will seek to maximize use of the utility poles with 70 percent aerial construction and 30 percent underground construction throughout the City. The second design assumes 100 percent underground construction, which would result in the event the builder is unable to or does not wish to negotiate a pole attachment agreement or wants to deploy quickly without needing to rely on other entities to move their attachments or replace crowded poles. Both designs encompass about 450 route miles.

In total, the first design is estimated to cost approximately \$64 million for the backbone and distribution plant, or \$1,700 per passing, with an estimated additional cost for subscriber drops of \$240 per subscriber. The fully underground design is estimated to cost \$112 million for the backbone and distribution plant, or \$3,000 per passing, with an estimated additional cost for subscriber drops of approximately \$210 per subscriber.

This design assumes a network that serves 37,588 passings within Vallejo. CTC generated address points from the Microsoft Buildings National Dataset. After bringing the California buildings data into ArcGIS Pro, a selection was made for only the buildings inside the City of Vallejo. These sites do not account for multi-family dwelling units, which may include multiple addresses.

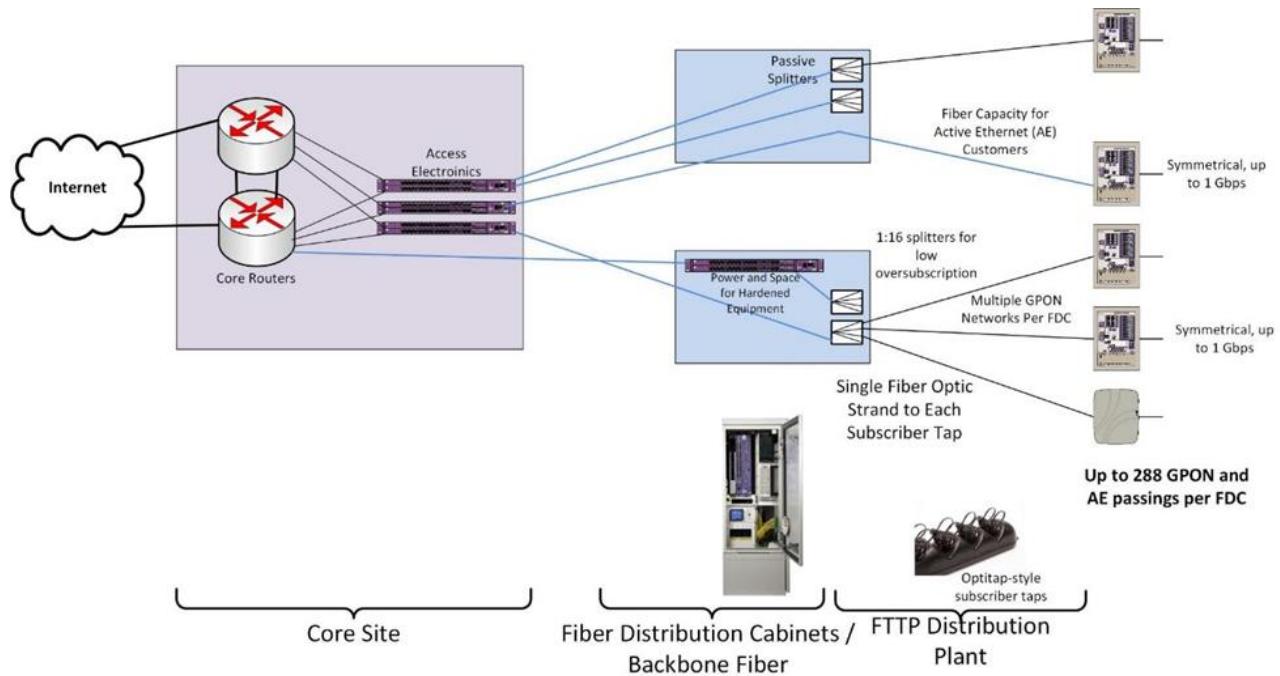
Table 8: Estimated capital cost for fiber-to-the-premises network

Passings	
Total number of passings	37,588
Design 1: 70% Aerial/30% Underground	
Backbone and distribution plant	\$64,000,000
Cost per passing	\$1,700
Estimated drop cost per customer	\$240
Design 2: 100% Underground	
Backbone and distribution plant	\$112,000,000
Cost per passing	\$3,000
Estimated drop cost per customer	\$210

6.4.1 Network architecture

We developed a conceptual, high-level fiber-to-the-premises outside plant network design that is aligned with best practices in the industry and is open to a variety of electronic architecture options. The figure below shows a logical representation of the fiber-to-the-premises network architecture we recommend based on the conceptual outside plant design.

Figure 14: High-level fiber-to-the-premises architecture



This drawing illustrates the primary functional components in the fiber-to-the-premises network, their relative position to one another, and the flexibility of the architecture to support multiple subscriber models and classes of service.

The recommended architecture is a hierarchical data network that would provide scalability and flexibility, both in terms of initial network deployment and ability to accommodate the increased demands of future applications and technologies. The central characteristics of FTTP data network include:

- **Capacity** – ability to consistently provide efficient transport for subscriber data at advertised speeds, even at peak times
- **Availability** – high levels of redundancy, reliability, and resiliency; the ability to quickly detect faults and reroute traffic
- **Efficiency** – no traffic bottlenecks; efficient use of resources

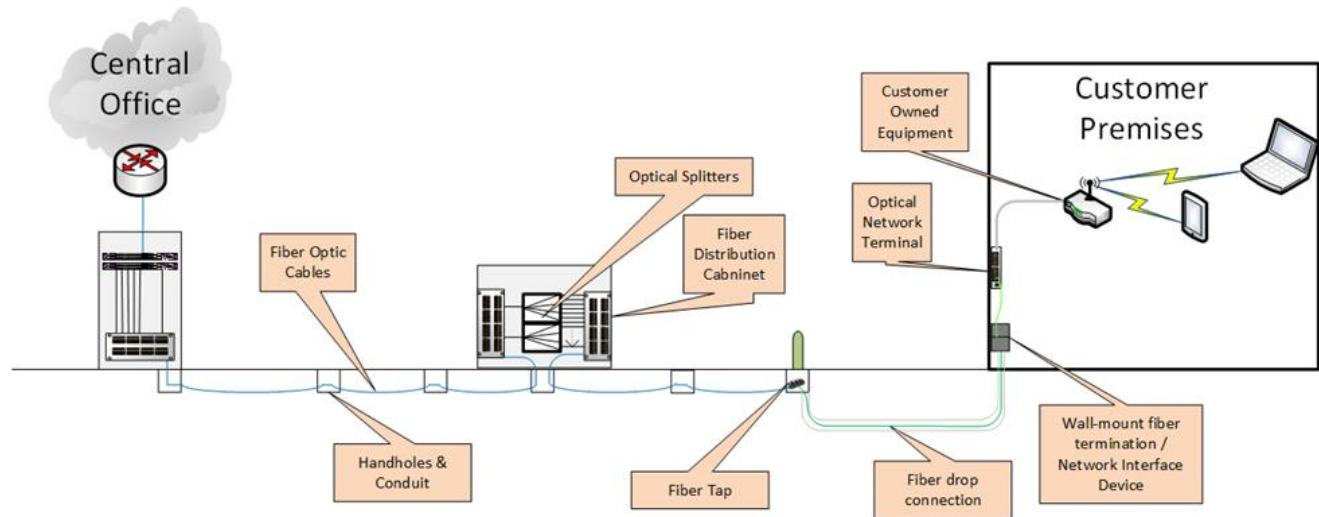
- **Scalability** – ability to grow in terms of physical service area and increased data capacity, and to integrate newer technologies without new construction
- **Flexibility** – ability to provide different levels and classes of service to different customer environments; can support an open access network or a single-provider network; can provide separation between service providers on the physical layer (separate fibers) or logical layer (separate Virtual Local Area Network (VLAN) or Virtual Private Network (VPN) providing networks within the network)
- **Security** – controlled physical access to all equipment and facilities, plus network access control to devices

This architecture offers scalability to meet long-term needs. It is consistent with best practices for either a standard or an open-access network model to provide customers with the option of multiple network service providers. This design would support the current industry standard Gigabit Passive Optical Network (GPON) technology, as well as 10 Gbps XGS-PON and NG-PON2 standards. It could also provide the option of direct Active Ethernet (AE) services on a limited basis, such as for business customers, using spare fiber capacity built into the designs.

The design is based on a Gigabit Passive Optical Network (GPON) architecture, which is the most commonly provisioned fiber-to-the-premises service—used, for example, by AT&T Fiber, Verizon (in its FiOS systems), and Google Fiber. GPON supports high-speed broadband data and is easily leveraged by triple-play carriers for voice, video, and data services.

GPON uses passive optical splitting, which is performed inside fiber distribution cabinets (FDC), to connect fiber from the Optical Line Terminals (OLTs) to the customer premises where it connects to an Optical Node Terminal (ONT) on the outside or inside of the premises. With GPON service (Figure 15), the FDCs house multiple optical splitters, each of which splits the fiber link to the OLT between 16 to 32 customers. The GPON OLT uses single-fiber (bi-directional) modules called SFPs (Small Form Factor Pluggable) which consists of a laser transmitter and a receiver to support multiple (less than 32) subscribers, so each customer receives a fiber connection all the way to the premises.

Figure 15: GPON fiber network with a buried service drop



The design assumes placement of manufacturer-terminated fiber tap enclosures within the public right-of-way or easements, providing watertight fiber connectors for customer service drop cables, and eliminating the need for service installers to perform splices in the field. This is an industry-standard approach to reduce both customer activation times and the potential for damage to distribution cables and splices.

6.4.2 Assumptions and criteria

The cost of building an FTTP network will depend in large part on what percentage of the network infrastructure is built on aerial poles as opposed to inside underground conduit. Therefore, we provided two estimates. The first design assumes the City will seek to maximize the use of poles with 70 percent aerial construction and 30 percent underground construction. The second design is for 100 percent underground in the even the builder is unable to secure the necessary pole attachment agreements. Both designs assumed the existing and proposed backbone fibers would be used.

The fiber-to-the-premises network design was developed with the following criteria based on the above assumptions and required characteristics of the hierarchical fiber-to-the-premises network:

- Underground conduit and fiber will be installed in the public right-of-way or in an easement on the side of the road.
- The aerial fiber design will make use of existing poles where possible.

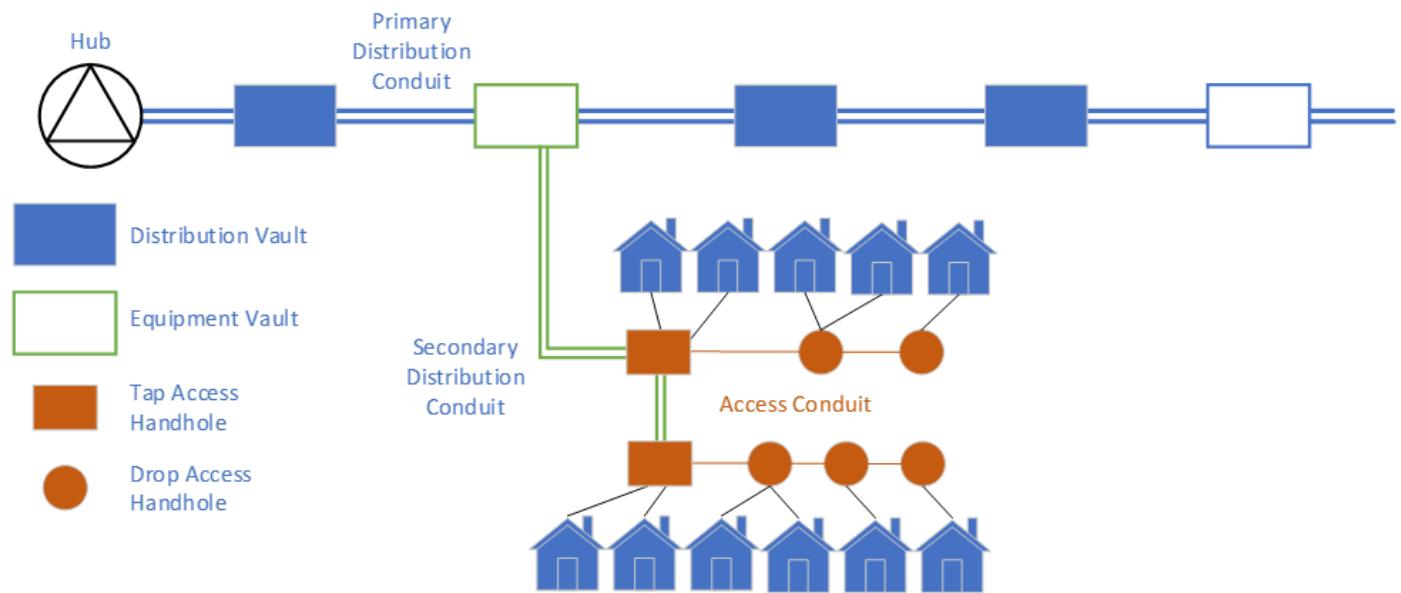
- Backbone fiber sizes will range from 144- to 288-count cables; extended lateral fiber sizes will range from 48- to 144-count cable; and short lateral and drop fiber will contain 12 strands.
- The network will target up to 288 passings per secondary distribution point, each served from an FDC containing optical splitters.
- The distribution plant will terminate at multi-port subscriber tap terminals (i.e. “taps”) in underground handholes, each serving no more than 12 homes.
- Access conduit will be placed in drop access handholes placed at the edge of the parcel for each serviceable passing (one handhole per one or two passings).
- The underground vault spacing along distribution routes will be no more than 750 feet.
- Hub shelters will be constructed to support network electronics with backup power generation, redundant cooling systems, robust physical security, and inert gas fire-suppression systems.
- Where possible, the distribution plant network routes will avoid crossing major roadways, railways, and waterways.
- In the aerial design, we assume that the builder is able to obtain an attachment agreement from the pole owner.
- We assumed a conservative estimate for the average make-ready cost per foot of approximately \$6, based on typical unit costs for make-ready and pole replacement in other cities. The table below provides our assumptions for the make-ready costs.

Table 99: Estimated make-ready costs

Cost factor	Estimate
Make-ready cost per move	\$450
Average moves per pole	2
Average poles per mile	45
Percent of poles requiring make-ready	50%
Percent of poles requiring replacement	5%
Average pole replacement cost	\$5,000
Average make-ready cost per foot	\$6

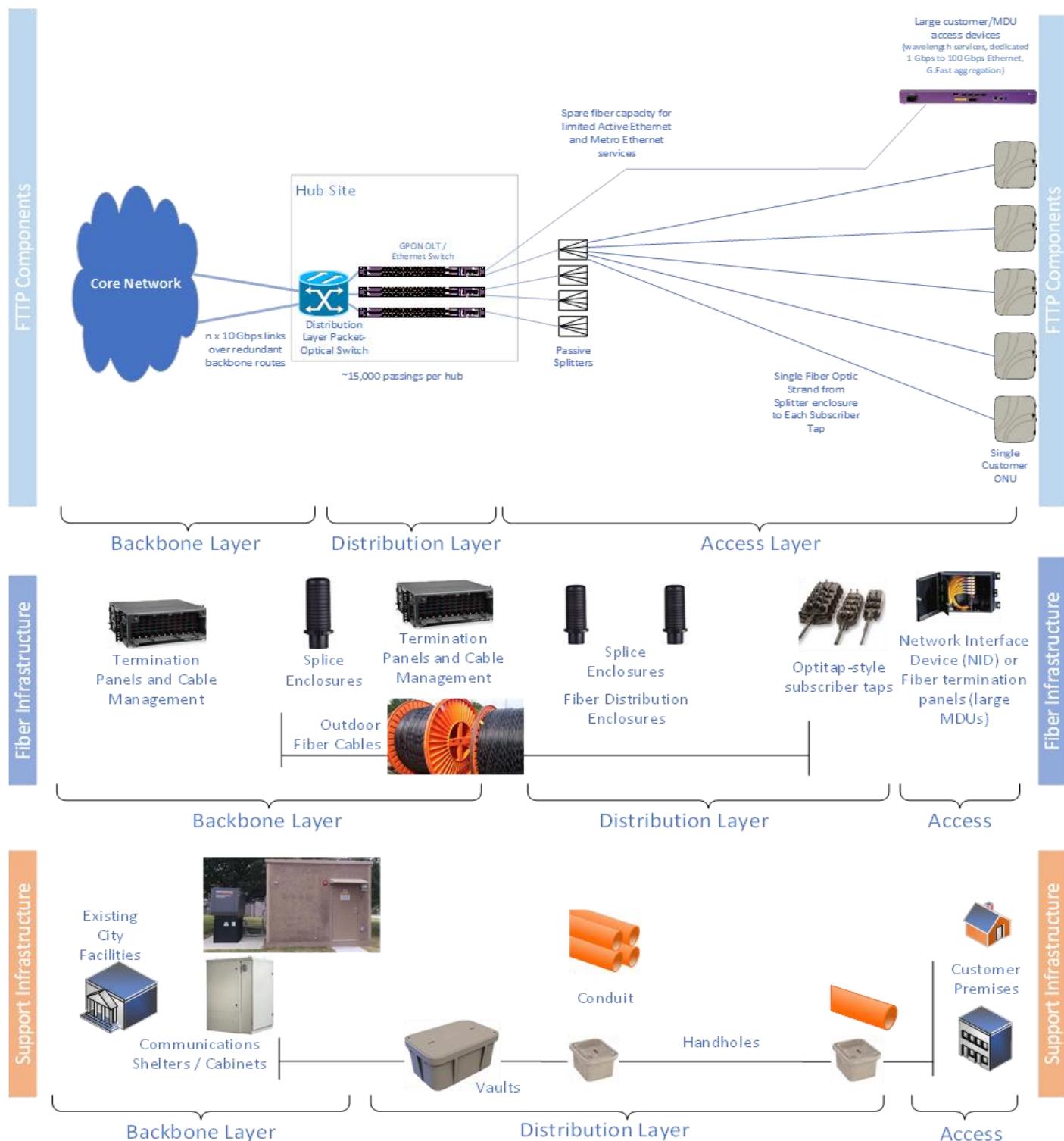
Figure 16 shows the conceptual architecture for the physical plant in the fiber-to-the-premises network. A hub will feed primary distribution conduit through distribution vaults located throughout the City. Some distribution vaults will be designated as equipment vaults, which contain splitters to feed secondary distribution conduit to tap access handholes located near residents. Each tap access handhole will then connect to drop access handholes located on the edge of the parcel but still within the City's right-of-way. By installing infrastructure to the edge of each premises parcel, costs are reduced for future installation to a subscriber.

Figure 16: Conceptual design for the fiber-to-the-premises network



The figure below shows a logical representation of the fiber-to-the-premises network architecture we recommend based on the conceptual outside plant design. It also illustrates the primary functional components in the fiber-to-the-premises network, their relative position to one another, and the flexibility of the architecture to support multiple subscriber models and classes of service.

Figure 17: High-level fiber-to-the-premises architecture and components



6.4.3 Deployment costs for a citywide network

The cost for the backbone and distribution plant contains the following elements:

- **Project management** encompasses overall project and contract management, including oversight of the construction and engineering contractor(s), equipment suppliers, and right-of-way agreements. We assumed a two-person project management team for three years.
- **Engineering and as-builts** includes system-level architecture planning, preliminary designs, and field walkouts to determine candidate fiber routing; development of detailed engineering prints and preparation of permit applications; and post-construction “as-built” revisions to engineering design materials.
- **Conduit and vault infrastructure** consists of all labor and materials related to underground communications conduit construction, including conduit placement, vault/handhole installation, and surface restoration; and includes all work area protection and traffic control measures inherent to roadway construction activities.
- **Utility pole make-ready** consists of the labor needed for preparing poles for the addition of new aerial cabling. This includes moving existing cables to make room for new cables or replacing poles if the existing pole is at maximum capacity.
- **Fiber optic cables and components** consists of the material and labor costs specific to the installation of fiber optic cables, taps, splice enclosures, and other related components, irrespective of the cable pathway (underground conduit or aerial placement).
- **Fiber splicing, testing, and documentation** includes all labor related to splicing of outdoor fiber optic cables.
- **Hub facilities and systems** consists of the material and labor costs of placing hub shelters and enclosures; related hub systems (backup power generation, cooling systems, etc.); and terminating backbone fiber cables within the hubs.
- **Post-Covid-19 market demand contingency** accounts for price increases on material due to supply chain interruptions during the Covid-19 pandemic. This contingency is not applied to the project management and engineering and as-builts categories because they do not incorporate construction material.

Electronics are not included in the backbone and distribution plant cost estimates.

We also provide the estimated cost for subscriber drops. This represents the cost of material and labor for installing aerial or underground infrastructure across a subscriber’s property. This cost does not include any customer premises equipment (CPE), such as a modem.

6.4.3.1 Design with 70 Percent aerial and 30 percent underground construction

When taking all of these considerations into account, the total cost of the design with 70 percent aerial and 30 percent underground is approximately \$65 million, or \$1,700 per passing. This cost is itemized in the following table. Note that the costs have been rounded (Table 10).

Table 10: Estimated capital cost for citywide backbone and distribution plan (70 percent aerial, 30 percent underground construction)

Cost category	Estimated cost
Project management	\$1,850,000
Engineering and as-builts	\$5,050,000
Conduit and vault infrastructure	\$22,150,000
Materials	\$3,950,000
Labor	\$18,200,000
Aerial strand	\$3,350,000
Materials	\$850,000
Labor	\$2,500,000
Utility pole make-ready	\$9,650,000
Fiber optic cables and components	\$11,750,000
Materials	\$8,400,000
Labor	\$3,500,000
Fiber splicing, testing, and documentation	\$2,500,000
Hub facilities and systems	\$250,000
Backbone and distribution plant total cost	\$56,550,000
Post-Covid-19 market demand contingency on construction material (15%)	\$7,400,000
Backbone and distribution plant total cost with contingency	\$63,950,000
Number of passings	37,588
Cost per passing	\$1,700

6.4.3.2 Design with 100 percent underground construction

The total cost of the design with 100 percent underground is approximately \$111 million, or \$3,000 per passing (Table 11). Again, note that the costs have been rounded.

Table 11: Estimated capital cost for citywide backbone and distribution plan (100 percent underground construction)

Cost category	Estimated cost
Project management	\$1,850,000
Engineering and as-builts	\$6,550,000
Conduit and vault infrastructure	\$73,900,000
<i>Materials</i>	\$13,250,000
<i>Labor</i>	\$60,650,000
Fiber optic cables and components	\$13,250,000
<i>Materials</i>	\$8,0,000
<i>Labor</i>	\$5,000,000
Fiber splicing, testing, and documentation	\$2,500,000
Hub facilities and systems	\$250,000
Backbone and distribution plant total cost	\$101,750,000
Post-Covid-19 market demand contingency on construction material (10%)	\$14,000,000
Backbone and distribution plant total cost with contingency	\$115,750,000
Number of passings	37,588
Cost per Passing	\$3,100

7 Policy and process recommendations

Interviews with public officials and ISPs in and around the City reveal various policy areas in which improvements could be made. Notable best practices that the City could adopt include passing a written Dig Once ordinance, re-evaluating aspects of the permitting process, expanding the GIS integration program, and increasing coordination with the private sector and regional initiatives.

7.1 Dig Once ordinance

The City of Vallejo does not currently have a Dig Once ordinance, but rather an internal policy for notifying interested parties of upcoming projects in the municipal right-of-way. A formal ordinance would provide clarity and consistency in directing and permitting telecommunications infrastructure projects and would also allow for strategic planning for new conduit or fiber routes to areas of priority for the City.

In our interview with the City's Public Works Department, we came to understand that some barriers exist to implementing the existing policy and should be considered when developing an ordinance. For example, there is little strategic or proactive communication with ISPs to help plan for infrastructure deployment; the City receives an application for an encroachment permit from providers as they develop their own, internal strategies within the City. Furthermore, we learned that the Planning Department does most communicating with outside entities and this communication is not generally coordinated with Public Works.

A best practice in these situations is for the City to develop relationships with the various ISPs operating in the City and have regular conversations with them about their plans, the City's plans, and plans from other entities such as PG&E to enter the right-of-way. In this way, the City could ensure that areas of strategic importance are being considered for the placement of fiber-ready conduit or fiber to help build out a citywide network.

Additionally, the City should adopt a policy mandating the installation of City-owned conduit (where it does not exist) in all new developments and open trenches. This policy, known as a shadow conduit policy, would allow the City to limit future disruption to its rights-of-way; both the City and the private sector would be able to install fiber without additional digging. This approach has been used to positive effect in cities such as Bellevue, Wash. Although it requires an upfront financial investment and a commitment of resources to manage and lease the conduit, over time it can eliminate significant costs and bottlenecks in the infrastructure construction process.

Model language for a Dig Once Ordinance is in Appendix C.

7.2 Permitting process and fees

Best practices from around the State and interviews with the City's Public Works Department and various private sector stakeholders illustrate possible improvements in the City's permitting process. If the City is looking for opportunities to make its construction environment more attractive to broadband providers, the City should consider reevaluating its traffic control plan requirements, continue to expand its online permitting application, and improve collaboration and communication efforts between departments.

Under the current municipal code, a traffic control plan is required for any modification of the telecommunications facility or wireless communications facility.²⁷ Feedback from entities looking to manage or build broadband infrastructure assets in the City unanimously agreed that this is an overly stringent policy. Many projects applying for right-of-way encroachment permits are minimally invasive, perhaps on the scale of working on a quarter of a block for one day. For projects of this size, that actual impact on traffic in the City is negligible, and to require a traffic control plan serves only to slow down the process. By amending this policy, ISPs and infrastructure management companies would more easily service Vallejo, and also those internal resources that are currently put towards approving and analyzing those traffic control plans could be dedicated elsewhere in the local government.

A possible improvement to the traffic control plan requirement could include new code detailing a distinction between major and minor projects.²⁸ In this scenario, major projects would be given a different set of standards and requirements than their more minor counterparts, creating a convenient mechanism to preserve traffic control plans in projects that really need them while allowing commonplace projects to proceed more efficiently. This has been implemented successfully across the State, with one of the nearest examples being the City of Oakland.²⁹

In addition to the traffic control plan, the City should continue to develop its online permitting application. Vallejo has used an online permitting application to centralize many different permitting processes since 2020. This is already a large step for municipalities to take and seems to have worked well since its introduction in the City. Continuing to maintain and build out the web application will ensure the private sector has easy access to entrance and will help facilitate

²⁷ City of Vallejo Municipal Code, Ord. No. 1769 N.C. (2d), § 1 (August 22, 2017),
https://library.municode.com/ca/vallejo/ordinances/municipal_code?nodeId=866721 (accessed April 13, 2022).

²⁸ It is important to note that the actual delineation can be more specific than simply between various "projects." For example, it could only separate encroachment projects, or excavation.

²⁹ City of Oakland Municipal Code,
https://library.municode.com/ca/oakland/codes/code_of_ordinances?nodeId=TIT12STSIPUPL_CH12.08EN
(accessed April 13, 2022).

planning. The City should also evaluate the application's data/analytics capabilities to ensure their departments can accurately track their own progress.

Centralized permitting also needs to occur offline. Interviews with the Public Works Department indicate that there is little collaboration (at least when it comes to independent carriers) between Public Works and Planning. Although each department has their own domain, increased coordination and communication between the two could help both in the short term by alleviating and/or preempting issues, but also by assisting long-term planning. To accomplish both of those goals, the City should leverage the shared online permitting center to achieve more frequent and fruitful interdepartmental communication.

Additionally, applicants should note whether they have any pending applications for federal and State funding for the infrastructure; this will help inform citywide strategic planning and ensure alignment with other approval processes.

Finally, the City should update its written policies to include language explicitly allowing such construction methods outlined in Senate Bill 378, such as microtrenching. According to SB 378, "the local agency with jurisdiction to approve excavations shall allow microtrenching for the installation of underground fiber if the installation in the microtrench is limited to fiber, unless the local agency makes a written finding that allowing microtrenching for a fiber installation would have a specific, adverse impact on the public health or safety."³⁰ Broadening the allowed construction methods to include microtrenching not only would hasten the deployment of new fiber, but would also align the City with this State law.

7.3 GIS integration

Maintaining accurate data on the location of existing infrastructure will be key to many of the City's goals. The City is already using the new online permitting application to great effect in this realm. The online permitting application has full GIS integration for planned and recent projects, allowing users to see locations, times, and descriptions of these projects. This information is valuable for the private sector and would enable the City to enforce an effective Dig Once policy.

However, there is a blind spot in the City's GIS database: The City currently has little to no centralized mapping of existing infrastructure (i.e., installed before the current permitting system). Because the majority of broadband infrastructure was put in place before the inception of online permitting applications, it is a near universal challenge for all municipalities to

³⁰ California State Senate, "SB. 378,"

https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220SB378 (accessed April 14, 2022).

understand where assets are located, and who owns them. Among other challenges, this impedes the City from identifying areas that lack infrastructure and might be a high priority.

The City should continue to work on the GIS integration of the online permitting application so that they may add previously processed permits to the database. Furthermore, the work should continue to include on the same map information on past, present, and future broadband infrastructure plans.

One possible administrative method of executing this level of GIS integration would be to require any relevant broadband permitting applicant to attach a KMZ, shapefile, or similarly usable type file of the location, shape, and type of the infrastructure on which they plan to work. This would quickly allow for the mapping of most assets that will be built or managed in the future.

To develop an understanding of where infrastructure has been placed historically, the Public Works Department, whenever time and resources allow for it, could go through any remaining previously approved permitting applications and upload rough sketches of where the broadband assets are placed.

However, while an easily understood visualization of where broadband infrastructure exists could aid the City in achieving its strategic goals, ISPs have historically opposed efforts to publicly document their assets—because that information could open doors to competing ISPs who are interested in serving gaps in the incumbents' networks. Therefore, the City should be prepared for some amount of pushback from the industry.

7.4 Engagement with the private sector

Through an outreach initiative with private providers in and around the City, a bottleneck in transparency has emerged. Without readily available market information, private sector stakeholders are unable to evaluate Vallejo as a potential service area.

The City could jumpstart private sector interest by making the following types of information public:

1. Locations, employee counts, and industry of all medium and large businesses in the City.
2. Locations and technical specifications for any current or planned data centers. Additionally, any lots/land that appear to be particularly viable for future data centers.
3. The locations and populations of multi-dwelling units.
4. Any current gaps in infrastructure, including any areas that the City feels is a priority.

The City should engage with ISPs on a regular basis to discuss strategic deployment of broadband assets and aligning capital projects with the City's needs. Comcast, for example, has indicated it

has plans to upgrade its infrastructure in Vallejo; the City should be discussing with them ways to facilitate that effort.

7.5 Interconnections with neighboring cities and regional efforts

Additional coordination with neighboring public sector entities is recommended to best align the City with regional efforts. Broadband infrastructure and the internet are not contained within political borders, and much of the strategizing occurs on scales larger than a single municipality. It would be wise for the City to communicate with Solano County and the cities of Fairfield and Vacaville; all are either in the process of or considering developing broadband master plans.

The City should also communicate with the California Department of Technology to coordinate planning with the California for All Middle-Mile Broadband Initiative.³¹ This project will fund at least 18 open-access middle-mile infrastructure projects throughout the State, the nearest one to Vallejo being in San Leandro.

³¹ California Department of Technology, “Middle-Mile Broadband Initiative,” <https://middle-mile-broadband-initiative.cdt.ca.gov/> (accessed April 13, 2022).

8 Programmatic recommendations

The digital divide cannot be resolved just by building broadband infrastructure. Unlike the landscape in 2016, today there is a new funding environment and specific attention on other barriers to connectivity. This expansion of broadband policy has created a host of other opportunities that can be leveraged to provide benefits to the residents of the City of Vallejo. To minimize expenditures on these programs, the City should monitor the State's development of a statewide Digital Inclusion Strategy which will include support for implementing programmatic solutions.

This Broadband Master Plan recommends that the City create campaigns and programs that can promote the significant number of digital literacy programs that already exist in the area and that are supported by ongoing State funding opportunities, and to support the development of additional digital literacy projects that will likely evolve as the result of new funding sources.

The City can also work with providers and community-based organizations to support outreach efforts to promote carrier-neutral broadband affordability programs and programs that offer discounted devices such as laptops and tablets.

Finally, to better understand the types of connections City residents are using and where gaps in connectivity may continue to exist, the City could promote internet speed testing using readily available applications.

Each of these options are discussed in further detail below.

8.1 Digital literacy

Ubiquitous access to high-speed internet does not serve a community if residents lack the skills to navigate online content safely and effectively. The concept of “digital literacy” embodies these skills and is further defined in the IIJA as “the skills associated with using technology to enable users to find, evaluate, organize, create, and communicate information.”³²

Digital literacy programs teach individuals and families how to perform everyday online tasks that may seem self-evident to more experienced users including, how to sign up for a free email account, how to find relevant and useful information, how to navigate translation and in-language services, how to use online banking or bill payment, and even how to use Zoom. More advanced training could include cybersecurity, using Google Maps and how to navigate social media and avoid “fake news.” It is often the lack of these skills that create barriers to connectivity.

³² Infrastructure Investment and Jobs Act of 2021, Public Law 117-58, Division F, Title III USC § 60301 *et seq.*, (Digital Equity Act of 2021, <https://www.congress.gov/117/plaws/publ58/PLAW-117publ58.pdf> (accessed April 13, 2022).

To help City residents overcome this barrier, the City of Vallejo should consider partnering with community organizations to promote or provide these classes. Below is a list of potential partners, many of which are already serving in this space. While this is not intended to be an exhaustive list, it represents a wide variety of organizations and agencies that may be willing to partner with the City to develop creative outreach and program solutions in the short term, as well as agencies that could help the City prepare for the application process of various sources of digital equity funding that will be available via the State digital equity grants that are currently being developed. These funding opportunities for digital equity projects are discussed in further detail in Section 9.

8.1.1 Senior Planet

Senior Planet (from AARP) provides a host of online classes for seniors to learn how to navigate online. Their courses cover such topics as technology tutoring and discussion groups, fitness apps, and online bill pay, and are all available virtually and many are in-language.

8.1.2 Ability Now Bay Area

Ability Now provides similar programs to those provided by Senior Planet, but with a focus on people living with developmental disabilities

8.1.3 EveryoneOn

EveryoneOn is a national organization that has aggregated several online education tools that can be used to supplement a comprehensive digital literacy program.

8.1.4 Digital Literacy Rocks!

[Solano County Computer and Digital Skills Center](#) offers an array of paid, instructor-led classes to help participants build digital skills.

8.1.5 Tech Exchange

An Oakland-based organization that sells refurbished devices at discounts, manages free device programs, provides minor tech support services and a small number of online digital literacy classes, including some classes in-language. This organization currently partners with the Oakland School District and Oakland Undivided to provide devices at no or low cost and minor tech support to those students.

8.1.6 Human-i-t

This program [provides self-paced computer and internet training](#), and also works with organizations to provide low-cost computers and devices.

8.1.7 Internet for All Now

Internet for All Now is a program funded by the California Emerging Technology Fund primarily intended to advocate for digital inclusion policy initiatives at the State and local levels. However,

its website also has outreach materials for affordability programs and federal subsidies (such as the Affordable Connectivity Program).

8.1.8 Workforce Development Board of Solano County

Although primarily focused on workforce development activities, the WDB could be an effective partner in outreach and promotion of digital literacy programming, or even working with the City to develop curricula.

8.1.9 Solano County Library

Again, a non-traditional partner in this field, but the [City of San Jose Public Libraries](#) have had great success developing and implementing digital literacy curricula in collaboration with [the California Emerging Technology Fund](#) – a model that City of Vallejo should consider exploring.

8.2 Broadband affordability

The City should consider creating campaigns and initiatives to promote broadband affordability programs, including device distribution programs. Research demonstrates that these programs are generally undersubscribed because people are unaware of them or do not understand how to apply for them.³³

8.2.1 Service provider affordability programs

While ISPs do not generally release details on their programs' enrollment,³⁴ both Comcast and AT&T have broadband affordability programs available to the residents of Vallejo. AT&T's Access service provides either 100 Mbps for \$30 or 10 Mbps download speeds for up to \$10 per month, or both services may be available depending on the network technology serving the household. AT&T provides no advertised minimum upload speed commitment with either offering. The

³³ Tyler Cooper & Jason Shevik, "Emergency Broadband Benefit Recap: 7.1 Million Households Enrolled, Adoption Varies Significantly by State," (Broadband Now, December 16, 2021), <https://broadbandnow.com/internet/emergency-broadband-benefit-report> (accessed April 13, 2022); See also, California Emerging Technology Fund, "Recommendations for ISPs to Consider in Responding to COVID-19", April 28, 2020, <https://www.cetfund.org/recommendations-for-internet-service-providers-to-consider-in-responding-to-covid-19/> (last accessed April 13, 2022).

³⁴ Indeed, policy makers have often had difficulty getting information about these provider-sponsored discount programs. To ensure that these programs can be an important tool to fill the affordability gap, the California Legislature recently required that service providers report enrollment and describe service offerings for these discount programs when requested by the CPUC. The new statutory requirement, Pub. Util. Code Section 884.2, grants the CPUC authority to require that California ISPs must report on "each free, low-cost, income-qualified, or affordable internet service plan advertised by the provider." While it may be that some of the information from this reporting will be confidential, it is likely that the CPUC will make general information about these programs available to the public so that stakeholders, like the City, can develop outreach materials for its residents. The CPUC has yet to announce rules for this reporting. Pub. Util. Code Section 884.2 is available at https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=PUC§ionNum=884.2. (accessed April 13, 2022).

program includes free installation and equipment and does not require a contract or deposit. In some cases, households will have a monthly data allowance of either 150 gigabytes or 1 terabyte and are charged \$10 per 50 GB overage.³⁵

Comcast's low-income offering is called Internet Essentials. Comcast also offers two tiers of service, a 100 Mbps download and 10 Mbps upload service for \$30 and a 50 Mbps download and 5 Mbps upload at \$10 per month. Comcast also offers bundles with a wireless service for a further discount. This is not a fiber-based service and the available speeds for this service will depend on whether Comcast has performed upgrades to its network. Comcast offers a broader set of qualifying low-income programs than AT&T's Access service, but Comcast does not have an income qualification option.³⁶

Both AT&T and Comcast are also participating in the Affordable Connectivity Program (ACP). The ACP, discussed further below, provides subsidized and discounted broadband service and broadband capable devices to eligible households.³⁷ AT&T and Comcast encourage customers to apply for and become qualified for the ACP before signing up for their corporate discounted services.³⁸ ACP subsidizes a service provider up to \$30 for a service offering and up to \$100 for a device.³⁹ In most cases, combining the ACP subsidy and the discounts offered under the Access or Internet Essential programs provide the end user customer with a free broadband service.

The City should prioritize outreach and marketing campaigns to inform City residents about these programs and how the ACP and service provider discount programs can work together. The City can, for example, create and provide informational materials about these programs to City and County agencies that work with eligible populations such as the Department of Housing and Community Development or the City Water Department. These agencies can, in turn, send

³⁵ AT&T, "Access from AT&T," <https://www.att.com/internet/access/> (accessed December 26, 2021). This service is open to "qualifying" households that participate in the Affordable Care Program, Supplemental Nutrition Assistance Program (SNAP) or Supplemental Security Income (SSI) for California households only. AT&T also extends eligibility to include households at 200 percent or less of the federal poverty line, and those participating in the National School Lunch Program (NSLP).

³⁶ Comcast, <https://www.internetessentials.com/covid19> (accessed March 30, 2022).

³⁷ In the Matter of Affordable Connectivity Program WD Docket 21-450, Report and Order and FNPRM (FCC 22-2) (January 21, 2022) (ACP Final Rules), <https://docs.fcc.gov/public/attachments/FCC-22-2A1.pdf> (accessed January 27, 2022).

³⁸ Comcast, "Comcast Expands Affordable Connectivity Program Offers with Faster Internet Essentials Service and Xfinity Mobile" (March 1, 2022), <https://corporate.comcast.com/press/releases/comcast-affordable-connectivity-program-internet-essentials-service-xfinity-mobile> (accessed April 4, 2022); AT&T, <https://www.att.com/help/affordable-connectivity-program/internet/existing-customer/> (accessed April 4, 2022).

³⁹ Federal Communications Commission, "Affordable Connectivity Program," <https://www.fcc.gov/acp> (accessed April 4, 2022).

informational fliers to their clients and participants in their own low-income programs such as the Water Rate Assistance Program.

As another example, the City can work with Solano County to distribute ACP materials to participants in the WIC program or could work with local economic development organizations and various chambers of commerce, such as the Hispanic, Black, or Vietnamese Chambers of Commerce to help better promote this program. Existing non-profit and community-based organizations can also help facilitate communications with affected populations such as seniors, English-language learners, or people living with disabilities. These community partners will often have toolkits and in-language material posted online or available for distribution about these discount programs so that the City can leverage these existing resources to help advance its own outreach efforts.

Some of the groups listed above, including Tech Exchange, EveryoneOn and Human i-t, also manage device discount programs. For example, the organization EveryoneOn is working with another statewide nonprofit, the California Emerging Technology Fund, to provide a referral program that reaches out directly to families in the Vallejo City School District to provide them with information and further referrals to the federal Affordable Connectivity Program, carrier discount services and discounted devices.⁴⁰

8.2.2 California LifeLine Program

In addition to wireline carrier affordability programs, the California Public Utilities Commission (CPUC) manages the State's low-income telephone program, also known as California LifeLine. This program differs from the ACP discussed above because it provides discounts for wireless voice and data services and voice-only wireline service to eligible households in California. Like ACP, participation in the program by wireless and cable is voluntary and not all service providers offer LifeLine discounts. As part of the T-Mobile/Sprint merger transaction, T-Mobile has committed to participate in LifeLine through its affiliate Assurance Wireless at least until 2025.⁴¹

⁴⁰ EveryoneOn, <https://www.everyoneon.org/find-offers-vallejocityusd?custom=1&partner=vallejocityusd> (accessed March 30, 2022).

⁴¹ Description of the Assurance California Plan is available at <https://www.assurancewireless.com/lifeline-services/states/california-lifeline-free-government-phone-service> (accessed March 31, 2022); see also, the CPUC's press release "CPUC Approves Merger of Sprint and T-Mobile" (April 16, 2020), <https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M333/K367/333367934.PDF> (accessed March 31, 2022).

In 2021, Verizon and TracFone also committed to ongoing LifeLine participation through the TracFone brand as part of Verizon's purchase of Tracfone.⁴²

The California LifeLine discount program provides discounts on wireline and wireless service to eligible households. Eligibility is defined as a household that participates in at least one of 10 qualifying state and federal social services programs such as Medicaid/Medi-Cal, Federal Housing Assistance, or Veteran's benefits or the household can demonstrate that it has an income of less than 150 percent of the federal poverty level. This program works with the federal LifeLine program to coordinate customer discounts. The program has been offering discounts for low-income wireline voice customers for almost 40 years. Today, a wireline customer will pay between \$8 and \$12 per month for voice-only service. In Vallejo, this offer is only available through AT&T wireline service. A LifeLine customer can bundle a discounted voice service with a broadband service from AT&T.⁴³

LifeLine discounts for wireless services are more popular. While only the reseller-affiliates of the facilities-based carriers participate in this program, and AT&T has no participation whatsoever, there are 10 smaller wireless resellers such as TracFone, Assurance Wireless, and Truconnect that participate in the program.⁴⁴

Eligible customers can receive substantial discounts on wireless voice and data services from participating providers. While the plans vary, the minimum service standards for the program require unlimited talk and text and approximately 4 GB to 6 GB of data monthly all at no cost to the end user; providers also usually provide a device for no cost to the end user in most cases.⁴⁵

⁴² TracFone offers LifeLine service under the SafeLink brand name. More information is available at <https://www.safelinkwireless.com/Enrollment/Safelink/en/Web/www/default/index.html#!/welcomeCenter>; see also, the CPUC's press release "CPUC Requires Consumer Protection Measures for Verizon's Acquisition of TracFone" (November 18, 2021),

<https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M424/K116/424116598.PDF> (accessed March 31, 2022).

⁴³ The CPUC has information about the program available at <https://www.cpuc.ca.gov/consumer-support/financial-assistance-savings-and-discounts/lifeline/california-lifeline-eligibility> (accessed March 31, 2022) and the program has its own website for consumers in multiple languages, <https://www.californialifeline.com/en> (accessed April 13, 2022).

⁴⁴ CPUC Lifeline Program subscription data for 2022, broken down by participating providers, https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/communications-division/documents/lifeline/customer-count/2022_maximussubscribercountsasof_03152022.xls (accessed April 13, 2022).

⁴⁵ California Public Utilities Commission, Docket R.20-08-002, Decision Establishing Specific Support Amount and Minimum Service Standards, D.20-10-006 (October 8, 2020), at Attachment 1, <https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M348/K751/348751101.PDF> (accessed April 13, 2022); See, for example the LifeLine offering for TruConnect Wireless in California, https://www.truconnect.com/offers/ca?utm_source=google&utm_medium=cpc&campaignid=15995630053&adgroupid=132656566956&creative=576644589099&keyword=free%20cell%20service&gclid=CjwKCAjw6dmSBhBkEiA_W-EoHvhZoKGhbKOMFzs5USjQgHobqtaEs6CitXJt8bwrrQy9rNSz0aXvRoC2CYQAvtD_BwE (accessed April 13, 2022).

The wireless provider will receive a \$25 subsidy from State and federal LifeLine funds. LifeLine customers also have access to Wi-Fi services in some cases.

These discounted mobile wireless services are insufficient for a low-income household to reliably work from home, engage in online learning, or participate in other critical online activities. However, in light of the affordability and access barriers to residential broadband service discussed above, many low-income households rely on their mobile wireless service and smartphones for home internet access.⁴⁶ As the City considers all options to support data, internet and broadband connectivity for its most vulnerable residents, information about the California LifeLine program be part of the affordability toolkit that the City makes available as part of outreach efforts.

8.2.3 Federal Affordable Connectivity Program Outreach Funding

As discussed in more detail below, a cornerstone of the federal government's policy to promote affordable broadband access is the Affordable Connectivity Program. Through the IIJA, the FCC is tasked with implementing this \$14 billion subsidy program for broadband services and devices. As part of the statutory structure for this program, Congress directed the FCC to adopt a framework to ensure that information about the program will be disseminated through multiple stakeholders to the intended beneficiaries.⁴⁷

In a recent rulemaking, the FCC lays out a detailed outreach plan that encompasses requirements for educating potential customers about the program through the efforts of the FCC and service providers, as well as cross-agency collaboration (e.g., disseminating information through other social services programs).⁴⁸ The FCC also requires its own staff, as well as the agency that administers the ACP, to develop "comprehensive provider education and training programs, as well as consumer outreach plans."⁴⁹ These materials may prove valuable for the City to develop its own outreach and engagement efforts, in partnership with local agencies, as discussed above.

The FCC also issued a proposal for public comment regarding an outreach grant program that will dedicate millions of dollars to an FCC-administered process that will provide direct funding for outreach and consumer education efforts.⁵⁰ While the authority for this grant program is laid out

⁴⁶ Andrew Perrin, "Mobile Technology and Home Broadband 2021," Pew Research Center, June 3, 2021, <https://www.pewresearch.org/internet/2021/06/03/mobile-technology-and-home-broadband-2021/> (accessed April 14, 2022).

⁴⁷ IIJA, Division F – Broadband, Title V, Section 60502(a)(10).

⁴⁸ In the Matter of Affordable Connectivity Program WD Docket 21-450, Report and Order and Further Notice of Proposed Rulemaking (FCC 22-2) (January 21, 2022) (ACP Final Rules), paragraphs 190-209, <https://docs.fcc.gov/public/attachments/FCC-22-2A1.pdf> (accessed January 27, 2022).

⁴⁹ ACP Final Rules, paragraph 208.

⁵⁰ ACP Final Rules, at paragraphs 270-280.

in statute, the FCC still has many open questions that it must answer before it can issue rules for this outreach program. In its Rulemaking for the ACP, the FCC requested further public comment on many aspects of the grant program including what types of entities should be eligible to request and receive grants and whether local agencies and government entities will be eligible for the funding. The FCC also requested comment on the types of outreach activities that will be eligible for funding under this program, application processes, and the reporting requirements for grant recipients. The FCC likely will issue rules and begin to take grant applications for this program in late third quarter 2022.

Despite the months-long wait, the City should monitor this program closely and work with local non-profit agencies, such as those discussed above, to explore funding opportunities through this outreach grant program to support consumer education and outreach work, as well as support for application processing. The City should ensure that its potential community partners are aware of the development of this program and that these potential partners coordinate with the City, and other regional stakeholders, before applying for funding under this program.

8.3 Broadband speed testing

To maximize the City's eligibility for State and federal funding sources—especially those created by California SB 156 and the Infrastructure Investment and Jobs act, it is critical that actual connection speeds be mapped in the community. While the maps developed for this report show connection speeds reported by ISPs (i.e., FCC Form 477), developing more accurate and granular data would strengthen the City's planning efforts.

The City should target areas of particular interest and then deploy any of the readily available speed test tools, such as Ookla, to accurately map available connection speeds beyond those that are reported to the federal government or advertised as available by ISPs.

9 Federal and State funding opportunities

The federal government has allocated billions of dollars to support broadband infrastructure and programs nationwide as part of both ARPA and the IIJA. The State of California has also committed funding to address broadband access and adoption gaps.

9.1 Federal funding

Significant new funding sources have recently been authorized that will expand the opportunities to create meaningful programs to expand digital access and equity for communities across the country. These programs will develop at both the federal and State levels and be the subject of significant rulemaking processes for design and implementation, making the next two years important for Vallejo, the local service providers and community-based organizations to prepare for and implement new funding and program opportunities.

For example, the Treasury Department has rules regarding the framework and requirements for spending the American Rescue Plan Act funds and the U.S. Department of Commerce's National Telecommunications and Information Administration (NTIA) is currently taking public comment and preparing rules to implement key broadband deployment and equity pieces of the Infrastructure Investment and Jobs Act (IIJA).⁵¹ Also during this time, as discussed briefly above the FCC has implemented the \$14 billion Affordable Connectivity Program to support affordable data services to eligible households for either wireless or wireline services.

The most significant funding opportunities are discussed in more detail below. These programs, along with several others, provide the City a point of reference to further analyze how it can use these funding programs to help it achieve its broadband access goals for the City and the surrounding area.

9.1.1 Infrastructure Investment and Jobs Act

The \$1 trillion Infrastructure Investment and Jobs Act (IIJA)—including \$65 billion in broadband funding for extensive deployment and digital equity initiatives—was signed into law on November 15, 2021. The NTIA is directed by Congress to implement programs that will consist of \$48.2 billion of the IIJA broadband funds and the Agency is currently in the process of drafting rules for implementation of several of the programs. NTIA is charged with issuing rules for the broadband deployment funding by May 14, 2022, which will set guidelines for the application

⁵¹ Infrastructure Investment and Jobs Act, Public Law 117-58, Division F, 2021, <https://www.congress.gov/117/plaws/publ58/PLAW-117publ58.pdf> (accessed April 13, 2022).

process.⁵² As part of this process, NTIA is directed to use federal broadband deployment maps, which are still in development, to determine the allocation of broadband deployment funding to the states. The NTIA may make preliminary funding disbursements based on existing mapping data, which would make some of the funding available on a much shorter timeframe. In either event, once that money is distributed, states are directed to develop a comprehensive set of grant programs to further distribute the money to subrecipients with the goal of expanding broadband access and digital equity to benefit communities throughout each state. Additionally, applications for the Digital Equity Planning program included in the IIJA will not be accepted until October of 2022, yet the Act sets out significant pre-planning requirements for the states that include providing opportunities for public input on digital equity throughout the year.⁵³

There is still much work to be done at the federal level and possible opportunities for local entities to open a dialogue with the state agencies tasked with applying for and distributing this funding. In California, the CPUC and the Department of Technology (CDT) have been identified as the agencies primarily responsible for standing up programs with this broadband funding. The IIJA places a strong emphasis on community outreach and engagement at several steps in the funding and program process for both broadband deployment and digital equity. Over the coming months, the agencies responsible for administering the funds at the federal and state level may release more requests for comments; develop frameworks and rules; and issue notices of funding opportunities—including for the kinds of programs that could address gaps in Vallejo. The City should monitor and participate in the process as this funding flows from the NTIA and FCC, down to the State level (CPUC and CDT) for further distribution to local agencies, communities, and service providers.

The NTIA will administer \$48.2 billion of the broadband funding through the following programs:⁵⁴

- *Broadband Equity, Access, and Deployment (BEAD) Program:* \$42.45 billion “for broadband deployment, mapping, and adoption projects”

⁵² NTIA issued a request for comment on January 10, 2022, regarding the broadband deployment funding program, the digital equity planning grant program, and the middle-mile grant program. Notices for comment on additional digital equity and Tribal programs will be forthcoming. More information is available at https://www.ntia.gov/files/ntia/publications/iija_broadband_rfc.pdf (accessed January 27, 2022).

⁵³ The legislature has a pending bill that directs the California Department of Technology to begin the State’s Digital Equity Plan development process in consultation with “the public, California Public Utilities Commission and the Broadband Council”—AB2750 (Bonta, 2022), available at

https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220AB2750 (accessed April 13, 2022).

California legislature is also considering a very high-level Digital Equity Bill of Rights, AB2753 (Reyes, 2022), available at https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220AB2753 (accessed April 13, 2022).

⁵⁴ NTIA, “Grants,” <https://ntia.gov/category/grants> (accessed November 17, 2021).

- *Digital Equity Act Programs:* \$2.75 billion “for grant programs that promote digital inclusion and equity to ensure that all individuals and communities have the skills, technology, and capacity needed to reap the full benefits of our digital economy”
- Tribal Broadband Connectivity Program: \$2 billion
- *Enabling Middle-Mile Broadband Infrastructure Program:* \$1 billion “for the construction, improvement or acquisition of middle-mile infrastructure”

Of these, BEAD and the digital equity programs represent opportunities for securing funding—based on the local prioritization and, potentially, a successful grant application to the competitive element of the digital equity program. Also, the IIJA allocates an additional \$14 billion to the Affordable Connectivity Program—a subsidy that likely will go directly to low-income broadband subscribers.

9.1.1.1 Broadband Equity, Access, and Deployment (BEAD) Program

California will receive a minimum of \$100 million in BEAD funding—representing the initial minimum distribution to each state.⁵⁵ Additional allocations will be distributed based on a state’s unserved and high-cost areas.

NTIA reports that “the first priority for funding is for providing broadband to unserved areas (those below 25/3 Mbps), followed by underserved areas (those below 100/20 Mbps), and then serving community anchor institutions (1/1 Gbps).”⁵⁶ Funding will be sent to states who will then make sub-grants. A subgrantee that receives funding to deploy a network will be required to ensure the networks capable of delivering at least 100/20 Mbps service within four years of the date of the subgrant—and to offer a low-cost service for low-income subscribers.⁵⁷

While Vallejo may not qualify as an “underserved” eligible area for deployment funding given the advertised availability of 100 Mbps service, the law also provides for other applications for BEAD grants that will be further developed by NTIA. The statute allows funding to be used for broadband planning (up to 5 percent of funding), connecting anchor institutions such as City

⁵⁵ Broadband USA, “Broadband Equity, Access, and Deployment (BEAD) Program,” <https://broadbandusa.ntia.doc.gov/resources/grant-programs/broadband-equity-access-and-deployment-bead-program> (accessed April 5, 2022).

⁵⁶ NTIA, “Grants,” <https://ntia.gov/category/grants> (accessed November 17, 2021); see also, IIJA, Division F, Title I, § 60102(h)(1), <https://www.congress.gov/bill/117th-congress/house-bill/3684> (accessed November 17, 2021).

⁵⁷ IIJA, Division F, Title I, § 60102(h)(4), (h)(5), <https://www.congress.gov/bill/117th-congress/house-bill/3684> (accessed April 5, 2022).

facilities, supporting broadband adoption efforts such as digital literacy programs, and constructing infrastructure to serve low-income families in multi-dwelling buildings.⁵⁸

After the NTIA releases its rules, the next step will be the allocation of funding to the states and several yet-to-be-finalized dates for states to submit a series of planning documents and applications. Due to the complexity of this process, and the reliance on FCC's new broadband mapping process to identify "eligible areas" for funding, it is unlikely that any funding will be available to local entities prior to the fourth quarter of 2022. Yet, it is likely that federal, state, and local agencies will spend significant resources throughout this year to plan for these projects, including work to solicit local community input and engagement. City of Vallejo should prioritize communication with the California Department of Technology and the CPUC to ensure that your community needs are represented in the decision-making process.

9.1.1.2 Digital Equity Planning Grant Program

NTIA's digital equity program comprises three elements:

1. State Digital Equity Planning Grant Program (\$60 million)
2. State Digital Equity Capacity Grant Program (\$1.44 billion)
3. Digital Equity Competitive Grant Program (\$1.25 billion)

NTIA has stated that these programs aim "to promote the meaningful adoption and use of broadband services across the targeted populations in the Act, including low-income households, aging populations, incarcerated individuals, veterans, individuals with disabilities, individuals with a language barrier, racial and ethnic minorities, and rural inhabitants."⁵⁹

The State Digital Equity Planning Grant Program provides funding directed toward state broadband offices to develop digital equity plans, with required local stakeholder engagement and input. These plans serve as the framework for each state's digital equity projects that can be funded through the State Digital Equity Capacity Grant Program. The State Digital Equity Capacity Grant funding will be distributed in annual grants to each state over five years "to implement digital equity projects and support the implementation of digital equity plans."⁶⁰ States are directed to use this money to establish programs to fund both statewide and local digital equity efforts. The Digital Equity Competitive Grant Program differs from the other two programs

⁵⁸ IIJA, Division F, Title I, § 60102(d)(2), (e)(1), <https://www.congress.gov/bill/117th-congress/house-bill/3684> (accessed April 5, 2022).

⁵⁹ NTIA, "Grants," <https://ntia.gov/category/grants> (accessed November 17, 2021).

⁶⁰ BroadbandUSA, "NTIA's Role in Implementing the Broadband Provisions of the 2021 Infrastructure Investment and Jobs Act," <https://broadbandusa.ntia.doc.gov/news/latest-news/ntias-role-implementing-broadband-provisions-2021-infrastructure-investment-and> (accessed November 17, 2021).

because it allows for grants from the NTIA directly to local agencies, and other community organizations such as nonprofits, anchor institutions including schools, Tribal entities, and workforce programs.⁶¹

Current and anticipated efforts in Vallejo to address digital equity issues may qualify for funding under these federal digital equity programs, but more clarity and guidance will come as NTIA issues rules and guidance for these programs. Similar to the efforts described for the BEAD program, the City should remain vigilant to information about the development of these programs and opportunity for public input and collaboration with key community partners.

9.1.1.3 Enabling Middle-Mile Broadband Infrastructure Program: \$1 billion “for the construction, improvement or acquisition of middle-mile infrastructure”

The NTIA will also oversee a new direct grant program related to middle-mile infrastructure expansion.⁶² This program likely will not be available in urban areas with extensive cable coverage, like Vallejo. The Middle-Mile Broadband Infrastructure Program (MMBIP) is a means of maximizing creative partnerships between middle-mile providers (including state and local entities) with providers or entities that have last-mile solutions but may lack the incentive or resources to build the backbone necessary to reach the harder to reach places in rural America. Additionally, the program seeks to “to promote broadband connection resiliency through the creation of alternative network connection paths that can be designed to prevent single points of failure on a broadband network.”⁶³

Eligible areas must lack service offerings of at least 25/3 Mbps. This requirement alone will make areas such as Vallejo, with extensive wired broadband coverage, unlikely candidates for this funding. If awarded funding, grantees will have to prioritize:

1. Connecting resulting infrastructure to last-mile networks that will provide services to households in unserved areas
2. “Connecting non-contiguous trust lands”
3. Offering wholesale service at reasonable rates on carrier-neutral basis

⁶¹ BroadbandUSA, “Digital Equity Programs,” <https://broadbandusa.ntia.doc.gov/digital-equity-programs> (accessed April 5, 2022); see also, IIJA, Division F, Title III § 60305 (Digital Equity Competitive Grant Program), <https://www.congress.gov/117/plaws/publ58/PLAW-117publ58.pdf> (accessed April 13, 2022).

⁶² BroadbandUSA, “Enabling Middle Mile Broadband Infrastructure Program,” <https://broadbandusa.ntia.doc.gov/resources/grant-programs/enabling-middle-mile-broadband-infrastructure-program> (accessed April 5 2022); see also, IIJA, Division F, Title IV, §§ 60401 *et seq.*, <https://www.congress.gov/117/plaws/publ58/PLAW-117publ58.pdf> (accessed April 13, 2022).

⁶³ IIJA, Division F, Title IV, § 60401(b)(1) (Enabling Middle Mile Broadband Infrastructure), <https://www.congress.gov/117/plaws/publ58/PLAW-117publ58.pdf> (accessed April 13, 2022).

Grantees will also have to ensure that the infrastructure proposed can deliver gigabit speeds for the eventual last-mile connections to anchor institutions and provide direct interconnections that will “facilitate the provision of broadband service to anchor institutions located within 1,000 feet of the middle-mile infrastructure.”

Rules are expected in May. Once issued, awards are expected to be made within nine months and grantees will be expected to complete construction within five years of the award (which may be extended). Eligible entities are States and divisions of local government as well as tribal entities and territories, nonprofits and cooperatives. Partnerships are encouraged.

9.1.1.4 The \$14 billion Affordable Connectivity Program will subsidize broadband bills for eligible low-income subscribers

The IIJA also allocates \$14.2 billion for an Affordable Connectivity Program (ACP) to be administered by the FCC. The FCC released its rules for the ACP on January 21, 2022.⁶⁴ This program will provide \$30 monthly subsidy to service providers toward a discounted broadband subscription for eligible low-income residents. The ACP will also subsidize the cost of a “connected device” up to \$100, including laptops, desktops and tablets, but not cell phones or tablets with cellular service capabilities.⁶⁵ The ACP has broad eligibility criteria allowing households at 200% of poverty or those participating in a wide variety of federal subsidy programs to qualify for these benefits.

While the ACP has significant potential to support access to robust residential broadband service for low-income households, the success of the ACP will hinge on the ease of the enrollment process and strong outreach and education about the program, including in partnership with participating ISPs. As discussed above, Congress allowed money appropriated to the ACP to be used for outreach and education purposes. The FCC has expressed strong support for the need for robust outreach and has developed outreach materials and created an “outreach partner” program that may also include paid outreach efforts, to try to increase participation rates for this important program.⁶⁶ The City, along with other stakeholders and community connectors, should consider ways to take a leadership role in developing and supporting enrollment efforts throughout Vallejo and the surrounding community. It should closely monitor the development of the ACP outreach grant process and work with community members to support this program.

⁶⁴ In the Matter of Affordable Connectivity Program WD Docket 21-450, Report and Order and Further Notice of Proposed Rulemaking (FCC 22-2) (January 21, 2022) (ACP Final Rules),

<https://docs.fcc.gov/public/attachments/FCC-22-2A1.pdf> (accessed January 27, 2022); see also, IIJA, Division F, Title V, §§ 60501 *et seq.*, <https://www.congress.gov/117/plaws/publ58/PLAW-117publ58.pdf> (accessed April 13, 2022).

⁶⁵ ACP Final Rules, paragraphs 92-118.

⁶⁶ ACP Final Rules, paragraphs 190-195; FNPRM at 271-280.

9.1.2 American Rescue Plan Act

9.1.2.1 Coronavirus Capital Projects Fund

The Treasury's Coronavirus Capital Projects Fund (CPF) is a \$10 billion program authorized under the American Rescue Plan Act of 2021 that will provide flexible funding opportunities for a wide range of broadband-related projects to be administered at the state level. The program will allow funds to be used for costs that fit into one of three major categories:

- Broadband Infrastructure Projects: “[C]onstruction and deployment of broadband infrastructure designed to deliver service that reliably meets or exceeds symmetrical speeds of 100 Mbps so that communities have future-proof infrastructure to serve their long-term needs.”
- Digital Connectivity Technology Projects: “[P]urchase or installation of devices and equipment, such as laptops, tablets, desktop personal computers, and public Wi-Fi equipment, to facilitate broadband internet access for communities where affordability is a barrier to broadband adoption and use.” You read that right: Affordability matters. Those who can't afford to pay for services, even if available, are considered unserved.
- Multi-Purpose Community Facility Projects: “[C]onstruction or improvement of buildings designed to jointly and directly enable work, education, and health monitoring located in communities with critical need for the project.”

California will receive \$540,249,909 in CPF funding. The California Legislative Analyst's Office issued a report on April 6, 2022, that identified this CPF allocation as part of the funding for the California Public Utilities Commission's Last Mile Federal Funding Account program, discussed further below.⁶⁷

9.1.2.2 Coronavirus State and Local Fiscal Recovery Fund

The U.S. Treasury has released final rules for the Coronavirus State and Local Fiscal Recovery Funds program (SLFRF).⁶⁸ Established by the American Rescue Plan Act (ARPA), this program will

⁶⁷ California Legislative Analyst's Office, Overview of Last-Mile Broadband Infrastructure Project Administration and Funding, April 6, 2022, <https://lao.ca.gov/handouts/socservices/2022/Last-Mile-Broadband-Infrastructure-040622.pdf> (accessed April 11, 2022); see also, Department of the Treasury, “Guidance for the Coronavirus Capital Projects Fund,” September 2021, <https://home.treasury.gov/system/files/136/Capital-Projects-Fund-Guidance-States-Territories-and-Freely-Associated-States.pdf>.

⁶⁸ Department of the Treasury, 31 CFR Part 35 (Pandemic Relief Programs) (effective April 1, 2022), <https://home.treasury.gov/system/files/136/SLFRF-Final-Rule.pdf> (accessed January 27, 2022); see also, “Coronavirus State & Local Fiscal Recovery Funds: Overview of the Final Rule,” January 2022, <https://home.treasury.gov/system/files/136/SLFRF-Final-Rule-Overview.pdf> (accessed April 13, 2022).

distribute \$350 billion in emergency funding to eligible state, local, territorial, and Tribal governments.

These funds can be used in areas without access to reliable service at speeds of 100/20 Mbps, but can also be broadly invested, “in projects designed to provide service to locations with an identified need for additional broadband investment.”⁶⁹

This program will fund broadband deployments and digital inclusion strategies designed to facilitate connectivity and has been designed to enable states and localities “to identify the specific locations within their communities to be served and to otherwise design the project” to fit their needs.⁷⁰

- 1. Infrastructure projects must support 100 Mbps symmetrical speeds. Funding can also go to support projects that offer 100/20 Mbps, but only in cases where geographical, topographical, or fiscal constraints make the higher speed offerings impractical and where the deployed infrastructure can be scaled to reach 100 Mbps symmetrical.** For the purposes of the Fiscal Recovery Funds, Treasury’s approach to broadband infrastructure matches some of the most forward-thinking states’ broadband grant programs and attempts to address the modern communications needs of most consumers. The program also strongly suggests that projects focus on fiber deployments.

This appears to be a concession to incumbent cable providers who can cost-effectively extend to unserved locations from their current network footprint and are on course to achieve symmetric speeds. Most cable companies have implemented DOCSIS 3.1—and while they currently limit upstream to 35 to 50 Mbps, field upgrades would allow them to deliver gigabit speeds upstream and would also put them on a long-term roadmap to DOCSIS 4.0’s 10/6 Gbps capability.

- 2. Projects are encouraged to prioritize areas that do not have reliable wireline service offerings at 100/20 Mbps.** Treasury gives recipients broad discretion to determine community needs for additional broadband investment. This includes situations where an area may appear to be served by a provider with 100/20 Mbps service, but the area may have significant service quality and outage problems with the current service, or the service offerings may be unaffordable. Even in those situations, funding may be available.

⁶⁹ Department of the Treasury, “Coronavirus State & Local Fiscal Recovery Funds: Overview of the Final Rule,” page 39, <https://home.treasury.gov/system/files/136/SLFRF-Final-Rule-Overview.pdf> (accessed April 13, 2022).

⁷⁰ Department of the Treasury, “Coronavirus State and Local Fiscal Recovery Funds, Interim Final Rule,” 31 CFR Part 35, RIN 1505-AC77 (released May 10, 2021), page 71, <https://home.treasury.gov/system/files/136/FRF-Interim-Final-Rule.pdf>. Interim Final Rules, “Interim Final Rules.”

- 3. Projects are encouraged to prioritize affordability as well as local broadband solutions.** After noting that the U.S. has some of the most expensive broadband service in the world,⁷¹ the program's rules place special emphasis on ensuring that the resulting broadband service provided over the funded network is affordable. The Treasury requires that projects receiving this funding must require the service provider to participate in the federal ACP or otherwise provide "access to a broad-based affordability program" that is similar to the benefits provided under the ACP.⁷² The Treasury also encourages recipients to "prioritize support for broadband networks owned, operated by, or affiliated with local governments, non-profits, and co-operatives, given that these networks have less pressure to generate profits and a commitment to serving entire communities."⁷³
- 4. Projects are encouraged to prioritize last-mile connectivity.** While Treasury underscores this, states and localities are not precluded from setting their own priorities, and other initiatives that could improve affordability by investing in capacity bottlenecks such as middle-mile or data center builds could be funded.⁷⁴
- 5. Infrastructure projects are expected to meet strong labor standards.**⁷⁵ This includes project labor agreements, community benefit agreements, and wages at or above the prevailing rate with local hire provisions.
- 6. Projects can address a wide array of broadband-related concerns.** In addition to infrastructure, these State and Local Fiscal Recovery Fund dollars can also be used for an array of other initiatives that respond to the public health and economic impacts of the pandemic. While Treasury leaves the door open for a wide variety of fundable initiatives, it offers the general guidance that recipients shall "first identify a need or negative impact of the Covid-19 public health emergency and, second, identify how the [proposed] program, service, or other intervention addresses the identified need or impact."⁷⁶
- 7. Allocations from these funds can be leveraged as matches for other broadband grant opportunities.** Because these funds are considered locally administered, if an entity is

⁷¹ "Even in areas where broadband infrastructure exists, broadband access may be out of reach for millions of Americans because it is unaffordable, as the United States has some of the highest broadband prices in the Organisation for Economic Co-operation and Development (OECD)." Interim Final Rules, page 70, U.S. Department of the Treasury.

⁷² SLFRF Final Rules, Federal Register, Vol. 87, No. 18, Supplementary Information, page 4421 (January 27, 2022).

⁷³ SLFRF Final Rules, Federal Register, Vol. 87, No. 18, Supplementary Information, page 4421 (January 27, 2022).

⁷⁴ SLFRF Final Rules, Federal Register, Vol. 87, No. 18, Supplementary Information, page 4418, 4420-4421 (January 27, 2022).

⁷⁵ SLFRF Final Rules, Federal Register, Vol. 87, No. 18, Supplementary Information, page 4408-4409, 4444 (January 27, 2022).

⁷⁶ SLFRF Final Rules, Federal Register, Vol. 87, No. 18, Supplementary Information, page 4341 (January 27, 2022).

already targeting a federal grant or State grant opportunity that requires matching funds, the Fiscal Recovery Funds can be leveraged for that purpose.⁷⁷ It is important that these funds are used to pay for separate expenses than the other matching funds.

California will use \$3.2 billion of its allocation of State and Local Fiscal Recovery Funds to invest in its statewide Middle Mile Broadband Initiative.⁷⁸

9.2 State of California funding

The California Department of Technology (CDT) and the California Broadband Council are two State agencies directly involved in setting California's broadband policy and programs. The Broadband Council issued its Broadband for All Action Plan in 2020.⁷⁹ This Action Plan reflects the principles and goals set out by the Governor and has served as a guidance document for many State agencies as they have carried out broadband policy and programs. CDT has been the State agency to generally oversee the State's broadband policy implementation, including the Action Plan.⁸⁰ In 2021, the CDT was tasked with implementing a \$3B spending program to expand middle-mile networks throughout the State.

The CPUC has been a leader and catalyst for California's broadband access policies and programs for many years. The California LifeLine Program (see Section 8.2.2), is a longstanding CPUC-administered program that has provided discounts for services to keep people connected. Since that time, the Commission has adopted several public purpose programs that advance broadband policy goals including the California Advanced Services Fund and the Teleconnect Fund. The CPUC has also been heavily involved in the CDT middle-mile project.

9.2.1 California Advanced Services Fund (Public Utilities Code Section 281)

This important program was created in 2007 by the California Public Utilities Commission (CPUC) to set money aside for broadband infrastructure projects in unserved areas of California. The program received Legislative codification in 2010 as Public Utilities Code Section 281, allowing a line-item surcharge on customer bills to support this program. The Legislature has declared that

⁷⁷ SLFRF Final Rules, Federal Register, Vol. 87, No. 18, Supplementary Information, page 4422 (January 27, 2022).

⁷⁸ California Legislative Analyst's Office, Overview of Last-Mile Broadband Infrastructure Project Administration and Funding, April 6, 2022, <https://lao.ca.gov/handouts/socservices/2022/Last-Mile-Broadband-Infrastructure-040622.pdf> (accessed April 11, 2022); see also, California Department of Technology, First Report to the Legislature on the Middle-Mile Broadband Initiative, March 14, 2022, https://cdt.ca.gov/wp-content/uploads/2022/03/22692-CDT22-MMBI-Legislative-Report_FINAL.pdf (accessed, April 11, 2022).

⁷⁹ California Broadband Council, "Broadband for All Action Plan," <https://broadbandcouncil.ca.gov/wp-content/uploads/sites/68/2020/12/BB4All-Action-Plan-Final.pdf> (accessed April 5, 2022).

⁸⁰ California Broadband Council, "Closing the Digital Divide," <https://broadbandforall.cdt.ca.gov/> (accessed April 13, 2022).

the goal for this Fund is to support projects that will provide broadband access to “no less than 98% of California households in each consortia region” by 2032.⁸¹

The CPUC and the Legislature have revised and amended the rules for this program several times since 2010, but the core of the program remains the same. Currently, the statute caps the amount that can be collected through end user surcharges to \$150 million per year between 2022 and 2032. The statute also earmarks \$2 billion in ARPA recovery funds, discussed above, to support last-mile broadband infrastructure programs over the next four years.

CASF is composed of several “accounts.” In light of Vallejo’s priorities of addressing digital equity issues and leveraging its existing fiber network to address gaps in broadband access within the City, the following accounts are most relevant:

1. Broadband Infrastructure Grant Account
 - a. This account funds last-mile broadband projects to unserved areas (defined as having no provider that offers at least one tier of service offering 25/3 Mbps, with priority given to areas with only 10/1 Mbps or less).
 - b. The Fund will only support projects that deploy infrastructure “capable” of providing last-mile service at 100/20 Mbps and offers only narrow opportunities to fund middle-mile on an “as needed” basis to support the last-mile projects.
 - c. Grant recipients must offer an **“affordable” broadband service** over the facilities—generally \$15 per month for at least 25/3 Mbps. (The CPUC may revise this requirement within the next year.)
 - d. The Commission coordinates with a variety of stakeholders.
 - e. Existing providers have an opportunity to review the grant applications and provide evidence of existing facilities in the proposed service area.
 - f. This Fund can be used to pay for **line extension projects** under limited circumstances with a \$5 million cap on “aggregate” project funding allowed under this provision.
 - g. Applicants do not have to be a certificated telecommunications company or “traditional” service provider to apply for this money.

⁸¹ See SB4, Chapter 671 (October 8, 2021), revising Pub. Util. Code Section 281, https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=PUC§ionNum=281 (last accessed March 31, 2022).

2. Broadband Adoption Account

- a. This account was created to fund projects that “increase publicly available or after school broadband access and digital inclusion.” Examples include:
 - i. Digital literacy
 - ii. Public education
 - iii. Free broadband in public spaces, including outreach for these programs
 - iv. Outreach and means to increase broadband access and adoption (e.g., call centers, materials)
- b. Eligible applicants include a wide variety of entities including local governments, nonprofits, schools, and libraries.
- c. Priority for funding will go to communities with “demonstrated low broadband access.”
- d. Current rules set a cap of 85 percent funding for “eligible” program costs (as specifically defined by the CPUC).
- e. CPUC is required to create a set of “digital inclusion metrics” for applicants to report on as a condition of receiving payment.
- f. This Fund is specifically prohibited from being used to subsidize household access to broadband service itself.
- g. The CPUC has adopted implementation guidelines and detailed application and reporting requirements, including appropriate uses and device distribution to qualifying low-income families to take home after completing digital literacy training courses.⁸²

3. Federal Funding Account

The State Legislature allocated \$2 billion of federal funding from the ARPA SLFRF funds to the CPUC for a new last-mile federal funding program.⁸³ On March 2, 2022, the CPUC

⁸² CPUC, “California Advanced Services Fund, Broadband Adoption Account: Application Requirements and Guidelines,” <https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/communications-division/documents/casf-adoption-and-access/d2109004-revised-adoption-account-guidelines.pdf> (accessed April 13, 2022).

⁸³ SB 4, Chapter 671 (October 8, 2021), Section 2 (revised Public Utilities Code Section 281(n)), https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220SB4 (accessed April 13, 2022).

issued a Proposed Decision to implement its statutory mandate for the program.⁸⁴ The Commission took public comment on this Proposed Decision in March and has made some slight revisions to the proposal based on that public input. The Commission is scheduled to vote on the Proposed Decision by the end of May 2022. While the Commission is expected to adopt the Proposed Decision and launch this Federal Funding program by the end of the third quarter of 2022, the CPUC may still further revise its proposal before the final vote.

As currently crafted, the CPUC's Proposed Decision includes a broad spectrum of eligible entities that can apply for this program, including facilities-based broadband service providers, local governments, electric utilities, non-profits, cooperatives, and Tribal governments; however, pursuant to the federal rules for this funding, the CPUC has stated its intent to prioritize requests from local governments, nonprofits, and cooperatives, finding that these networks have less pressure to generate profits and a stronger commitment to serve entire communities.⁸⁵ The CPUC is also encouraging investor-owned electric utilities to enter into partnerships to deploy broadband and apply for this funding.⁸⁶ As part of its statutory mandate, the CPUC's Proposed Decision offers a planned allocation of the funding for this program pursuant to a formula that identifies counties as urban or rural using 2019 data.⁸⁷ Using this formula, the CPUC has categorized Solano County as an urban county and allocated \$17 million to fund broadband infrastructure projects located in the County. Other aspects of this program are expected to include:

- a. Projects must be capable of offering 100 Mbps symmetrical to end users throughout the funding area except under unique circumstances as defined by the rules.
- b. Projects must meet affordability requirements to offer both a “low-income eligible” service offering and a “low-cost” broadband plan that does not exceed a \$40 rate for end users for speeds of no less than 50/50 Mbps.

⁸⁴ California Public Utilities Commission, Docket R.20-09-001, Proposed Decision of Commissioner Alice Reynolds Adopting Federal Funding Account Rules, issued March 2, 2022, <https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M466/K763/466763362.PDF>.

⁸⁵ CPUC, Proposed Decision on Federal Funding Account Rules, March 2, 2022, pages 46, 97 (Finding of Fact 13), <https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M466/K763/466763362.PDF> (accessed April 13, 2022).

⁸⁶ CPUC Proposed Decision on Federal Funding Account Rules, March 2, 2022, page 28, <https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M466/K763/466763362.PDF> (accessed April 13, 2022).

⁸⁷ CPUC Proposed Decision on Federal Funding Account Rules, March 2, 2022, pages 32-35, <https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M466/K763/466763362.PDF> (accessed April 13, 2022).

- c. Grants will be prioritized for areas that are “unserved” (only available service at less than 25/3 Mbps) but will also be granted for projects in areas that are “underserved” (service available at only 100/20 Mbps or less).
- d. Projects must specify fiber technology, although applicants can justify the use of different technology with additional evidence and documentation that fiber is infeasible.
- e. The CPUC expects that all funds will be distributed by June 30, 2023. It will accept applications two times a year on a schedule that will be developed after the CPUC adopts the Proposed Decision. A project will be reviewed within 6 months after it is submitted. Applications will require a detailed set of 19 items that are set out in the proposed rules for the program. There is also a ministerial review process for grants less than \$25 million with no objections or competing applications. There is an objection process that allows interested parties to review the submitted applications and file comments objecting to the application on the basis of an error of fact, policy or a violation of a statutory requirement.

Each of these CASF programs can be a valuable funding opportunity to advance the City’s broadband access and digital equity priorities. In most cases, the City can apply for funding directly, or as part of a consortium of entities. As discussed above, in its proposed framework for the Federal Funding Account, CPUC has stated that it will prioritize local governments that plan to build out a last-mile network to provide services to its residents. However, under this scenario, as a direct grant recipient, the City must be prepared to offer broadband service within the funded areas. In the alternative, the City could actively investigate, research, and conduct outreach to community partners that could work with the City to apply for this funding to support projects in the City. The City could consider a formal public-private partnership for these projects with an existing service provider or a nonprofit agency or consortium to jointly apply for the funding and offer service over the network.

9.2.2 Other CPUC programs

The City should also be aware of funding opportunities from the CPUC for planning and technical assistance that could help the City research and determine its options. The Legislature set aside \$50 million for a Local Agency Technical Assistance program, which the CPUC implemented in February 2022.⁸⁸ This program provides grants in amounts of up to \$1 million to a local agency, including cities, counties, and utility districts, to support technical assistance for broadband infrastructure planning. This funding can be applied toward environmental review processes,

⁸⁸ See CPUC Decision 22-02-026 (February 25, 2022), Docket Number R.20-08-021, <https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M454/K873/454873811.PDF> (accessed April 12, 2022).

needs assessments, engineering designs, market studies, business plans and similar efforts. The CPUC will accept applications for this technical assistance program on a rolling basis.

The CPUC is also in the process of creating a Loan Loss Reserve Fund of \$750 million to support local governments, tribes, and non-profits in securing enhanced public financing to construct and operate public fiber networks.⁸⁹ This funding is designed to be used as collateral for local agencies to receive better borrowing rates and terms on financing of these projects. The Fund can also pay for the costs of debt issuance and a reserve for payment of principal and interest on debt. This Fund can serve as another tool for larger projects that the City may create through its own resources or as a partnership. The CPUC will design and implement this funding opportunity toward the end of 2022.

⁸⁹ SB156 (Chapter 112 (July 20, 2021), Section 8 (adds Pub. Util. Code Section 281.2); see also, CPUC Assigned Commissioner's Second Amended Scoping Memo and Ruling, Docket No. R.20-08-021 (March 1, 2022), pages 5-8, <https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M455/K677/455677087.PDF> (accessed April 14, 2022).

Appendix A: Enterprise Broadband Services (2016 analysis)

To support our analysis of the feasibility of the City implementing a municipal broadband network, we assessed the current (as of 2016) market for enterprise broadband. This section provides an overview of competitive providers for dark fiber and lit services with respect to the enterprise customers within the City of Vallejo.

During the course of our research, we identified 11 service providers in the Vallejo area that offer a range of services, from dark fiber connectivity to data transport services, with speeds that range from 1 Mbps to 100 Gbps. Individual providers tailor these services to customers' requirements (speed, class of service, etc.). Greater proximity to the provider's existing network infrastructure results in lower service pricing. Providers prefer to offer transport services between locations on their network (On-Net) and provision Multiprotocol Label Switching (MPLS) based services for connecting locations that are Off-Net.

A trend that we expect to continue is the consolidation of competitors through mergers and acquisitions. Competitors are discussed in detail in the following sections.

Dark fiber services

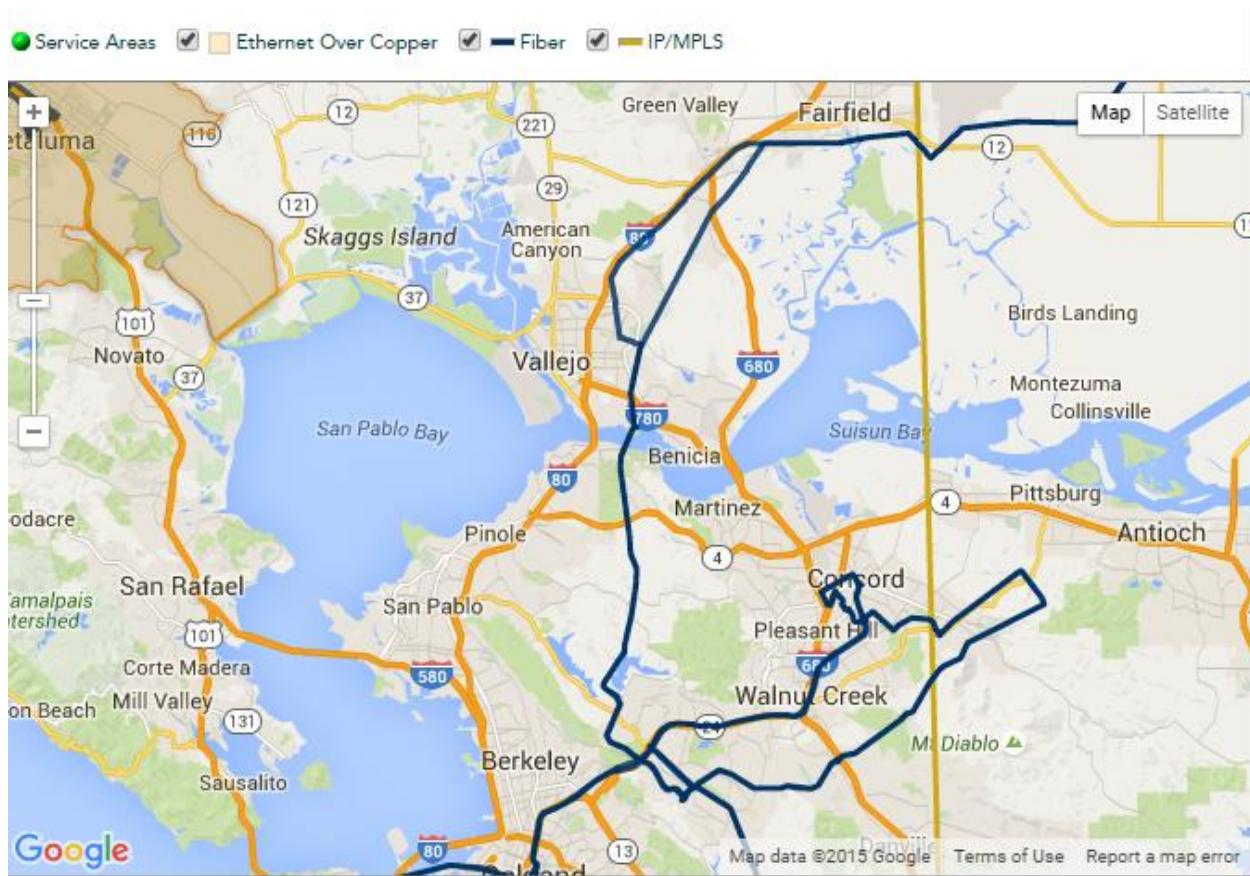
Three service providers operate in the City and offer dark fiber in some service areas: Integra Telecom, Level 3, and Zayo. CTC facilitated multiple calls with company representatives to review the companies' network details and planned expansion in the region; through these discussions, we determined that none of these carriers currently offer dark fiber services in the City. All three of these carriers have long-haul dark fiber that traverse the City. Of the three, only Integra has actual plans to expand into the City and may be enticed to enter into a metro dark fiber use agreement with the City that would enable the company to offer these services commercially.

Integra Telecom

Integra Telecom has long-haul dark fiber services traversing the City. The company provides flexible options in securing dark fiber through bundles, leases, and Indefeasible Rights of Use (IRU) agreements. The dark fiber routes are depicted in Figure 18.⁹⁰ Dark fiber pricing varies individually, based on distance from the provider's fiber ring. A difference of a few tenths of a mile can lead to significant differences in the price of dark fiber connectivity, due to additional construction costs.

⁹⁰ <http://www.integratelecom.com/pages/network-map.aspx> (accessed October 2015).

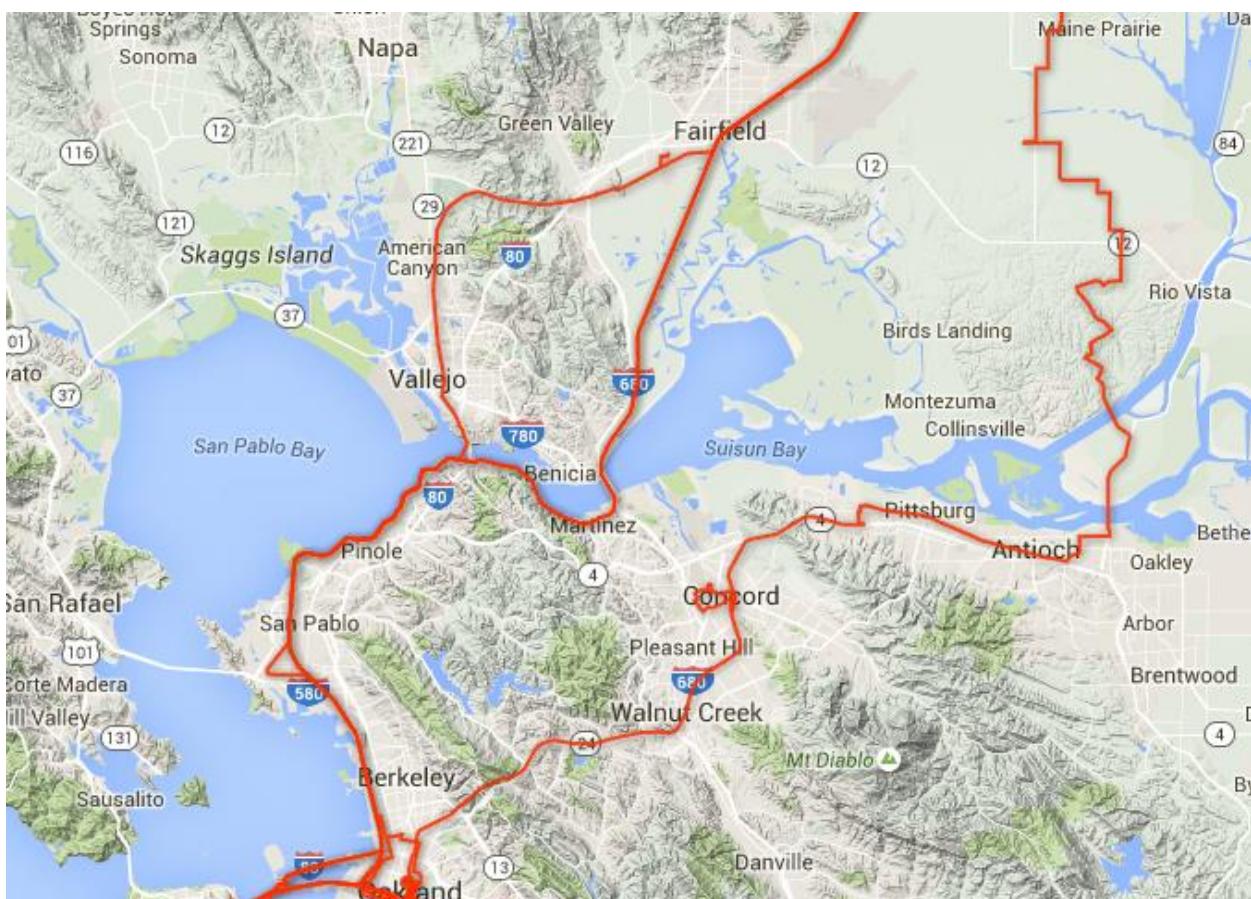
Figure 18: Integra Telecom network map



Level 3

Level 3 has multiple dark fiber routes in Vallejo, as depicted in Figure 19. Services are offered only to select customers based on their application requirements.

Figure 19: Level 3 dark fiber routes⁹¹



Zayo

Zayo provides dark fiber connectivity over its national network of metro and intercity fiber. The company claims to have proven expertise in deploying major new dark fiber networks and offers multiple financing options, including leases and Indefeasible Rights of Use (IRU) agreements.

Zayo only has two fibers on its path through Vallejo. These were acquired through XO and are in the Level 3 underground conduit network. Zayo has lit services on these routes and no ability or rights to break out of the fiber at new locations in the City.

We have heard that Zayo is planning a new long-haul fiber build from Sacramento to San Francisco that will go through Benicia. That is shown on the map below in gray, but we believe that route is still under development.

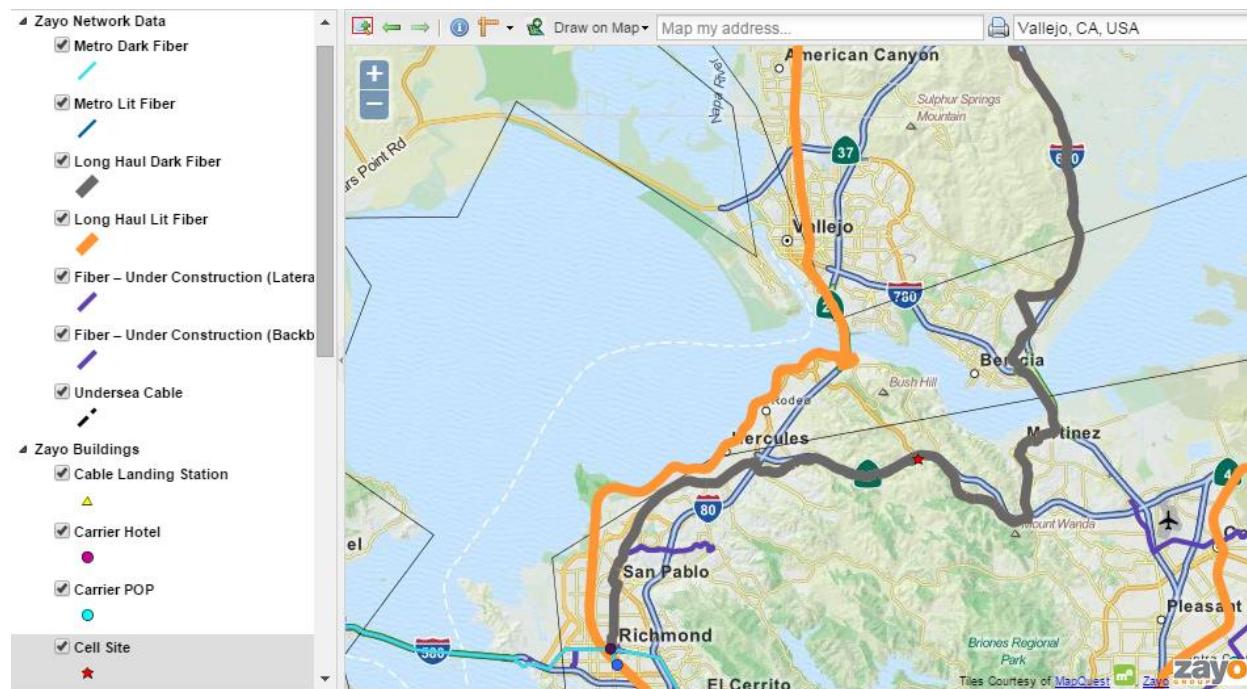
Pricing varies significantly depending on whether the building is On-Net or not; if the location is Off-Net, construction and splicing costs would apply.⁹² A dark fiber lease between two On-Net

⁹¹ <http://maps.level3.com/default/> (accessed October 2015).

⁹² <http://zayofbersolutions.com/why-dark-fiber> (accessed October 2015).

locations in San Francisco that are five miles apart has a monthly recurring charge of \$3,756 for a one-year term and \$2,087 for a five-year term. There is a non-recurring charge of \$5,000 as part of the pricing.

Figure 20: Zayo fiber map⁹³



Lit services

Types of services available

Almost all existing service providers offer enterprise-grade, Ethernet-based services. Bandwidths range from 1 Mbps to 100 Gbps. Ethernet service can be classified into three types: Ethernet Private Line (EPL or E-Line), Ethernet Virtual Private Line (EVPL) and Ethernet Local Area Network (ELAN). These may be known by different names among providers.

EPL is a dedicated, point-to-point high-bandwidth Layer 2 private line between two customer locations. EVPL service is similar to EPL but is not dedicated between two locations. Instead, it provides the ability to multiplex multiple services from different customer locations onto one point on the provider's network (multiple virtual connections) to another point on the network. ELAN is a multipoint-to-multipoint connectivity service that enables customers to connect physically distributed locations across a Metropolitan Area Network (MAN) as if they were on the same Local Area Network (LAN).

⁹³ <http://www.zayo.com/network/interactive-map> (accessed October 2015).

The Internet services over Ethernet are typically classified under two categories: Dedicated Internet Access (DIA) and MPLS IP Virtual Private Networks (IP-VPN). Providers prefer to offer MPLS-based IP-VPN services when the service locations are off-net thus avoiding construction and installation costs. MPLS-based networks provide high performance for real-time applications such as voice and video and are typically priced higher.

Providers and sample pricing

The carriers that provide these services in the Vallejo area are AT&T, Comcast, Integra Telecom, Level 3, MegaPath, Sonic, Verizon, Windstream Communications, XO Communications, and Zayo. The sample prices we identify below depend on the bandwidth, location, and network configuration; whether the service is protected or unprotected; and whether the service has a switched or mesh structure.

For purposes of comparison, one incumbent provided the following sample pricing for service to a building on Mare Island. All prices are for full transport and Internet access with no oversubscription (guaranteed speeds).

Table 12: Incumbent Sample Monthly Pricing

Symmetrical Speeds	Service to Building on Mare Island
50 Mbps	\$1,125
100 Mbps	\$1,556

AT&T has four different types of Ethernet products: GigaMAN, DecaMAN, Opt-E-MAN, and Metro Ethernet. GigaMAN provides a native-rate interconnection of 1 Gbps between customer end points. It is a dedicated point-to-point, fiber optic-based service between customer locations, which includes the supply of the GigE Network Terminating Equipment (NTE) at the customer premises. DecaMAN connects the end points at 10 Gbps and is transmitted in native Ethernet format similar to GigaMAN, only 10 times faster. Opt-E-MAN service provides a switched Ethernet service within a metropolitan area. It supports bandwidths ranging from 1 Mbps to 1,000 Mbps, and configurations such as point-to-point, point-to-multipoint, and multipoint-to-multipoint. Metro Ethernet service provides various transport capabilities ranging from 2 Mbps through 1 Gbps while meeting IEEE 802.3 standards.⁹⁴ In California, AT&T offers its OPT-E-MAN

⁹⁴ <http://goo.gl/oTVp0e> (accessed October 2015).

service to the State's CALNET 3. Since 2014, the transport rates (not including DIA) for the silver level of service have been as follows:

Table 13: AT&T OPT-E-MAN Service Transport Pricing to CALNET 3

Bandwidth	Monthly Fee
10 Mbps	\$358.44
100 Mbps	\$696.64
1 Gbps	\$879.50

Service is only available where facilities exist. In areas where such facilities are not available, customers must purchase repeater service at a rate of \$257.85 per month.

Comcast provides EPL services. EPL service enables customers to connect their customer premises equipment (CPE) using a lower cost Ethernet interface, as well as using any Virtual Local Area Networks (VLAN) or Ethernet control protocol across the service without coordination with Comcast. EPL service is offered with 10 Mbps, 100 Mbps, 1 Gbps, or 10 Gbps Ethernet User-to-Network Interfaces (UNI) and is available in speed increments from 1 Mbps to 10 Gbps.⁹⁵

Level 3's Metro Ethernet dedicated service is available in bandwidth options of 3 Mbps to 1 Gbps and its EVPL offers speeds ranging from 3 Mbps to 10 Gbps.⁹⁶ It is an end-to-end, Layer 2, switched Ethernet service delivered via a Multi-protocol Label Switched (MPLS) backbone. Internet services are available in a range of 14 speeds up to 10 Gbps.⁹⁷

MegaPath offers business Ethernet services in the Vallejo area with advertised symmetric speeds up to 45 Mbps. Higher speeds are available on a case-by-case basis.⁹⁸

Integra Telecom offers Ethernet services from 1.5 Mbps to 10 Gbps. Point-to-point E-Line and multipoint-to-multipoint ELAN configurations are available.⁹⁹ A 1 Gbps DIA service in the City of Vallejo is priced at \$9,500 monthly for a three-year term, with an installation charge of \$250.

Verizon offers ELAN), EPL, and EVPL. The ELAN is a multipoint-to-multipoint bridging service at native LAN speeds. It is configured by connecting customer UNIs to one multipoint-to-multipoint Ethernet Virtual Connection or VLAN, and provides two class-of-service options—standard and real time. The EPL is a managed, point-to-point transport service for Ethernet frames. It is

⁹⁵ <http://goo.gl/owpABK> (accessed October 2015).

⁹⁶ <http://goo.gl/7HozWq> (accessed October 2015).

⁹⁷ http://www.level3.com/~/media/files/factsheets/en_etherne_t_fs_etherne_tmatri_x.pdf (accessed October 2015).

⁹⁸ http://www.megapath.com/data/etherne_t/ (accessed October 2015).

⁹⁹ <http://goo.gl/i7xlul> (accessed October 2015).

provisioned as Ethernet over SONET (EoS) and speeds of 10 Mbps to 10 Gbps are available. The EVPL is an all-fiber optic network service that connects subscriber locations at native LAN speeds; EVPL uses point-to-point Ethernet virtual connections (EVCs) to define site-to-site connections. It can be configured to support multiple EVCs to enable a hub-and-spoke configuration and supports bandwidths from 1 Mbps to 10 Gbps.¹⁰⁰

Windstream Communications has a nationwide presence serving major metropolitan areas. In Vallejo, it offers DIA services with speeds up to 1 Gbps.^{101,102}

XO Communications offers carrier Ethernet and DIA services at multiple bandwidth options, from 3 Mbps to 100 Gbps, over its Tier 1 IP network.^{103, 104} A 1 Gbps DIA service in the City has a monthly recurring charge of \$3,907 for a three-year term. There were no non-recurring charges for the sample location on Santa Clara Street that we used to gather these price quotes.

Zayo delivers Ethernet in three service types, with bandwidth ranging from 100 Mbps to 10 Gbps and options like quality of service (QoS) guarantees and route protection based on customer needs. The different types of services offered are Ethernet-Line, which provides point-to-point and point-to-multipoint configurations with reserved bandwidth availability; ELAN, with multipoint configurations having a guaranteed service level; and Ethernet Private Dedicated Network (E-PDN) with a completely private, managed network operated by Zayo, with dedicated fiber and equipment.¹⁰⁵

Pricing for 10 Gbps and 1 Gbps point-to-point Ethernet lines between two on-net locations in San Francisco is provided in the tables below.

Table 14: Sample Zayo Pricing – 10 Gbps Ethernet Transport (Excluding DIA) in San Francisco

Term	60 Month	48 Month	36 Month	24 Month	12 Month
Monthly Recurring Costs	\$2,916	\$3,054	\$3,192	\$3,364	\$3,847
Non-Recurring Costs	\$1,350	\$1,350	\$1,350	\$1,350	\$1,350

¹⁰⁰ <http://www.verizonenterprise.com/products/networking/ethernet/> (accessed October 2015).

¹⁰¹ <http://goo.gl/1VmtPv> (accessed October 2015).

¹⁰² <http://www.windstreambusiness.com/shop/products/ca/vallejo> (accessed October 2015).

¹⁰³ <http://www.xo.com/carrier/transport/ethernet/> (accessed October 2015).

¹⁰⁴ <http://www.xo.com/network-services/internet-access/ip-transit/100G/> (accessed October 2015).

¹⁰⁵ <http://www.zayo.com/ethernet> (accessed October 2015).

Table 15: Sample Zayo Pricing – 1 Gbps Ethernet Transport (Excluding DIA) in San Francisco

Term	60 Month	48 Month	36 Month	24 Month	12 Month
Monthly Recurring Costs	\$1,468	\$1,527	\$1,585	\$1,658	\$1,863
Non-Recurring Costs	\$1,350	\$1,350	\$1,350	\$1,350	\$1,350

Additional examples of pricing, for the sake of comparison, including the following:

Zayo charges a monthly recurring cost of \$1,613 to \$2,090 (depending on the contract term) for 1 Gbps point-to-point Ethernet service between on-net sites in the Los Angeles region that are three miles apart.

In the Bay area, Zayo's pricing for 1 Gbps and 10 Gbps wavelength services between carrier hotel locations in San Francisco and Sacramento includes monthly recurring charges of \$2,800 and \$3,500, respectively, for a three-year term. An additional, non-recurring charge of \$3,600 is also applied to these circuits.

Zayo's pricing for 10 Gbps and 1 Gbps DIA service at an on-net location in San Francisco is provided in the tables below.

Table 16: Sample Zayo Pricing – 10 Gbps DIA in San Francisco

Term	60 Month	48 Month	36 Month	24 Month	12 Month
Monthly Recurring Costs	\$8,429	\$9,553	\$11,239	\$12,925	\$14,048
Non-Recurring Costs	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000

Table 17: Sample Zayo Pricing – 1 Gbps DIA in San Francisco

Term	60 Month	48 Month	36 Month	24 Month	12 Month
Monthly Recurring Costs	\$1,772	\$2,008	\$2,362	\$2,717	\$2,953
Non-Recurring Costs	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000

Appendix B: Small business broadband products

In addition to enterprise and residential, many ISPs offer small business internet connections. This market tends to mirror the residential service in coverage, with few technical differences in the service — small businesses tend to purchase these packages for their faster technical assistance rather than upgraded technology. In the City of Vallejo, there are several ISPs offering small business products, the two largest being Comcast and AT&T.

Comcast offers six different small business internet packages to residents in Vallejo.¹⁰⁶ These packages range in download speed from 35 Mbps to 1 Gbps. They are shown in detail in the table below.

Table 1818: Comcast Small Business Internet Packages

Service	Advertised Download/Upload Speeds (Mbps)	Monthly Price (non-promotional)
Business Internet 35	35/5	\$71.95
Business Internet 100	100/15	\$119.99
Business Internet 200	200/20	\$134.99
Business Internet 300	300/30	\$164.99
Business Internet 600	600/35	\$239.99
Business Internet 1 Gig	1000/35	\$339.99

AT&T is able to leverage its fiber network in some areas to offer higher upload speeds than Comcast. Elsewhere, they rely on DSL hybrid. The table below illustrates its small business service offerings.

Table 1919: AT&T Small Business Internet Packages

Service	Advertised Download/Upload Speeds (Mbps)	Monthly Price (non-promotional)
Internet 25	25/2-5	\$60.00

¹⁰⁶ The availability of these offers closely mirrors the coverage footprints discussed in Section 3.

Internet 50	50/10	\$85.00
Internet 75	75/8-20	\$115.00
Business Fiber 100s	100/100	\$75.00
Business Fiber 300s	300/300	\$90.00
Business Fiber 1000s	940/880	\$150.00

10 Appendix C: Model Dig Once ordinance¹⁰⁷

The following Dig Once ordinance is adapted from the City of South San Francisco, and captures the main features of a comprehensive legislative tool, as opposed to an internal policy:

Chapter XX.XX

OPEN TRENCH NOTIFICATION AND TELECOMMUNICATION INFRASTRUCTURE IMPROVEMENTS

XX.XX.XX Purpose.

The City Council finds and determines that the requirements and conditions in this chapter are necessary for the following reasons:

- a. To encourage the systematic development of telecommunications infrastructure and in turn maximize the availability of telecommunication and broadband service to residents and businesses within the city.
- b. To protect and control access to the public right-of-way, and to extend the life of city streets and other civil infrastructure and reduce the cost of ongoing maintenance by encouraging cooperation between utility companies, public agencies, and city departments.
- c. To streamline and simplify the process of installing and upgrading telecommunications equipment throughout the city, and to encourage the improvement and modernization of the city's telecommunication infrastructure.

XX.XX.XX Definitions.

As used in this chapter, the following terms shall have the following meanings:

- a. "Applicant" means an individual or entity submitting an encroachment permit application for an excavation project pursuant to section 13.40.003.
- b. "Public right-of-way" or "ROW" shall mean the area across, along, beneath, in, on, over, under, upon, and within the dedicated public alleys, boulevards, courts, lanes, roads, sidewalks, spaces, streets, and ways within the city.

¹⁰⁷ City of South San Francisco, <https://www.ssf.net/home/showpublisheddocument/15880/636951776359530000> (accessed April 14, 2022).

- c. "Conduit" refers to a tube, duct, structure, or other device designed for enclosing telecommunication wires or cables.
- d. "Enhanced Remediation" means any and all standards and/or processes established by the Public Works Director that are intended to serve the purpose of ensuring that excavations performed in an area where an Open Trench Notification process has been completed will include all work necessary to restore the area to its original or enhanced condition prior to the excavation.
- e. "Excavation" refers to any process which breaks up or removes material from the ground through any digging, drilling, boring or other activity for the purpose of installing underground utilities, infrastructure, structures, or other equipment.
- f. "Facilities" and "Infrastructure" refer to wires, cables, conduit, switches, transmission equipment or other equipment for use in transmitting or processing telecommunications services or for providing support or connection to such equipment.
- g. "Open Trench Notification" shall mean the notification process set forth under Section 13.40.004.
- h. "Service providers" refers to any person, company, corporation or other entity providing data, voice, cable, video or other information services by wire, fiber optic cable or other technology.
- i. "Telecommunication" refers to data, voice, video or other information provided by wire, fiber optic cable or other technology.

XX.XX.XX Open Trench Notification Triggered for Excavation Projects.

- a. The Public Works Director shall determine, upon receipt of an encroachment permit application for an excavation project pursuant to Section 13.04.010 or approval of specifications for a public works project, that if either criteria in subsection (i) or (ii) below are met:
 - a. The application or specification involves utility infrastructure construction, road construction or resurfacing, or other work that will result in an excavation that could reasonably include, or prepare for, the installation of broadband conduit, or is part of the Information Technology Strategic Plan.

- b. It spans 900 feet or three city blocks within the ROW, or involves terrain that is difficult or expensive to traverse (e.g. a bridge), or is an element of a larger project that will require installation or upgrading of utility infrastructure.
- b. If an encroachment permit application for an excavation project or approval of specifications for a public works project satisfies either subsection (i) or (ii) above, the applicant shall be required to comply with the Open Trench Notification as provided in Section 13.40.004.
- c. The Public Works Department shall initiate the Open Trench Notification process by delivering notice and instructions for participation in accordance with the requirements of provided in Section 13.40.004.

XX.XX.XX Notification Process.

- a. In compliance with section 13.40.005, all Service Providers and third parties interested in collocating conduits and telecommunication facilities in the project excavation area shall inform the Public Works Department of the interest to participate in the manner set forth in subsection (a) of section 13.40.005 from the date of an Open Trench Notice issued pursuant to subsection (b) of this section.
- b. The Public Works Director, in consultation with the Information Technology Department, shall develop and implement an Open Trench Notification Policy, as may be amended from time to time, that establishes the standards and processes to carry out the intent and requirements of this chapter.
- c. At a minimum, the Open Trench Notification Policy shall include the following:
 - i. The procedure by which the Public Works Department will initiate the Open Trench Notification process for each qualified excavation project pursuant to subsection (b) of section 13.40.003.
 - ii. The procedure for receiving, processing, and reviewing of notices of intent to participate from interested Service Providers and third parties for collocation of conduits and telecommunication facilities in the project area.
 - iii. The timeline for interested Service Providers and third parties to submit notices of intent to participate in collocation work and delivering notices received to the project applicant.

- iv. The criteria for determining whether responses received from interested Services Providers and third parties for collocation work are competent and may be forwarded to the applicant.
- v. The procedure for receiving, processing, and reviewing of any protests regarding negotiations between the parties for collocation of conduits and telecommunication facilities in the project area.
- vi. The criteria for determining whether the information provided in support of a protest sufficiently demonstrate that further negotiation is appropriate, and the timeline for such further negotiation if warranted.

XX.XX.XX Response to Open Trench Notifications

- a. Services Providers and third parties interested in participating in the open trench collocation pursuant to section 13.40.004 shall submit a notice of intent to participate to the Public Works Department within 30 days of an Open Trench Notice issuance. The notice of intent shall contain sufficient information to constitute a competent response to be forwarded to the project applicant pursuant to subsection (c)(iv) of section 13.40.004.
 - i. Responses to open trench notifications shall be forwarded to the project applicant. The applicant is responsible for negotiating collocation of conduits and/or other telecommunication facilities with any interested third parties for the project location.
 - ii. Protests regarding negotiations between the parties for collocation work and any information in support thereof may be submitted to the Public Works Department. The Public Works Department shall be responsible to determine whether the information provided sufficiently demonstrate that further negotiation is warranted.
- b. The Information Technology Department Director shall designate staff to receive notifications of pending excavation projects, broadband-related work, and other encroachment permit applications that are subject to the Open Trench Notification process.
- c. The Information Technology Director shall determine whether to submit a response to the Open Trench Notification for collocating conduits or telecommunication facilities at the project location, by considering the following:

- i. The collocation of city-owned conduit in a given project is consistent with the Information Technology Strategic Plan, or will support the achievement of other city objectives.
 - ii. The incremental installation cost is reasonable.
 - iii. The cost of maintaining the conduit over time is proportionate to its value to the city.
 - iv. Sufficient funds are available within existing budgets, or can be obtained from other sources.
 - v. Collocation should be pursued in furtherance of overall city goals and priorities, the collocation makes sense.
- a. If the Information Technology Director submits a response to the Open Trench Notification for collocation work, the Information Technology Director or his designee shall attempt to negotiate an acceptable agreement with the project applicant. If negotiation is successful, the Information Technology Department shall coordinate the design and construction of the collocation work with the Public Works Department, including whether installation of facilities in addition to conduits would be necessary.
 - b. Any conduits or telecommunication facilities collocated pursuant to subsection (b) shall be the property of the City.
 - c. The Information and Technology Department shall maintain a geodatabase of communications assets located within or connecting to the city, including but not limited to:
 - i. city-owned conduit and appurtenant facilities;
 - ii. fiber optic cable;
 - iii. towers and tower sites;
 - iv. communications facilities and services belonging to third parties that are used by the city;
 - v. real estate, poles, and other city-owned assets leased to third parties for telecommunication purposes.
 - vi. Third party network data provided to the City in conjunction with such leases or permitting processes, or as may become available through other means, including

but not limited to a future electronic plans submission program, or as collected by other agencies or provided by telecommunications companies.

XX.XX.XX Compliance with the Open Trench Notification Process; Enhanced Remediation.

- a. The Open Trench Notification Process shall be deemed complete if no responses were received from interested parties pursuant to subsection (a) of section 13.40.005, or if the applicant has negotiated collocation of conduits and/or other telecommunication facilities with any interested third parties pursuant to subsection (a) of section 13.40.005.
- b. The Open Trench Notification Process shall also be deemed complete if either party to the collocation negotiation required herein submits a protest to the Public Works Department regarding the negotiation, and the Public Works Department determines that, pursuant to subsection (c) of section 13.40.004 and based on the information provided to it, further negotiation is inappropriate or not warranted.
- c. The Public Works Director shall not approve any project application that is subject to the Open Trench Notification process and requirements of this chapter unless an application has satisfied the Open Trench Notification requirements established herein. A project that has satisfied the requirements of this chapter may be approved by the Director, subject to other applicable requirements and authorizations in the most current editions of the City's Municipal Code or any applicable public works construction standards, to allow permitted work to commence.
- d. After an application has been approved, any subsequent excavation work or project by the applicant or any other Service Provider or third party in the project area shall be subject to Enhanced Remediation requirements for five years following the completion or abandonment of such subsequent work or project. Enhanced Remediation may include general standards or standards specific to an excavation. The Public Works Department shall adopt policies and guidelines to set forth such Enhanced Remediation requirements consistent with the intents of this chapter.

XX.XX.XX Implementation.

Within 60 days after this chapter takes effect, the city shall email, fax, mail or deliver a copy of it to telecommunications service providers and other affected entities doing business within the city.

XX.XX.XX Waivers.

- a. In the event of an emergency or urgent conditions that require immediate action, or for other good cause relating to the public health, safety or welfare, the Public Works Director may waive or modify, in whole or in part, the Open Trench Notification requirements established by this chapter.
- b. The Public Works Director may exempt projects from the requirements of this chapter where compliance has been determined by the Public Works Director to be not practical or feasible. Requests for an exemption shall be made in writing and the Public Works Director's decision shall be final. A request for exemption shall include all information necessary for the Public Works Director to make a decision, including but not limited to documentation showing factual support for the requested exemption. The Public Works Director may approve the exemption request in whole or in part, with or without conditions.

XX.XX.XX Violations

Violations of this chapter is hereby declared to be a public nuisance. Any violation of this chapter shall be subject to abatement by the city, as well as any other remedies that may be permitted by law for public nuisances, and may be enforced by injunction, upon a showing of violation.

XX.XX.XX No Conflict with Federal or State Law.

Nothing in this chapter shall be interpreted or applied so as to create any requirement, power, or duty in conflict with nay Federal or State law.

SECTION 4. Severability

If any provision of this Ordinance or the application thereof to any person or circumstance is held invalid or unconstitutional, the remainder of this Ordinance, including the application of such part or provision to other persons or circumstances, shall not be affected thereby and shall continue in full force and effect. To this end, provisions of this Ordinance are severable. The City Council of the City of South San Francisco hereby

declares that it would have passed each section, subsection, subdivision, paragraph, sentence, clause, or phrase hereof irrespective of the fact that any one or more sections, subsections, subdivisions, paragraphs, sentences, clauses, or phrases be held unconstitutional, invalid, or unenforceable.

11 Appendix D: Shadow conduit specifications¹⁰⁸

The following is a collection of technical specifications to support the City in the creation of a shadow conduit policy and was developed by the Monterey Bay Economic Partnership and the Central Coast Broadband Consortium. These guidelines generally assume that empty conduit is being installed. If conduit is being installed to support a specific user, purpose or fiber project, then those considerations should drive design decisions and feasibility determinations.

1. Conduit Size

- a. 2-inch conduit is sufficient for multiple high capacity fiber cables using current technology (432 strands or more), and can be subdivided using inner-duct that would allow multiple service providers to share a single conduit.
 - b. 4-inch conduit has even more capacity but, due to its larger size, can present design problems, for example when connecting to vaults. This size of conduit was standard when telecommunications systems depended on thick bundles of copper cables, but is not necessary for most modern fiber applications. However, 4-inch conduit should be considered for installation on bridges, railroad crossings and in other circumstances where future changes would be particularly difficult or impossible.
 - c. Smaller conduit, e.g. 1.25-inch, is useful when it is not possible to install 2-inch conduit or when many, separate conduits are installed. It may be preferred when conduits are expected to be used by a single service provider, rather than shared among many over time, or when it meets the needs of an anticipated project or service provider.
2. The size and number of conduits installed depends on the particular needs of any given project, and the number of likely or confirmed participants. For example, installation of a bank of four 2-inch conduits provides sufficient flexibility to accommodate a range of needs, and is a better option than installing two 4-inch conduits. However, because of the ability to subdivide it, installing two 2-inch conduits would not necessarily be less useful than two 4-inch conduits. As a starting point, installation of a bank of four 2-inch conduits can be considered as a reasonable standard when construction is done on a prospective basis on a main street, while a

¹⁰⁸ Monterey Bay Economic Partnership & Central Coast Broadband Consortium, "Shadow Conduit Specifications 1.0,"

https://www.tellusventure.com/downloads/bank/mbep_ccbc_conduit_specifications_version_10_1dec2016.pdf
(accessed April 13, 2022).

- single conduit capable of supporting multiple inner-ducts might be sufficient for a smaller or more peripheral street.
3. An additional factor to consider is whether future conduit installation would be particularly problematic, as with railroad right of ways, or even impossible, which is often the case with bridges. In these circumstances, installation of more and/or bigger conduit than would normally be the case is advisable.
 4. Conduit may be located in either streets or sidewalks, however installation in sidewalks is typically easier and less expensive. Traffic control is a much smaller issue, there are usually fewer existing underground utilities, and vault lids do not need to be traffic rated. Contractors are responsible for locating gravity feed lines, and this responsibility should be spelled out in the bid documents and/or the jurisdiction's standards.
 5. Sweeping conduit bends should be used to allow cable to be pulled without exceeding pull-tension thresholds when placing high-count fiber cables (e.g. 864-count). Unsupported conduit bends should have a minimum bend radius of 48-inches, and bends utilizing manufactured elbows should have a minimum radius of 36-inches (45-degree elbow maximum). However, when necessary, modern fiber optic cables are capable of supporting bends of up to 90-degrees.
 6. A number of factors should be considered in determining if the addition of conduit to a host project is feasible. These factors include:
 - a. Length of the conduit section that would be installed. There is no absolute, minimum useful length for conduit sections. However, very short or isolated sections might not be cost effective to use, unless installed as part of a larger plan.
 - b. Proximity to current or planning public facilities and community anchor locations, and economic development needs and plans.
 - c. Presence of other city or county-owned communications infrastructure, or other open access communications facilities or services.
 - d. Whether physical constraints (bridges, freeway underpasses, underground utility districts) would make it unlikely that there are cost-effective alternatives in the vicinity if needed in the future.
 - e. Whether any partners or customers or other users can or will make immediate use of it.

- f. The cost of alternative routes, such as placement on utility poles, if needed in the future.
 - g. Budgetary constraints, or added costs that render the host project infeasible.
 - h. Time constraints, particularly the possibility of delaying installation of critical infrastructure.
 - i. Risk of interfering with operation or maintenance of host project facilities.
7. Installing detector wire/warning tape 3 inches to 6 inches above the conduit is a common standard, but circumstances can vary widely and this question should be addressed on a case by case, engineering design basis. Pull ropes should be included as a standard design element. Pull ropes with built-in detector wire are available and, depending on the circumstances, could perform adequately.
8. Choice of material depends on circumstances, however HDPE and PVC are commonly used materials.
9. Backfill type and materials, and other remediation/construction measures should be determined by the standard specifications used by the jurisdiction concerned.
10. When conduit is installed on a generic, “open trench” basis, a minimum standard is to install conduit the entire length of the trench, with sweeps installed to a future access point and with both ends capped and buried for future use. Where possible, vaults or hand holes should be placed at either end, and any lateral conduit that is installed should likewise terminate at an access point.