Taft Broadband Study

Final Report

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1. Summary and recommendations

As detailed below, the quality and extent of existing residential broadband infrastructure in the Taft/ Maricopa area is significantly below the average for California. Service is either relatively expensive or unavailable. The two primary wireline carriers in the area are Verizon, which does not offer broadband service, and Bright House, which does.

Both Verizon and Bright House are involved in transactions which could result in a change of ownership for the wireline systems – telephone, cable television and broadband – which serve Taft. A merger is pending between Time-Warner Cable (which is the controlling owner of Bright House) and Comcast which could result in the Taft/Maricopa cable system being absorbed by Comcast. Verizon is in the process of selling its Californian telephone systems, including the one serving the Taft/Maricopa area, to Frontier Communications.

The Comcast/Time-Warner/Bright House transaction is controversial and it is uncertain whether it will be approved by state and federal regulators. If it is, the likelihood is that significant conditions, such as those detailed below, will be imposed. The Verizon/Frontier transaction is of a more routine nature and its approval is likely, although conditions might also be imposed.

The Taft/Maricopa area is on the edge of wireless Internet service providers' coverage areas, and although some report providing service that meets the California Public Utilities Commission's (CPUC) 6 Mbps download/ 1.5 Mbps upload speed standard, these claims are not supported by CPUC field testing. Likewise, these providers do not meet the Federal Communication Commission's (FCC) higher standard of 25 Mbps download and 3 Mbps upload speeds.

Recommended steps to improve broadband infrastructure and access in the Taft/Maricopa area include:

1. Open discussions with Bright House's local management regarding the company's past participation in the Connect2Compete program, which provides low cost Internet access to qualifying households, and the possibility of offering it in the Taft/Maricopa area.

2. Either via an informal letter or through formal participation in the proceedings, provide comments regarding the Comcast/Time-Warner/Bright House transaction to the CPUC and the FCC expressing support of the merger conditions currently proposed by the CPUC. In particular, stress the educational and economic benefit of requiring Comcast to offer and actively promote low cost Internet access service (i.e. its Internet Essentials package) to low income households in the Taft/Maricopa area.

3. File a formal request to become a party to the proceeding when the CPUC opens its review of the proposed sale of Verizon's telephone systems to Frontier Communications. Assuming the request is approved, submit comments requesting the CPUC require Frontier to upgrade the system in the Taft/Maricopa area to provide broadband service that meets CPUC standards, as a condition of approving the transaction.

4. Develop a carrier-neutral program to promote the adoption of affordable Internet service plans by families in the Taft/Maricopa area. This program could be based on the Get Connected template developed by the California Emerging Technology Fund (CETF), with the assistance of its local grantee, Fresno State University.

5. Coordinate the cooperative purchase of high capacity Internet access service by local educational institutions, government agencies and large companies with the objective of increasing local purchasing power by aggregating existing telecommunications budgets.

6. Negotiate directly with middle mile (inter-city) broadband service providers with the objective of establishing an independent, high-capacity fiber-based link between the Taft/Maricopa area and major Internet interconnection points. This kind of link can provide low cost, high capacity industrial grade Internet bandwidth to local educational institutions, government agencies, large companies and retail-level Internet service providers in the community.

7. Ascertain the interest of local governments, educational institutions, businesses and residents in developing community-based Internet access. Options include building a consumer and/or business focused network using fiber optic or wireless technology, and/or establishing community-supported Internet and computer access centers.

8. If interest exists, identify a lead agency for a community broadband project and move to the feasibility, financing and request for proposal stages.

2. Broadband infrastructure

2.1. Report card

In general, core broadband infrastructure in the Taft/Maricopa area is poor, compared to the Californian average. The best grade – "D" – is found in the City of Taft and adjacent unincorporated communities, and the City of Maricopa. Residential wireline broadband service in those locations is only available from one provider and meets the CPUC's minimum standard of 6 Mbps download/1.5 Mbps upload speeds. The remaining unincorporated areas score grades ranging from "F-" – no residential wireline infrastructure at all – to "D-", which indicates that significant portions of those communities lack infrastructure and the balance only meets the CPUC's minimum.

	Households	GPA	Grade
Derby Acres CDP	144	0.0	F-
Dustin Acres CDP	252	0.9	D-
Fellows CDP	40	0.0	F-
Ford City CDP	1,426	1.0	D
Maricopa	466	1.0	D
McKittrick CDP	46	0.0	F-
Mettler CDP	36	0.0	F
South Taft CDP	733	1.0	D
Taft	2,525	1.0	D
Taft Heights CDP	776	1.0	D
Tupman CDP	73	0.0	F-
Valley Acres CDP	193	0.9	D-
County	372	0.3	F+
Overall	7,082	0.9	D-

Internet service providers regularly submit reports regarding advertised download and upload speeds to the California Public Utilities Commission. This data is either reported on a census block basis, or by address or simple maps, which can be re-mapped to census blocks. The information submitted as of 31 December 2014 and published by the CPUC in July 2014 was used for this report.

The study area is generally defined as the cities of Taft and Maricopa, and the surrounding unincorporated area. A total of five census tracts were examined, three of which (06029003400, 3500 and 3600) comprise the central area of the City of Taft and adjacent, developed unincorporated areas. Another, 3303, takes in Maricopa, some outlying areas of Taft and surrounding unincorporated areas.

The fifth, 3304, takes in the remainder of Taft and extends north and east to encompass several unincorporated communities.

To develop a broadband report card for the region, this data was sorted by the type of service provider – core infrastructure, commercial/industrial, fixed wireless, mobile – and letter grades were assigned to each census block in the region based on the level of service reported by core infrastructure companies.

A "C" grade means a census block has the most common service choices found in California, typical of the standard packages offered by AT&T and Comcast. "A" and "B" grades are given where superior service is offered, at least compared to the Californian average.

A "D" grade indicates that service is worse than the average in California, but meets the minimum standard of 6 Mbps download and 1.5 Mbps upload speed set by the California Public Utilities Commission. A census block fails – rates an "F" – if the service available doesn't even meet the CPUC's minimum standard. This methodology is more completely explained below.

These letter grades were then assigned a numeric value on a four-point scale (A=4, B=3, etc.). Average scores – similar to grade point averages – were calculated for cities, unincorporated communities (i.e. census designated places) and the balance of the unincorporated area that surrounds cities and CDPs.

2.2. Fiber availability

Onsite surveys conducted on 21 July 2014 and 2 December 2014 found three companies that maintain fiber optic infrastructure in the study area: Bright House, the incumbent cable company; Verizon, the incumbent telephone company; and Vast Networks, a long distance fiber optic company. Only Bright House provides consumer-level Internet access service in the Taft-Maricopa area.

Figure 2.1- Vast Networks fiber marker in Taft.

Bright House's fiber infrastructure appears limited to serving as trunk connections between its network operations center and residential nodes. Verizon owns long haul fiber that appears to provide middle mile connectivity for its telephone services in the area. Its fiber runs north, out of Taft, along State Route 33.

A separate long haul fiber line also runs generally north and south through Taft, connecting to major Internet exchanges in the San Francisco and Los Angeles areas. The line bypasses Maricopa on its east side, heading east to connect with the major fiber routes that run generally along Interstate 5, and with the Central Valley Next Generation Broadband Infrastructure Project, which serves the eastern side of the Central Valley and the Sierra foothills. The CVNGBIP is a partnership between the Corporation for Education Network Initiatives in California (CENIC) and the Central Valley Independent Network, LLC (CVIN). CENIC is the primary provider of subsidised Internet bandwidth and inter-campus connectivity to educational institutions in California.

Vast Networks, which is affiliated with the CVIN owns the fiber route through Taft, although some of the route markers still bear the name of its original owner, WilTel Communications. A network map provided by Vast indicates that the nearest existing access point to this route is located north of McKittrick. According to Vast, it is not presently in use, and its condition is unknown.

Assuming this fiber line is in serviceable condition, it can form the basis for an independent link to major Internet interconnection points in either northern or southern California, or both. As the owner of this line, Vast Networks could provide this link. However, other long haul fiber companies (e.g. Level 3, Inyo Networks, Sunesys) might also be able to lease access to this fiber and use it to interconnect to their existing networks.

2.3. Broadband adoption

The CPUC collects data from statewide video franchise holders regarding the penetration and adoption rates of broadband service throughout California. This information is published on the California Broadband Availability map. However, in cases where only a single company reports broadband subscriber figures, the information is not publicly released.

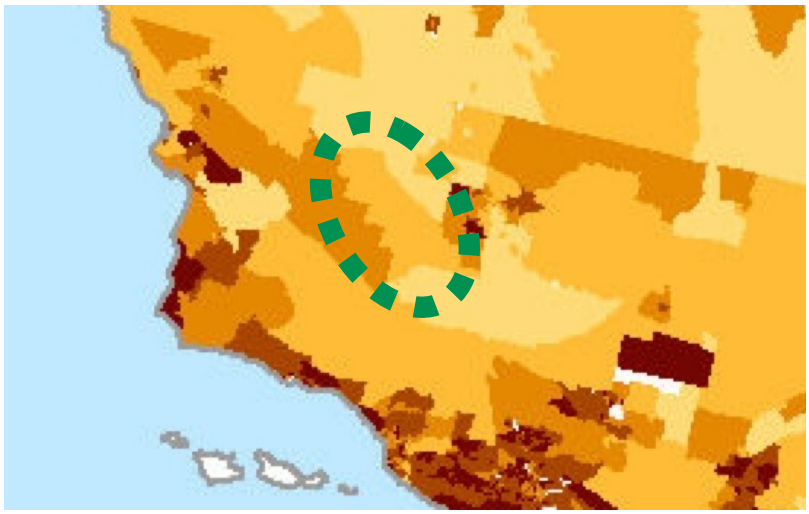


Figure 2.2 - Federal data shows a 20% to 40% broadband adoption rate in the Taft/Maricopa area.

The California Broadband Availability map contains no information regarding broadband adoption or penetration in the Taft/Maricopa, or indeed anywhere within Bright House's service area. This absence could be due to a lack of reporting from Bright House or because the information can be directly attributed to Bright House and has therefore been suppressed. However, county-by-county figures released by the CPUC show an average adoption rate of 61% in Kern County. Given that level of adoption county-wide, it is likely that Bright House did submit adoption rate information to the CPUC and the lack of specificity is due to data suppression. The statewide average is 74%, but the figure for rural areas is only 45%.

A map prepared by the Federal Communications Commission using a somewhat different methodology shows that broadband adoption in the Taft/Maricopa area is in the 20% to 40% range. The methodology is comparable enough, however, to reach the conclusion that broadband adoption by consumers living in the Taft/Maricopa area is substantially lower – half or less – than the statewide or Kern County averages, and lower than the average for rural areas in California. This conclusion is in line with findings in other areas – urban and rural – where broadband infrastructure is sub-par (see section 5.12 below for more detail).

2.4. Broadband adoption programs

The Office of Community and Economic Development at Fresno State University manages an ongoing broadband adoption program targeting low income communities under a Get Connected grant from the California Emerging Technology Fund (CETF). It is also the lead agency for the San Joaquin Valley Regional Broadband Consortium, which is funded by the CPUC via the California Advanced Services Fund and likewise supports broadband adoption efforts.

The center piece of broadband adoption programs funded by CETF are low cost Internet access packages offered by cable television companies to low income households. Examples include the Connect2Compete package offered by Bright House Networks (the local incumbent cable company) in other states (but not in California), and the Internet Essentials package offered by Comcast, which is in the process of attempting to acquire control of Bright House Networks. However, these programs include other elements as well, such as computer and Internet training, access to low cost equipment and ongoing cooperation with other Internet service providers.

3. Service providers

Three companies have filed reports with the CPUC claiming to offer consumer service in the Taft/ Maricopa area: Bright House Networks, TW Telecom and unWired Broadband. A fourth company, Verizon, provides voice-only telephone service in the area and has not upgraded its network to support broadband service.

3.1. Bright House

Bright House Networks is the primary Internet service provider in the Taft-Maricopa area. It is a cable company which offers television, telephone and Internet service in the Cities of Taft and Maricopa and adjacent unincorporated areas, and to residential areas northeast of Taft along State Route 119. It does not serve the Fellows area or the area between Taft and Maricopa.

Internet service is offered throughout its footprint at speeds of up to 90 Mbps download/10 Mbps upload. This information is generally consistent with the reports that Bright House filed with the CPUC, except that the maximum upload speed reported is 6 Mbps, as opposed to the 10 Mbps speed advertised. The CPUC has not validated Bright House's data, however. The speed level reports are the same throughout Bright House's California service area, which extends east through the Bakersfield area and north as far as Wasco. These speed levels, if validated, are sufficient to meet the CPUC's minimum consumer Internet service standard of 6 Mbps download and 1.5 Mbps upload speeds, and the FCC's higher standard of 25 Mbps down/3 Mbps up.

According to a representative at its office in Taft, who was interviewed on 21 July 2014, its standalone monthly Internet pricing is as follows:

Bright House Service Plans

Download speed	Upload speed	Introductory rate, 1 year	Full price
1 Mbps	512 Kbps	$24.25	$40.00
10 Mbps	1 Mbps	$37.00	$57.00
30 Mbps	2 Mbps	$60.00	$77.00
60 Mbps	5 Mbps	$78.00	$93.00
90 Mbps	10 Mbps	$93.00	$108.00

Bright House has participated to a limited extent in the Connect2Compete program which offers $10 per month Internet service to households with at least one child on a free or reduced price lunch program at school. This offer is not available, however, to people living in Bright House's California service area and its availability in other parts of the U.S. is uncertain – the information on the Bright House website indicates that the program was only valid for two years, in 2012 and 2013.

The outlook for Bright House is likewise uncertain. If state and federal regulators approve a proposed merger between Time-Warner (which is effectively the majority owner of Bright House) and Comcast, Comcast would assume operational control, if not full ownership.

Comcast has a similar $10 per month program called Internet Essentials, which it claims to offer throughout its California service area. This program is controversial because of repeated and well documented problems that people have encountered when attempting to sign up for it and in maintaining access to it over the long term. The service speeds offered – 5 Mbps download and 1 Mbps upload – are below the minimum residential broadband service standard set by the CPUC.

Bright House and Comcast, along with other parties such as Time-Warner and Charter Communications, have applied to the CPUC for permission to transfer state telephone service authorizations as a part of the merger transactions. A preliminary decision[1] from the administrative law judge handling the case has affirmed the CPUC's jurisdiction over both the telephone and broadband service aspects of the merger, and has proposed several conditions for approval that Comcast would have to meet. These include:

- Build out broadband service to every home in its new territory that currently gets cable television service within two years, and expand into unspecified, nearby areas, and ensure that all homes can receive service at 25 Mbps download and 3 Mbps upload speed within five years. Since it appears that Bright House already offers broadband service meeting that standard to all the homes it serves with cable television service in the Taft/Maricopa area, this requirement might be moot.
- Offer standalone Internet access to its entire expanded service area at Time-Warner rates. Time-Warner sells standalone Internet service at prices ranging from $15 per month for 3 Mbps to $45 per month for 100 Mbps. This price cap would last five years, and would cut prices in the Taft-Maricopa area by more than half.
- Expand eligibility for the $10 per month Internet Essentials program "to include all households in the service territory of the merged company having household incomes equal to 150% of the federal poverty level or less", increase the service level provided to 10 Mbps download and 1 Mbps upload speeds, provide a WiFi-enabled router, "enroll at least 45% of eligible households…within two years" and meet various other requirements. The language of the proposed decision contains some ambiguities, but it is understood that the intent is to apply all of these requirements to current Bright House service areas, including the Taft/Maricopa area and that this language will be cleaned up in the final version.
- "[C]onnect and/or upgrade Internet infrastructure for K-12 schools and public libraries in unserved and underserved areas in Comcast's combined California service territory so that it is providing high speed Internet to at least the same proportion of K-12 schools and public libraries in such unserved and underserved areas as it provides to the households in its service territory".

There are also requirements for customer service, privacy, communications with the public (including web site design), service reporting standards, supplier diversity, disabled access, lifeline and 911

[1] Proposed Decision Of Administrative Law Judge Bemesderfer Granting With Conditions Application To Transfer Control (Application 14-06-012) filed 13 February 2015. http://www.tellusventure.com/downloads/comcast/cpuc_proposed_decision_comcast_13feb2015.pdf.

service, battery back ups, commercial service pricing and access to Internet television service. Comcast would also be prohibited from opposing municipal broadband projects for five years.

These requirements are preliminary only, and must go through a review process and be approved by commissioners. Any decision by the CPUC would only take effect if the merger and associated transactions were also approved by federal authorities, and state attorneys general and utility commissions where applicable. The federal process is anticipated to be completed in mid-2015, although it could go longer. It is possible that approval conditions imposed by federal authorities could modify or preempt requirements placed on the merger by the CPUC, and legal challenges in state and federal courts are expected.

Until the uncertainty over ownership and management of Bright House systems is resolved, it is unlikely that any major capital investments will be made, although routine work will continue. However, this uncertainty is not necessarily a bar to the extension of Bright House's existing Connect2Compete program to the Taft/Maricopa area. In fact, providing this low cost Internet access plan could be a benefit to Bright House as it pursues approval of the proposed merger by demonstrating a good faith effort to conform to standards of good corporate behaviour as well as comply with the wishes of regulators.

3.2. Verizon Communications

Verizon Communications is currently the incumbent local exchange carrier (ILEC) in the Taft-Maricopa area, providing voice-only telephone service. It does not offer any Internet service, and has not announced plans to do do. The reason for this lack of service could be antiquated lines and/or central office equipment, a condition that was commonly associated with the former ILEC, GTE, which Verizon acquired. Insufficient intercity middle mile bandwidth could also be a factor.

Figure 3.1 - Verizon's wireline telephone systems, which will be sold to Frontier Communications, include the one serving the Taft/Maricopa area..

In February 2015, Verizon announced an agreement to sell its wireline telephone systems in California, including the one serving the Taft/Maricopa area, to Frontier Communications, which is a relatively small ILEC serving some rural areas of the state. This transaction must be approved by California and federal regulators, and the companies have stated that this approval is expected by the middle of 2015. While the purchase is being finalized, Verizon will not make any significant capital improvements to its existing systems.

Frontier has not announced any specific plans for the Californian systems it intends to acquire, and is not expected to do so prior the completion of the transaction unless required by regulatory bodies. However, unlike Verizon, Frontier has invested in upgrading broadband service in the rural telephone systems it owns in California, and participates in the California Advanced Services Fund (CASF) and the federal Connect America Fund broadband infrastructure subsidy programs. During the company's most recent conference call with investment analysts, a Frontier representative said that it would be

continuing participation in the federal program and recent filings with the CPUC indicate that it has the same intention regarding CASF.

This sale is less controversial than the Comcast/Time-Warner/Bright House/Charter transactions, however there are issues which must be resolved by regulators, including the CPUC. It would not be a surprise if conditions were imposed prior to regulatory approval, at the state or federal level, although requirements as far reaching as those proposed for the Comcast transactions would be unusual.

3.3. TW Telecom

Formerly owned by Time-Warner, TW Telecom is an independent company that specializes in providing high speed services to businesses. It has filed a report with CPUC claiming to offer service on the outskirts of Taft, Maricopa and McKittrick, at speeds between 50 Mbps and 100 Mbps, download and upload. The CPUC has not validated this claim. The areas it reports serving appear to primarily be oil industry sites and/or locations where it could be providing intercity connectivity to Bright House. These areas do not include any community anchor institutions, or significant residential or business areas. The one exception is a small area of central Maricopa.

There is no indication that TW Telecom owns any significant primary broadband infrastructure in Taft. Typically, commercial-grade broadband providers such as Time-Warner have resale agreements with primary providers, such as Bright House or Verizon, to use leased lines to deliver service. However, it is possible, given the isolated nature of the locations served, that TW Telecom has installed some of its own infrastructure.

3.4. unWired Broadband

One wireless Internet service provider (WISP) – unWired Broadband – has reported to the CPUC that it provides service in the Taft-Maricopa area, using unlicensed spectrum. The data it filed with the CPUC indicates that it can deliver service in some locations in the Taft-Maricopa area that meets the minimum 6 Mbps down/1.5 Mbps up standard, however this claim is unlikely to be correct, for several reasons.

First, the report appears to have been generated by standard, uncorrected radio frequency modelling software, which shows the Taft-Maricopa region to be on the edge of a much larger service area. This type of modelling does not produce accurate, wide area service availability maps, particularly for unlicensed spectrum and at the edge of coverage areas.

Second, the CPUC has only been able to validate 14% of these service claims, supporting the view that the modelling that unWired performed in order to generate these reports was unsophisticated.

Finally, the unWired website does not include Taft, Maricopa, McKittrick or any other nearby communities on the list of places it serves. This omission indicates that even if it is technically possible to provide service in some locations, it is not commercially feasible for the company to expend much effort in doing so.

unWired Broadband Service Plans

Symetrical	**Download Speed**	**Upload Speed**	**Monthly Cost**
Standard Wireless	1.5 Mbps	1.5 Mbps	$69.95
Plus Wireless	2.0 Mbps	2.0 Mbps	$99.95
Silver Wireless	3.0 Mbps	3.0 Mbps	$149.95
Gold Wireless	4.0 Mbps	4.0 Mbps	$199.95
Platinum Wireless	5.0 Mbps	5.0 Mbps	$299.95
Titanium Wireless	6.0 Mbps	6.0 Mbps	$349.95
Asymmetrical			
Basic Wireless	2.0 Mbps	384 Kbps	$59.95
Standard Wireless	3.0 Mbps	512 Kbps	$79.95
Plus Wireless	4.0 Mbps	768 Kbps	$109.95
Silver Wireless	6.0 Mbps	1.0 Mbps	$159.95
Installation cost			
3 year commitment	$99		
2 year commitment	$199		
1 year commitment	$299		

Affordability is an issue for WISP service in general and unWired in particular. Its least expensive monthly service plan – even in the areas where it does advertise service – is $60 for 2 Mbps down/384 Kbps up. The only service plan that meets the CPUC's minimum service standard costs $350 per month, although one that comes close – 6 Mbps down/1 Mbps up – costs $160 per month. None of these plans meets the FCC's minimum of 25 Mbps down/1 Mbps up.

3.5. Mobile broadband service

Mobile data field testing conducted by the CPUC shows that none of the four major mobile service providers in California – AT&T, Verizon, Sprint, and T-Mobile – deliver service that meets the CPUC's minimum 6 Mbps down/1.5 Mbps up standard, let alone the FCC's higher minimum. In making this determination, the CPUC takes service reliability into account: even if higher peak speeds are sometimes present, the actual speed determination is based on what an average customer might experience 80% of the time.

AT&T reports that its mobile service provides download speeds between 3 Mbps and 6 Mbps in Taft and Maricopa, and that is offers higher speeds in surrounding rural areas. T-Mobile reports download speeds of between 1.5 Mbps and 3 Mbps in the area, while Sprint reports its service to be at between

768 Kbps and 1.5 Mbps download speeds. Field testing by the CPUC indicates that these service levels may be present in some areas, at some times.

Verizon reports download speeds of between 10 and 25 Mbps, however this performance claim is not supported by CPUC field testing, which indicates the Taft area may receive download speeds in the 6 to 10 Mbps range, while the Maricopa area receives service in the 3 to 6 Mbps range. Upload speeds, however, are substandard across the board.

4. Community-based broadband

4.1. Background

Some cities – Palo Alto, San Leandro, Benicia and Santa Monica are examples – are involved to one degree or another in developing broadband facilities and services for commercial and industrial areas. Other cities, for example Alameda, Loma Linda, Brentwood, Lompoc and Provo, Utah, have pursued broadband projects that are focused on providing consumer-grade Internet service to homes. Each city has its own particular set of circumstances, constraints and needs, but all have determined that broadband is an essential twenty-first century utility – as necessary for economic development and social equity as water or electricity – and that there is a public interest in encouraging its development.

Consumer-grade Internet access is typically a shared resource, with many subscribers contending for the same bandwidth, and is subject to speed and volume limits as determined by the provider. This type of service often meets the needs of small and medium businesses, but not always. And it is generally inadequate for larger companies, which need commercial and industrial grade broadband facilities.

"Commercial grade" service is defined as being similar to residential service in that the provider takes effectively all responsibility for installing, maintaining and supporting the service. Speeds are similar (6 to 100 Mbps), but service levels, reliability, consistency and pricing are higher. Comcast's Business Class service or AT&T's business DSL service are examples of commercial grade service.

"Industrial grade" service refers to service where the customer plays a much greater role in building and supporting the service, including buying different elements from different vendors and managing installation and support. Speeds would be higher – perhaps as high as a gigabit per second or more – and quality of service levels could be as high as found in top tier Internet exchanges. DS-3 circuits or dark fiber strands are examples of industrial grade service.

Municipal broadband business models include city or county owned and operated networks, partnerships with private companies, and facilitation of the development of completely private systems. Networks can be fiber-based and focused on either business and industrial customers or on consumer-grade service to homes. Or systems can be developed using wireless technology, either as a primary consumer service, a point-to-point business oriented service or as amenity-grade hot spots for residents and visitors. Other options include establishing community centers where Internet access is available to residents, as well as potentially offering access to equipment and training.

Examples (in California unless otherwise indicated) include:

City of Palo Alto – the municipal electric utility has installed more than 40 miles of fiber optic cables, which it makes available to business and industrial customers.

City of Santa Clara - similar to Palo Alto, the city's electric utility provides access to fiber optic lines to businesses, and also uses the smart meter infrastructure it has installed to support amenity grade WiFi service.

City of San Leandro - the city has entered into an agreement with a local company, Lit San Leandro, to provide access to city-owned conduit. The private company installed fiber optic lines in the conduit, which support commercial and industrial customers. In exchange, the city receives access to the network for its own use and, eventually, will receive conduit lease revenue.

City of Benicia - the city has awarded a contract to Lit San Leandro to provide industrial-grade Internet service to a local industrial and a nearby redevelopment area.

City of Santa Monica - the city's information technology department provides ethernet connectivity between local businesses and nearby data centers, where high capacity Internet bandwidth can be obtained relatively inexpensively.

City of Loma Linda - the city requires newly built and remodelled homes to include fiber optic connections to the city-run network, which offers optional Internet service to residents.

City of Brentwood - for the past 15 years, the city has required new home construction to include empty conduits which are deeded over to city. An agreement has been reached with an independent Internet service provider, Sonic.net, to use the city-owned conduit to install fiber lines and provide fiber-to-the-home service to homes already served by conduit, and extend the system over time throughout the city.

City of Provo, Utah - the city's municipal electric utility built a fiber-to-the-home system using bonds that were to be paid back via the revenue generated. However, the revenue was insufficient to meet bond obligations and a mandatory monthly fee was added to residential and commercial electric bills. The system was subsequently sold to Google for a nominal amount, although the bond obligations remain with the city and local electric ratepayers.

Kansas City, Kansas and Missouri and Austin, Texas – local governments have worked with Google Fiber to facilitate construction of privately-owned, competitive fiber-to-the-home systems. This facilitation includes access to government owned facilities, such as right of ways and pole access for fiber installation and real estate leases for equipment huts, as well as a high degree of cooperation in granting permits and carrying out inspections.

City of Alameda - the city's electric utility built a cable system offering video and Internet service which competed for customers with the incumbent private telephone and cable companies. It could not generate sufficient revenue to meet its bond obligations and the system was sold at a loss to the local private cable operator, Comcast. Because the bonds were only backed by revenue from the cable system, and not the electric utility or the city's general fund, bondholders bore the loss.

City of Lompoc - the city's electric utility built and continues to operate a municipal WiFi utility which was originally intended to provide ubiquitous Internet access to homes and businesses. Although using WiFi to provide primary Internet access to homes proved problematic, the system provides a valuable, albeit low speed, lifeline option for residents and access for visitors.

4.2. Options for Taft and Maricopa

As noted above, Taft and Maricopa have access to an independently owned middle mile fiber optic line that, if serviceable, could deliver high capacity bulk Internet access at wholesale prices. This could be accessed by local agencies, institutions and businesses on a cooperative basis, and provide the necessary wholesale bandwidth to a local fiber or wireless-based Internet system or both.

A city-sponsored fiber-to-the-home and/or fiber-to-the-business system was discussed at the broadband workshop conducted on 2 December 2014 in Taft by Tellus Venture Associates. Based on that informal discussion, it appeared that a fiber-to-the-home system could be built within the city limits at a cost somewhere in the $5 million to $10 million range, although further study would be needed to develop a reliable estimate for budgetary purposes. A system that targeted only businesses would cost far less. Assuming that middle mile fiber is available, Internet access prices could range from a nominal cost for speeds in the 5 Mbps to 10 Mbps range, as Google Fiber is doing in Kansas City and Provo, and as is being proposed in other Utah cities, to $40 to $70 per month for gigabit service.

A system based on wireless technology could also be built, at a cost probably in the $1 million to $5 million range, to provide residential service, or point-to-point business service for much less. Although point-to-point wireless links can support gigabit-class speeds, the number of locations which can be served is relatively limited. Ubiquitous residential service can be provided using wireless technology, however speeds and reliability will be significantly less than fiber-based service and monthly costs could potentially be higher.

Local institutions, such as schools and government facilities, could be used as Internet hubs where local residents could come to gain access Internet service, either using their own portable equipment, for example devices which might be provided to students, or using public terminals provided for that purpose. These hubs could be served by wholesale bandwidth purchased on a cooperative basis as discussed above.

4.3. Next steps

If a community-based broadband system is deemed to be a viable option for the Taft/Maricopa area, then the first recommended step would be to ascertain the interest of local agencies and educational institutions and, potentially, major businesses, in cooperatively purchasing bulk Internet bandwidth and to assess the technical and financial feasibility of using the middle mile fiber line owned by Vast Networks to support such a purchase.

An alternative to developing a cooperative purchasing agreement would be to use existing bulk bandwidth provided to local educational institutions via CENIC and the Kern County Office of Education, however legal restrictions on the use of that bandwidth would limit it to activities which supported educational objectives. It couldn't be used to provision a public Internet access system, although it might be possible to use it to support community-center access.

As incumbent providers, Bright House and Verizon (or successor companies) might be a source of wholesale Internet bandwidth as well. While they are unlikely to willingly support a competitive,

public-facing system, they might be interested in supporting an Internet hub/computer center program, since such programs can serve to develop new customers for them.

The second step is to identify a lead agency for a community broadband project. Local educational institutions might be able to sponsor community-center access, but would not be suited to developing and operating a community-based Internet service provider. This type of project is most often pursued by cities, however counties – Inyo is an example – have done so too. Other potential sponsors include utility districts, joint powers authorities and non-profit or cooperative corporations established for that purpose.

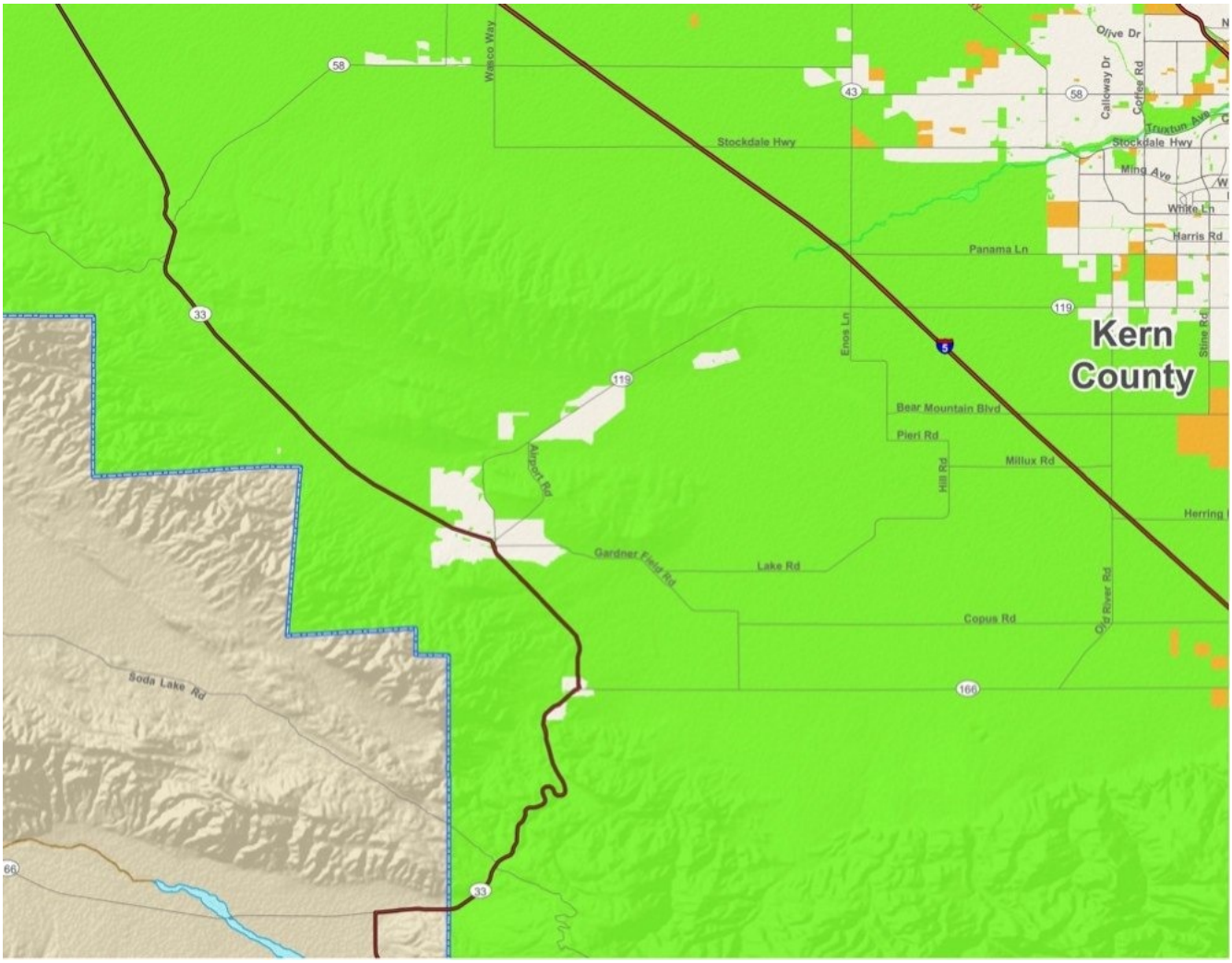
Once a lead agency has been selected, a preferred business model and reference technology should be determined and a feasibility study completed, with a request for proposal developed on that basis. At the same time, financing options need to be investigated and the source of funds identified.

5. Appendix A – Maps

5.1. Under served and unserved areas

Any area that where broadband service is present but not reasonably available at a minimum speed level of 6 Mbps download and 1.5 Mbps upload is considered “underserved” (orange areas) by the CPUC. Areas with a complete lack of broadband service, other than via satellite or dial-up or similar means, are considered “unserved” (green areas).

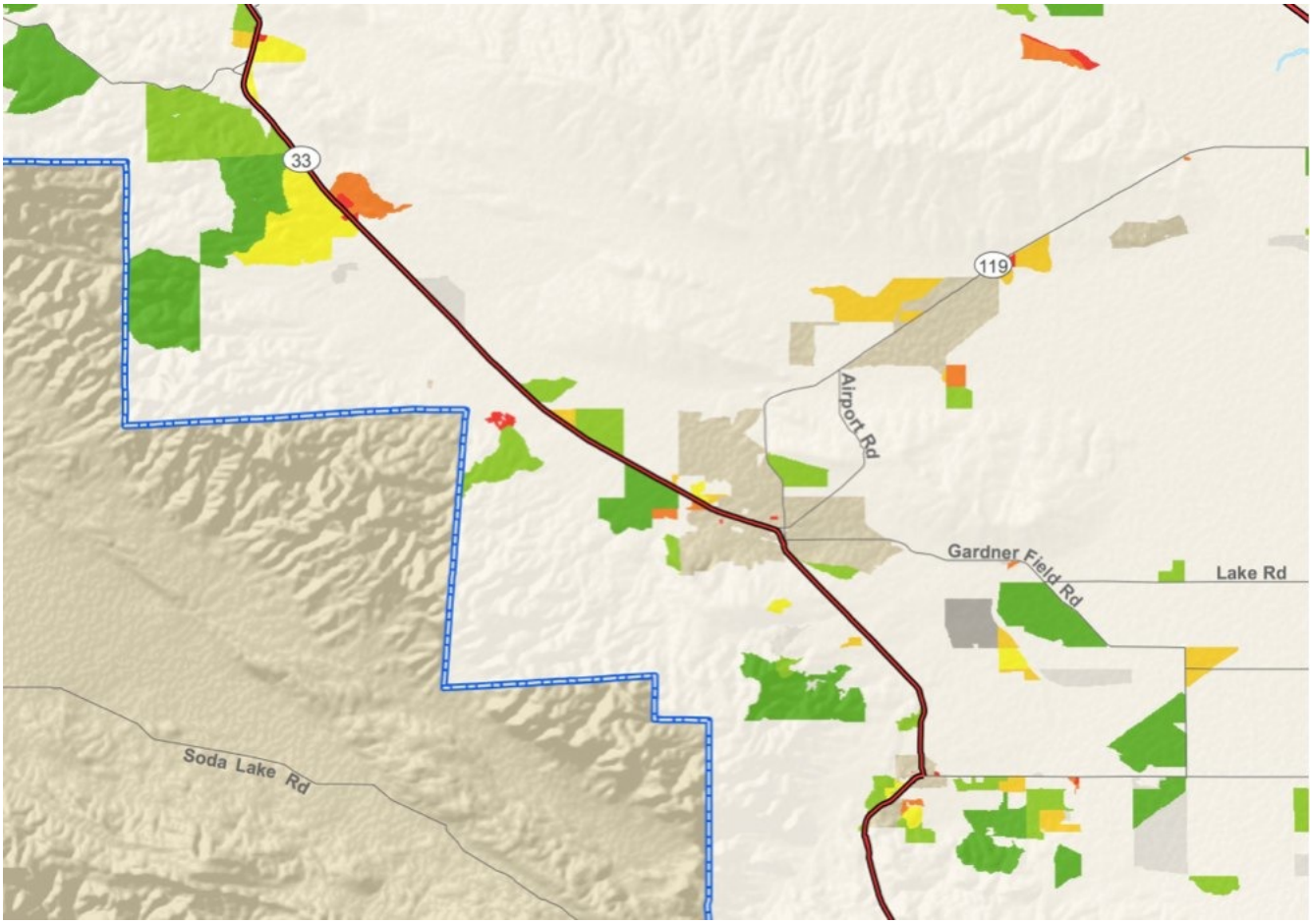
Unserved areas have priority for infrastructure grants and loans from the California Advanced Services Fund, which will provide up to 70% of construction costs as a grant and 20% (up to $500,00 per project) as a loan. Underserved areas are limited to 60% grant and 20% loan funding.



Source: Analysis done for California Emerging Technology Fund using CPUC round 9 data.

5.2. Population density of CASF-fundable areas

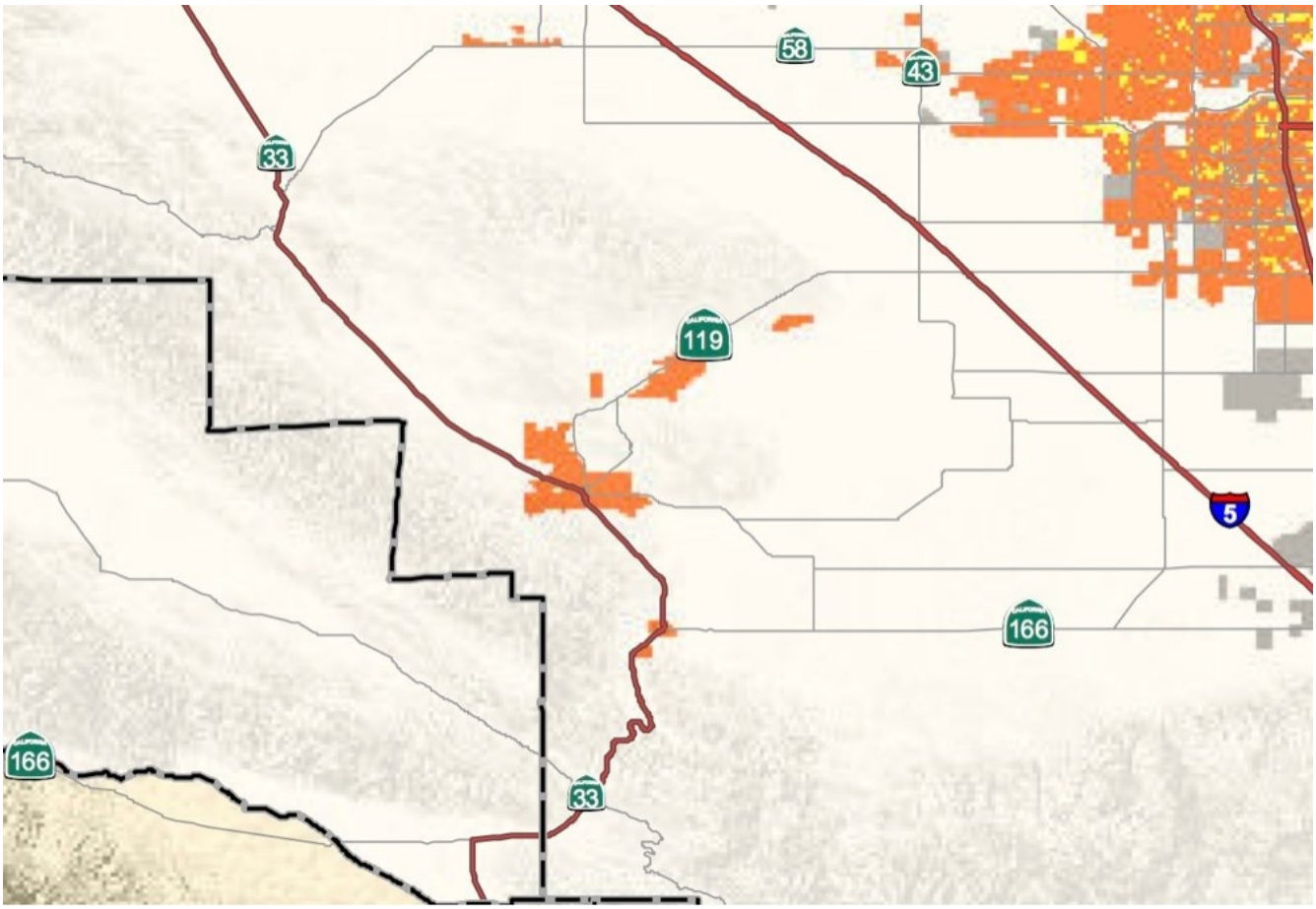
Color coding ranges from light green (lightly populated) to red (densely populated). White and grey are unpopulated. Areas within Kern County showing no color coding are "served" (i.e. at least one provider offers service at 6 Mbps down and 1.5 Mbps up) and therefore not eligible for CASF funding.



Source: Analysis done for California Emerging Technology Fund using CPUC round 9 data.

5.3. Broadband infrastructure report card

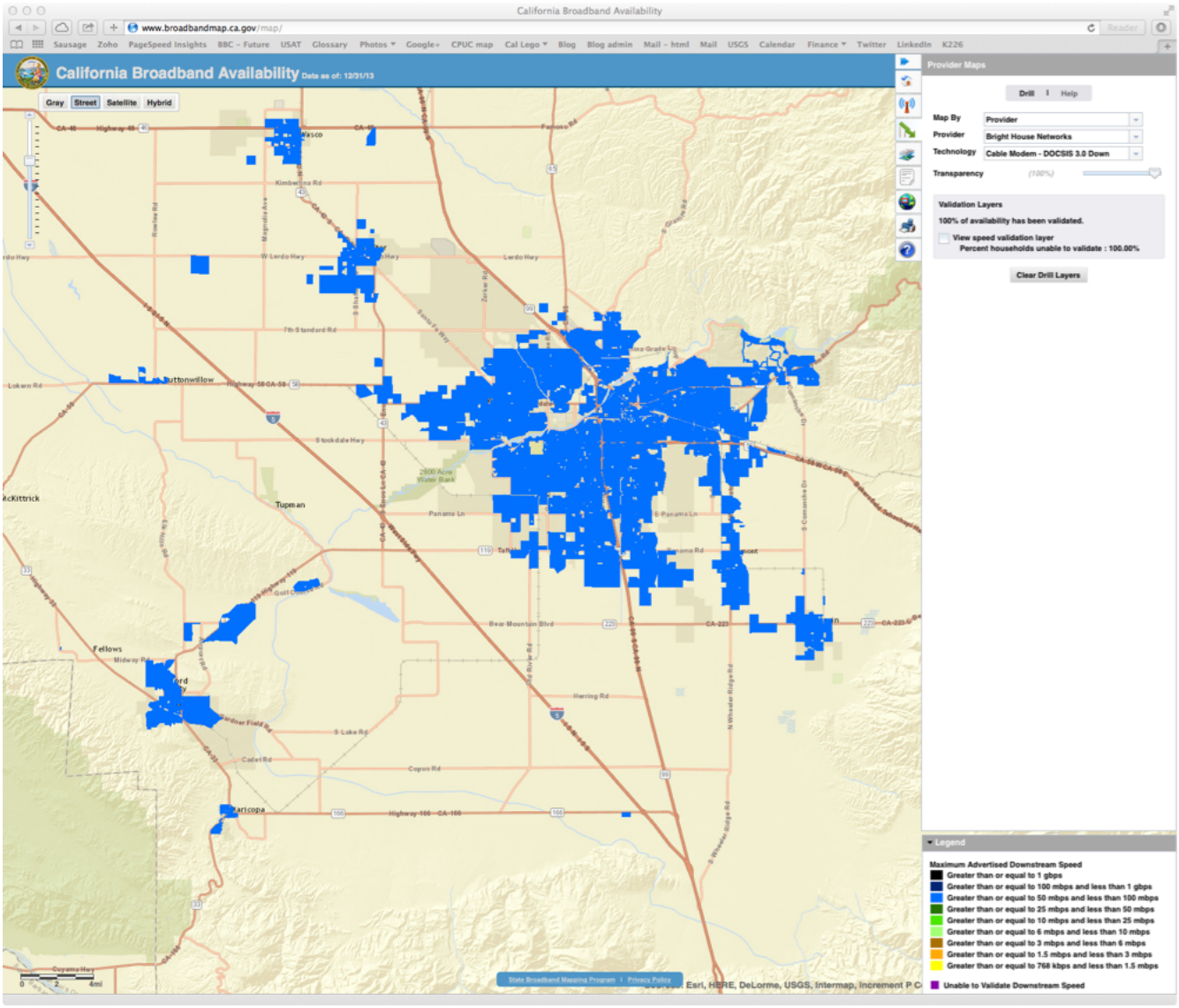
Areas are graded according to existing primary broadband infrastructure. Areas colored in white are "F-", areas in grey are "F", areas in orange are "D" and areas in yellow are "C". No areas within the map below received an "A" or "B" grade.



Source: Analysis done for Central Coast Broadband Consortium using CPUC round 9 data.

5.4. Bright House Networks regional availability

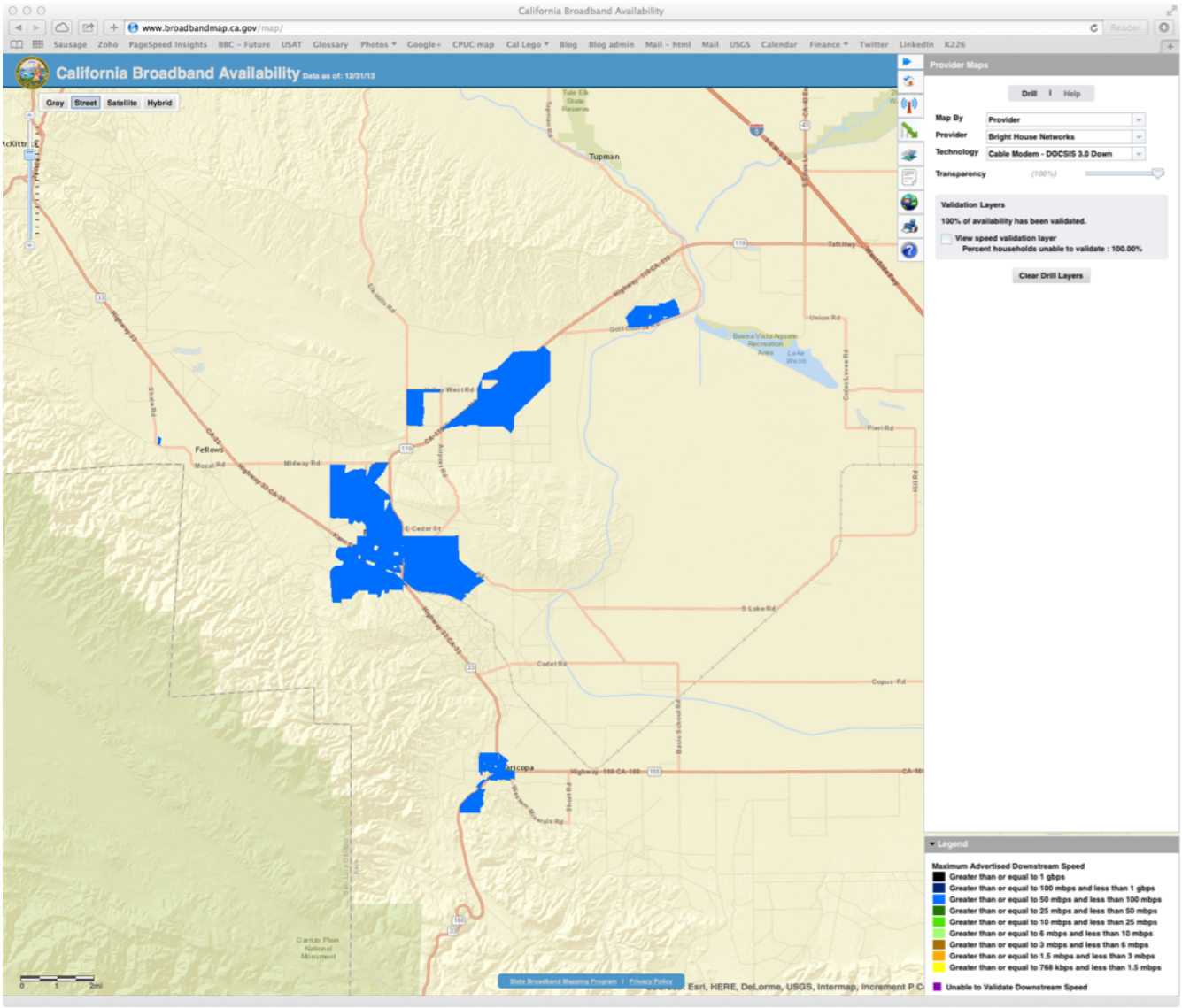
Areas shaded in blue represent census blocks where Bright House claims to offer service at between 50 Mbps and 100 Mbps download speeds.



Source: Bright House Networks round 9 report to the CPUC.

5.5. Bright House Networks local availability

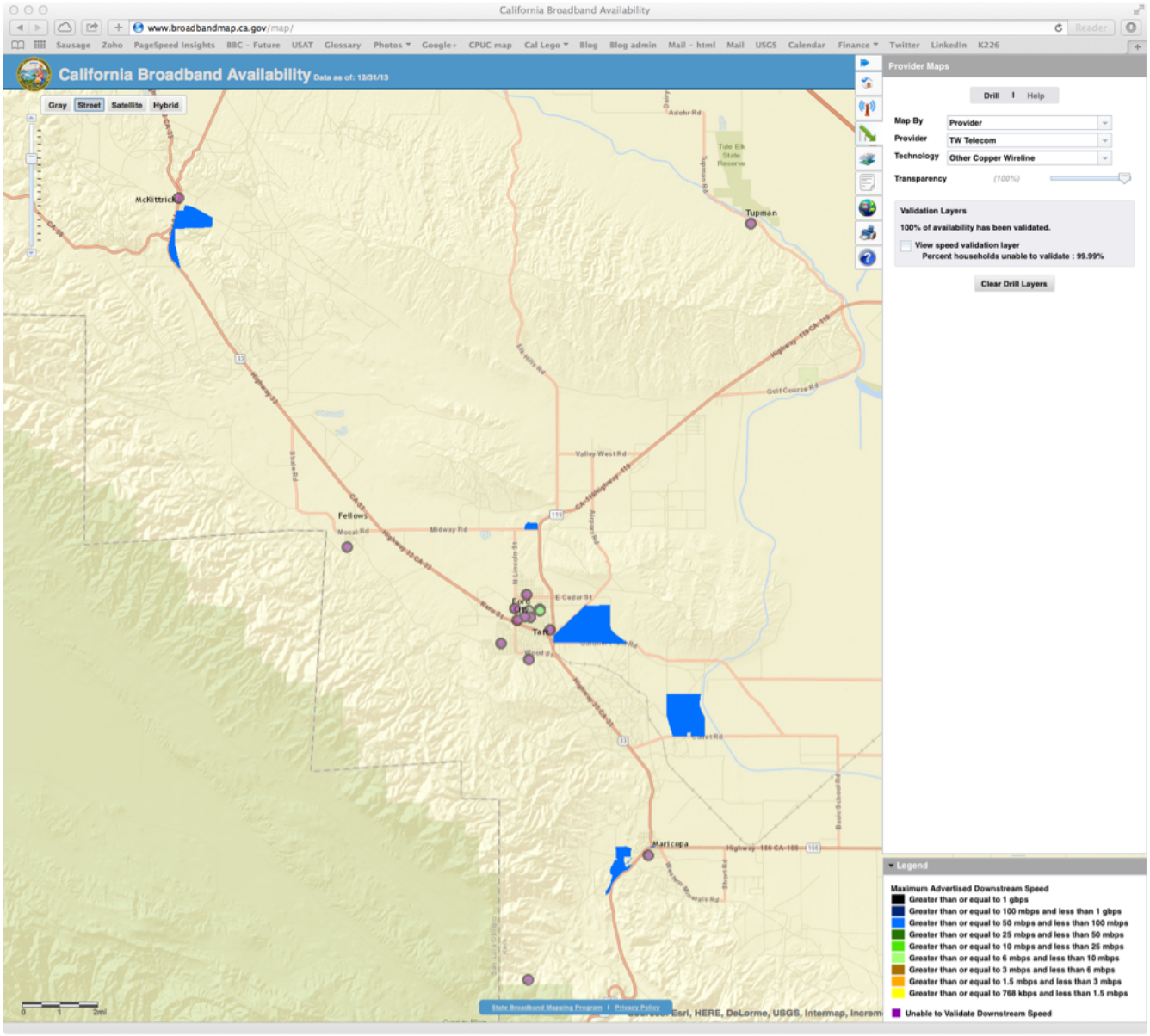
Areas shaded in blue represent census blocks where Bright House claims to offer service at between 50 Mbps and 100 Mbps download speeds.



Source: Bright House Networks round 9 report to the CPUC.

5.6. TW Telecom availability

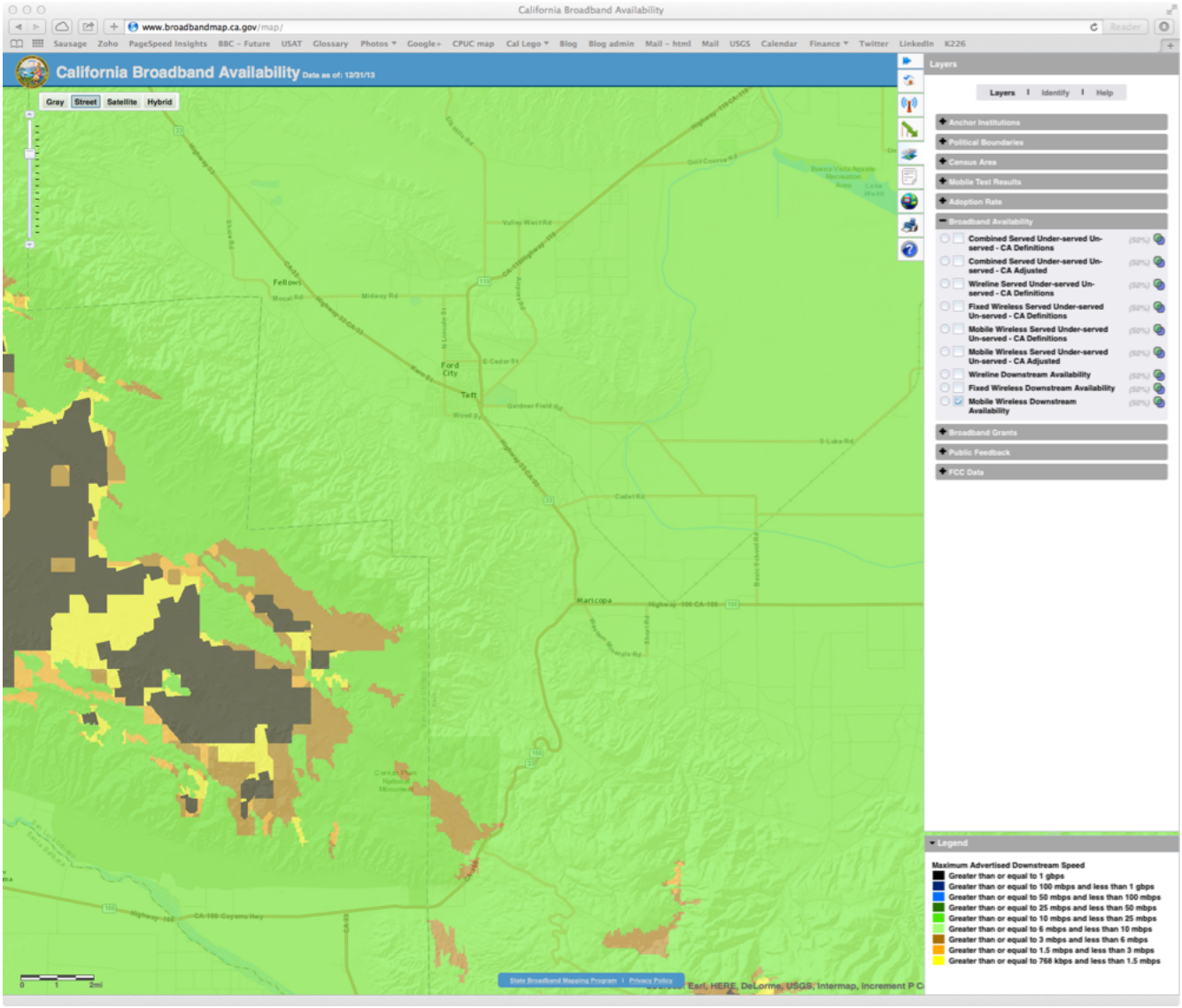
Areas shaded in blue represent census blocks where TW Telecom claims to offer service at between 50 Mbps and 100 Mbps download speeds. Dots represent community anchor institution locations.



Source: TW Telecom round 9 report to the CPUC.

5.7. Mobile wireless broadband availability

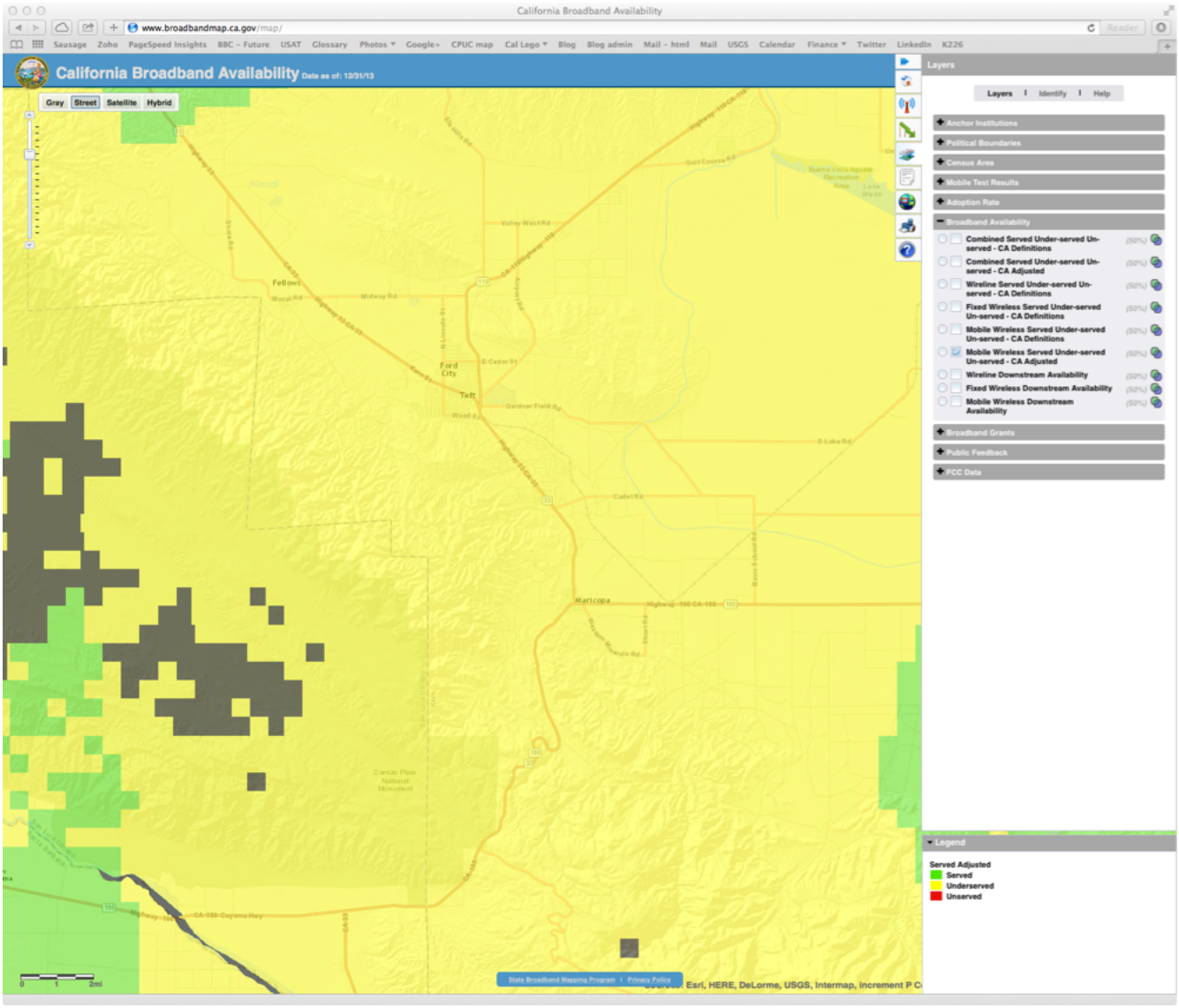
Map aggregates download speed reports from mobile carriers.



Source: mobile carriers' round 9 reports to the CPUC.

5.8. CPUC mobile broadband test results

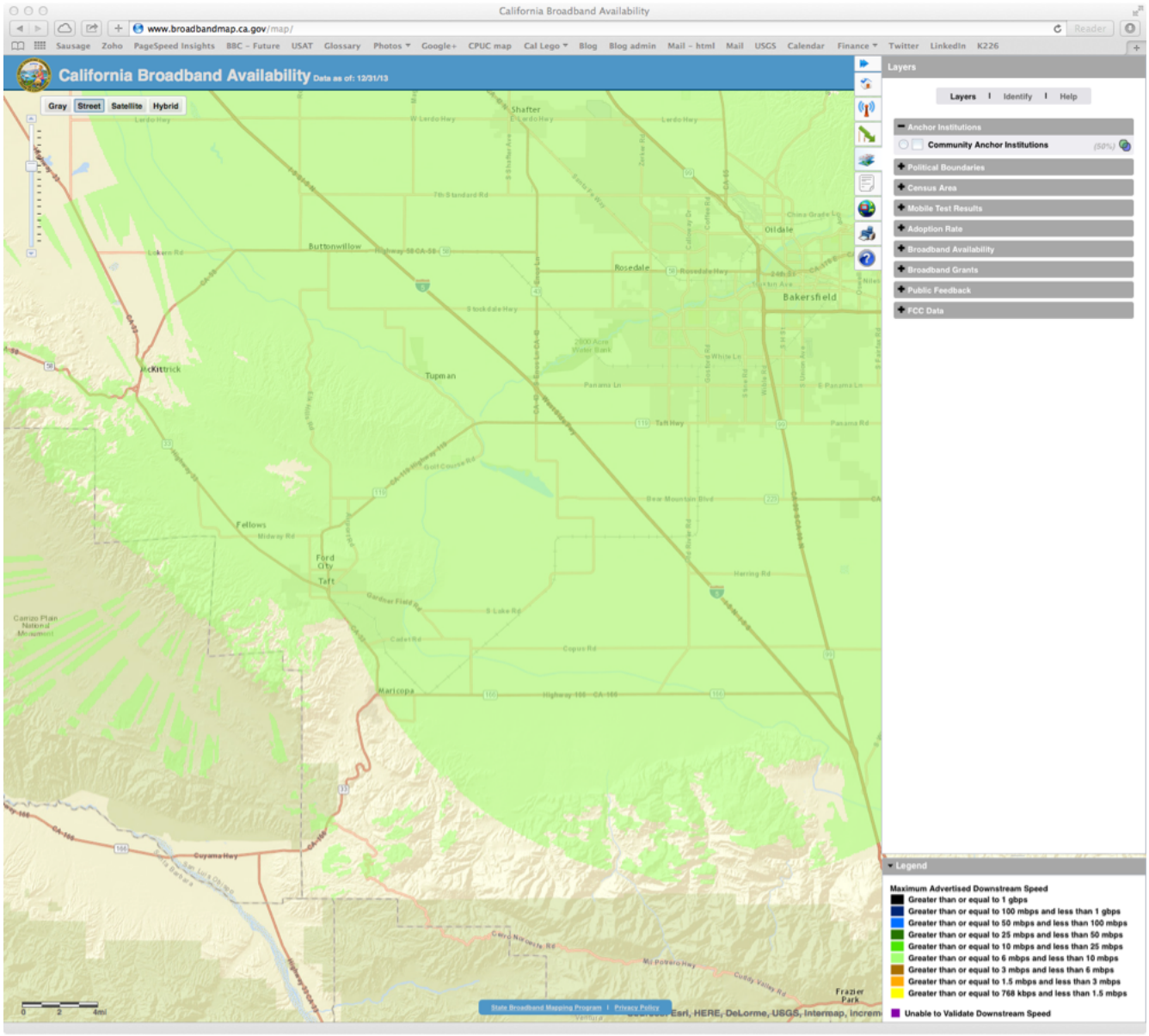
Map shows the CPUC's estimate of actual mobile broadband availability based on its own field testing.



Source: CPUC mobile field tests, included with round 9 data.

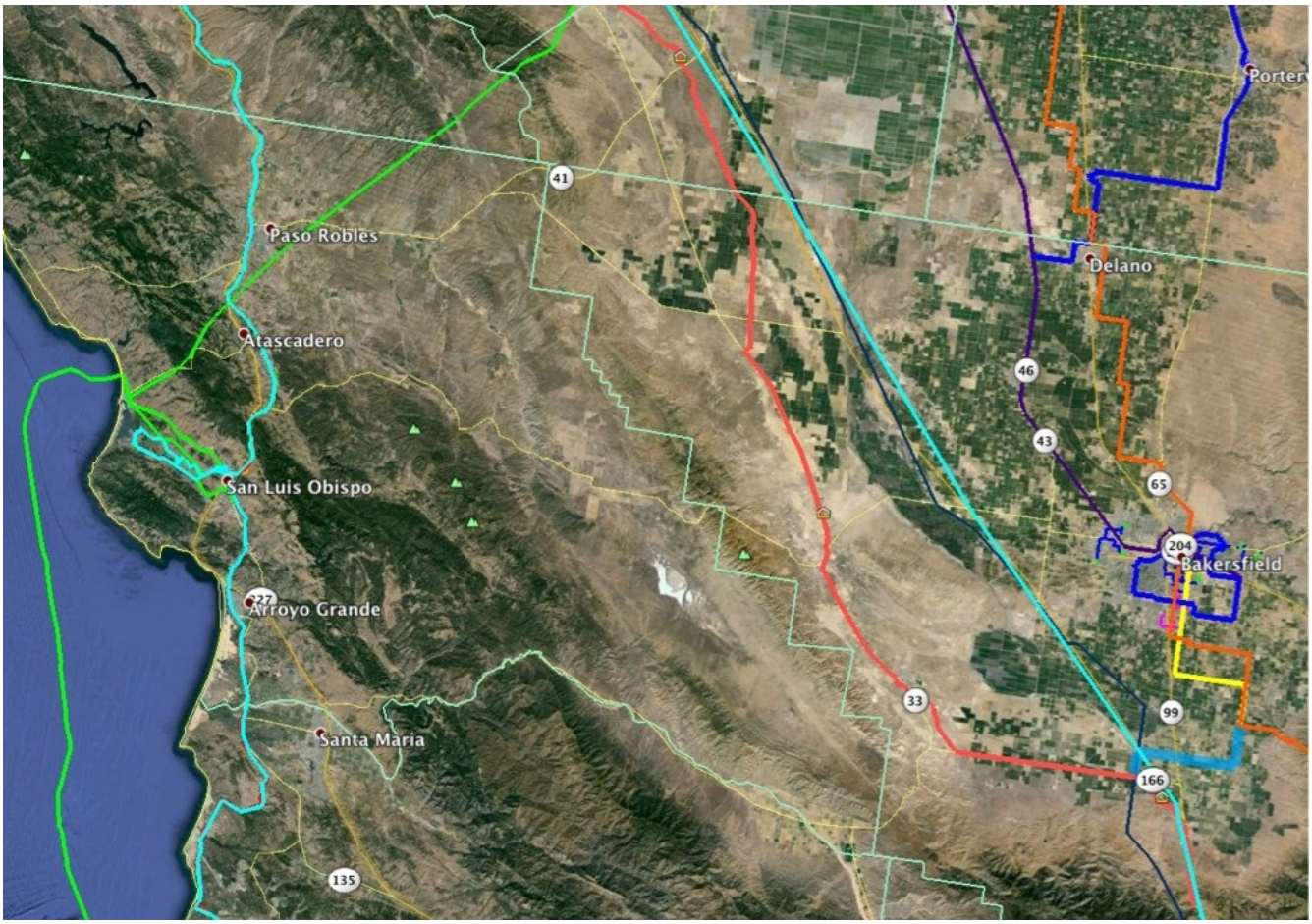
5.9. Fixed wireless broadband availability

Map aggregates download speed reports from fixed wireless Internet service providers.



Source: fixed wireless ISPs' round 9 reports to the CPUC.

5.10. Regional middle mile fiber routes

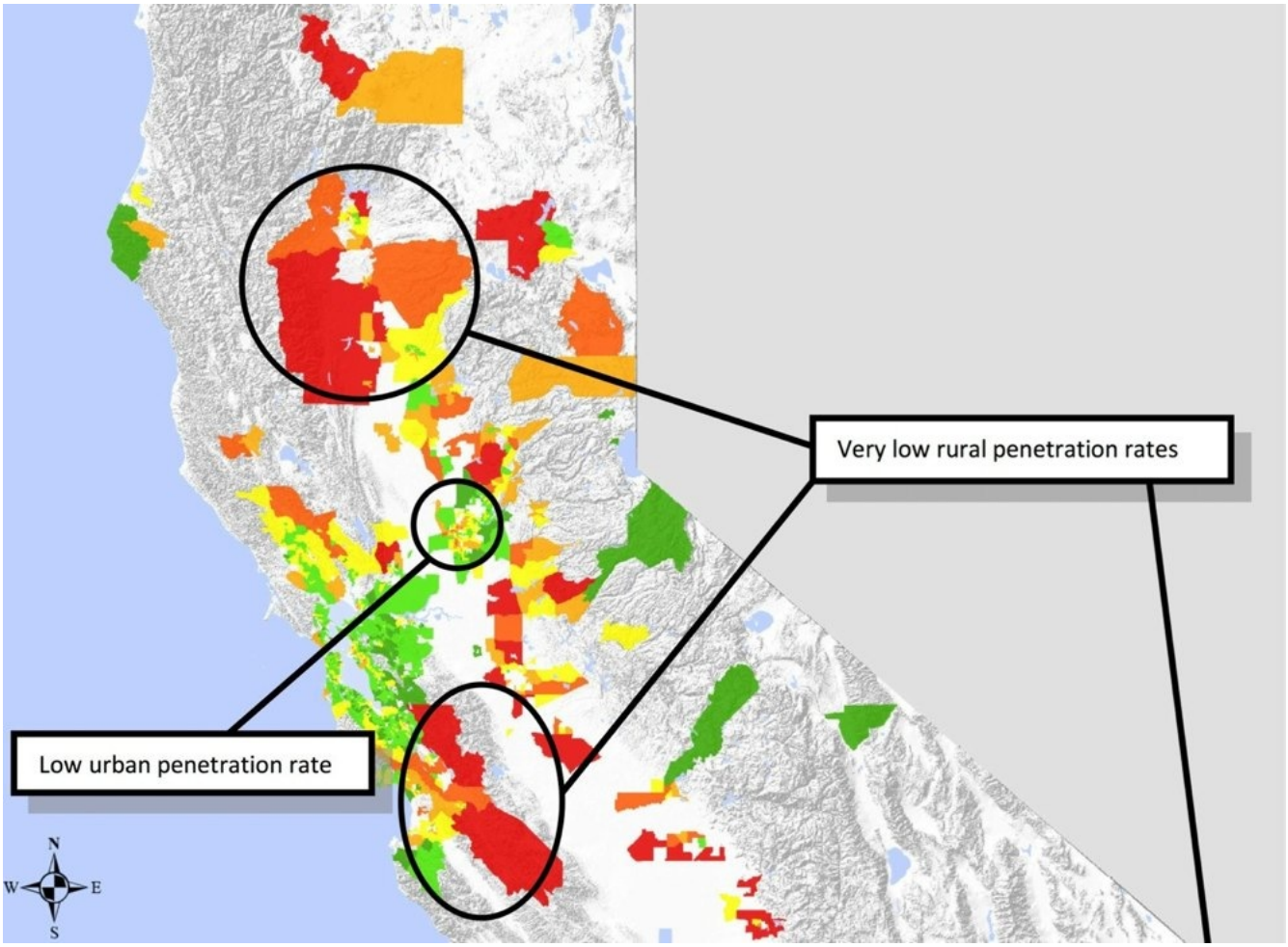


Source: various company provided and/or independently researched map data.

5.11. Local middle mile fiber route

Source: Vast Networks.

5.12. Rural broadband adoption in California



Rural broadband adoption rates in California tend to be very low, according to data collected by the California Public Utilities Commission. However, the CPUC data does not include figures for the Taft/ Maricopa area, due to confidentiality restrictions (only one provider in the area, Bright House, reports adoption rates to the CPUC). Source: CPUC.

6. Appendix B – Grading methodology

The primary data for assessing the quantity and quality of broadband infrastructure in the Taft region comes from the California Public Utilities Commission, which collects service level reports from providers throughout California. This data can be broken down to the census block level, and shows what level of service Internet companies claim to provide, but not necessarily what they deliver. The accuracy of this data and the definition of service levels varies from company to company, although it is generally consistent within any given company. In other words, if Company Z exaggerates the speeds and availability of home Internet service, it tends to do so to more or less the same extent everywhere. By using a comparative system for ranking, rather than using the absolute values provided, the variation in the accuracy of the data can be smoothed out and an apples-to-apples comparison can be achieved.

The data collected by CPUC was divided into three categories: core wireline service, commercial broadband service providers and mobile carriers.

Consumer-grade service throughout California was assessed, and used as one of the two primary grading benchmarks, the other being the CPUC's standard for minimum acceptable service of 6 Mbps download/1.5 Mbps upload speed. Upload speed was given equal weight to download speed, even though it's generally less critical for consumers, because upload speed gives a good indication of the capacity of the underlying infrastructure. When a service provider skimps on upload speeds, as frequently happens, it is usually because its cables and other core equipment have a limited capacity.

Grades were then assigned as follows:

A - Two competing providers, both advertising maximum download speeds of at least 25 Mbps and maximum uploads speeds of 6 Mbps, or 3 or more competing providers offering that standard of service in combination.

B - Competing providers, both advertising maximum download speeds of at least 10 Mbps and maximum uploads speeds of 6 Mbps.

C - Competing providers, one advertising max down/up speeds of at least 10/6 Mbps and the remainder meeting CPUC's minimum 6 down/1.5 up standard.

D - At least one provider advertising speeds that meet the CPUC's minimum standards of 6 Mbps down and 1.5 Mbps up.

F - At least one provider offers service, but no service is available that meets the CPUC's minimum standard of 6 Mbps down and 1.5 Mbps up (meets CPUC's definition of underserved).

F- - No broadband service available (meets CPUC's definition of unserved).

A "C" grade indicates that the consumer grade broadband services, and consequently the underlying core infrastructure, in a given area meets the statewide average. A "D" grade means it meets the minimum passing service standard set by the CPUC. "F" grades indicate full or partial failure, which also means the area is eligible for infrastructure construction subsidies from the Commission. "A" and "B" grades show that service in an area is superior to the California average.

The first step in grading was to give a letter grade to each census block in the three counties. Then, the grade points were tallied, weighted by population and averaged for the census blocks within cities, counties and unincorporated areas, to produce a numerical grade on a four point scale, which was rounded to the nearest tenth.

The numerical grade point average for an area was then converted to a letter grade on the following scale:

A	4.0
A-	3.7-3.9
B+	3.3-3.6
B	3.0-3.2
B-	2.7-2.9
C+	2.3-2.6
C	2.0-2.2
C-	1.7-1.9
D+	1.3-1.6
D	1.0-1.2
D-	0.7-0.9
F+	0.3-0.6
F	0.0-0.2
F-	No service available