2020 Congestion Management Process Update

SACOG
Sacramento Area Council of Governments

December 2020

BOARD MEMBERS AND MEMBER JURISDICTIONS

SACOG MISSION

Provide leadership and a dynamic, collaborative public forum for achieving an efficient regional transportation system, innovative and integrated regional planning, and high quality of life within the greater Sacramento region.

WHAT WE DO

The Sacramento Area Council of Governments (SACOG) is an association of local governments in the six-county Sacramento region. Its members include the counties of El Dorado, Placer, Sacramento, Sutter, Yolo, Yuba and the 22 cities within.

SACOG provides transportation planning and funding for the region and serves as a forum for the study and resolution of regional issues. In addition to preparing the region's long-range transportation plan, SACOG approves the distribution of affordable housing in the region and assists in planning for transit, bicycle networks, clean air, and airport land uses.

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Acknowledgements

This update of SACOG's Congestion Management Process would not have been possible without the following contributors:

- CMP Working Group members, whose staff dedicated time to provide input on the CMP along with information critical to its development. Members included staff from the following agencies:
    - Caltrans District 3;
    - City of Sacramento;
    - Sacramento County;
    - El Dorado County Transportation Commission (EDCTC); and
    - Placer County Transportation Planning Agency (PCTPA)
- Sacramento Regional Transit District, who provided important information on planned and programmed transit projects whose completion will play an important role in addressing congestion in the SACOG region.
- Federal Highway Administration (FHWA), who provides the National Performance Measurement Research Data Set (NPMRDS) speed data, which was essential for computing the congestion and reliability metrics in the CMP.

1 Introduction

This document is an update of SACOG's Congestion Management Process (CMP). To develop the CMP and this report, SACOG has:

- Assembled a local agency Working Group to provide feedback on CMP development;
- Updated the CMP road, bike, and transit networks based criteria from its 2017 CMP, but using updated traffic volume and transit ridership data;
- Assembled a Working Group-vetted list of objectives and multimodal performance measures based on its 2020 MTP-SCS, SACOG's performance-based Funding Round program, and SACOG's Regional Progress Report;
- Revised several key performance metrics to better align with federal MAP-21 performance metrics;
- Evaluated and updated corridors that are "deficient" based on more recent congestion and traffic volume data; and
- Reviewed and updated strategies to address congestion based on changing MTP policies, new and updated projects submitted by member agencies, and on-the-ground conditions.

The results of this process are updated performance measures, a thorough analysis and identification of priority congested corridors in the region, strategies for each corridor, and a well-defined, repeatable process to assist SACOG, Caltrans, and local jurisdictions with congestion management over time. As an ongoing process, the CMP will be monitored and updated every four years and integrated into the planning process for the Metropolitan Transportation Plan/Sustainable Communities Strategy (MTP/SCS) developed by SACOG for the region.

2 Background on Federal Congestion Management Requirements

2.1 What the CMP Is

Congestion management is the application of strategies to improve transportation system performance and reliability by reducing the adverse impacts of congestion on the movement of people and goods. A congestion management process, or CMP, is a systematic and regionally accepted approach for managing congestion that provides updated information on transportation system performance and assesses alternative strategies for congestion management that meet state and local needs.

The congestion management process has eight steps:

1. Develop regional objectives
2. Define CMP network
3. Develop multimodal performance measures
4. Collect data and monitor system performance
5. Analyze congestion problems and needs
6. Identify and assess strategies
7. Program and implement strategies
8. Evaluate strategy effectiveness

2.2 Federal CMP Requirements

Federal law requires metropolitan areas whose population is over 200,000, known as Transportation Management Areas (TMAs), to develop a congestion management process (CMP) as an on-going process that is fully integrated into the metropolitan transportation planning process. Federal law also states that "In a TMA designated as a nonattainment area for ozone or carbon monoxide pursuant to the Clean Air Act, Federal funds may not be programmed for any project that will result in a significant increase in the carrying capacity for SOVs (i.e., a new general purpose highway on a new location or adding general purpose lanes, with the exception of safety improvements or the elimination of bottlenecks), unless the project is addressed through a congestion management process."[1]

[1] 23 CFR Section 450.322 (e) - https://www.ecfr.gov/ . Accessed December 2020.

3 CMP Planning Context

3.1 The CMP Cycle

Figure 3-1 below visualizes how the CMP fits into and supports other SACOG planning and reporting activities on SACOG's four-year MTP cycle.

3.1.1 Major Updates

At its core, the CMP is a part of SACOG's MTP-SCS, and every four years the CMP undergoes a "major" update in which the CMP and MTP-SCS mutually influence each other's development. The MTP-SCS update involves extensive outreach to stakeholders at member jurisdictions, members of SACOG's Board of Directors, and residents and businesses within the SACOG region. Through this outreach and from the objectives developed in the previous CMP, the MTP provides an agreed-upon vision for land use and transportation development for a 20-year period that it translates into transportation and land use policies and projects that align with those policies.

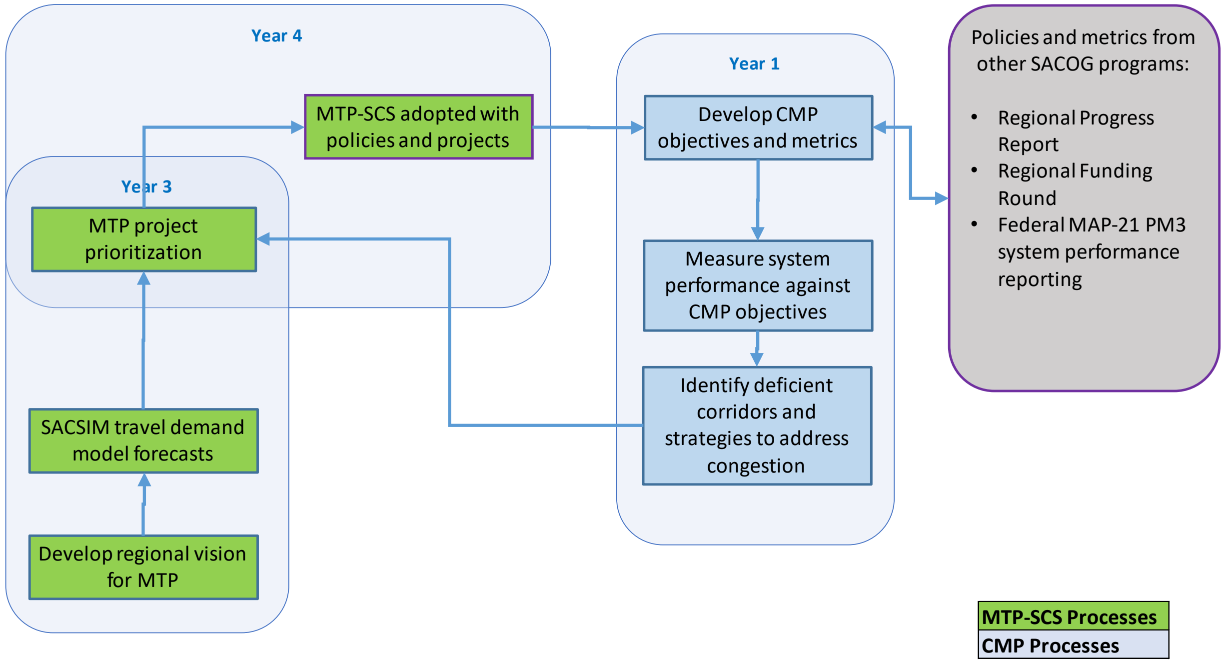
Once adopted, the MTP's policies, along with CMP Working Group collaboration, drive updates to the CMP objectives. From these updated CMP objectives, SACOG staff, in collaboration with CMP working group members, develop metrics to quantify the region's progress toward reaching those objectives. CMP metric development is done in coordination with several other SACOG performance initiatives, including:

- SACOG's Regional Funding Round program, which quantitatively evaluates transportation projects for funding;
- The Regional Progress Report, which is a regularly updated document tracking SACOG's progress on reaching key social, economic, and sustainability goals;
- MAP-21 PM3 System Performance reporting, which FHWA requires every two years.

With this two-way relationship, CMP metrics may be updated to align with metrics in one of the other reports, or vice-versa. In this way, SACOG ensures that the CMP remains a "current" document, whose objectives and metrics can change to both inform and be informed by SACOG agency goals as they evolve over time.

Using this set of objectives and metrics, the CMP measures congestion within the region, identifying congestion hot spots. The CMP's performance data are then combined with congestion data that SACOG's SACSIM19 travel demand model to help prioritize projects for inclusion in the next MTP's project list, which includes all projects planned for the MTP's 20-year horizon based on those projects' ability to help the region further the MTP's vision and policy goals.

Figure 3-1 CMP planning cycle and alignment with SACOG programs



3.1.2 Supplemental Monitoring Reports

In 2018, SACOG wrote a supplemental CMP Monitoring Report[2], which updated some of the values calculated for the 2017 CMP report, which was SACOG's first dedicated CMP submission. The Monitoring Report also analyzed the effects of FHWA changing the vendor who provides the NPMRDS speed data, to understand if any changes in measured performance were due to changes in data vendor rather than changes in real-world conditions. We do not anticipate producing future supplemental monitoring reports, but may do so if circumstances dictate, such as to flag a correction to a regularly updated CMP, or potentially if there is another change in the NPMRDS data source.

[2] SACOG 2018 CMP Monitoring Report available at https://www.sacog.org/congestion-management-process. Accessed December 2020.

4 CMP Working Group and Regional Objectives

4.1 The CMP Working Group

SACOG created a technical Working Group composed of representatives from Caltrans, Placer County Transportation Planning Agency (PCTPA), El Dorado County Transportation Commission (EDCTC), the City of Sacramento, and Sacramento County.

Working Group members are transportation professionals with expertise and local knowledge of their respective jurisdictions' transportation systems and congestion-related challenges. SACOG communicated regularly with Working Group members, who played an integral part in development and approval of SACOG's CMP objectives, CMP network definition, performance metrics, and identifying deficient corridors to incorporate into SACOG's strategies for addressing congestion.

4.2 CMP Objectives

SACOG updated the CMP objectives for 2020 using the following principles:

- Follow policies and principles in SACOG's adopted 2020 MTP-SCS[3]
- Align with the performance outcomes specified in SACOG's Funding Round[4]
- Have review and agreement on objectives from members of the CMP Working Group
- Utilize the following approaches to address congestion, in descending order of priority:
    - Provide alternatives to traveling in congested conditions, such as telework, transit, cycling, carpooling, etc.
    - Reduce the distance people need to travel in congested conditions through promoting land use strategies that enable people to meet their travel needs with shorter trips.
    - Gain more effective capacity on existing roadways through softer, operational measures like real-time information, ramp metering, and other ITS-based solutions.
    - Where other strategies do not sufficiently address congestion, construct additional capacity.

With these principles in mind, the objectives of the 2020 CMP are:

1. Maintain or improve travel time reliability for freight and passenger vehicles
2. Reduce traffic congestion for freight and passenger vehicles
3. Promote development that encourages making trips by public transit
4. Support proactive and innovative education and transportation demand management programs, covering all parts of the urbanized area, to offer a variety of choices to driving alone
5. Prioritize investments in transit, bike, and pedestrian improvements that reduce greenhouse gas emissions and vehicle miles traveled (VMT)
6. Implement pilot projects aimed at making micromobility (such as bike and scooter share) work for urban, suburban, and low-income areas of the region.

Chapter 6 details the metrics and broader SACOG policies connected to each of these objectives. Important to note is that the 2020 CMP objectives are updated and differ somewhat from those in the 2017 CMP. Appendix 1 provides more detail on what these updates are and why we made them.

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[3] MTP-SCS = Metropolitan Transportation Plan-Sustainable Communities Strategy. The SCS is a California-specific requirement of all MPOs to develop long-range plans that coordinate transportation and land use in order to reduce greenhouse gas emissions (GHGs). https://www.sacog.org/2020-metropolitan-transportation-plansustainable-communities-strategy-update. Accessed December 2020.

[4] SACOG Regional Flexible Funding Programs - https://www.sacog.org/regional-funding-programs. Accessed December 2020.

5 Defining CMP Networks

5.1 Road Network

To define the CMP road network for 2020, SACOG relied on the same criteria used in its 2017 CMP and 2018 CMP Monitoring Report. Specifically, a road is considered part of SACOG's CMP road network if it:

- Is part of the National Highway System (NHS)
- Has an average daily volume above the thresholds specified in Table 5-1 below.

Table 5-1 AADT Thresholds for Inclusion to CMP Roadway Network

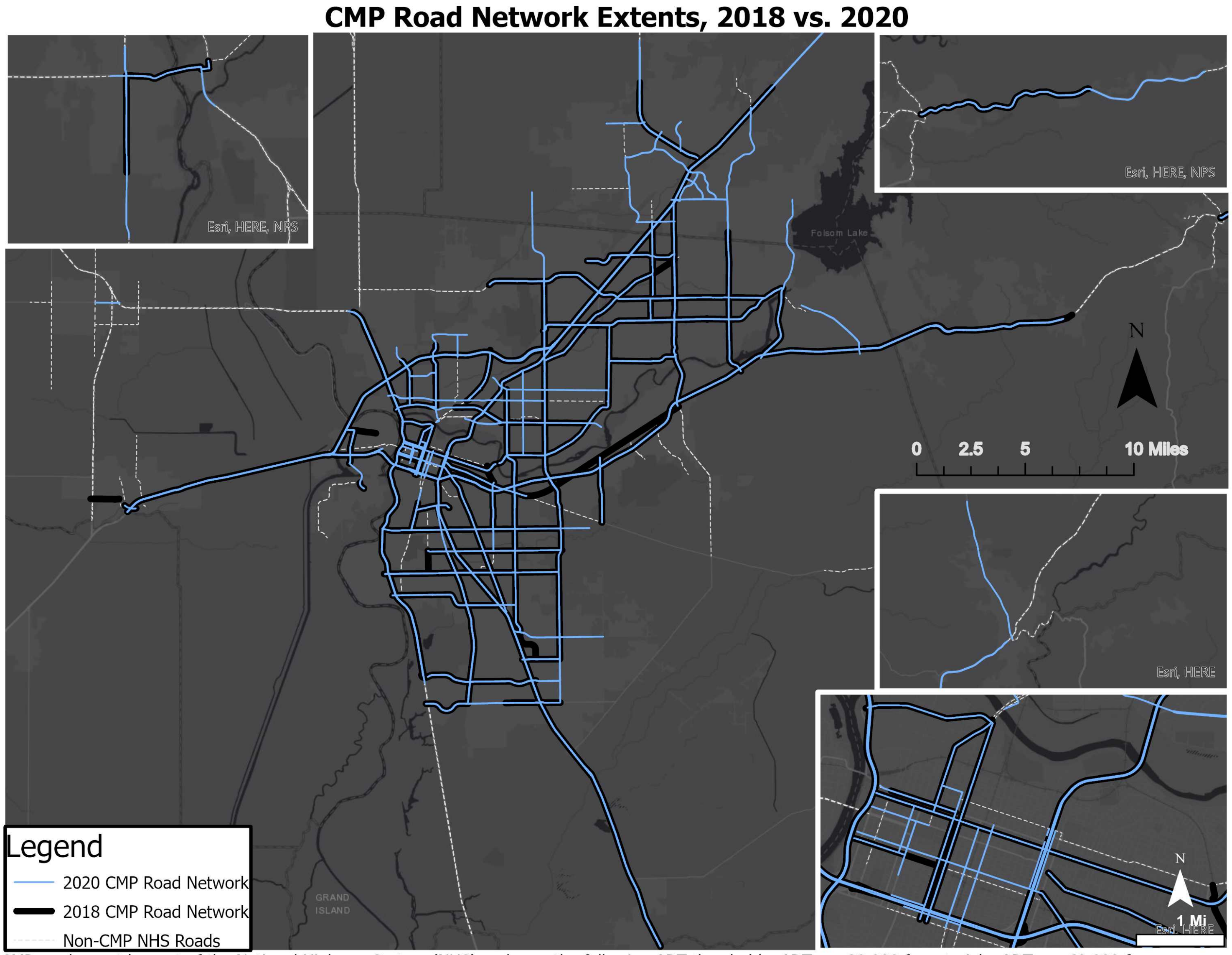
CMP Functional Classification Groupings	Inclusion AADT Threshold
Interstate	≥ 85,000
Other Freeways/Expressways	≥ 60,000
Principal Arterials	≥ 20,000

Using these criteria, SACOG filters the road network down to facilities that have a significant effect on the region's transportation system due to being part of the National Highway System and carrying significant traffic volumes. All performance analyses in the CMP are limited to roads that are part of the CMP road network.

Figure 5-1 compares the roadways that remained in the CMP network for the 2018 CMP Monitoring Report, this 2020 CMP update, as well as all roads designated as NHS roads within the SACOG region.

One omission from the CMP network are the portions of Grant Line Road, White Rock Road, and Kammerer Road that together will comprise the future Capital South East Connector. Presently, White Rock Road and Grant Line Road are on the NHS, while Kammerer Road is on the NHS as a "future principal arterial". While Grant Line Road and White Rock Road are on the NHS, they do not presently meet the minimum volume criteria for inclusion in the CMP network. However, the Capital South East Connector is a high-profile addition to the transportation network and we will closely monitor its volumes and congestion levels in future CMPs.

Figure 5-1 CMP Road Network Extent



CMP roads must be part of the National Highway System (NHS) and pass the following ADT thresholds: ADT >= 20,000 for arterials; ADT >= 60,000 for non-Interstate freeways and; ADT >= 80,000 for Interstate freeways. Exceptions were made in limited circumstances to avoid having "stubs" in the CMP network. Note that the NHS changes periodically and these changes will be reflected in future CMP updates.

5.2 CMP Transit Network

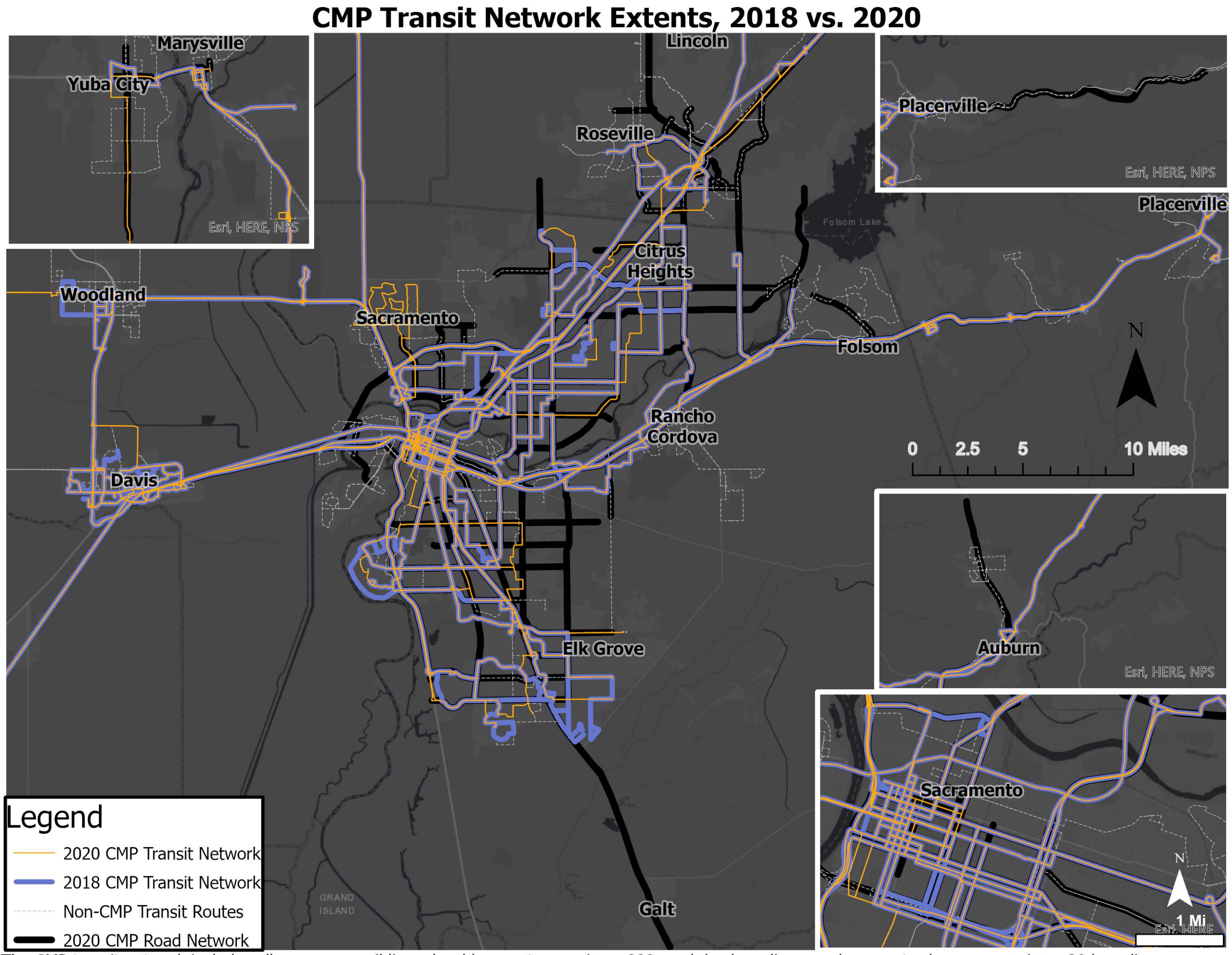
Fixed-route transit provides opportunities to manage or reduce congestion by more efficiently using existing road space and providing travelers an alternative to driving alone and/or in congested conditions, such as using rail transit or commuter and express bus services that operate in HOV lanes. Given this role, the CMP has incorporated a subset of transit routes that are relevant to the CMP roadway network, determined by a combination of relatively high ridership and proximity to the draft CMP roadway network. Based on these criteria, which were also used in the 2017 CMP, CMP transit routes selected include:

- All light rail lines.
- Amtrak's Capitol Corridor.
- Fixed-route bus lines that meaningfully could serve trips made on the CMP roadway network and meet the following ridership criteria:
    - Local bus lines with more than 800 boardings on an average weekday.
    - Commuter express bus routes with an average of >20 boardings per scheduled run, which equates to each vehicle running at least half full.

Figure 5-2 compares the resulting transit networks for this 2020 CMP update and the 2018 CMP Monitoring Report, along with other transit routes that did not meet criteria for inclusion in the CMP. The 2020 CMP transit network was based on 2019 transit ridership, while the 2018 network was based on 2016 ridership.

Appendix 6 provides a table of all routes included in the CMP transit network for the 2020 CMP update, along with each route's average weekday boardings.

Figure 5-2 CMP Transit Network



The CMP transit network includes all passenger rail lines, local bus routes serving >800 weekday boardings, and commuter buses averaging >20 boardings per bus trip. All bus routes also must have at least part of their service on the CMP road network.
Source: Google Transit Feed Specification; SACOG Transit Operators

5.3 Bikeway Network

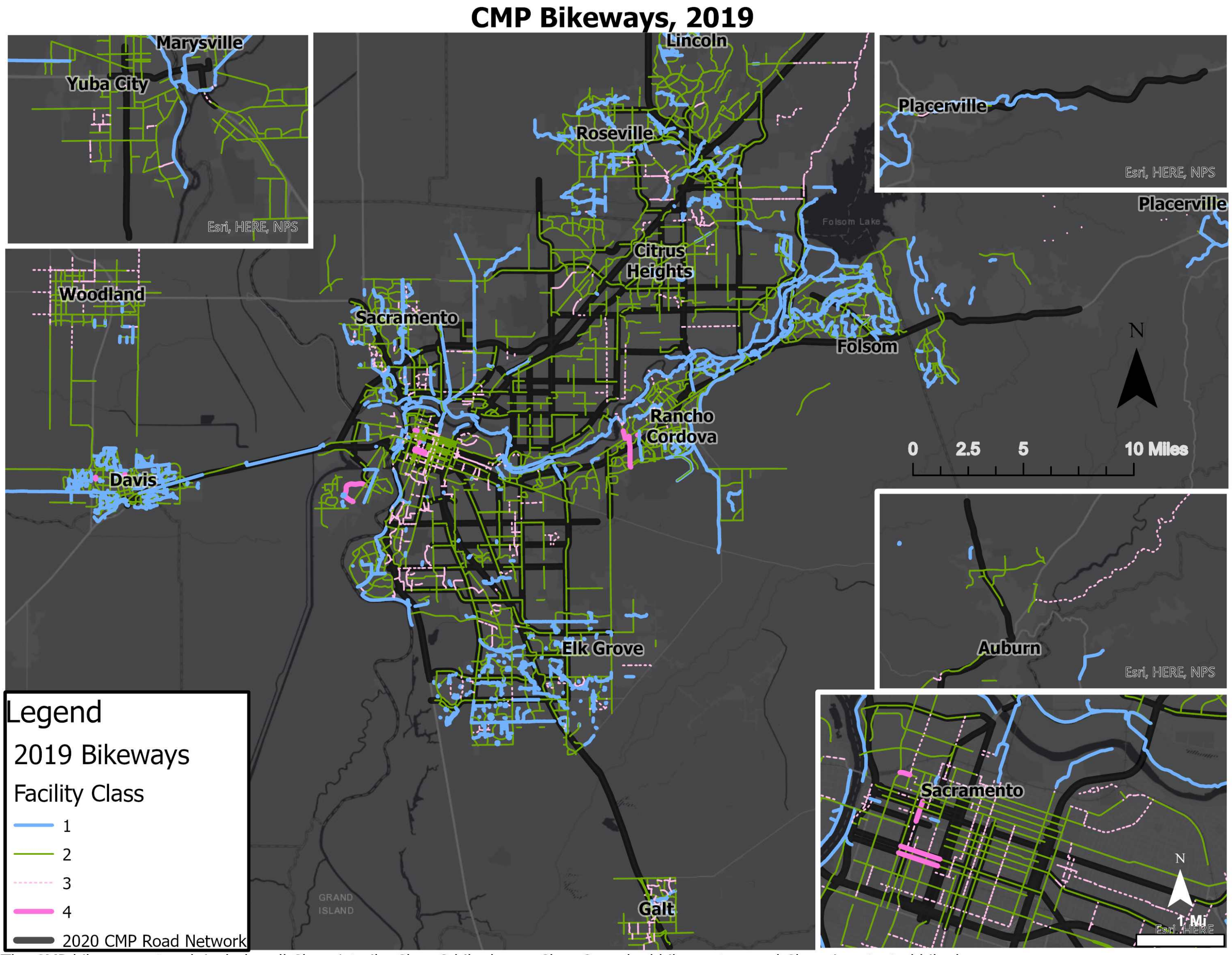
Like transit, bicycling helps address congestion by making more efficient use of road space, and in the case of Class 1 bike paths, relieves demand on CMP network roads by diverting travelers to dedicated bicycle facilities. Cycling also provides a first- and last-mile connection to major transit services as well, increasing the effective reach of transit services.

All SACOG bikeway facilities are in the CMP bikeway network, including:

- Class 1 off-street bike paths, which are paved and do not allow motorized vehicles.
- Class 2 on-street bike lanes, which provide a painted line delineating space for cyclists from general-purpose vehicles.
- Class 3 marked bike routes, which do not dedicate any portion of the roadway exclusively for cyclists, but generally have signage, markings, and sometimes traffic-calming infrastructure to make these more comfortable for cyclists.
- Class 4 protected cycle tracks, which are on-street facilities that provide a physical buffer between motor vehicle lanes and the bike lane.

Figure 5-3 shows the regional bikeway network as of 2019.

Figure 5-3 CMP Bikeway Network



The CMP bikeway network includes all Class 1 trails, Class 2 bike lanes, Class 3 marked bike routes, and Class 4 protected bike lanes.

6 Developing Multimodal Performance Metrics

6.1 Considerations for Developing Performance Metrics

Working Group members and SACOG staff selected performance metrics to measure progress toward the CMP regional objectives identified in Chapter 4 based on the following principles:

- Utilize the best available data and include time and resources to do validation and check the reasonableness of the sources used for the CMP; be open to identifying and using alternative data sources as they become available.
- Where possible, find alignment on performance metrics and data sources. The ability to share performance metrics and data sources developed as part of the CMP with other SACOG projects and initiatives is highly beneficial given the cost of developing and utilizing data for performance measurement. Other SACOG initiatives whose metrics and data sources overlap with the CMP include:
  - SACOG 2020 Regional Progress Report
  - MAP-21 PM3 metrics, reported to FHWA every two years[5]
  - SACOG Project Performance Assessment tool, used to assist with project selection in SACOG's Funding Round[6].
- Data availability should not limit the scope of issues and objectives to be addressed in the CMP. Where consensus exists on the importance of a particular objective to the goals of the CMP, that objective should be included with the best available data source and metric.

Following these principles, we carried over many of the objectives and metrics from the 2017 CMP, but we also used the 2020 CMP update as an opportunity to make several changes to both the objectives and metrics. Appendix 1 provides more detail on these changes and the rationale for making them.

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[5] 23 CFR 490 "National Performance Management Measures; Assessing Performance of the National Highway System, Freight Movement on the Interstate System, and Congestion Mitigation and Air Quality Improvement Program" https://www.federalregister.gov/documents/2017/01/18/2017-00681/national-performance-management-measures-assessing-performance-of-the-national-highway-system. Accessed December 2020.

[6] SACOG Regional Funding Round information - https://www.sacog.org/regional-funding-programs. Accessed December 2020.

6.1.1 Role of safety

Safety, specifically safety from injuries, fatalities, and property damage, is a critical topic in transportation planning. However, the focus of this report, being a CMP report, will not include safety. Safety is indirectly relevant to congestion, as collisions can lead to delays due to lane closures and from motorists slowing or stopping to look at the collision. In future CMP iterations, data permitting, we may integrate collision and roadway event data to help illustrate the potential role that roadway incidents have in congestion.

6.2 CMP Performance Metrics by Objective

Below is a more detailed description of each objective and performance metric, along with a description of each metric's rationale and relevance to its corresponding objective. Following the detailed descriptions, Table 6-1 provides an at-a-glance summary connecting the objectives to their relevant metrics. Results for all metrics are in Section 7.2.

6.2.1 Objective 1: Maintain or Improve Travel Time Reliability for Freight and Passenger Vehicles

Travel time reliability is an important mobility and congestion management goal because unreliable system performance leads to wasted time and lost economic activity by having to build in "buffer time" to trips that could otherwise be spent on productive activities. SACOG will use the following metrics to measure travel time reliability at both a segment level and a system level:

- *Truck travel time reliability ratio (TTTR)*

  TTTR, one of the performance measures in the federal MAP-21 PM3 rule[5], measures how consistent travel times are for truck traffic by comparing the 95th percentile travel time to the 50th percentile travel time. For example, if the 95th percentile travel time is 45 minutes and the 50th percentile travel time is 30 minutes, the TTTR is 1.5. A larger TTTR score means that there is a greater difference between the 95th and 50th percentile travel times, indicating less reliability.

  TTTR is calculated for both individual links and at a network level. For individual road links, the TTTR is the link's 95th percentile travel time divided by its 50th percentile travel time. The "network level" TTTR, calculated for interstate freeway links within the CMP network, is the distance-weighted average TTTR of all those links during each link's least reliable time period. For more details on the calculation method for TTTR, refer to Appendix 4.

  As defined in MAP-21, the TTTR only considers interstate freeways. For this CMP, the network extent for TTTR analysis was further restricted to only include interstate freeway segments that were part of the CMP road network, defined in Section 5.1.

- *Level of travel time reliability (LOTTR) index*

  Also from MAP-21 PM3, the LOTTR measure works on the same principle as the TTTR, but instead of using truck travel times, it uses travel times for all vehicles. And instead of calculating the reliability ratio as the 95th percentile travel time over the 50th percentile, LOTTR is based on the 80th percentile travel time divided by the 50th percentile travel time.

  Like the TTTR, the LOTTR is calculated at both a link level and at a system level. For system-level LOTTR, the LOTTR is calculated separately for interstates and non-interstates on the NHS, consistent with MAP-21 specifications for calculating the LOTTR. However, for this CMP, we limited the network further to only include NHS road links that are also part of the CMP network.

  More details on the LOTTR calculation methodology are provided in Appendix 4.

6.2.2 Objective 2: Reduce Traffic Congestion for Freight and Passenger Vehicles

Delay caused by congestion results in wasted fuel, additional vehicle-sourced pollutants, stress, and lost economic activity. This makes its measurement and management a primary element of SACOG's CMP. Congestion-related delay measures SACOG uses for the 2020 CMP update include:

- *Average speed during the four slowest hours of the day ("congested speed")*

  Used as the primary congestion metric in SACOG's 2020 Project Performance Assessment tool, known as the "congested speed" for short, the congested speed is calculated by identifying the four slowest one-hour periods out of a 24-hour weekday (excluding weekends), then calculating the average speed during those four slowest one-hour periods. For example, if a segment experienced its slowest speeds from 7am-8am, 8am-9am, 2pm-3pm, and 5pm-6pm, then the "congested speed" for that segment would be the average speed of those four one-hour periods.

  The rationale for this metric is that it identifies whether a segment experiences significant congestion during a long period of the day (at least four hours), while also flagging segments that may experience their worst congestion outside of the normal AM and PM peak periods.

  For more details on how we calculate the congested speed, refer to Appendix 5.

- *Percent of directional miles where average speed during slowest 4 weekday hours is less than 60 percent of free-flow speed*

  Using the four-hour congested speed described above, this metric enables a system-level look at how widespread significant congestion is. In alignment with the congestion threshold speed for MAP-21's person-hours of excessive delay (PHED) metric[7], this metric represents the share of directional miles that, during their slowest four hours, have a congested speed that is less than 60 percent of their "free-flow" speed, or the speed reflective of periods when vehicles move unencumbered by other vehicles on the road.

  To be consistent with the LOTTR metric, we calculated the percent-of-miles-congested metric separately for interstate and non-interstate facilities, and only for roadways that were on the CMP road network.

6.2.3 Objective 3: Promote Development That Encourages Making Trips by Public Transit

As outlined in the adopted 2020 MTP-SCS, land use is a major component of the SACOG region's approach to addressing regional mobility by encouraging development that makes mass transit a convenient travel option. Promoting such development helps address regional congestion by both reducing space demands on the region's roadways as well as providing alternatives, like light rail or buses in high-occupancy facilities, that are less affected by congestion.

In consideration of this objective, SACOG and the Working Group arrived at the metrics below to help measure development that encourages public transit use.

- *Dwelling units built within a half mile of high-frequency bus or rail service*
  This metric refers to residences built within a half-mile of light rail service, Amtrak Capitol Corridor service, or high frequency bus transit service, with "high frequency" defined as having peak period headways of 15 minutes or less.

  The rationale behind this metric is that light rail and high frequency bus service provide a level of convenience, speed, and flexibility that make them a more competitive alternative to traveling via private automobile, especially for traveling to more central destinations with heavy congestion or priced parking. Rail transit, even a lower-frequency service such as Amtrak's Capitol Corridor, was considered because it provides an effective way for users to bypass congestion by not sharing the road with private automobiles. Rail's separate right-of-way also gives it significant potential capacity should demand grow in the future, therefore locating housing within walking distance to rail transit is a key component of strategically providing housing where transit can be economically increased.

[7] The MAP-21 person-hours of Excessive Delay, or PHED metric considers person throughput, in addition to delay. However, at this time, we lack sufficiently granular traffic count data for all CMP network roads to accurately estimate PHED as a CMP metric. We hope to include it in future versions of the CMP.

- *Jobs within a half mile of high-frequency bus or rail transit service*
  Living near rail or high-frequency bus transit will do little to encourage use if the transit does not also travel to residents' common destinations. Therefore, the CMP also measures how many jobs are within a half-mile of rail or high-frequency bus transit, so SACOG can monitor the region's progress toward its broader goal of encouraging development that encourages public transit use.

6.2.4 Objective 4: Support Proactive and Innovative Education and Transportation Demand Management Programs Covering All Parts of the Urbanized Area, To Offer A Variety of Choices to Driving Alone

Transportation demand management (TDM) is an important suite of "soft" tools to address congestion through educating commuters on their available travel options, creating awareness of the relative costs and benefits to driving alone versus using shared or non-motorized transportation, and providing incentives to use shared or non-motorized transportation.

The metrics selected for the CMP assume that participation rates in TDM programs are a rough proxy for those programs' effectiveness. In particular, the metrics looked at include:

- *Count of employers in a Transportation Management Association*
  Transportation Management Associations (TMAs) are made up of employers and provide a shared resource that those employers and their employees can use to learn more about available travel options, benefit from services such as Emergency Ride Home[8] programs, match up with carpool/vanpool partners, and enroll in incentive programs such as transit pass subsidies and commuter clubs.

  Under the assumption that access to the services that TMAs provide will shift some commute trips from solo driving to more efficient modes such as transit, bicycling, and carpooling, monitoring the total number of employers in TMA can provide insight into how many commuters are exposed to the services and incentives that encourage commuting through modes other than solo driving. Important to point out is that this metric does *not* measure how effectively TMAs encourage commuters to use more space-efficient modes. However, we believe the mere exposure and education about alternative modes that TMAs can provide is a reason to monitor their prevalence in the region.

[8] Emergency Ride Home programs are a common TDM component that provide vouchers for a limited number of free taxi rides to commuters who normally use transit. The vouchers are designed to reduce commuters' concerns about occasionally being stranded due to missing the last bus home from work, having a family emergency that requires getting home before the first commuter bus leaves, etc.

- *Count of registered vanpools*
  By carrying up to 15 people per vehicle, vanpools are a significantly more space-efficient mode of transportation than solo driving. Monitoring the total number of regional vanpools provides a rough measure of how much demand for road space is eased through using vanpools.

- *Count of Commuter Club members*
  The Sacramento Region Commuter Club serves some of the functions of a TMA by providing members with services such as carpool and vanpool matching, bike and transit trip planners, and an Emergency Ride Home program.

  Membership in the Commuter Club is only a rough proxy for how many commuters are using a non-single occupant vehicle (SOV) travel mode, as a certain portion of members may not always use an alternative mode. However, it does serve as a reliable measure for regional awareness and interest in alternative travel modes, which is why SACOG includes it as a metric for TDM effectiveness.

- *Non-SOV mode share*
  Many factors beyond the influence of TDM programs can affect the non-SOV mode share, such as major economic or infrastructure changes. But because the primary aim of TDM efforts is to reduce single-occupant commute trips, using the Census journey-to-work mode split data is a rough way of measuring TDM efforts against desired outcomes.

6.2.5 Objective 5: Prioritize Investments in Transit, Bike, and Pedestrian Improvements That Reduce Greenhouse Gas Emissions and Vehicle Miles Traveled (VMT)

As Section 4.2 described earlier, encouraging a shift toward less space-intensive modes of travel is one of the key approaches SACOG uses to address congestion. To that end, one of SACOG's MTP goals is to encourage people to make more of their trips by biking, walking or public transportation, which not only require less road space per user, but also produce fewer greenhouse gas (GHG) emissions.

To measure how well SACOG is achieving this objective, the CMP looks at both demand and supply side factors related to walking, biking and transit, including:

- *Weekday transit boardings by route for CMP transit routes*
  Transit boardings at the route level are an overall measure of how big of a role transit serves in the region's travel. From a congestion management standpoint, increases in transit ridership over time are a positive change as it implies that more trips are being served by the existing road network, since transit is a more space-efficient mode of transportation.

- *Accessibility to jobs and services by walking, biking and transit*
  Few travelers will consider biking, walking, or using transit if those options do not offer them reasonable access to destinations they commonly go to, such as their jobs, grocery stores, schools, banks, etc. To gain insight into the ability of users to access typical daily or weekly needs using

alternative modes, we leveraged Sugar Access, developed by Bentley Systems, to estimate access to jobs and other common trip destinations traveling by transit, biking, and walking.

While this CMP only provides accessibility data for year 2019, we hope to continue having access to Sugar software in future CMPs so we can monitor changes in accessibility by different modes over time.

6.2.6 Objective 6: Implement Pilot Projects Aimed at Making Micromobility (Such as Bike and Scooter Share) Work for Urban, Suburban, Rural, and Low-Income Areas of The Region

Related to Objective 5 (Prioritize investments in transit, bike, and pedestrian improvements), new modes that have grown and changed significantly since the 2017 CMP are micromobility options such as bike share and scooter share. These services reduce some of the barriers that have traditionally discouraged people from traveling by bicycle or other non-motorized modes, such as concerns about bike theft, lack of at-home bike parking, insufficient funds to purchase a bicycle, having a bicycle that is not operational due to mechanical issues, etc.

Bike share and scooter share are very new additions to the SACOG transportation landscape and are run by private companies. In addition, as new industries, there has been significant change in the deployment methods and scale for both bike share and scooter share, and it is uncertain how and whether these companies will operate in the future. But during their short lifespan, they have had meaningful localized effects on travel behavior, detailed below in Section 7.1.6

Table 6-1 Objectives and metrics for 2020 CMP update

Generalized Objective	Performance Metrics	Policy Alignment
1 - Maintain or Improve Travel Time Reliability for Freight and Passenger Vehicles	MAP-21 Truck Travel Time Reliability (TTTR)	MAP-21 PM3; SACOG goal of "connected communities"
	MAP-21 percent of interstate person-miles that are reliable	MTP policy area (reliable transportation system); MAP-21
	MAP-21 percent of non-interstate person-miles that are reliable	MTP policy area (reliable transportation system); MAP-21
2 -Reduce Traffic Congestion for Freight and Passenger Vehicles	Average speed during slowest 4 hours of the day, all vehicles	2020 Funding Round
	Percent of directional miles where average speed during slowest 4 weekday hours is < 60 percent of free-flow speed for interstate roads	2020 Funding Round congestion metric
	Percent of directional miles where average speed during slowest 4 weekday hours is < 60 percent of free-flow speed for non-interstate roads	2020 Funding Round congestion metric
3 - Promote Development That Encourages Making Trips by Public Transit	Dwelling units built within half mile of high-frequency or rail transit service	MTP Policy 1 component: more housing and jobs in high-frequency transit areas
	Jobs within half mile of high-frequency or rail transit service	
4 - Support Proactive and Innovative Education and Transportation Demand Management Programs Covering All Parts of the Urbanized Area, to Offer a Variety of Choices to Driving Alone	Employers in a Transportation Management Association (TMA)	Objective is the same as MTP Policy 5
	Count of registered vanpools	
	Count of Commuter Club members	
	Non-SOV mode share	
	Weekday transit boardings by route for CMP priority transit routes	
5 - Prioritize investments in transit, bike, and pedestrian improvements that reduce greenhouse gas emissions and vehicle miles traveled (VMT)	Transit accessibility to jobs and POIs	Objective is the same as MTP Policy 25; metrics also used in PPA multimodal performance outcome
	Bike + Walk accessibility to jobs and POIs	
	Mode replacement breakdown of micromobility trips	
6 - Implement pilot projects aimed at making micromobility (such as bike and scooter share) work for urban, suburban, rural, and low-income areas of the region.	Mode replacement breakdown of micromobility trips	Objective is the same as MTP Policy 3
	Micromobility trips taken	

7 Data Collection and System Monitoring

This chapter describes the data collection and initial system assessment efforts undertaken to develop this initial CMP and prepare for future system monitoring.

7.1 Data Sources

7.1.1 Traffic Volumes

Traffic volumes were a primary factor for defining the CMP network per the criteria described Chapter 5, and will be a key monitoring data source to identify and evaluate changes to the network over time. Traffic counts came from the following sources:

- Caltrans' Traffic Census Program[9], which provides AADT values for all state highways.
- Local agency count programs—Each of the local agencies within the SACOG region count and archive vehicle volumes on selected roadway segments within their jurisdiction.

7.1.2 Traffic Speed Data

Traffic speed data, used to calculate the congestion and travel time reliability metrics, come from the National Performance Measurement Research Data Set (NPMRDS). Provided free of charge by FHWA in conjunction with Caltrans and INRIX[10], the NPMRDS provides average traffic speeds for 15-minute intervals for the nearly 1,800 road segments within the CMP network.

7.1.3 Transit Ridership

Transit routes and ridership data are for year 2019 and were collected from the transit agencies with routes in the CMP priority transit network. Appendix 6 provides ridership for each CMP transit route, while Section 7.2.5 gives a region-level summary of recent transit ridership trends.

7.1.4 Accessibility Data

Since the 2017 CMP, SACOG has gained access to Sugar Access software from Bentley Systems. Sugar leverages a robust all-streets road network, General Transit Feed Specification (GTFS) data, employment and population data from the American Community Survey and LEHD Origin-Destination Employment Statistics (LODES), commercially available point of interest (POI) data, and survey-based willingness-to-travel data to calculate accessibility to a variety of destination types using all common modes.

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[9] Caltrans Traffic Census Program. 2017. https://dot.ca.gov/programs/traffic-operations/census

[10] FHWA NPMRDS Traffic Ops Page. Accessed December 2020.. https://ops.fhwa.dot.gov/freight/freight_analysis/perform_meas/index.htm#data Accessed December 2020.

7.1.5 Commute Mode Split

We obtained commute mode split data from using the 2014-2018 5-Year American Community Survey table on Commuting Characteristics.

7.1.6 Bike and Scooter Share Data

SACOG obtained bike and scooter share trip data from Lime and JUMP, which operate bike and scooter share systems in the SACOG region.

7.2 System Monitoring Results

7.2.1 Results: Maintain or Improve Travel Time Reliability

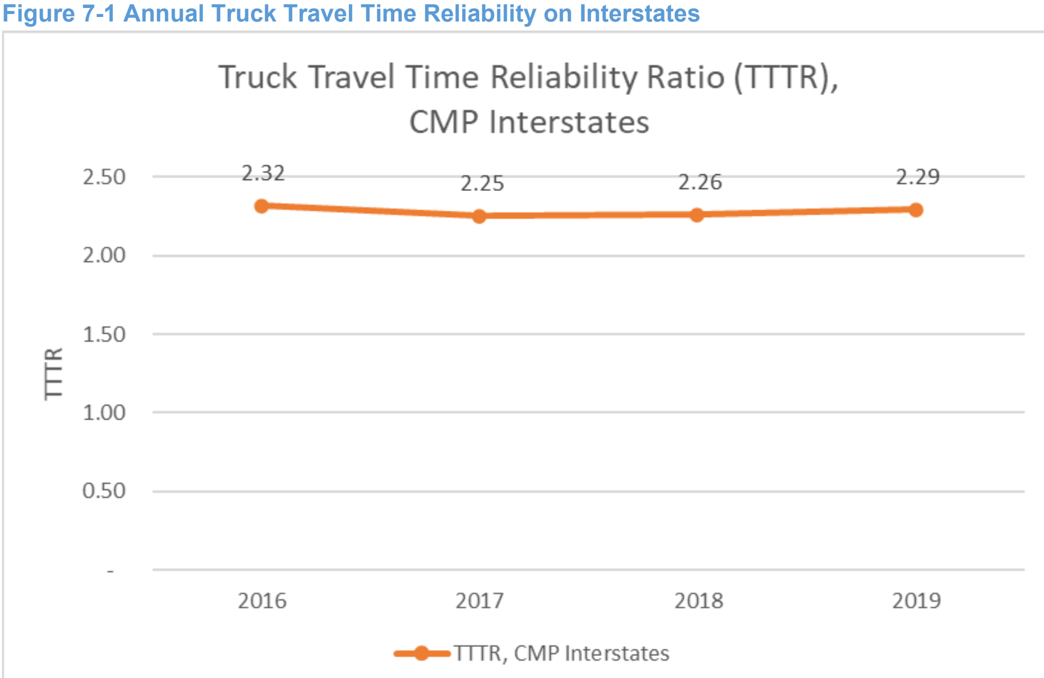
Freight Reliability

Figure 7-1 shows change in Truck Travel Time Reliability (TTTR) between 2015 and 2019. As described above in Section 6.2, TTTR only considers truck traffic on interstates. Between 2015 and 2019 there was a slight, though not meaningful, improvement in TTTR. Note that the TTTR is calculated only for portions of the interstate system that are on the CMP network, unlike the MAP-21 TTTR metric, which calculates TTTR for the entire interstate system within the SACOG region.

Further below, the map in Figure 7-2 shows how TTTR varies in different parts of the region, with the areas of most significant truck travel time reliability issues occurring in the region's core. The "deficient interstate corridors" shown in the map refer to deficient corridors identified for further analysis, described more in Section 8.1.

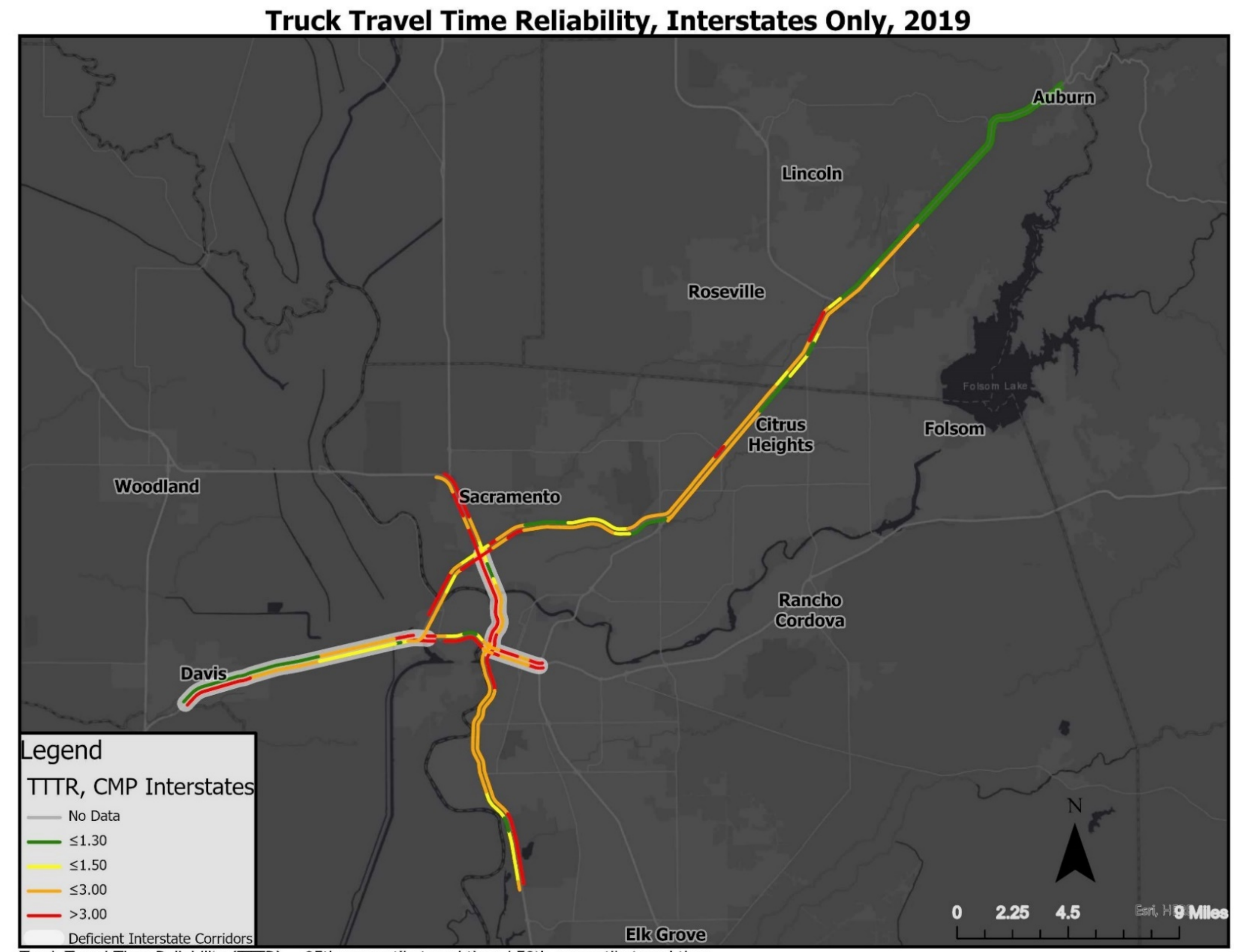
Important to note is that TTTR is based on dividing the 95th percentile travel time by 50th percentile travel time, while all-vehicle Level of Travel Time Reliability (LOTTR) is based on dividing the 80th percentile travel time by the 50th percentile travel time. As a result, the TTTR for a given road segment will usually be larger than the LOTTR for the same road segment.

Figure 7-1 Annual Truck Travel Time Reliability on Interstates



Source: National Performance Measurement Research Data Set (NPMRDS)

Figure 7-2 Truck Travel Time Reliability Map[11]



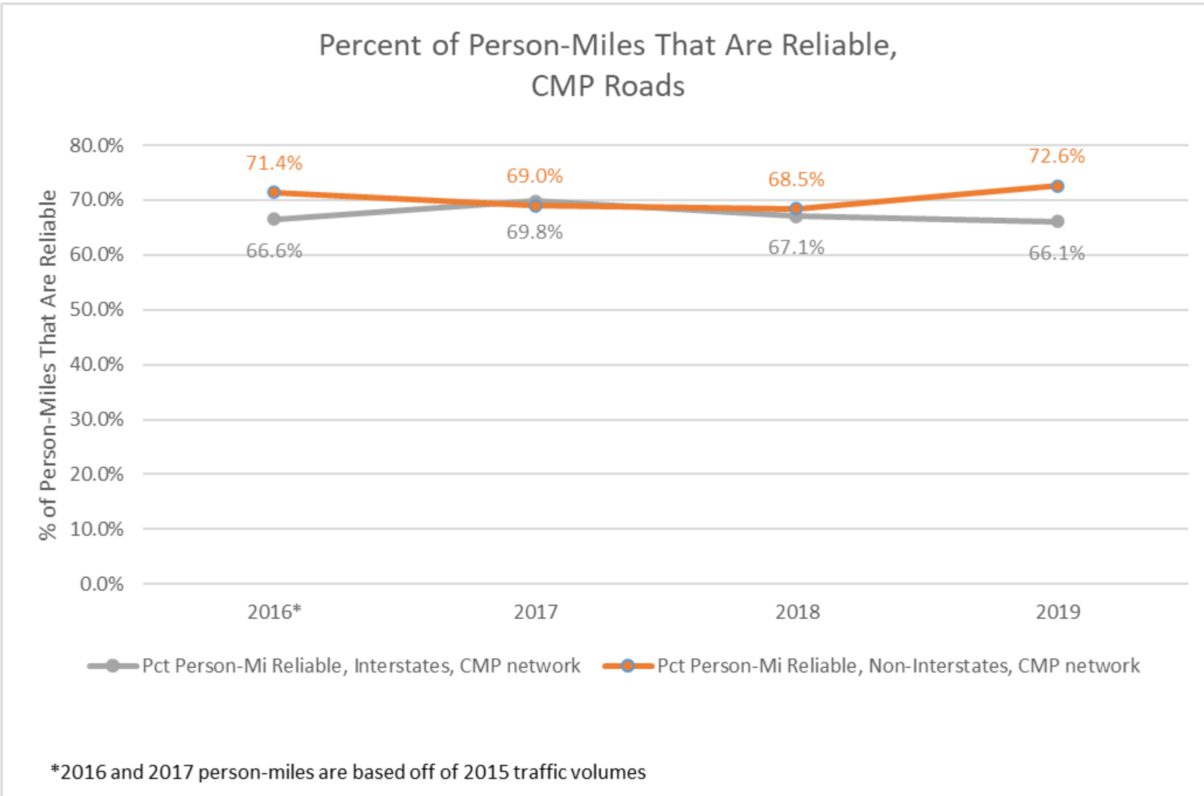
Truck Travel Time Reliability (TTTR) = 95th percentile travel time / 50th percentile travel time.
Map shows TTTR during the least reliable period out of Weekdays 6am-10am, 10am-4pm, 4pm-8pm, and Weekends 6am-8pm.
Time periods, percentiles, and use of interstates only is based on parameters for FHWA MAP-21 PM3 freight reliability metric.

[11] "Deficient corridors" highlighted in the map are discussed in greater detail in Section 9.1.1

All-Vehicle Level of Travel Time Reliability (LOTTR) on Interstates and Non-Interstates

Below, Figure 7-3 shows how the percent of person-miles that are reliable on CMP roads has changed over time, broken out by interstate versus non-interstate facilities. At a regional level, both interstate and non-interstate facilities had similar shares of person-miles that are reliable, with little change in system-level reliability between 2016-2019[12].

Figure 7-3 Percent of Person-Miles that Are Reliable on Interstate and Non-Interstate CMP Roads



Source: National Performance Measurement Research Data Set (NPMRDS)

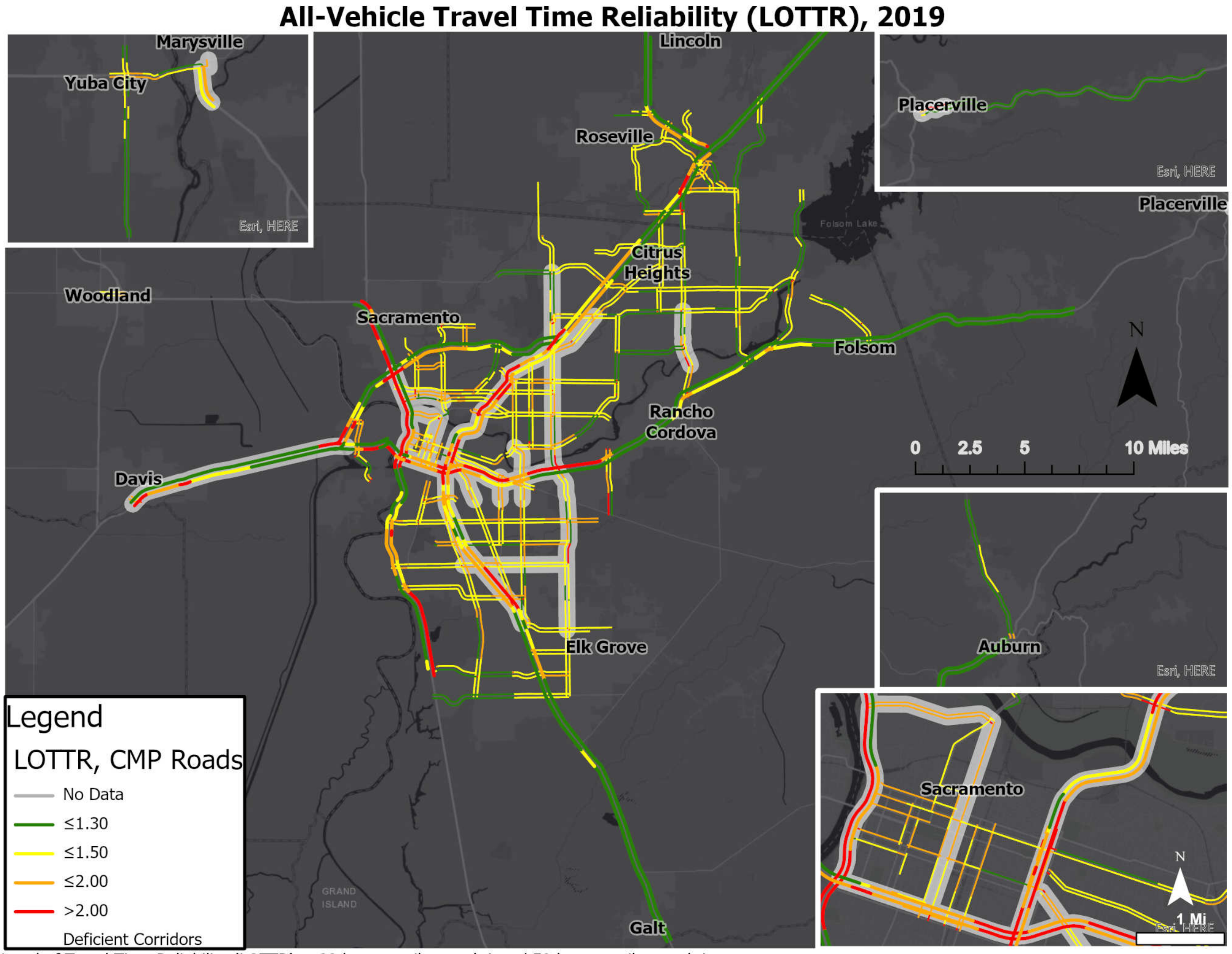
However, as the LOTTR maps in Figure 7-4 and

[12] Important to note is that the LOTTR for "non-interstate" facilities combines reliability on arterials and non-interstate freeways. We calculate separate LOTTR values based on interstate status, rather than physical operational characteristics (e.g. freeway vs. non-freeway), to align with MAP-21's LOTTR facility type splits, which are based on whether a facility is an interstate.

Figure 7-5 show, system-level reliability measures mask significant local variation in reliability. Some notable observations include:

- The least reliable segments tend to be on freeways near the region's core, and generally during the AM peak.
- I-80 between I-5 and SR-51 ("Business 80") saw notable reliability improvement between 2016 and 2019. Part of this is due to completion of new HOV lanes between El Camino Avenue to the west and SR-51 to the east.

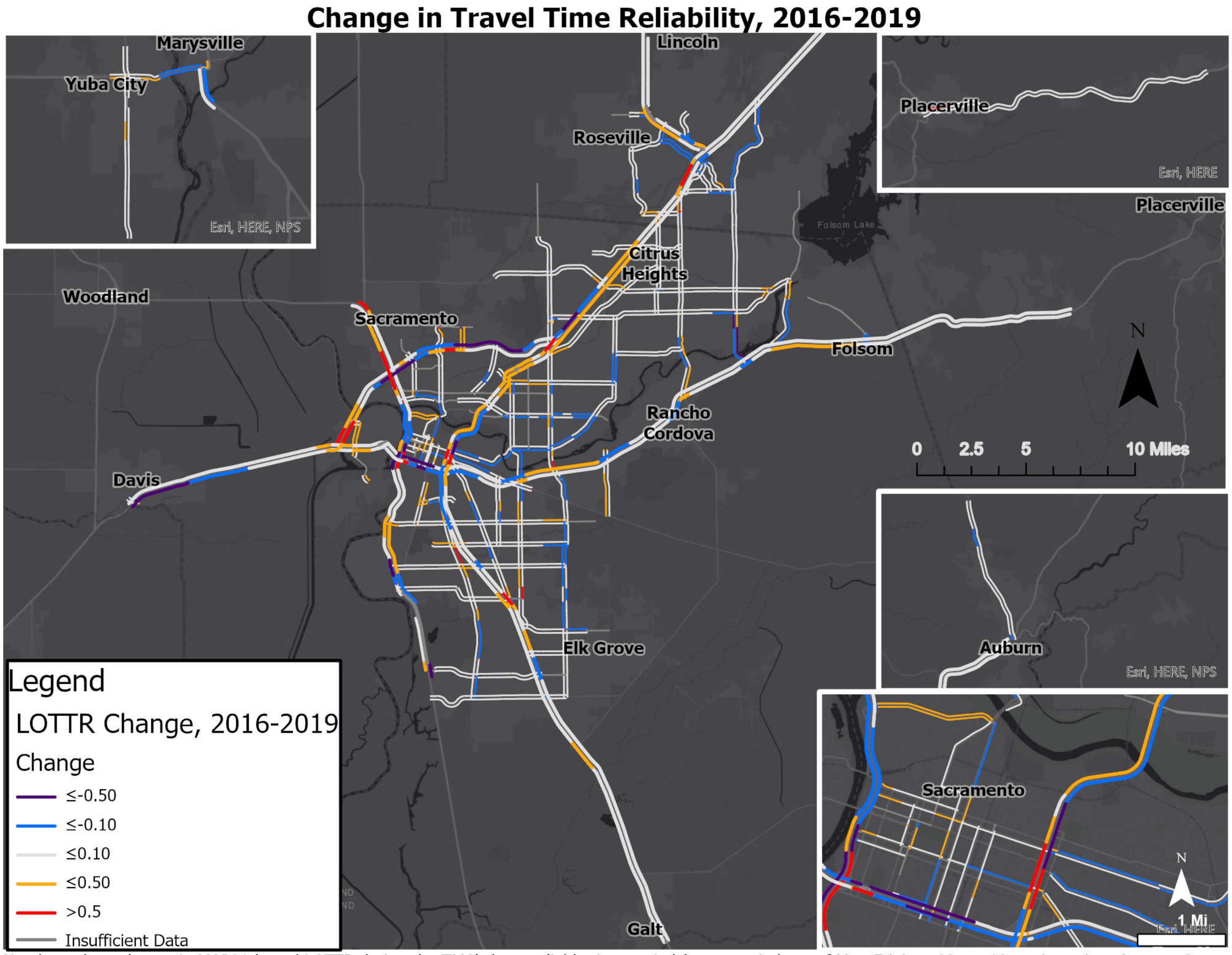
Figure 7-4 2019 All-Vehicle Level of Travel Time Reliability (LOTTR) Map[13]



Level of Travel Time Reliability (LOTTR) = 80th percentile travel time / 50th percentile travel time.
Map shows LOTTR during the least reliable period out of Weekdays 6am-10am, 10am-4pm, 4pm-8pm, and Weekends 6am-8pm.
Per 2017 MAP-21 rule, a road is considered reliable if its LOTTR <= 1.50

[13] "Deficient corridors" highlighted in the map are discussed in greater detail in Section 9.1.1

Figure 7-5 All-Vehicle Level of Travel Time Reliability (LOTTR), 2016-2019 Change Map



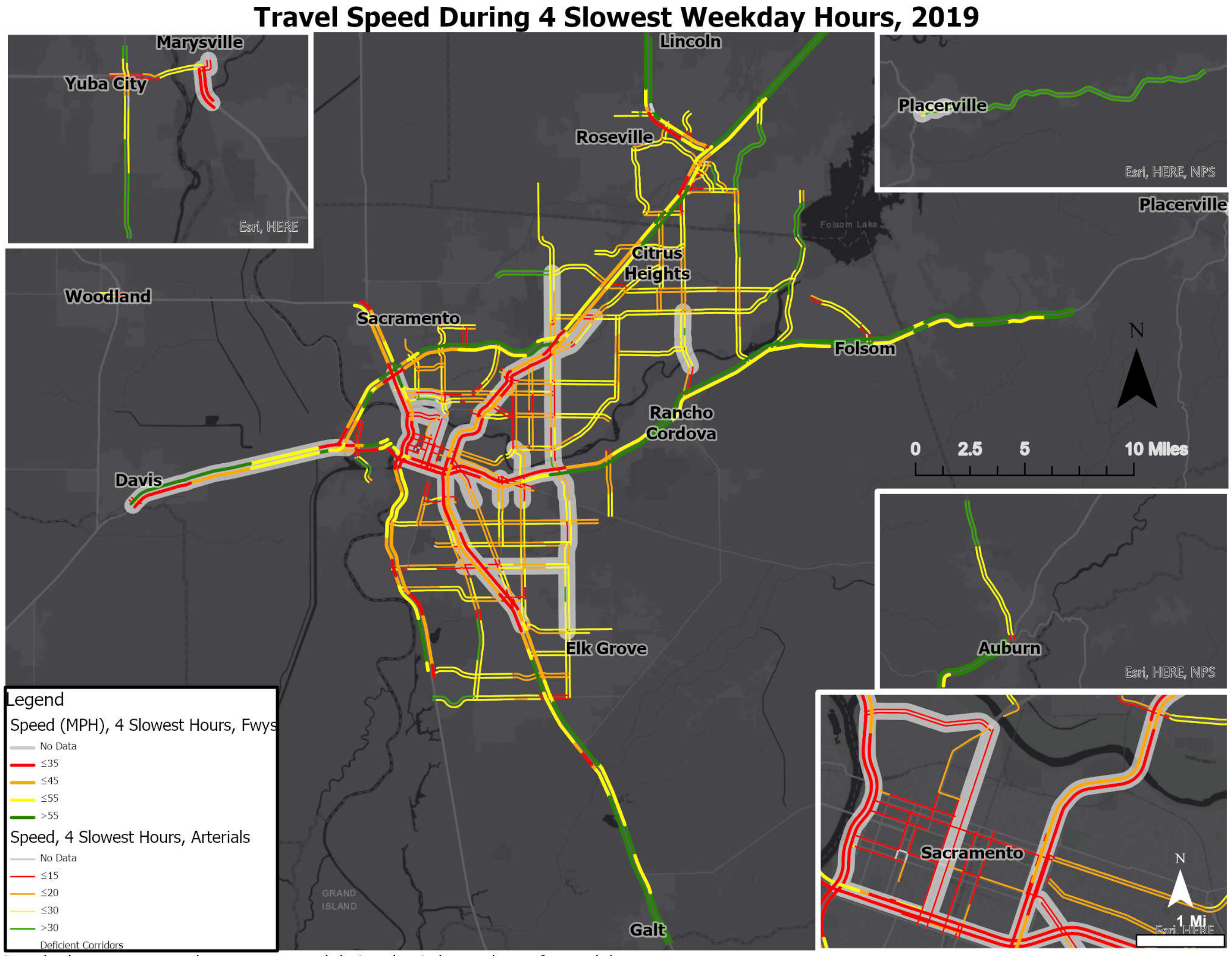
Numbers show change in MAP21-based LOTTR during the TMC's least reliable time period (worst period out of Mon-Fri 6am-10am, 10am-4pm, 4pm-8pm, or Sat-Sun 6am-8pm). Negative values indicate locations where travel times became more reliable.

7.2.2 Results: Reduce Traffic Congestion

Average speed during the four slowest hours of the day ("congested speed")

Figure 7-6 shows the average speed on each TMC during that TMC's four slowest weekday hours. As described in Section 6.2, the speed for the for slowest weekday hours, also known as the "congested speed" is calculated by identifying the four slowest hours of a typical 24-hour weekday based on data for the entire 2019 calendar year, then getting the average speed for those hours. Which four hours are slowest will vary by TMC, e.g., many will have their slowest four hours occur during the typical AM and PM peaks, but others will experience their slowest speeds at other times of day.

Figure 7-6 Average Speed During the Slowest Four Hours of a Typical Weekday[14]



Speeds shown represent the average speed during the 4 slowest hours for weekdays.

[14] "Deficient corridors" highlighted in the map are discussed in greater detail in Section 9.1.1

While Figure 7-6 provides an intuitive view by simply showing the speeds during the slowest hours, Figure 7-7 below shows the congested speed as a percentage of the "free-flow" speed[15]. Although not as immediately intuitive as the speed map in Figure 7-6, by showing congested speed as a percentage of free-flow speed, Figure 7-7 below better highlights areas whose speeds are significantly reduced due to congestion, making them stand out from segments whose speeds, although they may be slow, are not significantly slower than their free-flow speed. Areas that stand out as being particularly affected by congestion are:

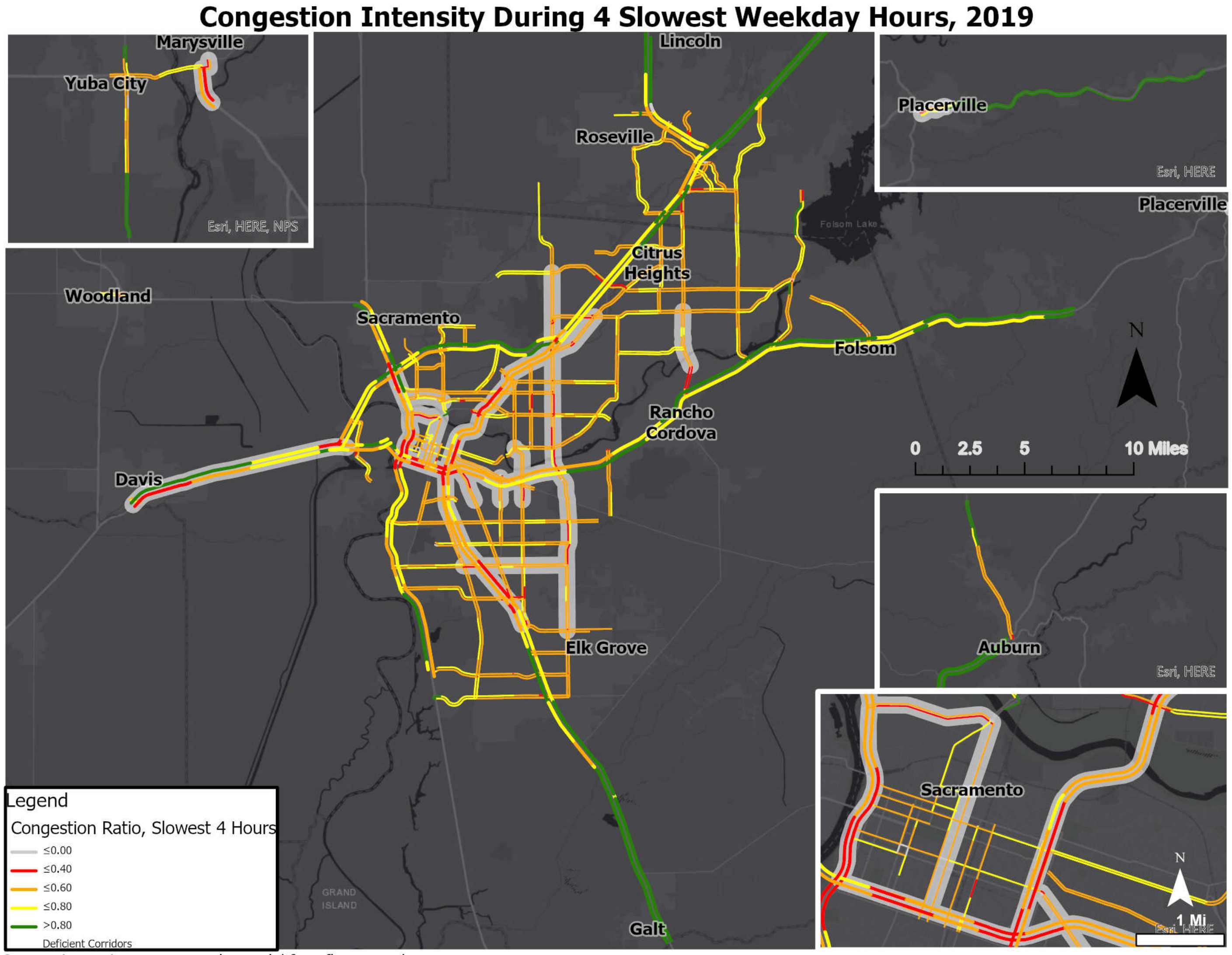
- I-5 through downtown Sacramento
- SR-99 through South Sacramento
- SR-51, or "Business 80"
- Eastbound I-80 through Davis
- US-50 between I-5 and SR-99

Below Figure 7-7, the map in Figure 7-8 shows how average congested speeds changed throughout the region between 2016-2019. Areas with notable changes include:

- I-80 between I-5 and SR-51 ("Business 80), which saw a significant increase of over 10mph in its average congested speed between 2016-2019. This increase is likely due to completion of the "80 over the top" HOV lanes project, which added HOV lanes on this section of I-80 between El Camino Avenue and SR-51. Note that this increase is likely the combination of the extra capacity afforded by a new HOV plus the ending of the delays caused by the HOV lane's construction.
- A short section of southbound SR99 south of Elk Grove saw its speed notably decrease between 2016-2019. Although initially surprising given the semi-rural and peripheral location of this segment, a look at Caltrans lane closure data[16] reveals that for several months during 2019, one of the two southbound lanes on this segment was closed during nighttime hours to install habitat mitigation infrastructure.

[15] "Free-flow" speed is supposed to represent speed when motorists are uninterrupted by the presence of other vehicles on the road. For freeways, we calculated it as being the 85th percentile travel speed between 8pm and 6am; for arterials, we calculated it as being the 60th percentile speed between 8pm-6am, using the lower percentile to roughly account for delay on arterials caused by traffic signals.
[16] Source: Caltrans Performance Measurement System (PeMS) data clearinghouse

Figure 7-7 Congested Speed as Percentage of Free-Flow Speed[17]

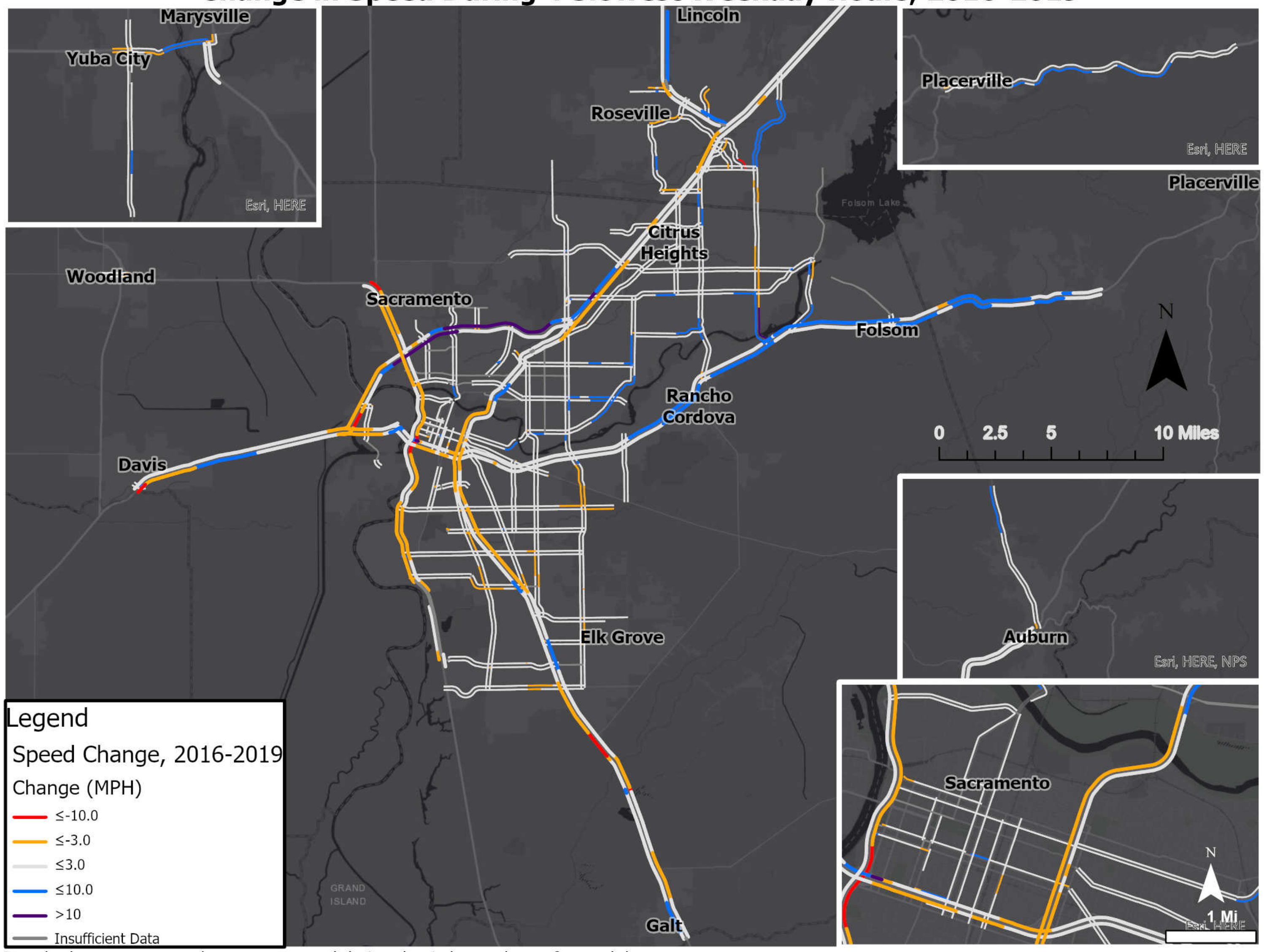


Congestion ratio = congested speed / free-flow speed
Congested speed = average speed during 4 slowest hours of typical weekday
Free-flow speed = 85th percentile speed between 8pm-6am for freeways; 60th percentile speed between 8pm-6am for arterials.

[17] "Deficient corridors" highlighted in the map are discussed in greater detail in Section 9.1.1

Figure 7-8 Change in average congested speed, 2016-2019

Change in Speed During 4 Slowest Weekday Hours, 2016-2019



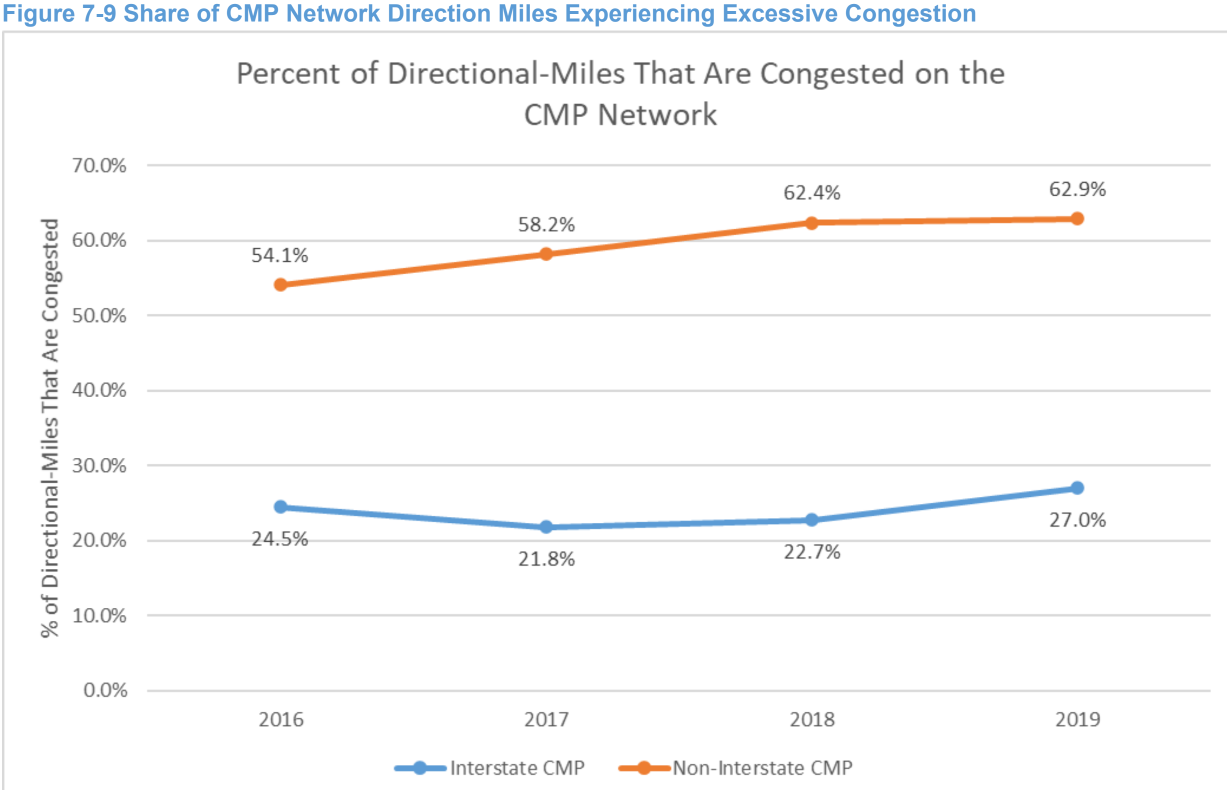
Speeds shown represent the average speed during the 4 slowest hours for weekdays.

Percent of directional miles where average speed during slowest 4 weekday hours is less than 60 percent of free-flow speed

While Figure 7-6 and Figure 7-7 above detail where congestion hot spots are in the region, the chart in Figure 7-9 distills congestion into an overall picture, showing what share of the CMP network is “excessively” congested during its four slowest hours. To define “excessive congestion”, we borrow a threshold from the MAP-21 PM3 PHED metric[7], defining excessive delay as being any delay occurring when the observed travel speed is less than 60 percent of the posted speed limit. E.g., if the posted speed limit is 60mph, then excessive delay starts accumulating when actual speeds drop below 35mph.

As Figure 7-9 shows, the share of interstate miles experiencing excessive congestion has stayed relatively stable, dipping slightly in 2017 then increasing between 2017 and 2019. In contrast, the share of congested miles on the non-interstate portions of the CMP network increased by over 16% from 2016 to 2019. Important to note is that “non-interstate” portions of the CMP combine arterial and non-interstate freeway segments on the CMP network. This classification into “interstate” and “non-interstate is based on the road types used in MAP-21 PM3 reporting[5].

Figure 7-9 Share of CMP Network Direction Miles Experiencing Excessive Congestion

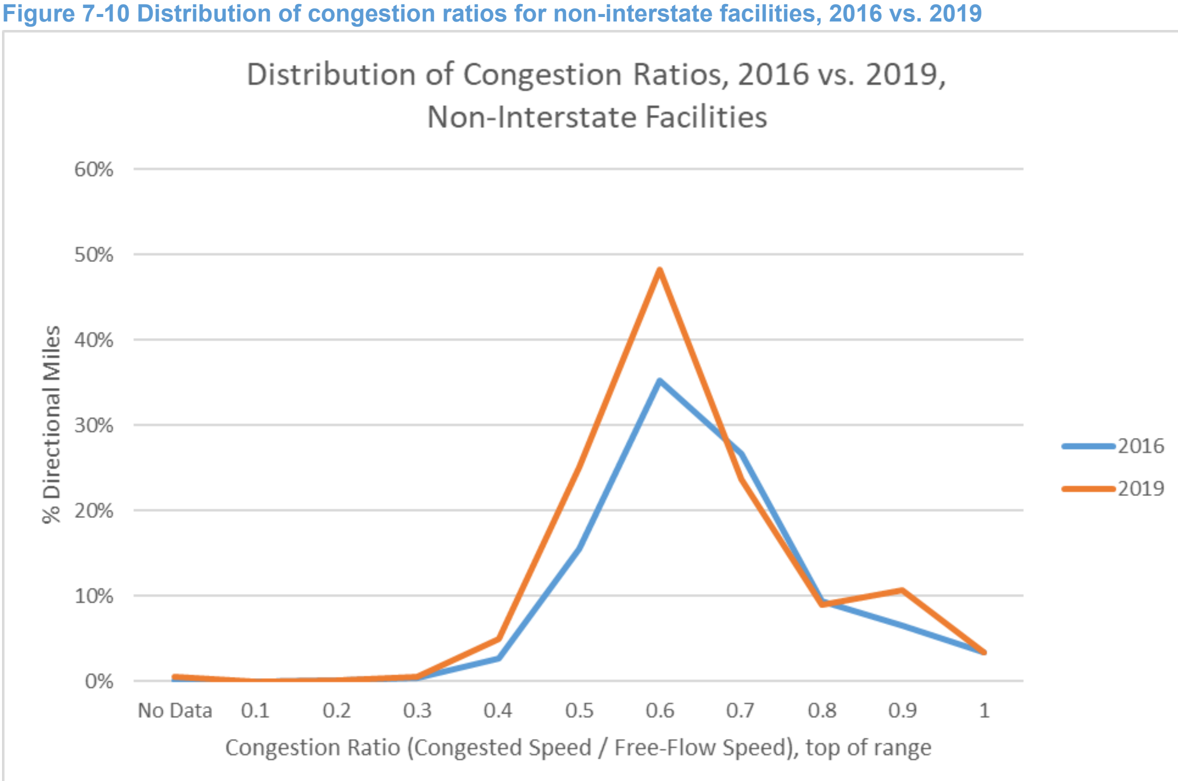


Source: National Performance Measurement Research Data Set (NPMRDS)

The 16% increase in the share of CMP network direction miles that are congested on non-interstate facilities at first seems significant, i.e., it seems like congestion has spread to more areas of the region. However, as Figure 7-10 shows, the increase in the share of directional miles that are congested is largely due to small speed decreases that pushed parts of the network from being “almost congested”, e.g., with a congested speed just above the 60% threshold, to being “congested by a small margin” by having their speed drop just enough to put them below the 60% threshold at which they are defined as congested.

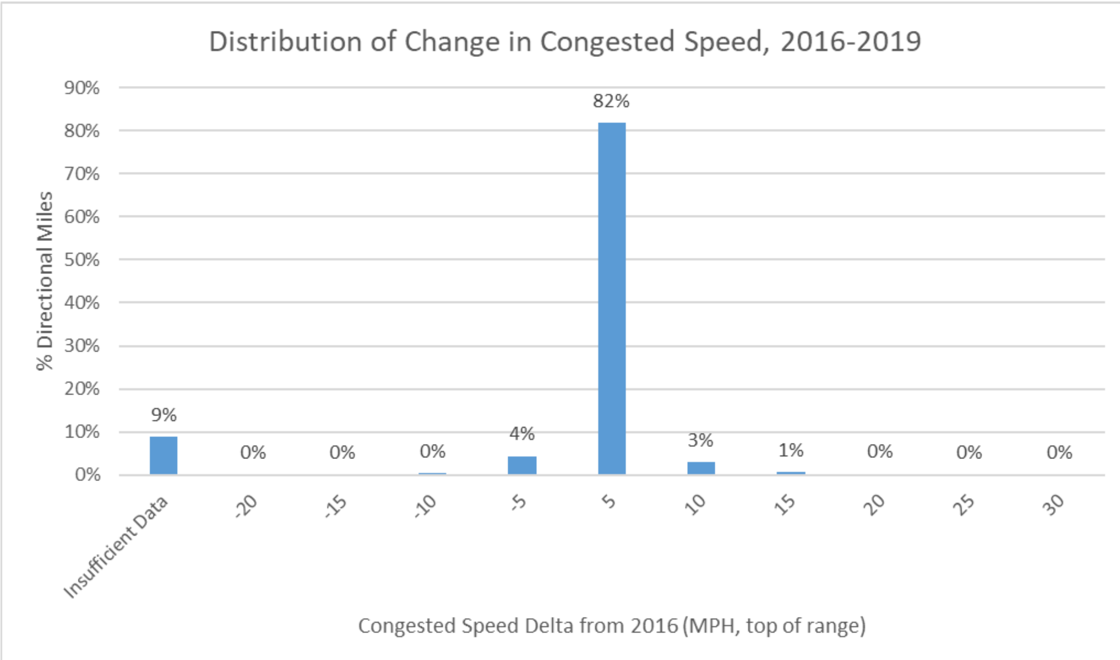
Further confirming that the spread of congestion is due mostly to small speed decreases is Figure 7-11, which shows that for over 80% of the CMP network, speeds between 2016 and 2019 changed by less than five miles per hour. In short, the apparent significant spread of congestion between 2016 and 2019 (i.e., the 16% increase in the share of the CMP network that is congested) is largely due to small speed changes that push many parts of the network from being “almost congested” just past the threshold to become congested.

Figure 7-10 Distribution of congestion ratios for non-interstate facilities, 2016 vs. 2019



Source: National Performance Measurement Research Data Set (NPMRDS)

Figure 7-11 Frequency distribution of change in congested speed, 2016-2019



Source: National Performance Measurement Research Data Set (NPMRDS)

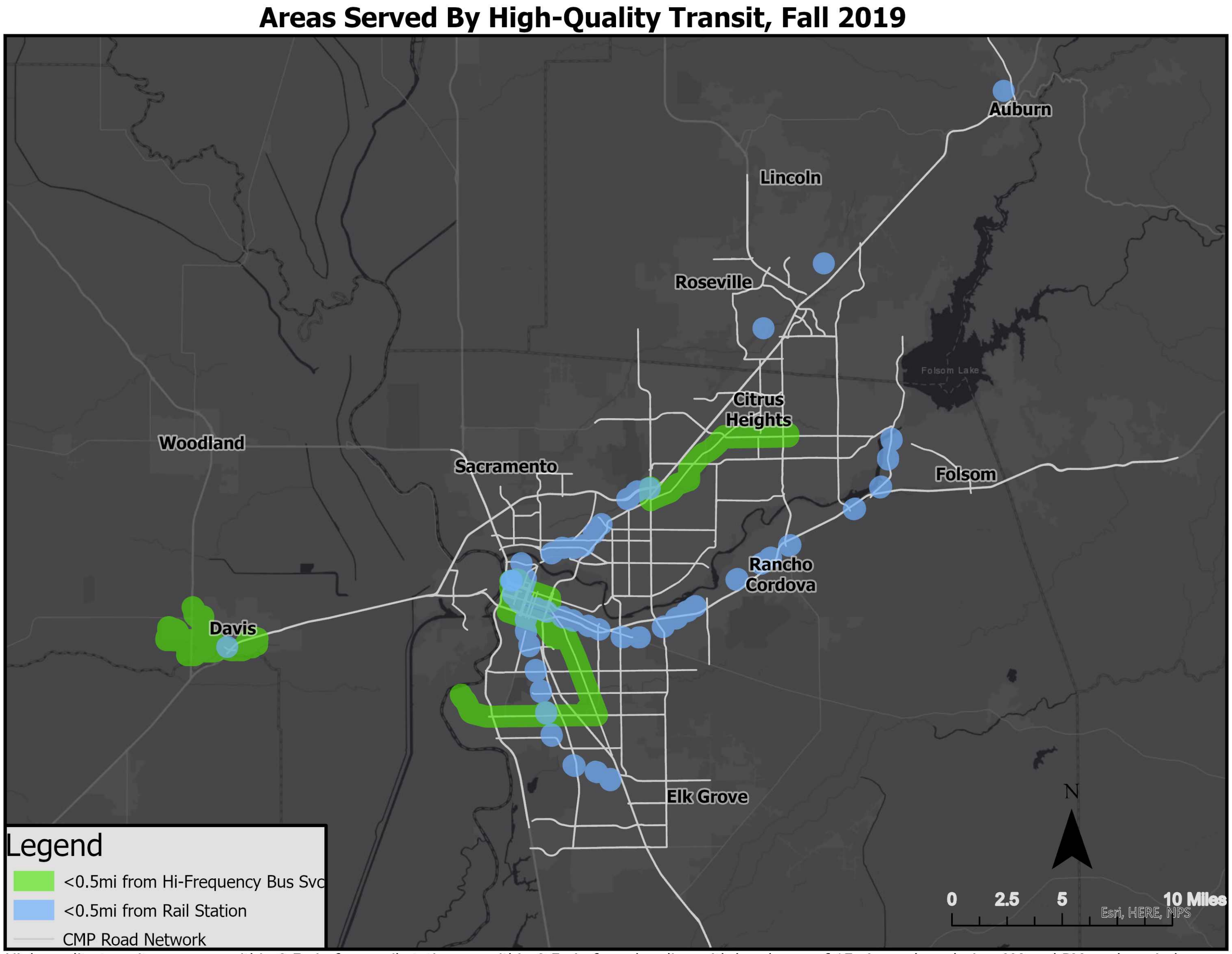
Another factor driving changes in system-level congestion, besides the modest speed changes, is the set of TMCs included in the CMP network. As Figure 5-1 showed earlier, the CMP road network changes with each CMP update based on the criteria described in Chapter 5. While the effect of changes to the CMP road network extent should generally be minor, they nonetheless will affect system-level outcomes such as the share of CMP directional miles that are congested.

7.2.3 Results: Promote Development That Encourages Making Trips by Public Transit

As described in Section 6.2, the region's success at "promoting development that encourages making trips by public transit" is measured by the share of jobs and housing that are in high-quality transit areas, defined as being within a half mile of either a rail stop (regardless of frequency) or a bus line with AM and PM weekday peak service headways of 15 minutes or less.

The map in Figure 7-12 shows the areas in the SACOG region that, as of September 2019, were in high-quality transit areas.

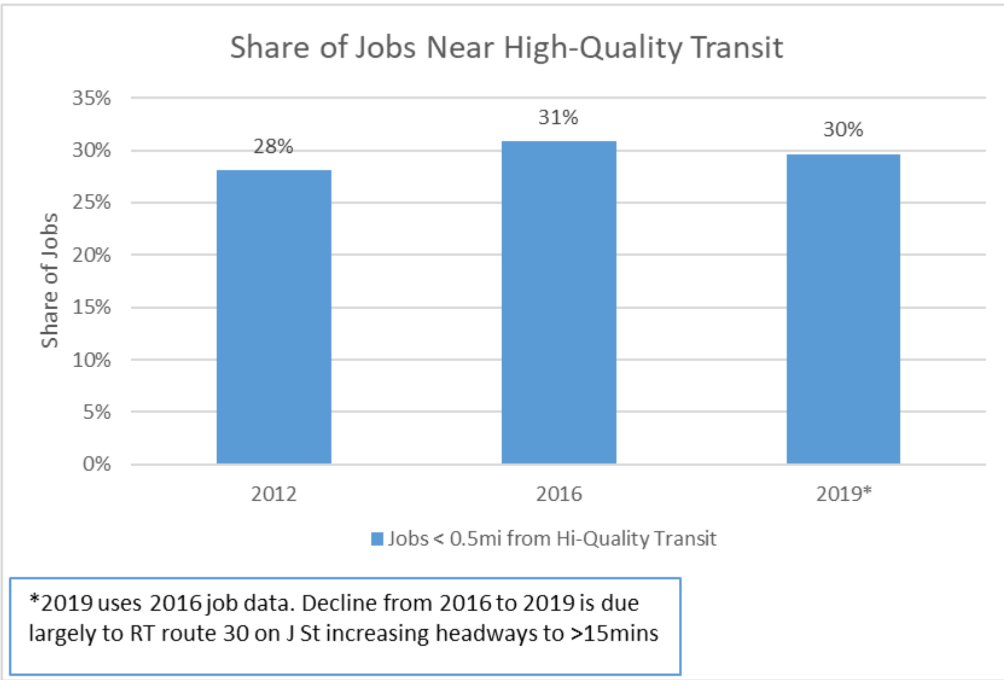
Figure 7-12 High-Quality Transit Areas as of September 2019



High-quality transit areas are within 0.5mi of any rail station, or within 0.5mi of any bus line with headways of 15mins or less during AM and PM peak periods.

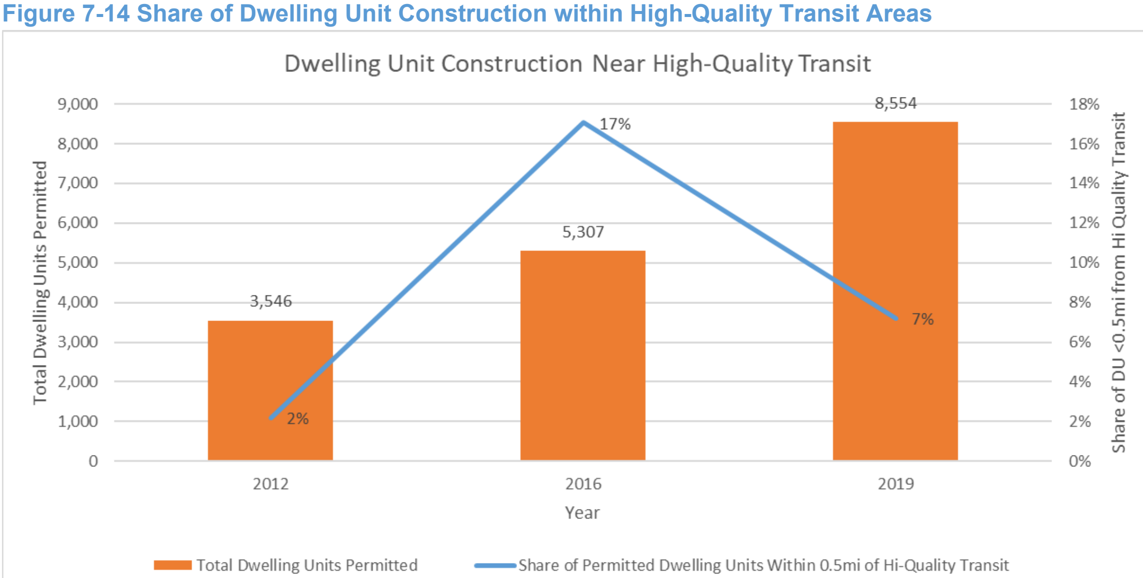
Figure 7-13 and Figure 7-14 respectively show the share of total jobs and share of dwelling unit construction within high-quality transit areas. Important to consider is that the share of housing and jobs in high-quality transit areas is a function of both transit service and where development happens. For example, the slight decrease in jobs and housing within high-quality transit areas from 2016 to 2019 is due at least in part to a reduction in the area near high-quality transit service, specifically due to removal of 15-minute bus service in East Sacramento.

Figure 7-13 Share of Regional Jobs within High-Quality Transit Areas



Source: SACOG employment inventory, General Transit Feed Specification (GTFS)

Figure 7-14 Share of Dwelling Unit Construction within High-Quality Transit Areas



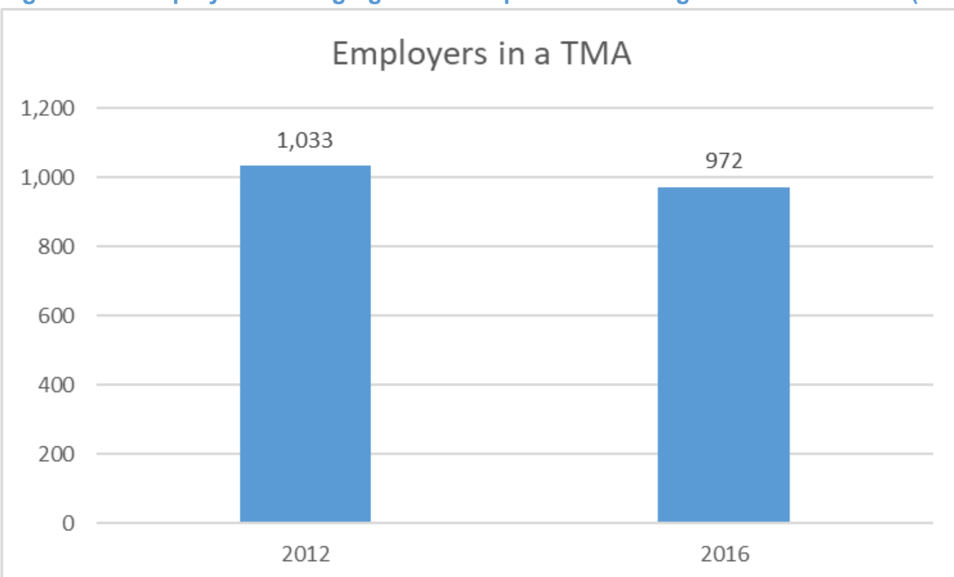
Source: SACOG-collected housing permit data, General Transit Feed Specification (GTFS)

7.2.4 Results: Support Proactive and Innovative Education and Transportation Demand Management Programs Covering All Parts of the Urbanized Area, to Offer a Variety of Choices to Driving Alone

Employers Belonging to a Transportation Management Association (TMA)[18]

The number of employers belonging to a TMA dropped about six percent between 2012 and 2016, the latter of which was the most recent year with TMA membership data available. We will continue monitoring participation to see if the decrease is a small variation or part of a longer-term trend.

Figure 7-15 Employers Belonging to a Transportation Management Association (TMA)



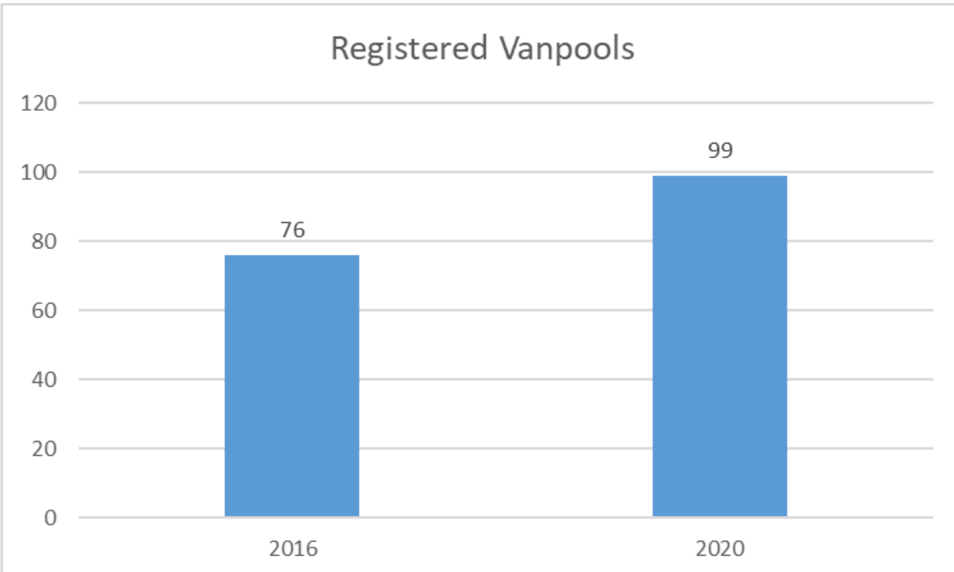
Source: SACOG employment inventory

[18] In the 2017 CMP, the source data year for TMA employers was wrongly reported as 2016. It should have been reported as 2012. It is corrected here.

Registered Vanpools

The number of registered vanpools increased by nearly a quarter between 2016 and 2020. Although a small number in absolute terms, vanpools represent an easy-to-implement, economical way for commuters to use a more space-efficient form of transportation and contribute to more efficient use of existing transportation infrastructure.

Figure 7-16 Registered Vanpools

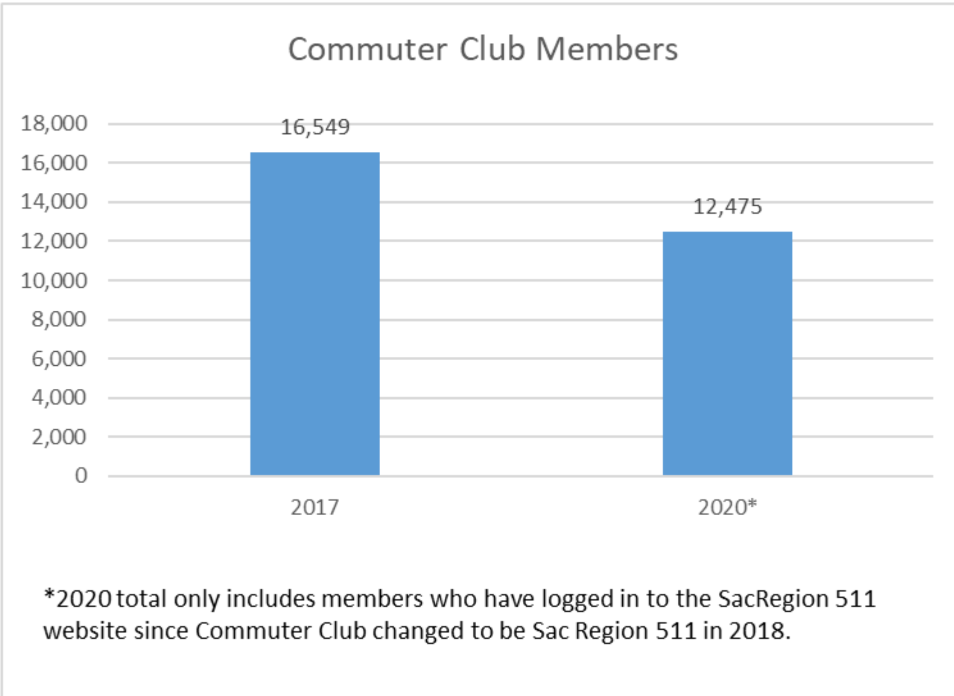


Source: SACOG vanpool database

Commuter Club Members

Although Figure 7-17 shows a large drop in Commuter Club members, a significant driver of the change was Commuter Club remaking itself as Sac Region 511 in 2018. This transition required all Commuter Club members to update their accounts, and in so doing revealed a significant number of people who had created Commuter Club accounts but never or very rarely used them.

Figure 7-17 Commuter Club Members

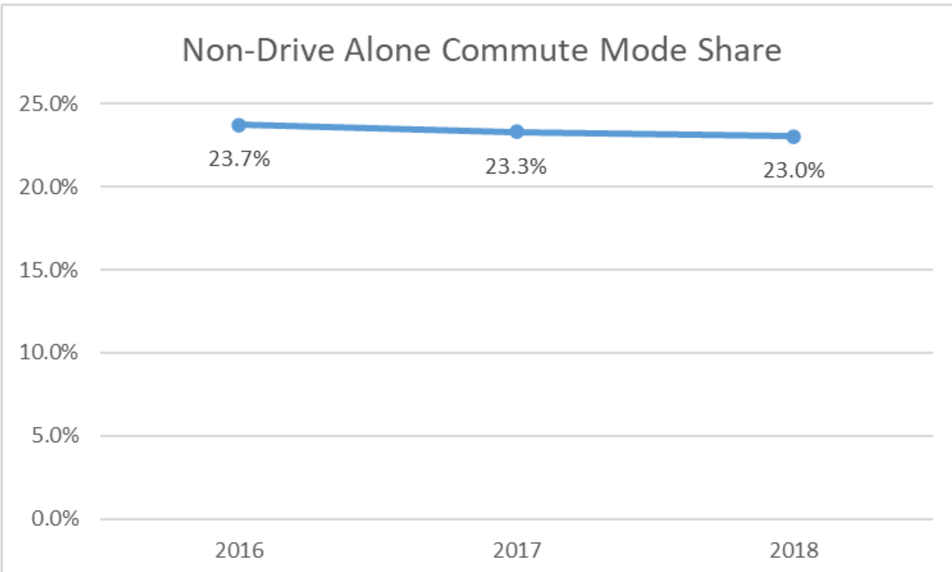


Source: SacRegion 511

Non-Drive-Alone Mode Share

Non-drive-alone mode share dropped slightly from 2016 to 2018. While not a desirable trend from a congestion management standpoint, the drop was also quite small. Furthermore, the effects of COVID19-based quarantine orders starting in March 2020 led to a significant increase in teleworking, which had already been a relatively fast-growing mode. While the long-term effects of COVID19 remain to be seen, SACOG is implementing programs, described more in Section 9.2, aimed at maintaining telework as a more popular means for commuters to access work.

Figure 7-18 Non-Drive-Alone Commute Mode Share



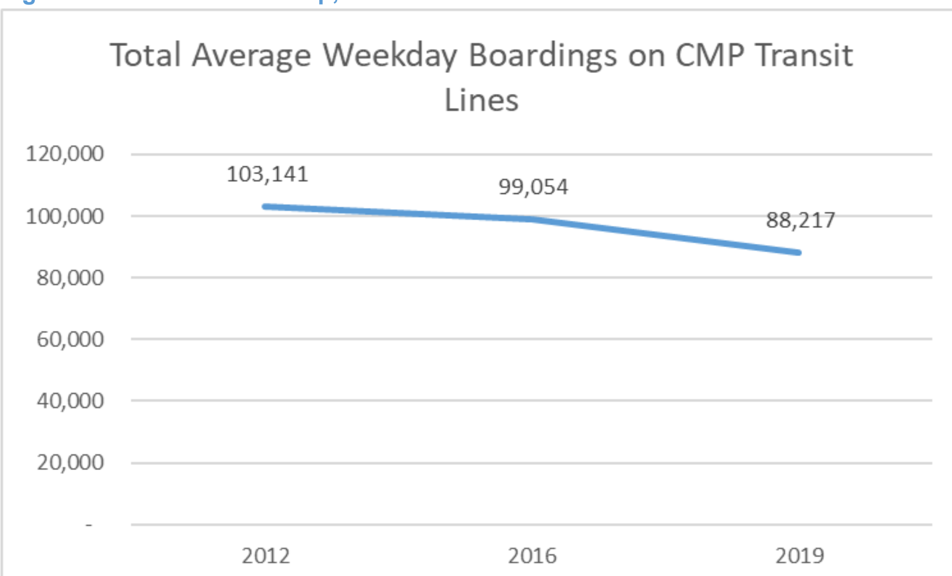
Source: 5-Year American Community Survey

7.2.5 Results: Prioritize Investments in Transit, Bike, and Pedestrian Improvements That Reduce Greenhouse Gas Emissions and Vehicle Miles Traveled (VMT)

Weekday transit boardings by route for CMP priority transit routes

Transit boardings are one of the CMP measures of how well the region's transit investments are helping reduce VMT and GHG emissions. While Appendix 6 lists out 2019 boardings by line for routes in the SACOG region, Figure 7-19 shows that, at a regional level, transit boardings have steadily but modestly declined since the 2012 transit year used for the 2017 CMP. This decline follows state and national trends in transit ridership, which has been falling in almost every major city, partly due to increases in car ownership among households that were traditionally more likely to use public transportation[19].

Figure 7-19 Transit Ridership, 2012-2019



Sources: Sacramento Regional Transit, Yolo County Transportation District, City of Roseville, City of Elk Grove, University of California at Davis, Sacramento County, El Dorado Transit, Yuba-Sutter Transit, 2019.

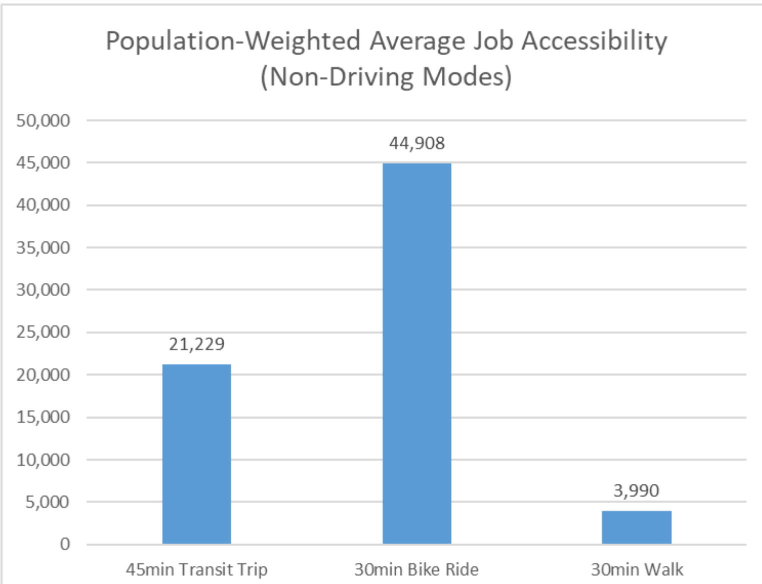
[19] Manville et al. *Falling Transit Ridership: California and Southern California.* University of California, Los Angeles Institute of Transportation Studies. January 2018

Transit, Walking, and Biking Accessibility to Jobs

The number of jobs that a typical person can reach by transit, walking, or biking is a rough indicator of how well transportation investments are working to serve commuters' needs: if one can reach more total jobs by these low- or no-VMT modes, the more likely his/her job can feasibly be reached by one of these modes.

Figure 7-20 shows how many jobs the typical SACOG resident can access by walking, transit, and biking. Further below, Figure 7-21 through Figure 7-23 provide a spatial picture of accessibility to jobs using each of these modes. In future CMPs, we hope to provide updated accessibility data to show how access using non-auto modes changes over time.

Figure 7-20 Average Job Accessibility by Transit, Walking, and Biking, 2019



Source: General Transit Feed Specifications via Bentley Sugar Access, 2019.

Figure 7-21 Map of Job Accessibility by Walking

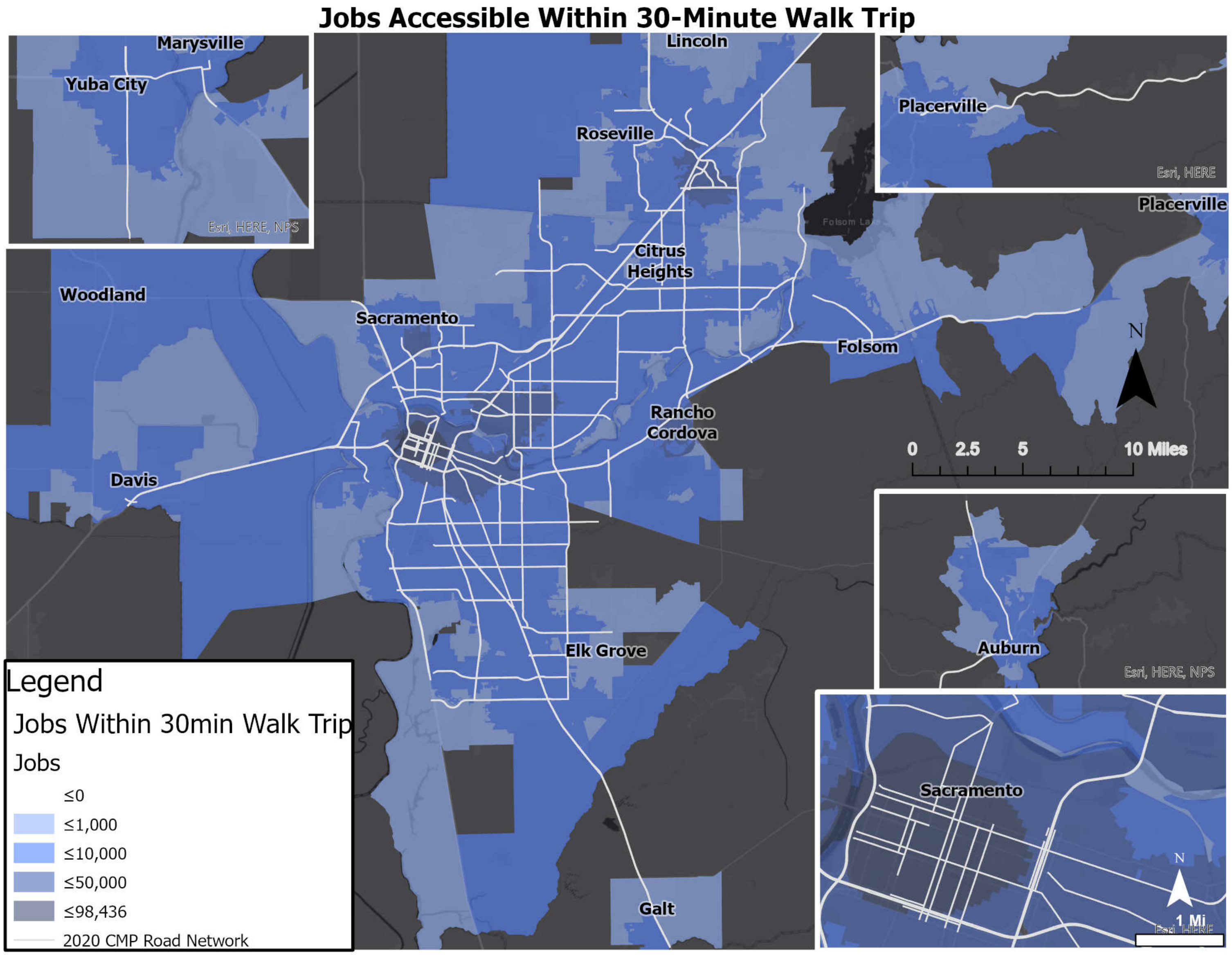


Figure 7-22 Map of Job Accessibility by Biking

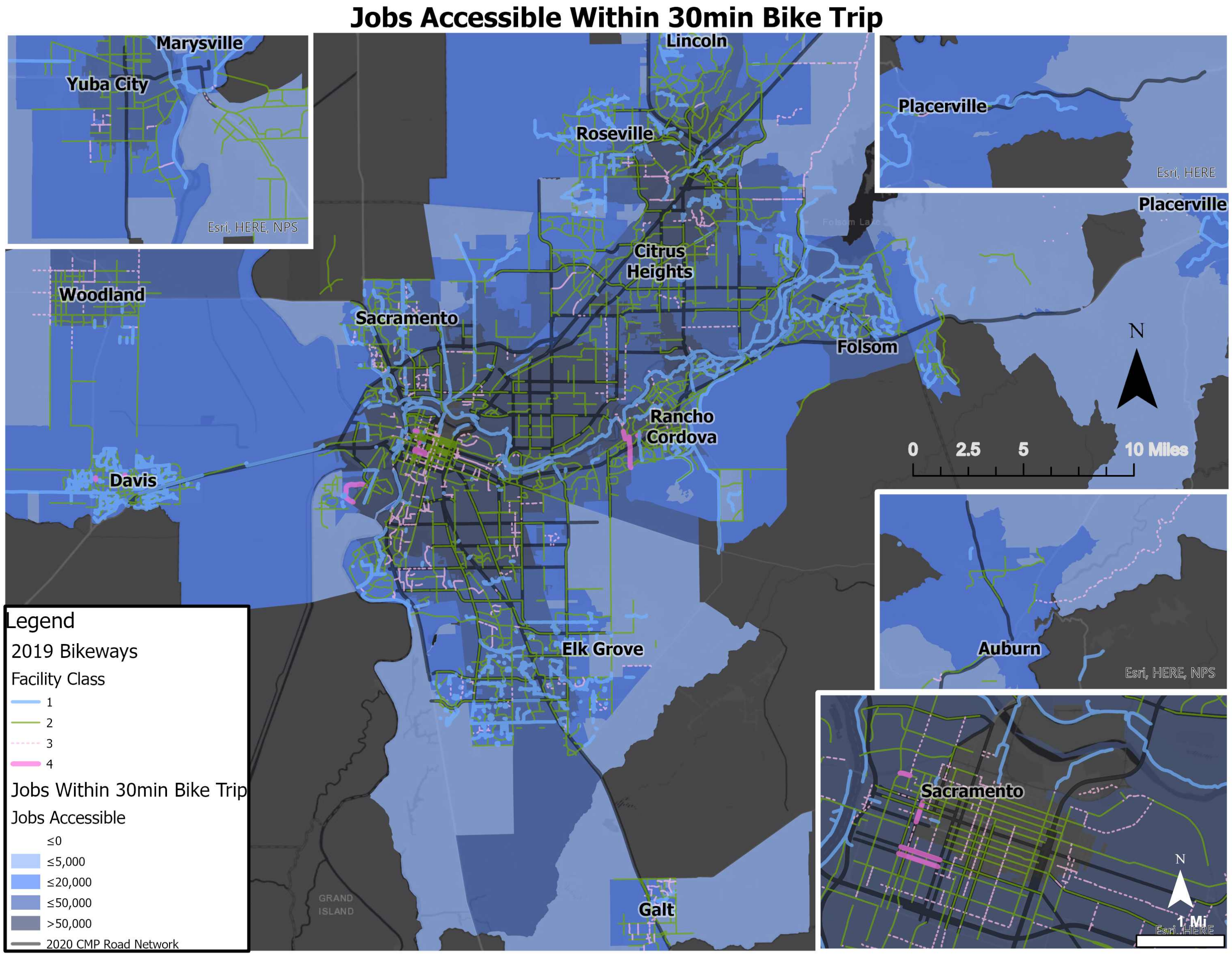
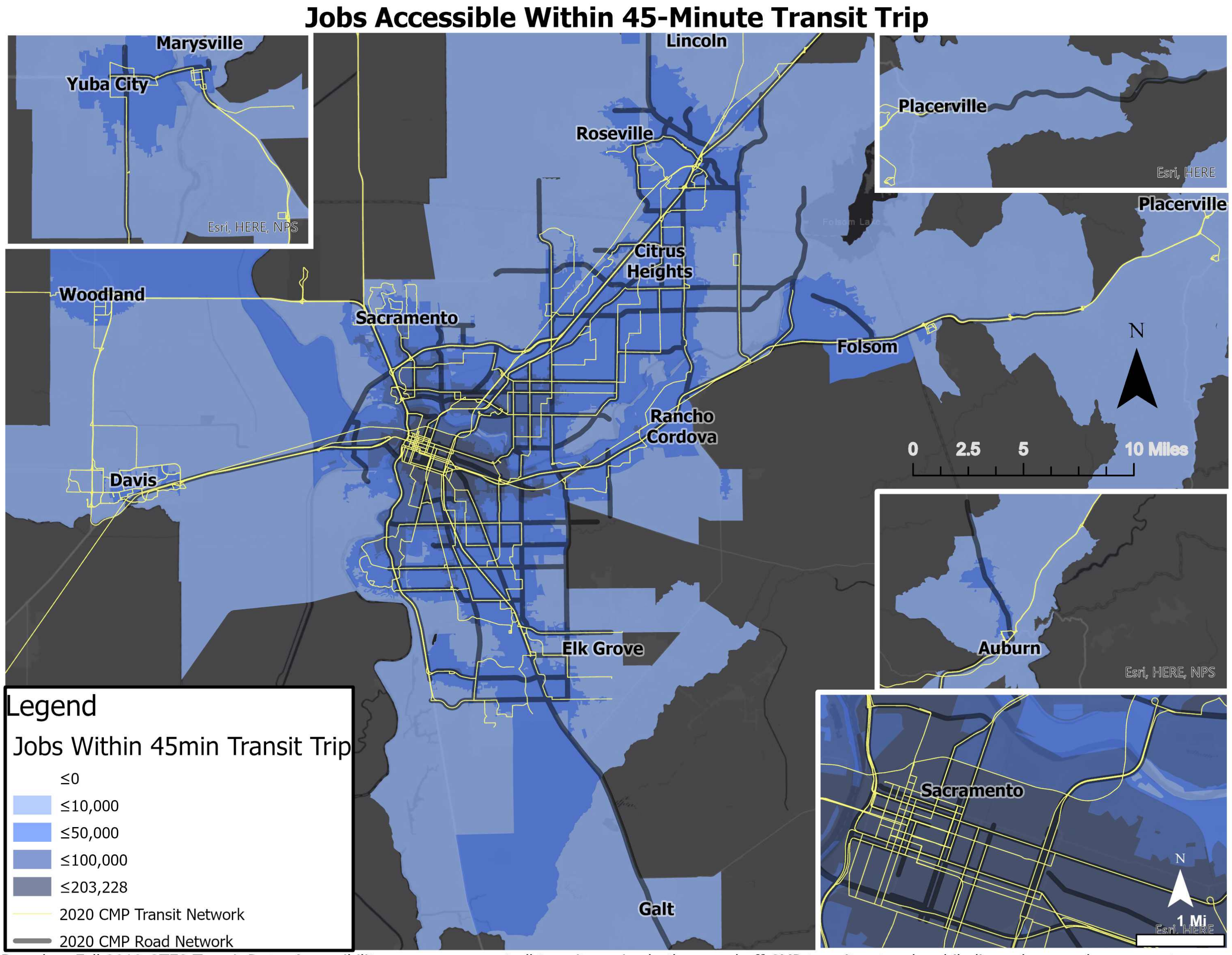


Figure 7-23 Map of Job Accessibility by Transit



Based on Fall 2019 GTFS Transit Data. Accessibility scores represent all transit service both on and off CMP transit network, while lines shown only represent transit within the CMP transit network. Assumes trip occurs between 7am-9am on a weekday.

Transit, Walking, and Biking Accessibility to Services

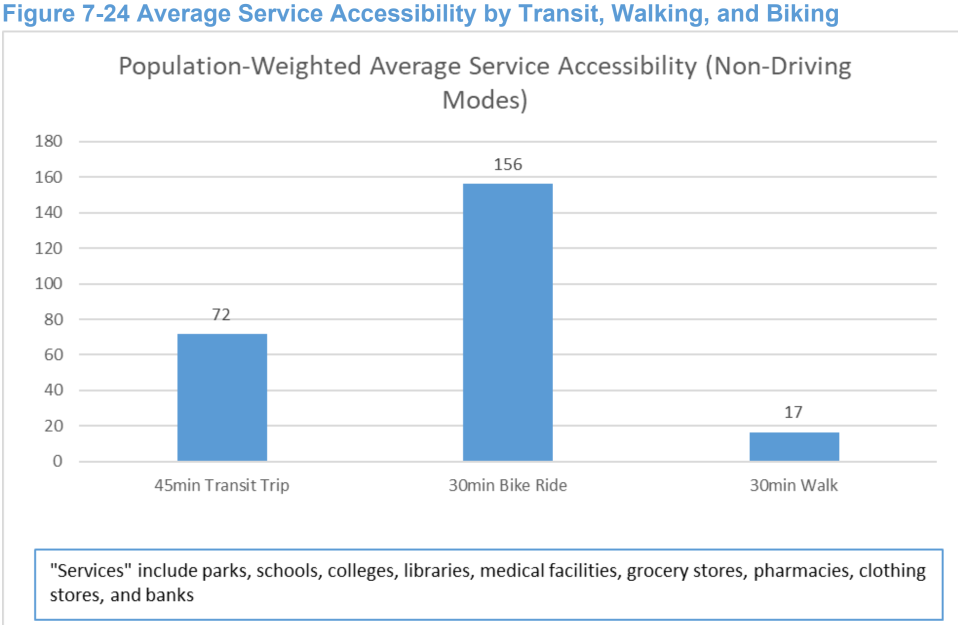
Since commute trips typically comprise less than 20% of a person's total daily trips, we also evaluate the region's investments in transit, biking, and walking infrastructure based on peoples' ability to use these modes to access common non-work destinations, including:

- Grocery stores
- Educational facilities, including K-12 schools, colleges, and libraries
- Medical facilities, including hospitals, pharmacies, and doctor's offices
- Public parks
- Clothing stores
- Banks

For the CMP, we aggregate these destination types into a single "service" destination. E.g., if a person can access one grocery store and one bank, we say they can access two "services".

Figure 7-24 charts the number of services that a typical SACOG resident can access by transit, biking and walking. Further below, Figure 7-25 through Figure 7-27 map out accessibility to services by each of these three modes.

Figure 7-24 Average Service Accessibility by Transit, Walking, and Biking



Source: HERE point-of-interest data and road network and GTFS transit service data, via Bentley Sugar Access, 2019.

Figure 7-25 Map of Service Accessibility by Walking

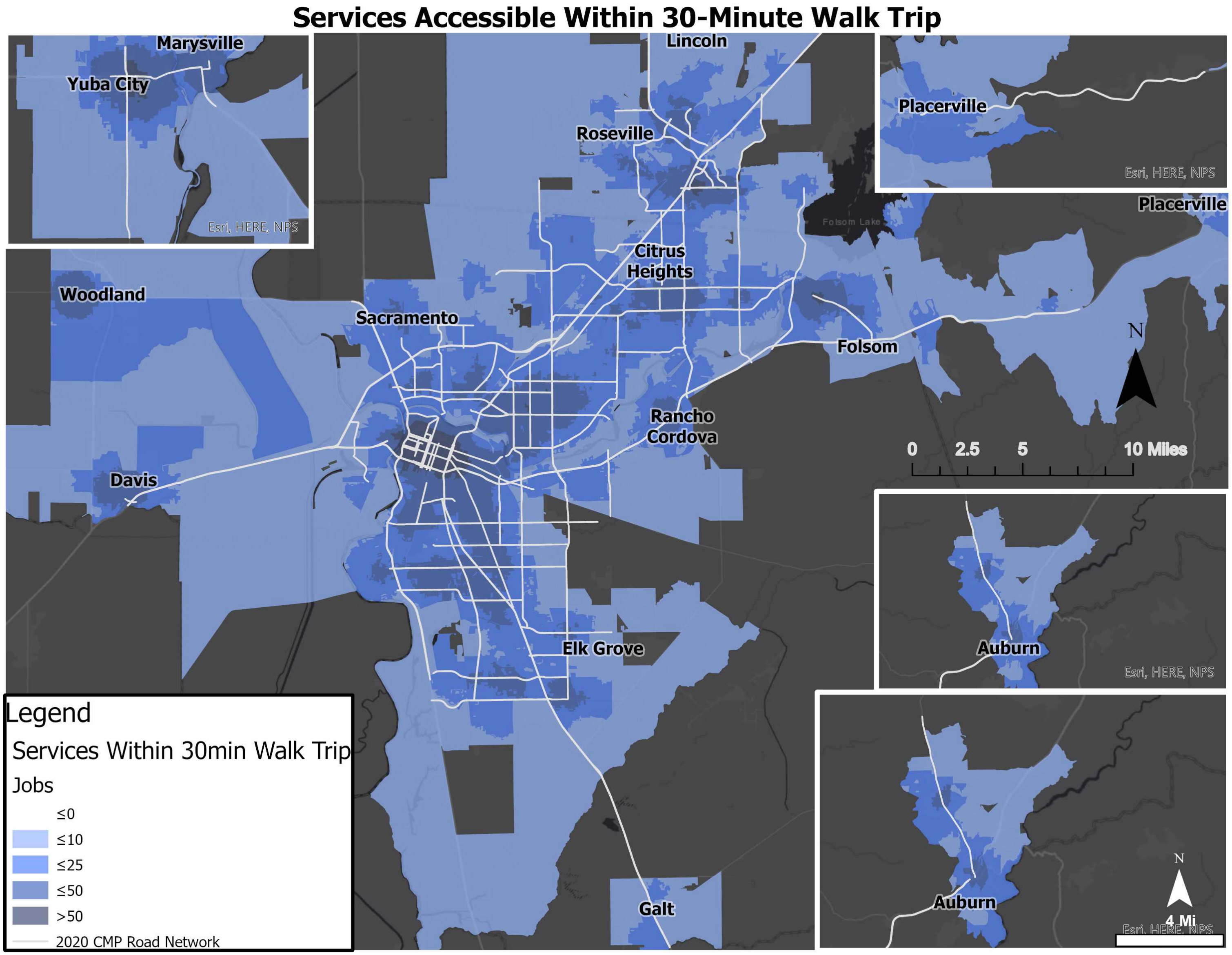
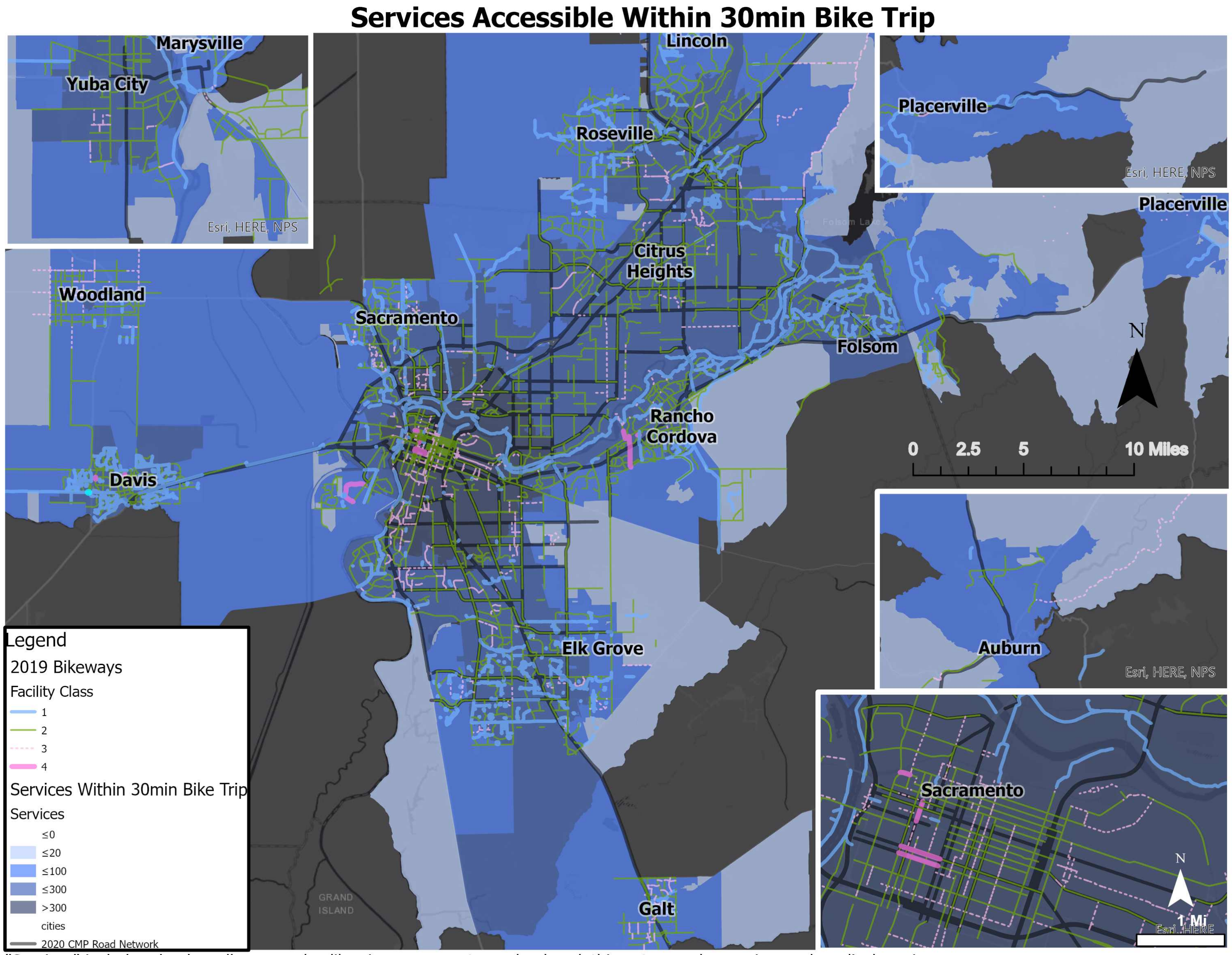
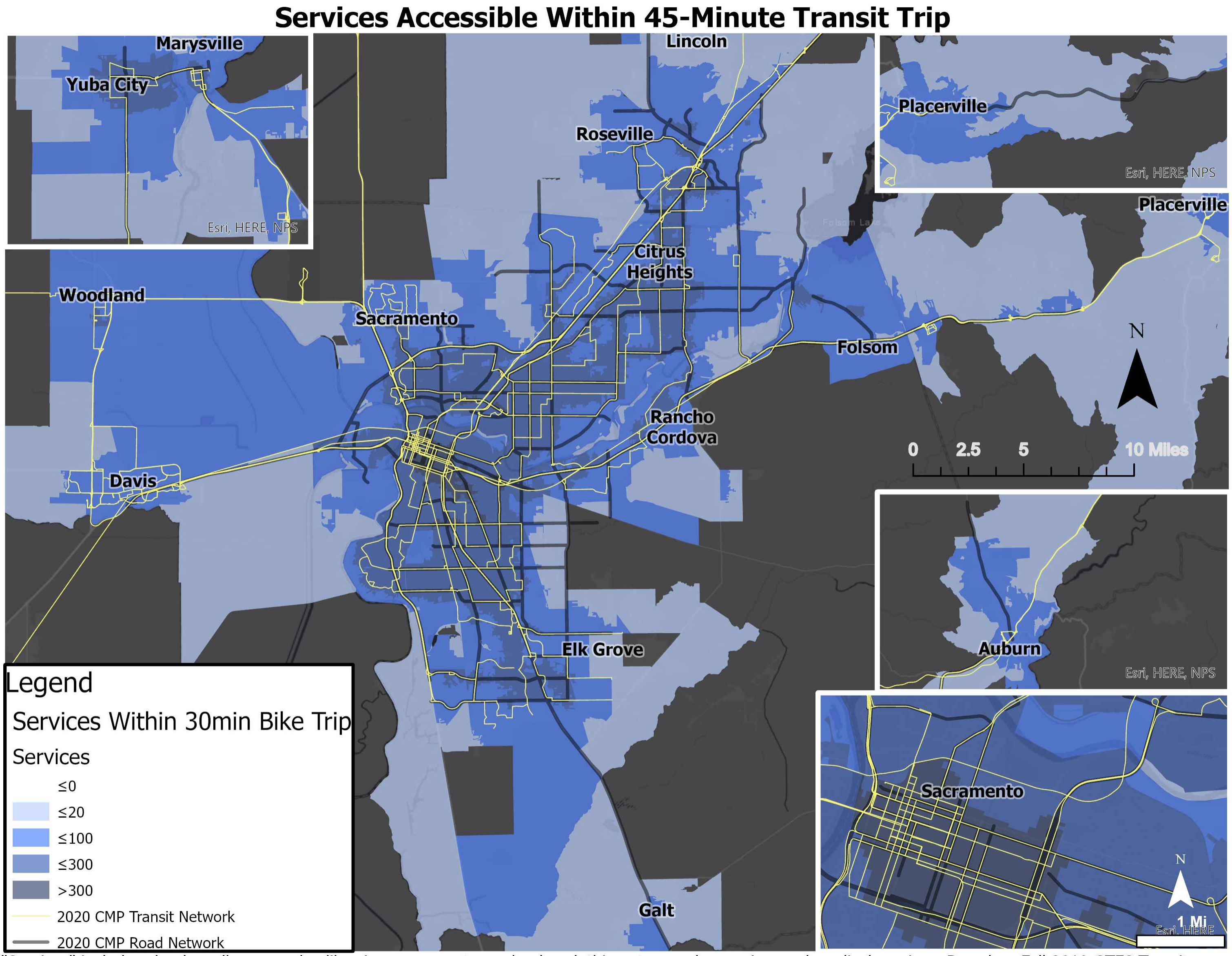


Figure 7-26 Map of Service Accessibility by Biking



"Services" include schools, colleges, parks, libraries, grocery stores, banks, clothing stores, pharmacies, and medical services.

Figure 7-27 Map of Service Accessibility by Transit



"Services" include schools, colleges, parks, libraries, grocery stores, banks, clothing stores, pharmacies, and medical services. Based on Fall 2019 GTFS Transit Data. Accessibility scores represent all transit service both on and off CMP transit network, while lines shown only represent transit within the CMP transit network. Assumes trip occurs between 4pm-6pm on a weekday.

Decay factors and time thresholds for accessibility

The accessibility maps and charts above assume certain time thresholds when determining whether a destination is "accessible" by a given mode. E.g., a job or service is considered "accessible" by bicycle if it is within a 30-minute bike ride. However, these thresholds are complemented by decay factors, which are based on State Smart Transportation Institute travel decay curves. The decay curves, shown in Appendix 7, indicate that the effective number of destinations falls as it becomes farther away from the origin. For example, if one grocery store is a two-minute walk from an origin, then Sugar would say there is one grocery store accessible. In contrast, for a grocery store that is 25 minutes away, Sugar would say there is only a fraction of a grocery store available, representing the fact that while most people would be willing to make a two-minute walk to a grocery store, far fewer people would walk 25 minutes to a grocery store.

7.2.6 Results: Implement Pilot Projects Aimed at Making Micromobility (Such as Bike and Scooter Share) Work for Urban, Suburban, Rural, and Low-Income Areas of The Region

Bike and scooter share usage

In 2019, approximately 1.7 million trips were taken on shared bike and scooter devices, which is likely an underestimation of the actual number of trips taken because they only represent data from one provider, JUMP, and does not include trips taken on Lime or Spin scooters[20].

While an impressive number of trips, understanding the potential effect that bike and scooter share have had on congestion depends on how those trips would have been made if bike and scooter share were not available. For example, bike/scooter trips that would have otherwise been taken by driving or taxi contribute to a reduction in congestion by shifting to a less space-intensive mode of travel. A 2020 UC Davis Institute of Transportation report[21], using 2019 data, summarizes how respondents would have traveled if bike and scooter share were not available. Nearly half of respondents would have made the trip either walking or on a personally-owned bicycle, and so their use of bike/scooter share does not result in a net decrease of car trips. But importantly, more than one in three respondents indicated that they would have either carpooled, driven alone, or taken a taxi/TNC[22]. For these respondents, the presence of bike and scooter share did result in a reduction in car trips. Extrapolated to the 1.7 million bike and scooter share trips taken by JUMP users in 2019, potentially equates to over a half-million car trips that were replaced by bike and scooter trips.

Since they are new technologies provided primarily by private startup companies, the future of bike and scooter share in the Sacramento region is uncertain, but based on its short existence it has proven to have considerable potential for providing an alternative to traveling in congested conditions, and we will continue to monitor it in future CMPs.

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[20] JUMP (operating as a subsidiary of Uber Technologies) was acquired by Lime in 2020, but in 2019 Lime was operating its own fleet of scooters separate from JUMP.

[21] Fitch et al. *Investigating the Influence of Dockless Electric Bike-share on Travel Behavior, Attitudes, Health, and Equity*. University of California, Davis Institute of Transportation Studies. 2020

[22] TNC = Transportation Network Company, such as Uber or Lyft

8 Analyze Congestion Problems and Needs

Using the results from the data collection and analysis in Chapter 8, we identified parts of the CMP network experiencing the most severe issues with congestion and reliability. This chapter summarizes our findings and identifies which corridors we will focus the CMP's congestion strategies on.

8.1 Identification of Corridors for Analysis

8.1.1 Deficient Corridors

The numbered corridors in Figure 8-1 were identified as *deficient* corridors. SACOG staff, in collaboration with CMP Working Group members, identified corridors as deficient if they were on the CMP highway network and met the following criteria:

- Experience significant congestion delay compared to other locations in the CMP network.
- Experience very unreliable travel times compared to other locations in the CMP network.

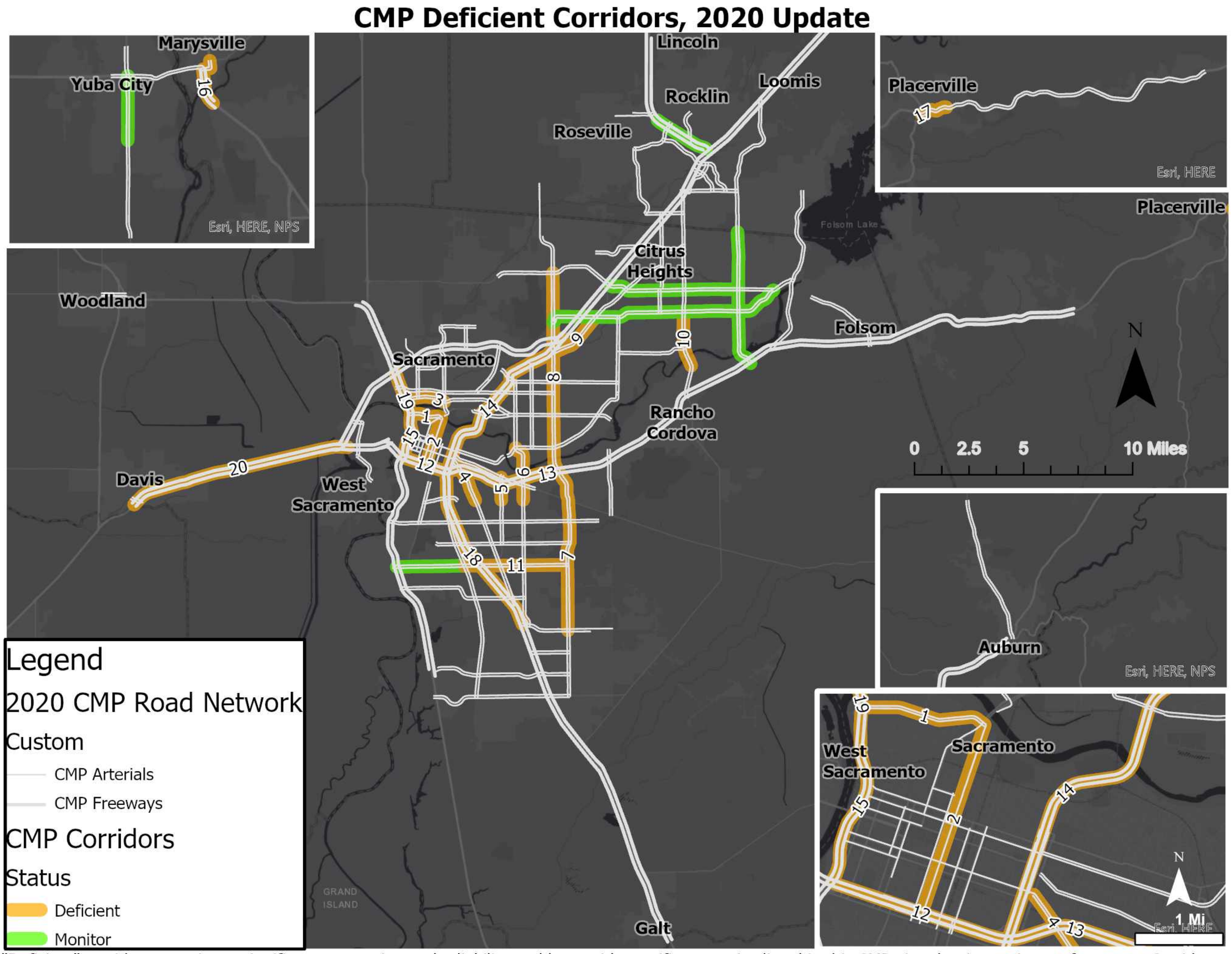
In addition to these criteria, SACOG staff also gave higher priority to flagging corridors as deficient if transit vehicles use them, since congestion and poor reliability will negatively affect more people on highways that high-occupancy vehicles like buses use.

Deficient corridors are highlighted in the CMP as targeted areas for more in-depth analysis and to identify corridor-specific strategies, serving as the bridge to use the CMP's data collection and analyses to inform and prioritize specific, actionable projects. These corridor-specific strategies, along with a performance profile of each corridor, are in Appendix 2.

8.1.2 Corridors for Monitoring

Corridors for *monitoring* are like deficient corridors in that they were identified by SACOG and Working Group members as areas of relatively high congestion and poor reliability. But unlike deficient corridors, monitoring corridors are only monitored for significant performance changes over time and do not have a performance profile or proposed specific strategies included in this report. Figure 8-1 maps out, but does not number, these corridors for monitoring.

Figure 8-1 2020 CMP Deficient Corridors



"Deficient" corridors experience significant congestion and reliability problems with specific strategies listed in this CMP aimed at improving performance. Corridors marked as "monitor" have less severe performance issues, but have had low performance in the past and will continue to be monitored.

9 Identify, Implement, and Assess Strategies

9.1 CMP Strategy Development

9.1.1 Strategy Selection Process

SACOG, in collaboration with the working group, selected strategies for addressing congestion based on whether the strategy:

- Is a planned or programmed project in the 2020 MTP-SCS,
- Supports policy goals outlined in the 2020 MTP-SCS,
- Prioritizes non-capacity measures to address congestion, and
- Where non-capacity measures are insufficient, strategically adds capacity to accommodate forecasted job and population growth.

9.1.2 System- Versus Corridor-Level Strategies

Congestion has many root causes involving land use, jobs-housing distribution, roadway design, and traffic operations, to name a few. Some of these causes are corridor- or location-specific, such as insufficient capacity, designs that require awkward or short merges, etc., while others are more systemic, such as land use patterns that require driving for most trips, or a lack of integration and communication in the transportation infrastructure to efficiently manage and distribute demand.

As such, we have grouped our strategies into two broad types:

- *System-level* strategies, which do not target congestion at any one hotspot, but affect higher-level factors that create congestion in the first place, such as land use patterns, presence of alternatives to driving, networked intelligent transportation infrastructure, etc.
- *Corridor-level* strategies, which focus on alleviating congestion at a specific location or on a specific corridor, such as adding vehicle capacity, adding bike lanes, HOV lanes, transit-only lanes, etc.

System-level strategies are addressed below, while corridor-level strategies are detailed for each deficient corridor in Appendix 2.

9.2 System-Level Strategies

9.2.1 Sac RT Forward Transit Service Optimization

In September 2019, Sacramento Regional Transit District (Sac RT) began executing its route optimization plan, known as RT Forward[23]. Developed over two years with extensive public input, RT forward was a "reimagining" of RT's bus network, focused on reorienting its service to provide more routes with service seven days a week, increase frequency, and run services later into the evening. With these changes, RT aims to make transit more convenient through higher frequency, and more useful to a wider range of the population by providing more service outside of typical Monday-Friday daytime hours.

Assessing RT Forward's success in terms of increasing transit ridership is difficult for several reasons:

- The ridership data used in this report is average daily ridership from September through November 2019, immediately after RT Forward was implemented. The ridership effects of such a significant transit service change can take months or longer to fully capture, therefore we cannot use the ridership numbers in this report as a true indicator of the plan's success. However, we will continue monitoring transit ridership, with a focus on measuring RT routes, in future CMP updates.
- While we have more recent ridership data available, including from Spring 2020, the outbreak of COVID-19 and ensuing shelter-in-place orders beginning in March 2020 led to a dramatic drop in transit ridership nationwide. Therefore, we still cannot measure the success of RT forward based on these data.
- The best assessment we have of RT Forward is based on data from January through March of 2020, which shows a roughly 30 percent increase in average weekday bus boardings systemwide. While a promising increase, it only reflects boardings three to five months after RT Forward was implemented. And importantly, the increase is likely driven in part by implementation of RT's RydeFreeRT program, which allows K-12 students who live in the City of Sacramento to ride RT buses and light rail for free.

9.2.2 ITS Master Plan

Intelligent Transportation System, or ITS, measures are an important way to reduce congestion and reliability challenges by using smart, connected infrastructure to promote more efficient use of existing capacity. SACOG in collaboration with Caltrans, Sacramento County, El Dorado County, and the cities of Sacramento, Citrus Heights, Elk Grove, Folsom, and Rancho Cordova, has developed an ITS Master Plan to implement and manage ITS programs and infrastructure in the SACOG region[24]. Example projects either planned or implemented under the Master Plan include:

- Growing the regional network of fiber communications to allow real-time collection of data on weather, traffic, incidents, etc. and use these data to inform adjustments to signal timing,

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[23] Sacramento RT Forward Announcement, 2019 - https://www.sacrt.com/apps/sacrt-forward-draft-networks/ Accessed December 2020.

[24] Sacramento ITS Master Plan - https://www.smartregionsacramento.org/ Accessed December 2020.

deployment of freeway service patrols, and provide real-time traveler information on Changeable Message Signs (CMS).

- Installing CCTV cameras at key intersections and freeway interchanges to monitor real-time conditions and collect multi-modal travel data.
- Develop integrated corridor management (ICM) strategies for key corridors that use connected transit and road infrastructure to provide real-time information to travelers on driving conditions, alternative routes, parking availability, and transit service updates.
- Additional freeway on-ramp meters to allow more efficient freeway operations.
- Conversion of ramp meters from having fixed operation schedules to "adaptive operation", changing their operating and timing based on real-time traffic conditions regardless of time of day or day of the week.

9.2.3 Bike and Scooter Share

Bike and scooter share programs, which both fall under the broader term of "shared micromobility", provide their users relatively low-cost, convenient access to bicycles and electric stand-up scooters. Among other goals, bike and scooter share aim to increase the portion of trips that people make by biking and scooter riding by eliminating common barriers to cycling, such as not owning a bicycle, not having a safe place to store a bicycle, having a bicycle with mechanical problems, etc.

Bike share

Beginning in May 2018, through a partnership between SACOG and JUMP, a fleet of 300 electric-assist bike share bicycles was deployed in the cities of Davis, Sacramento, and West Sacramento. In September 2018, JUMP tripled its fleet, to 900 bicycles.

Scooter share

In February 2019, JUMP supplemented its bicycle fleet with 100 electric scooters, followed by Lime, which deployed an additional 250 electric scooters in July 2019. By 2020, Sacramento had granted operating permits to four companies Lime (now the purveyor of JUMP bikes), Bird, Spin and Razor.

The future of micromobility in the Sacramento Region

As discussed in Section 7.2.6, bike and scooter share show significant promise as a means to shift trips from higher-emission, space-intensive modes like driving and paid ride hail services (e.g., Uber/Lyft/taxis) to more environmentally friendly, space-efficient modes like cycling and scooter riding. However, several factors make the future of these programs uncertain:

- Newness – as a relatively new entrant into the array of transportation options, there has been frequent change in the shared micromobility industry. For example, the bikes supplied by JUMP in Sacramento have had three different parent companies since the program's beginning just under two years ago[25]. Furthermore, there has been a shift in many cities from shared bicycle

[25] When first launched in spring 2018, JUMP cycles was the private operator of the bike share system. JUMP was then acquired by Uber Technologies, and in spring 2020 was acquired by Lime.

fleets being replace with shared scooter fleets. Lastly, it is not certain that there is enough long-term profitability in shared micromobility for the private sector to continue offering it.

- COVID-19 – All micromobility services were suspended in the City of Sacramento when COVID-19-related shutdowns occurred. As of August 2020, Lime (now the operator of JUMP bikes), Bird, Razor and Spin relaunched shared micromobility services, though it is difficult to say how COVID-19 will affect demand for such services in the mid and long term.

However, regardless of current uncertainties, we will continue to monitor to progress and effectiveness of bike and scooter share in future CMPs.

9.2.4 Freeway Service Patrol

The Sacramento Transportation Authority (STA), El Dorado County Transportation Commission (EDCTC), and Placer County Transportation Planning Agency (PCTPA) provide free towing and roadside assistance on freeways within Sacramento and Placer counties during AM and PM commute hours on weekdays. This service is known as the Freeway Service Patrol (FSP)[26,27,28], and helps reduce peak-hour congestion by moving stranded vehicles that would otherwise disrupt traffic flow or lead to collisions that could further delay traffic. In Sacramento County alone, FSP assists over 40,000 motorists in a typical year.

9.2.5 SACOG TDM Innovations Grant program

In 2018, SACOG disbursed $750,000 in competitive funds "to provide funding for testing new ideas and/or expanding into new markets, populations, and geographies with regards to Travel Demand Management (TDM) program goals."[29] Recipients invested these funds in programs that showed promise for expanding the potential markets for TDM and new mobility solutions to shift trips to more sustainable, space-efficient modes. Example recipient programs included:

- $150,000 for Sacramento Regional Transit to acquire software needed to pilot "microtransit" service, which would provide flexible, on-demand transit service in lower-density areas that are costly to serve with traditional fixed-route transit.
- $100,000 to help the City of West Sacramento develop "inclusive TDM strategies" that reach out to traditionally underrepresented populations and expand the reach and influence of TDM programs.
- $75,000 to help Sacramento Regional Transit set up a feed of real-time transit data for third-party apps like Waze and Transit to provide real-time service information to transit users.

These and similar programs are aimed at furthering the CMP goal of supporting proactive and innovative TDM programs. However, given their newness and pilot status, we cannot yet provide any performance

[26] Sacramento Transportation Authority, 2020. https://www.sacta.org/fsp-faq. Accessed December 2020.
[27] Placer County Transportation Planning Agency, 2020. http://pctpa.net/featured/freeway-service-patrol/. Accessed December 2020.
[28] El Dorado County Transportation Commission, 2020. https://www.edctc.org/fsp-comment-form. Accessed January 2021.
[29] SACOG staff report for October 2018 SACOG Board of Directors meeting.

data on these programs, but will continue to monitor their effectiveness and progress with follow-up data in future CMP updates.

9.2.6 SACOG TDM Mini Grant program

In addition to its larger TDM Innovations Grant program, SACOG also made $120,000 available in 2018 as small grants to promising initiatives that encourage non-driving forms of travel through its competitive TDM Mini Grant program. Example initiatives that received funding through the Mini Grants program include:

- $10,000 to Yuba-Sutter Transit to help pay for marketing to increase ridership on its commuter bus service to downtown Sacramento.
- $3,000 to UpCycle in Sacramento to provide bicycle safety classes to disadvantaged youth.
- $3,000 to WalkSacramento to help install wayfinding signage for active transportation modes in West Sacramento.
- $1,500 to the McClellan Park Transportation Management Association (TMA) to help fund Uber rides from light rail stations to job sites within the TMA.

As with the TDM Innovations Grants, it is hard to measure these programs' effectiveness due to their newness and other factors (e.g., it is difficult to measure the extent to which wayfinding signage increases biking and walking). However, such programs are small but important factors that together can lead to a meaningful shift in travel behavior through softer, education-based measures.

9.2.7 Green Means Go and Green Zones

As described on SACOG's website, the Green Means Go (GMG) program is a "…multi-year pilot program to lower greenhouse gas emissions in the six-county Sacramento region by accelerating infill development, reducing vehicle trips, and electrifying remaining trips."[30]

While GMG's overarching goal is to reduce greenhouse gas (GHG) emissions, its Green Zones program seeks to accelerate and encourage infill development, which would contribute to achieving the CMP objective of "promoting development that encourages making trips by public transit." Per the Green Zones Framework[31], specific characteristics of Green Zones include:

- Being a location within infill areas, defined by the 2020 MTP-SCS Community Type map as Center and Corridor Communities or Established Communities[32].

[30] SACOG Green Means Go, 2020. https://www.sacog.org/greenmeansgo. Accessed December 2020.
[31] Green Means Go Green Zone Framework, 2020. https://www.sacog.org/sites/main/files/file-attachments/framework_for_establishing_green_zones_approved_aug_2020_002.pdf?1598387417. Accessed December 2020.
[32] SACOG MTP-SCS home page - https://www.sacog.org/2020-metropolitan-transportation-plansustainable-communities-strategy-update. Accessed December 2020.

- Receiving support by local policies and actions that support increased development or redevelopment in the area. Examples of these policies and actions include: a specific plan, higher density zoning, public investment, nexus studies to facilitate fee reductions, economic development studies or plans, willingness to implement fee reductions and/or process streamlining for the area upon receiving funding for infrastructure improvements.
- Being a location with high accessibility to transit, jobs, education opportunities, and services.

Areas selected as Green Zones will receive funding to provide additional financial help to catalyze development in areas where trips to and from those developments can be more easily made by space- and resource-efficient modes like biking, walking, and transit. By facilitating trips using these alternative modes, existing transportation infrastructure can be used more efficiently, less money will be needed to finance motor vehicle capacity, and travelers will have better alternatives to avoid congestion (e.g., biking and walking rather than driving in congestion).

Importantly, GMG's funding for Green Zones will depend on funds being made available from the state, which SACOG as an agency has been advocating for in the state legislature. While the timing and amount of these funds is uncertain, SACOG sees GMG as a serious agency effort and has invested significant resources into it. In future CMPs we will provide follow-up on both funding for the program and, if applicable, specific projects that GMG has disbursed funds to.

9.2.8 Regional Telework Pilot Program

SACOG has long promoted telework (performing job duties from home using an internet connection rather than traveling to a worksite) as a means to reduce congestion. While it is challenging to directly attribute to SACOG-driven programs that promote telework, as Figure 9-1 shows, telework has been one of the fastest-growing commute modes in the region, nearly doubling between 2000-2018.

However as described in Chapter 10, the already-increasing share of workers who telework rose dramatically following COVID-19 shelter-in-place orders, which took effect in March 2020. Following shelter-in-place orders, nearly two thirds of workers who remained employed had switched to teleworking, and traffic congestion dropped dramatically, particularly during peak commute hours. While acknowledging that congestion levels will increase as the economy reopens and shelter-in-place orders are lifted, SACOG is hoping to conserve some of the increase in telecommuting in order to preserve some of its congestion-reducing effects even after shelter-in-place orders are lifted. To that end, SACOG launched its Regional Telework Pilot[33] in August 2020, which will:

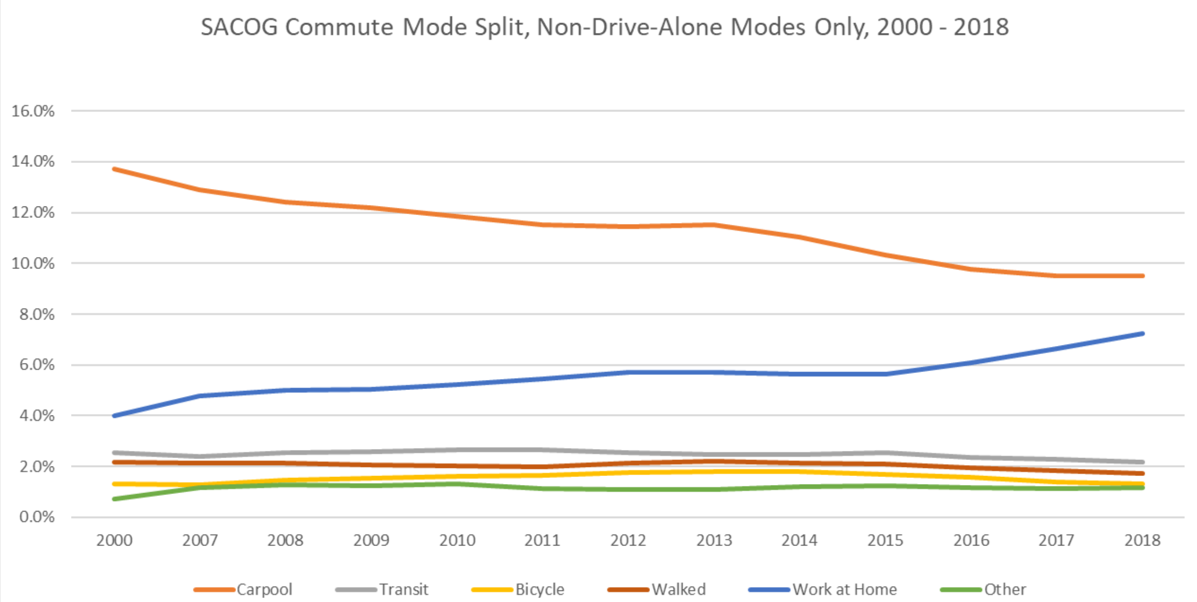
- Select 10-20 employers varied in job function, size, and geography to participate in the pilot.

[33] SACOG 2020 Regional Telework Pilot Program Page - https://www.sacog.org/pod/apply-regional-telework-pilot. Accessed December 2020.

- Employ expert consultants and SACOG staff to support employers in establishing telework policies and employee agreements, conduct training for virtual management, and provide insights on productivity monitoring, among other services identified in the recently conducted focus groups.

Through this pilot SACOG aims to preserve the higher rates of telecommuting even after shelter-in-place orders end, and in turn preserve some of the significant congestion reductions brought about by the COVID pandemic. It is impossible at this time to know what the program's effects will be, but we will continue monitoring the share of people who telework in future CMP updates.

Figure 9-1 Change in non-SOV commute modes in the SACOG region[34]



Sources: 2000 Decennial Census; 3-year American Community Surveys for 2007-2013; 1-year American Community Surveys for 2014-2018

[34] Note that Figure 10-1 does NOT include the drive-alone commute mode, which is the dominant commute mode used by over 75 percent of commuters in the SACOG region.

9.3 Corridor-Level Strategies

Corridor level strategies are included in each deficient corridor's profile in Appendix 2.

9.4 Strategy Implementation

Most strategies included in this CMP, and particularly its corridor-specific strategies, are implemented through SACOG's Metropolitan Transportation Improvement Program (MTIP)[35]. The MTIP, which is updated every two years, contains all transportation projects that are expected to receive full or partial funding within the next four years. All projects within the MTIP are also in SACOG's MTP-SCS, which looks at a longer (20-year) horizon and contains projects that are planned but not yet funded.

[35] SACOG MTIP home page - https://www.sacog.org/metropolitan-transportation-improvement-program. Accessed December 2020.

9.5 Strategy Assessment and Evaluation

9.5.1 Evaluation of System-Level Strategies

Evaluating the effects of system-level strategies on congestion and other system performance measures is difficult because congestion is affected by so many other factors, including economic changes, major construction projects, fuel prices, etc. which are beyond the scope and influence of the system-level strategies described above. That being said, some metrics in Chapter 7 can at least partially measure the effectiveness of system-level strategies based on usage of programs that fall under those strategies, such as:

- *Regional transit ridership*. As shown earlier in Figure 7-19, transit has generally been declining, following national trends. However, the 2019 ridership numbers were taken immediately following implementation of Sacramento Regional Transit's RT Forward Program, described in Section 9.2.1, whose full effects on ridership will not be known until sufficient time has passed for current riders to adjust to the service and for previous non-riders to learn whether it may make transit a more attractive option.
- *Bike and scooter share use*. As mentioned in Section 7.2.6, over 1.7 million bike share and scooter trips were taken in 2019, with Sacramento being one of the strongest bike share markets for bike share operator JUMP. The future is somewhat uncertain for such shared mobility services due to the effects of COVID19 on ridership as well as financial sustainability, and we will provide updates on their format and usage in future CMP updates.
- *Vanpool fleet size*. As Figure 7-16 shows, the number of active vanpools in the region increased from 76 to 99 from 2016 to 2019. While this increase would have a nearly immeasurable effect on overall system performance, vanpools do provide a more space-efficient travel option and we will continue to monitor their usage in future CMPs. Note that these numbers only reflect vanpools registered with Sac 511 and not all vanpools that may be operating in the SACOG region.

9.5.2 Evaluation of Corridor-Level Strategies

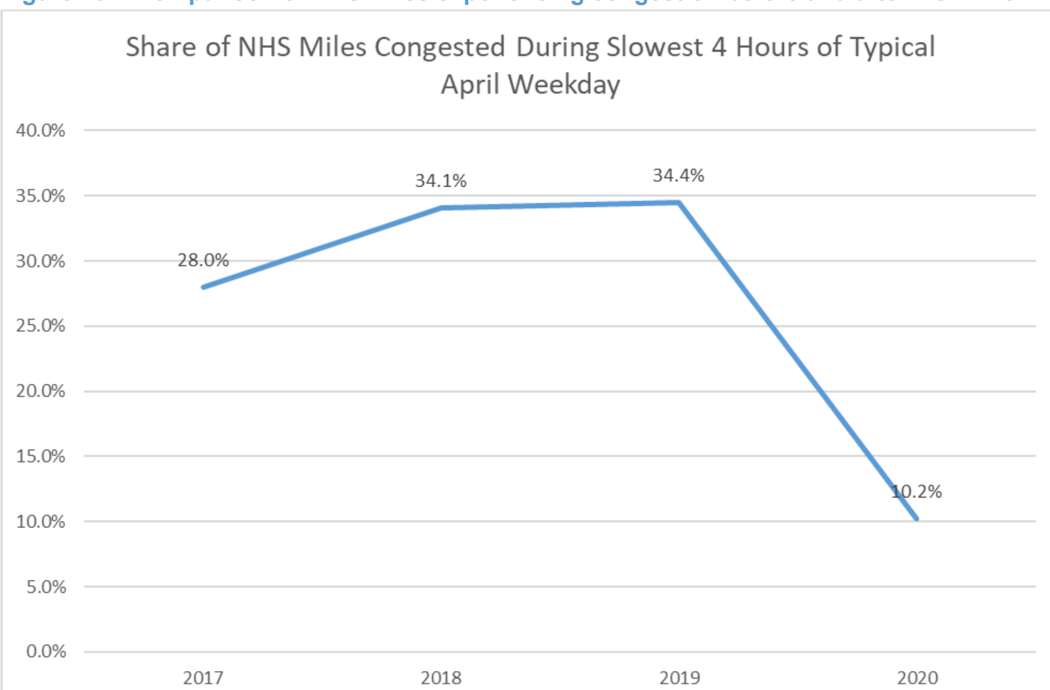
Corridor-level strategy evaluation is provided in the corridor profiles in Appendix 2.

10 Supplemental Chapter: Effects of COVID-19

After an initial outbreak in China beginning in late 2019, COVID-19, also known as coronavirus, grew to become a global pandemic. In the U.S., including the SACOG region, the pandemic resulted in shelter-in-place orders that began in March 2020 and are still largely ongoing at the writing of this report. The shelter-in-place orders have resulted in many non-essential businesses closing or significantly altering their operations, and many employers have transitioned to having many of their employees work from home.

While results are still preliminary and the longer-term effects of COVID-19-related shelter-in-place orders are still to be determined, one effect that is most relevant to the CMP is a significant drop in, and in many locations complete elimination of, peak period congestion delay. As Figure 10-1 shows, the share of the NHS system that experiences congestion was more than two thirds lower in April 2020 than for April of the previous three years. Note that the numbers in the chart refer to all NHS roads in the SACOG region, rather than just roads on the CMP network.

Figure 10-1 Comparison of NHS miles experiencing congestion before and after COVID19



Much of this drop in congestion is due to a large share of the workforce working remotely, reducing the typical peak loads during the AM peak that cause much of the congestion in the SACOG region. As described earlier in Section 9.2.8, SACOG has long promoted telework as a TDM strategy to reduce congestion. SACOG hopes to preserve some of the pandemic-driven telework increase through its Telework Pilot, which will provide technical assistance to a diverse sample of employers to help them maintain a higher level of telecommuting among their employees.

11 Appendices

Appendix 1 Updates to Objectives and Metrics from 2017 CMP

Table 11-1 lays out changes made to both objectives and metrics since the 2017 CMP. These changes are motivated by a variety of factors. Objectives may change based on updated agency priorities or input from CMP working group members. Metrics may change to increase consistency between metrics SACOG uses in the CMP and metrics it uses in other performance measurement projects, due to input from working group members, and in some cases from availability of new data sources that allow us to create metrics that we previously lacked the data to compute.

Table 11-1 Changes to CMP objectives and metrics since 2017

CMP Objective	Performance Metrics	Policy Alignment	Changes from 2017 CMP	Reason for Changes
1 - Maintain or Improve Travel Time Reliability for Freight and Passenger Vehicles	MAP-21 Truck Travel Time Reliability (TTTR)	MAP-21 PM3; SACOG goal of "connected communities"	TTTR ratio changed from 80th/50th travel time to be 95th/50th; Narrowed roadway scope to only consider interstate freeways; Supplemented map of TTTR with single, system-level TTTR number.	Make CMP TTTR better match definitions and methodology of MAP-21 TTTR metric.
	MAP-21 percent of interstate person-miles that are reliable	MTP policy area (reliable transportation system); MAP-21	Split out into interstate and non-interstate facilities; Added system-level LOTTR metric from MAP-21	Make CMP LOTTR better match definitions and methodology of MAP-21 LOTTR metric.
	MAP-21 percent of non-interstate person-miles that are reliable	MTP policy area (reliable transportation system); MAP-21		
2 -Reduce Traffic Congestion for Freight and Passenger Vehicles	Average speed during slowest 4 hours of the day, all vehicles	2020 Funding Round	Originally used average speed for fixed "peak period" covering 6am-9am and 3pm-6pm; Originally split between "freeway" and "non-freeway" instead of	Desire to identify areas with congestion outside traditional peak periods; Change matches CMP congestion metric with SACOG PPA tool and Regional Progress Report

CMP Objective	Performance Metrics	Policy Alignment	Changes from 2017 CMP	Reason for Changes
	Percent of directional miles where average speed during slowest 4 weekday hours is < 60 percent of free-flow speed for interstate roads	2020 Funding Round congestion metric	"interstate" vs. "non-interstate".	congestion measures; Split by interstate vs. non-interstate enables consistency between LOTTR and congestion measures, and with MAP-21 split between interstate/non-interstate.
	Percent of directional miles where average speed during slowest 4 weekday hours is < 60 percent of free-flow speed for non-interstate roads	2020 Funding Round congestion metric		
	~~Average peak period truck speed on interstates~~	~~None~~	Removed metric	Congestion already captured by all-vehicle speed metrics; no need to capture truck speed separately.
3 - Promote Development That Encourages Making Trips by Public Transit	Dwelling units built within 1/2 mile of high-frequency or rail transit service	MTP Policy 1 component: more housing and jobs in high-frequency transit areas	No changes	No changes
	Jobs within 1/2 mile of high-frequency or rail transit service			
4 - Support Proactive and Innovative Education and Transportation Demand Management Programs Covering All Parts of the Urbanized Area, to Offer a Variety of Choices to Driving Alone	Employers in a Transportation Management Association (TMA)	Objective is the same as MTP Policy 5	No changes	No changes
	Count of registered vanpools			

CMP Objective	Performance Metrics	Policy Alignment	Changes from 2017 CMP	Reason for Changes
	Count of Commuter Club members			
	Non-SOV mode share			
5 - Prioritize investments in transit, bike, and pedestrian improvements that reduce greenhouse gas emissions and vehicle miles traveled (VMT)	Weekday transit boardings by route for CMP priority transit routes	Objective is the same as MTP Policy 25; metrics also used in PPA multimodal performance outcome	No changes	No changes
	Transit accessibility to jobs and POIs		New metric; updated objective to include bike and walk, instead of just considering transit.	Insightful metric to understand changes in quality of non-driving mode options; Sugar Access software procurement enabled analysis
	Bike + Walk accessibility to jobs and POIs			
	~~Congested CMP directional miles with transit service~~	NA	Removed metric	Determined to not be particularly useful or insightful for measuring congestion or availability of alternatives to driving in congestion
	~~Unreliable CMP directional miles with transit service~~			
6 - Implement pilot projects aimed at making micromobility (such as bike and scooter share) work for urban, suburban, rural, and low-income areas of the region.	Mode replacement breakdown of micromobility trips	Objective is the same as MTP Policy 3	Newly added objective and metrics	Alignment with update MTP policy goal; Desire to keep CMP current with changes in transportation system and new technologies' effects on congestion and travel behavior.
	Micromobility trips taken			

Appendix 2 Deficient Corridor Analysis and Strategies

A 2.1 Overview of Deficient Corridors

Table 11-2 lists the deficient corridors identified for the 2020 CMP while the map in Figure 11-1 shows their locations. These corridors experienced higher levels of congestion and unreliable travel times compared to other parts of the CMP road network.

Table 11-2 CMP Deficient Corridor Overview

Figure	Corridor Description	Mapped Corridor Number	Primary Jurisdiction
Figure 11-2 Figure 11-2	Richards Blvd: I-5 to 16th St	1	City of Sacramento
Figure 11-3	16th St: Richards Blvd to US 50	2	City of Sacramento
Figure 11-4	Garden Highway: I-5 to Northgate Blvd	3	City of Sacramento
Figure 11-5	Stockton Blvd: Alhambra Blvd to 14th Ave	4	City of Sacramento
Figure 11-6	65th St: Folsom Blvd to 14th Ave	5	City of Sacramento
Figure 11-7	Howe Ave/Power Inn Rd: Fair Oaks Blvd to 14th Ave	6	City of Sacramento
Figure 11-8	South Watt Ave/ Elk Grove Florin Rd: Folsom Blvd to Calvine Road	7	Sacramento County
Figure 11-9	Watt Ave: Folsom Blvd to Elkhorn Blvd	8	Sacramento County
Figure 11-10	Auburn Blvd: Watt Ave to Madison Ave	9	Sacramento County
Figure 11-11	Sunrise Blvd: Madison Ave to Gold Country Blvd	10	Sacramento County
Figure 11-12	Florin Road: Franklin Blvd to Elk Grove Florin Road/South Watt Ave	11	Sacramento County
Figure 11-13	US-50: I-5 to SR-99	12	Caltrans D3
Figure 11-14	US-50: SR-99 to Watt Avenue	13	Caltrans D3
Figure 11-15	SR-51: US-50 to I-80	14	Caltrans D3
Figure 11-16	I-5: US-50 to Richards Blvd	15	Caltrans D3
Figure 11-17	SR-70: N. Beale Rd to 12th St	16	Caltrans D3
Figure 11-18	US-50: Mosquito Rd to Canal Street	17	EDCTC / Caltrans D3
Figure 11-19	SR-99: Calvine Rd to US-50	18	Caltrans D3
Figure 11-20	I-5: Richards Bl. to I-80	19	Caltrans D3
Figure 11-21	I80: Solano CL to US50	20	Caltrans D3

A 2.2 List of Terms Used in Profiles

- *Free-flow speed* represents the speed most motorists will travel at when unimpeded by other road users. We calculated it as follows[36]:
  - For freeways: The 85th percentile speed between 8pm-6am
  - For arterials: The 60th percentile speed between 8pm-6pm, to account for delay caused by traffic signals rather than other vehicles on the road.
- *Average speed during slowest four hours* is calculated by identifying the four slowest one-hour periods on a typical weekday, then getting the average of all speeds observed during those four hours.
- *Travel Time Reliability Index*, or LOTTR, is calculated as the 80th percentile travel time divided by the 50th percentile travel time for all travel times observed during the indicated time period(s). A higher LOTTR indicates a less reliable facility, and per MAP-21 PM3 rule, an LOTTR greater than 1.50 is considered "unreliable". More information on the LOTTR is provided in Section A 4.2.
- Project table fields:
  - *MTP Project ID* is the ID value for the project in SACOG's 2020 Metropolitan Transportation Plan project list[37].
  - *Status* describes what stage the project is in development. *Planned* projects have a completion year within the current MTP horizon (which for the 2020 MTP-SCS is 2040). *Programmed* projects are both within the MTP horizon and are at least partially funded. Programmed projects typically have a closer completion year than planned projects.

A 2.2.1 Considerations when reviewing profiles

Each corridor's profile shows projects proposed for it along with changes in congestion and reliability over time. These profiles are **not** evaluations of corridors' projects, and a corridor showing a decrease in performance over time should not be necessarily interpreted as a "failure" of a project to achieve its objectives. Instead, the profiles allow SACOG and jurisdictions to monitor corridor performance and see what projects are proposed for it that help address its congestion and reliability challenges, regardless of whether those projects seek to address congestion through capacity increases, operational improvements, or making alternative modes such as cycling and transit more attractive options to avoid congestion on the corridor. Additionally, if a deficient corridor has no projects proposed for it that address congestion, highlighting its deficiency can help inform future project development and prioritization.

A 2.3 Individual Deficient Corridor Profiles

The following pages provide more detailed profiles for each of the deficient corridors, with corridor-specific performance data, corridor descriptions, and strategies to address congestion on the corridor.

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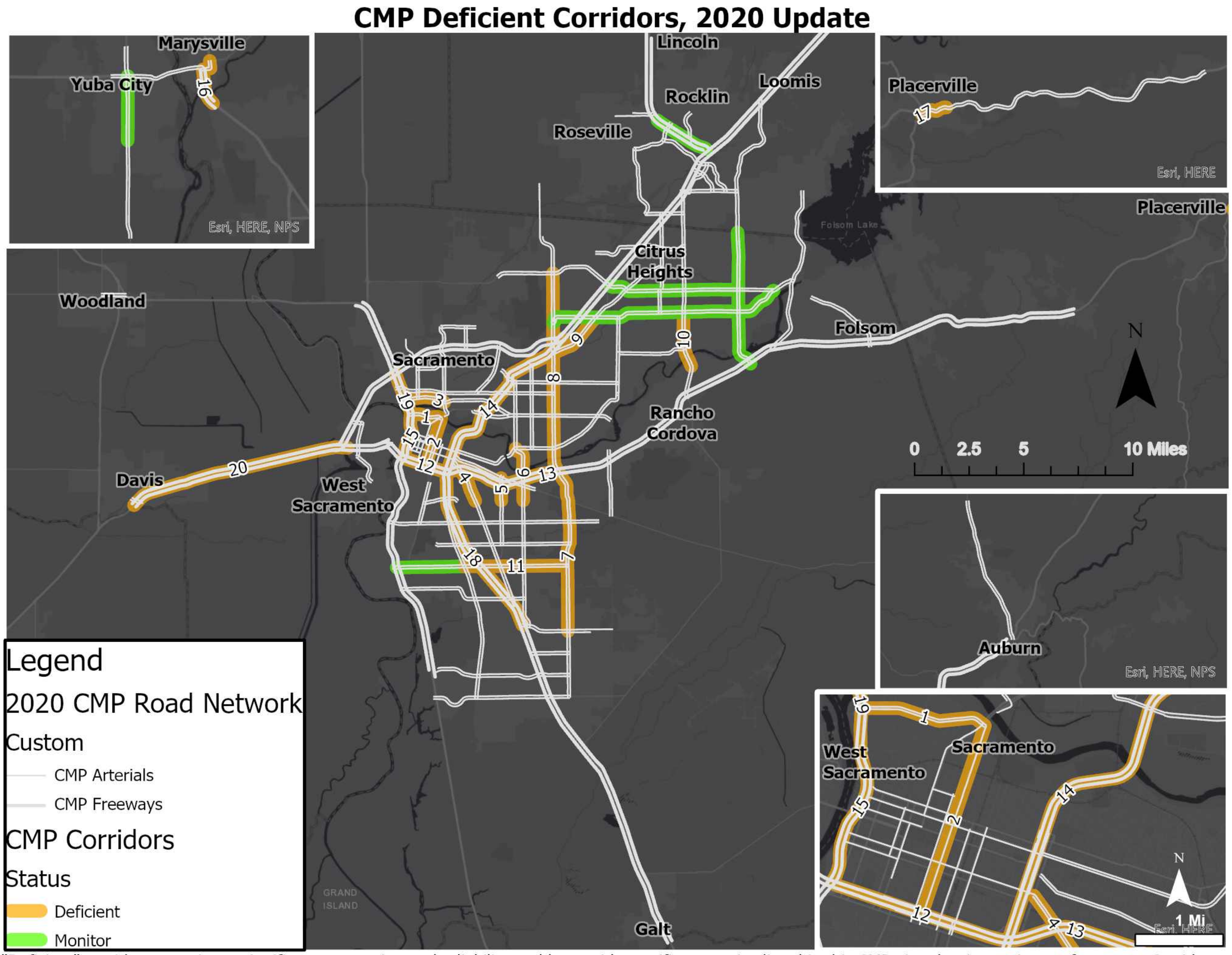
[36] For additional information on free-flow speed, along with caveats for its use, refer to Appendix 5

[37] SACOG MTP-SCS update. 2020. https://www.sacog.org/2020-metropolitan-transportation-plansustainable-communities-strategy-update. Accessed December 2020.

Figure 11-1 Deficient Corridor Map



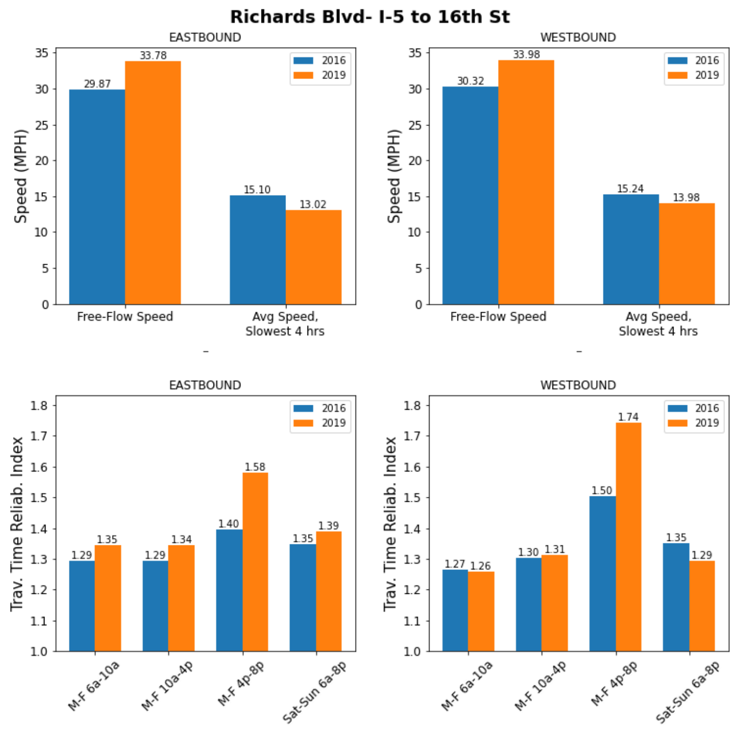
"Deficient" corridors experience significant congestion and reliability problems with specific strategies listed in this CMP aimed at improving performance. Corridors marked as "monitor" have less severe performance issues, but have had low performance in the past and will continue to be monitored.

Figure 11-2 Corridor Profile: Richards Bl. From I-5 to 16th St.

OVERVIEW

Jurisdiction:	City of Sacramento
Veh/day:	15,000 - 26,000
Transit:	Bus and Light Rail
Bike Facilities:	Class 2 bike lanes

This corridor has seen little change in its congestion and travel time reliability since the 2017 CMP. This is expected given that none of its planned projects have been completed. However, those projects will improve traffic operations and provide alternatives to traveling in congestion, including new LRT and bicycle facilities. This central, transit-rich area is also expected to receive 10,000 new housing units and 4M+ square feet of office/retail, furthering the CMP goal of more transit-oriented development.



CORRIDOR PROJECTS

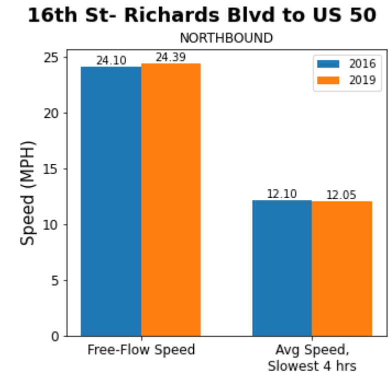
MTP Project ID	Description	Project Category	Est Completion	Status
REG18023	Dos Rios Light Rail Station: On Blue Line light rail, on the east side of 12th St., south of Richards Blvd.: build new	Transit Capital	2020	Programmed
SAC24998	In Sacramento, on N. 12th Street from American River to H Street, including Sunbeam Street and one block of Richards Blvd.: Convert westernmost travel lane between Richards and H Street into two-way cycle track and improve connection from Two Rivers Bike Trail to Richards Blvd.	Bike-Ped	2021	Programmed
SAC18170	I-5 at Richards Blvd. Interchange: Sacramento, Richards Blvd. and I-5; reconstruct interchange	Maintenance-	2027	Programmed
SAC25235	Green Line: Extend rail from Township 9 to North Natomas Town Center	Transit Capital	2030	Planned
SAC24537	Railyards Streets: Construct New Road/Bike/Ped Improvements to implement Railyards Specific Plan	New Roads	2026-2030	Planned
SAC24539	Lower American River Crossing: New all-modal Bridge: between downtown Sacramento and South Natomas across the Lower American River. Includes: Auto, transit, bicycle, and pedestrian facilties.	Capacity, Bike-Ped	2031-2035	Planned
SAC25245	River District Transportation Improvements: Roadway, bikeway, and pedestrian improvements to implement the River District Specific Plan.	Bike-Ped	2036-2040	Planned

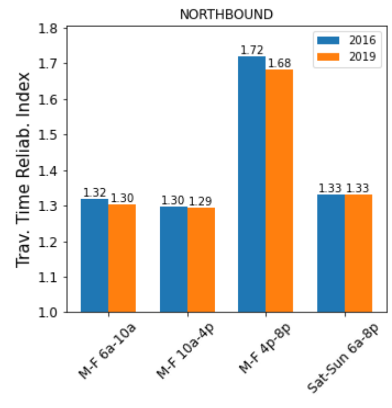
Figure 11-3 Corridor Profile: 16th Street from US-50 to Richards Bl.

OVERVIEW

Jurisdiction:	City of Sacramento
Veh/day:	15,000 - 30,000
Transit:	Commuter bus, local bus, light rail
Bike Facilities:	Parallel class 3 route on 17th St.

This high-demand corridor has seen little change in its congestion and travel time reliability since the 2017 CMP. Due to limited right-of-way and its dense, urban setting, strategies for this corridor are oriented toward improving conditions for walking and cycling, making these space-efficient modes more attractive alternatives to driving for shorter trips on and near the corridor.





CORRIDOR PROJECTS

MTP Project ID	Description	Project Category	Est Completion	Status
SAC24623	16th Street Streetscape: On 16th Street from S Street to N Street, pedestrian improvements including bulb-outs, landscaping and trees, banners, pavement treatments, bike racks, and street furniture,and street lights.	Bike/ped	2020	Completed
SAC25017	16th Street Streetscape - H st. to Richards Blvd.: North 16th St./Lincoln Highway, from H St. to Richards Blvd.: Streetscape improvements, including restriping travel lanes to 11 feet, on street parking on both sides, curbs, six foot separated sidewalk, and pedestrian lighting.	Bike/ped	2025	Programmed
SAC24557	Central City Specific Plan: Among other nearby improvements, construct a class 4 protected cycle track on 16th St from roughly X St. to N St.	Bike/ped	2030	Planned

Figure 11-4 Corridor Profile: Garden Hwy from I-5 to Northgate Bl.

OVERVIEW

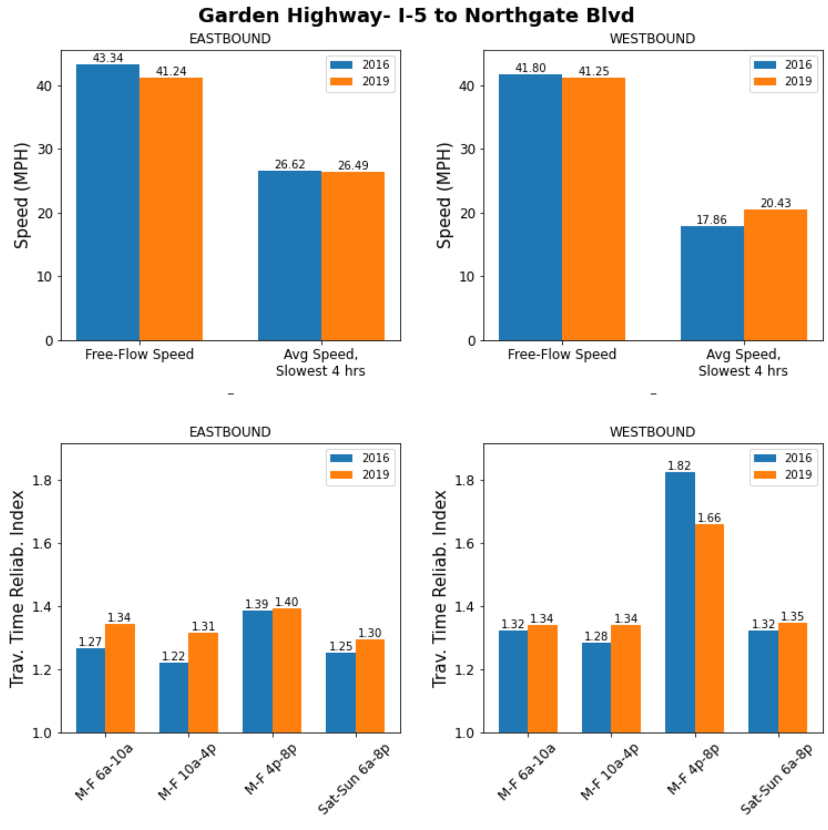
Jurisdiction: City of Sacramento

Veh/day: 17,500 - 21,000

Transit: Local bus west of Truxel Rd.

Bike Facilities: Bike lanes, Am. River Bike Path

This corridor has seen little change in its congestion and travel time reliability since the 2017 CMP. Much of its congestion is driven by travelers accessing I-5 to drive to downtown Sacramento. Two projects, notably a new LRT line and all-modal river crossing that connects to downtown Sacramento at Truxel Rd, will address congestion by encouraging a mode shift to transit and biking, in addition to providing a new connection for motor vehicles.



CORRIDOR PROJECTS

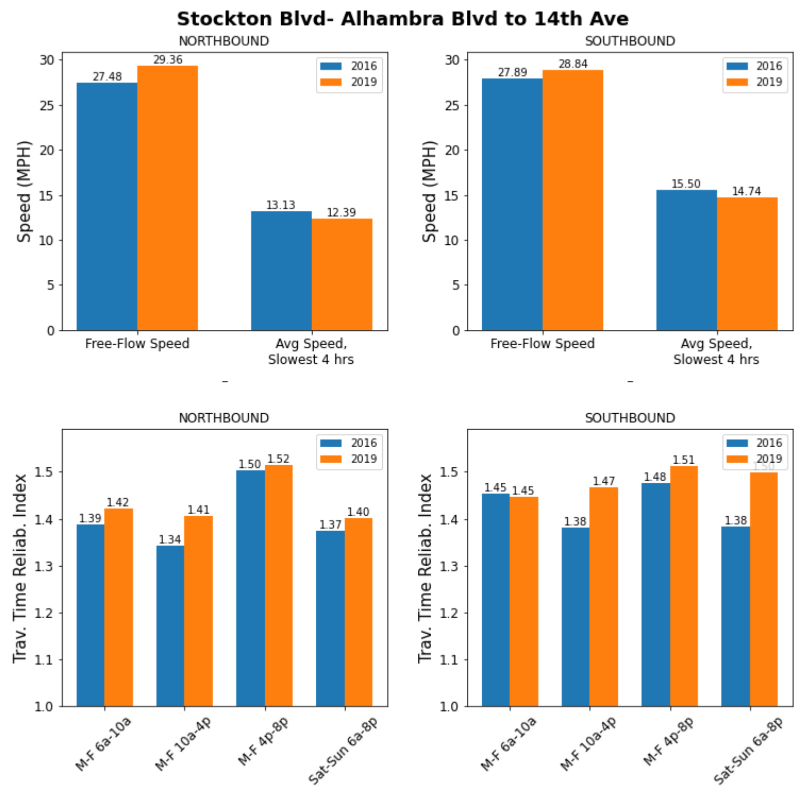
MTP Project ID	Description	Project Category	Est Completion	Status
SAC25235	Green Line: Extend rail from Township 9 to North Natomas Town Center	Transit Capital	2030	Planned
SAC24539	New all-modal Bridge: between downtown Sacramento and S. Natomas across the American River on Truxel Rd.	SOV capacity, bike/ped, transit	2031-2035	Planned

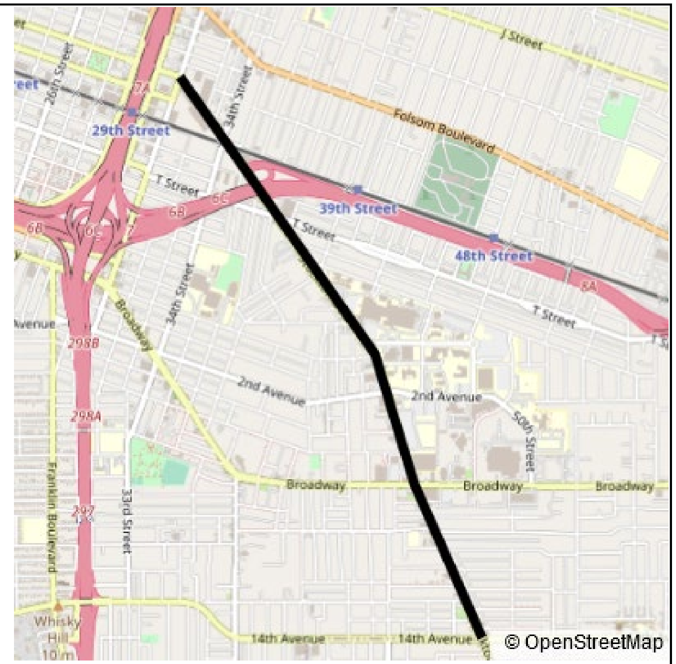
Figure 11-5 Corridor Profile: Stockton Bl. From Alhambra Bl. To Broadway.

OVERVIEW

Jurisdiction:	City of Sacramento
Veh/day:	14,000 - 24,000
Transit:	Local bus
Bike Facilities:	Bike lanes south of Broadway

This high-demand corridor, serving a major employment hub and providing freeway access, has seen little change in its congestion and travel time reliability since the 2017 CMP. Demand will increase with the opening of UC Davis Med Center's 1.2M square foot Aggie Square complex. Due to limited right-of-way and high costs of widening, congestion strategies focus on providing alternatives to driving in congestion, with planned projects repurposing existing right-of-way to improve travel using more space-efficient modes such as cycling and transit.





CORRIDOR PROJECTS

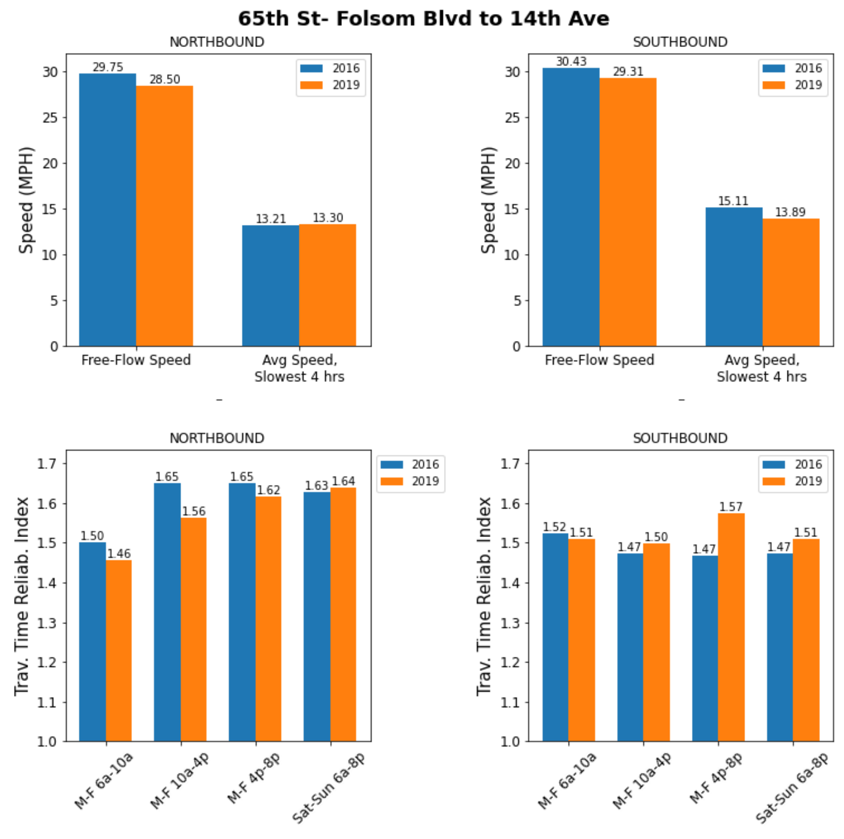
MTP Project ID	Description	Project Category	Est Completion	Status
SAC25244	Stockon Blvd Moblity Project: Improve safety, transit, and moblity on Stockton Blvd from Alhambra to 47th Street. Reduce number of lanes from four to two to accommodate BRT or Bike/Ped	Bike/ped, transit	2026-2030	Planned
SAC25151	Implement BRT service on 5 key corridors in Sacramento County, including Stockton Bl	Transit	2036-2040	Planned

Figure 11-6 Corridor Profile: 65th St from 14th Ave. to Folsom Bl.

OVERVIEW

Jurisdiction:	City of Sacramento
Veh/day:	30,000 - 60,000
Transit:	Local bus, LRT connection
Bike Facilities:	Green bike lanes under US-50

This corridor has seen little change in its congestion and travel time reliability since the 2017 CMP. The 65th Street Transit Station Area Specific Plan, already partially implemented, adds a new all-modal connection under US-50 near the corridor via Redding St, shortening walking distances between current and future high-density, student-oriented housing, the 65th St LRT station, and Cal State University. The Plan will also extend the 65th St bike lanes south until 14th Ave, and creates two new access points to the university at 67th St and 62nd St, shortening walk distances from adjacent housing.



CORRIDOR PROJECTS

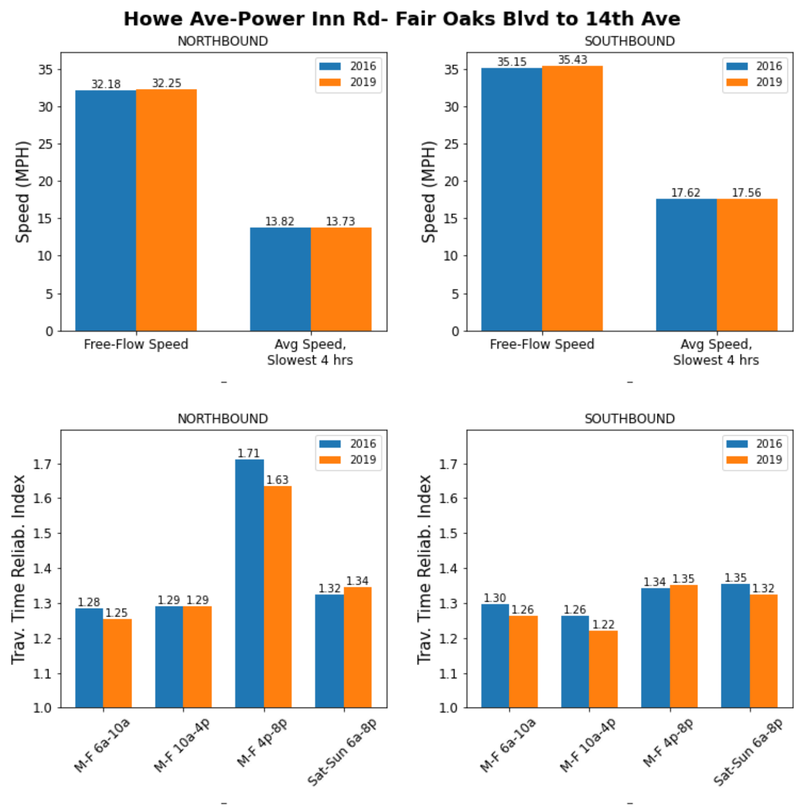
MTP Project ID	Description	Project Category	Est Completion	Status
SAC25246	ITS, Roadway, Bike, and pedstrian improvements to implement the 65th Street Transit Station Area Specific Plan, including 67th Street Extenstion from Folosm Boulevard to Elvas Avenue	ITS, bike/ped	2036-2040	Partially completed

Figure 11-7 Corridor Profile: Howe Ave./Power Inn Rd. from 14th Ave. to Fair Oaks Bl.

OVERVIEW

Jurisdiction:	City of Sacramento
Veh/day:	55,000 - 60,000
Transit:	Local Bus; LRT connection
Bike Facilities:	Class 2 bike lanes

This corridor has seen little change in its congestion and travel time reliability since the 2017 CMP. The portion south of Folsom Bl underwent significant rehabilitation in 2017, which provided more significant bicycle facilities to the corridor, but otherwise no significant projects are proposed for the corridor. Much of the delay is due to signalized intersections near Fair Oaks Bl at the north end and Folsom Bl/US-50 further south.



CORRIDOR PROJECTS

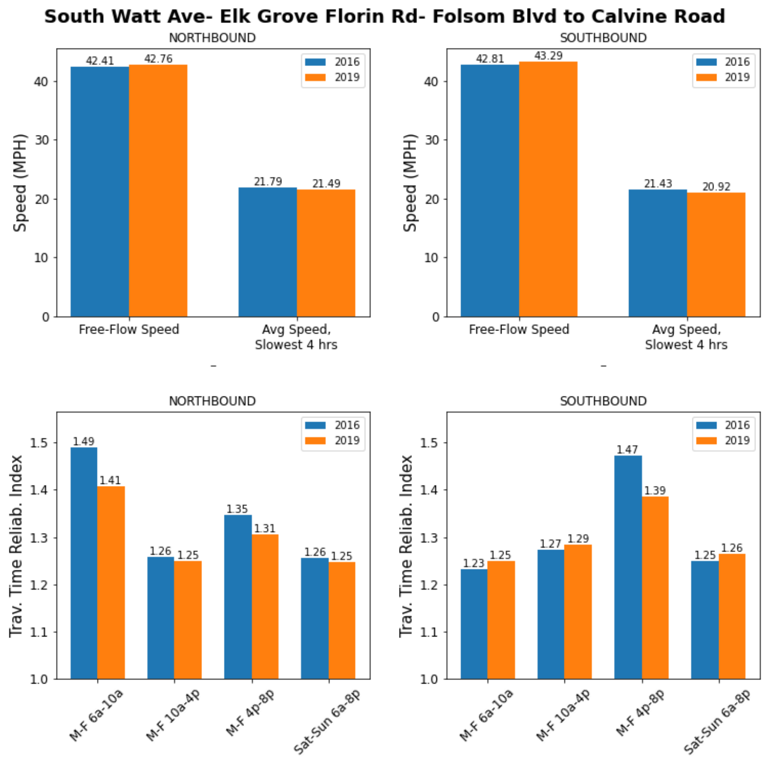
MTP Project ID	Description	Project Category	Est Completion	Status
SAC24723	Power Inn Rd., from Folsom Blvd. to Alpine Ave.: Pavement rehabilitation and complete streets improvements	Bike/ped	2017	Completed

Figure 11-8 South Watt Ave. from Calvine Rd. to Folsom Bl.

OVERVIEW

Jurisdiction: Sacramento County
Veh/day: 21,000 - 50,000
Transit: None
Bike Facilities: Some Class 2 bike lanes

This corridor has seen little change in its congestion and travel time reliability since the 2017 CMP. This is expected given none of the projects have been completed since then. However, as listed below, the corridor will be receiving several projects that will increase capacity and provide alternatives to driving, including enhanced transit service (potentially BRT) and bike lanes. Importantly, significantly job and population growth is planned for this corridor, which is why several capacity projects are planned for it.



CORRIDOR PROJECTS

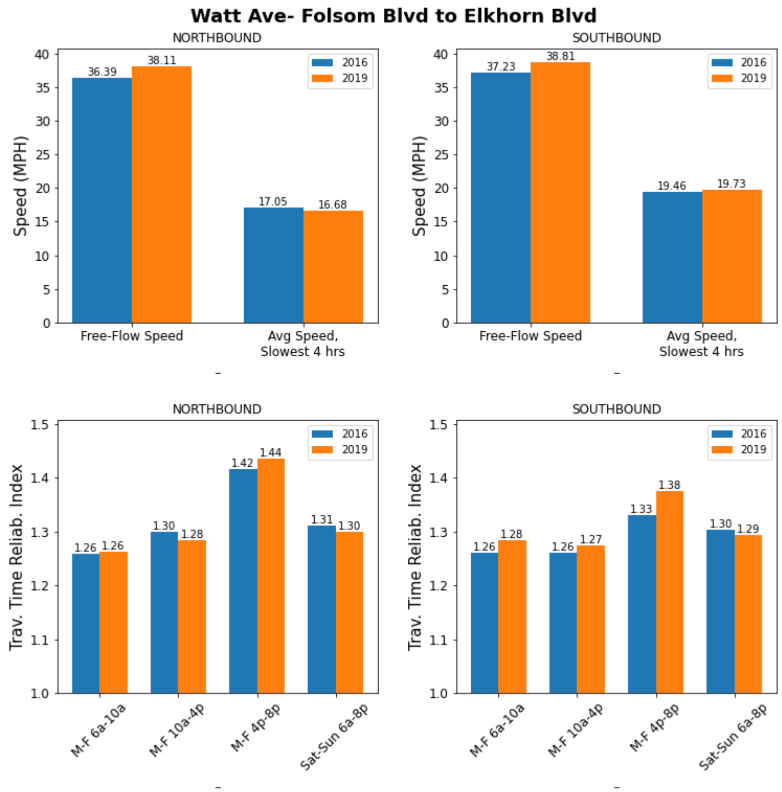
MTP Project ID	Description	Project Category	Est Completion	Status
SAC15170	In Sacramento County, Elk Grove-Florin Road from North of Elder Creek to Florin Road: widen from 2 to 4 lanes.	SOV Capacity	2020-2025	Programmed
SAC25192	South Watt Avenue Widening, Phase 1: Widen South Watt Avenue from Fruitridge Ave to Jackson Road (Route 16) from 2 to 4 lanes	SOV Capacity	2025	Programmed
SAC25193	In Sacramento County: South Watt Avenue from Florin Road to Fruitridge Road; widen from 2 to 4 lanes.	SOV Capacity	2025	Programmed
SAC25151	Implement BRT service on 5 key corridors in Sacramento County, including Watt/South Watt Ave	Transit	2036-2040	Planned

Figure 11-9 Watt Ave. from Folsom Bl. To Elkhorn Bl.

OVERVIEW

Jurisdiction:	Sacramento County
Veh/day:	33,000 - 99,000
Transit:	Local Bus, LRT connections
Bike Facilities:	Bike lanes

This corridor has seen little change in its congestion and travel time reliability since the 2017 CMP. The corridor will be widened to six lanes near the north end to accommodate significant expected population growth in north Sacramento and south Placer County. Along with this SOV capacity increase are enhanced bus service (potentially BRT) and improved, separated bike facilities to better accommodate and encourage users of more space-efficient modes like biking and transit.



CORRIDOR PROJECTS

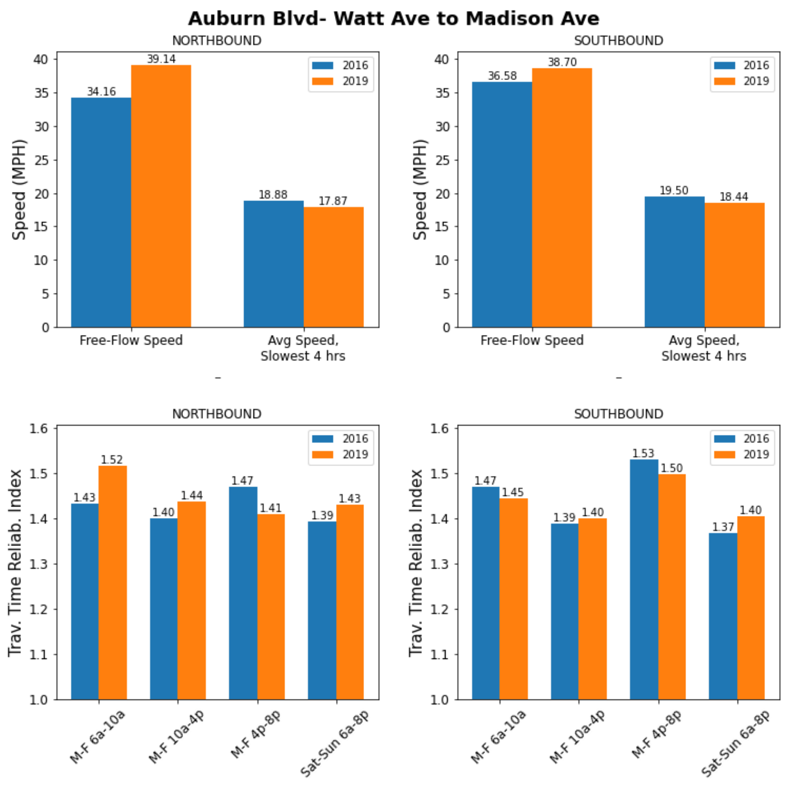
MTP Project ID	Description	Project Category	Est Completion	Status
SAC25187	In Sacramento County: Watt Avenue from Orange Grove Avenue to Roseville Rd.: Construct buffered bike lanes, separated sidewalks and landscape medians and improve signalized intersections. The project also extends bike lane and sidewalk improvements south from Orange Grove Avenue to I-80 westbound ramps.	Bike/ped	2025	Programmed
SAC15750	In Sacramento County, Watt Ave: Between Palm Ave. Don Julio Blvd. and Antelope Rd. Elkhorn Blvd. widen to 6 lanes; 3 lanes north bound on Watt Ave and 3 lanes southbound on 34th St; smart growth st. with proposed BRT/HI Bus - exclusive lanes.	SOV capacity, transit	2036	Planned
SAC15720	In Sacramento County, Watt Ave.: Between Elkhorn Blvd and Antelope Rd widen from 4 to 6 lanes	SOV capacity	2036-2040	Planned
SAC25151	Implement BRT service on 5 key corridors in Sacramento County, including Watt/South Watt Ave	Transit	2036-2040	Planned

Figure 11-10 Auburn Bl. From Watt Ave. to Madison Ave.

OVERVIEW

Jurisdiction:	Sacramento County
Veh/day:	20,000 - 34,000
Transit:	Local bus, LRT connection
Bike Facilities:	Bike lanes

This corridor has seen little change in its congestion and travel time reliability since the 2017 CMP. While it does experience some congestion, it also has alternative modes available including 15-minute bus service and class 2 bike lanes. Although congested, it is not especially unreliable, with its travel time reliability ratio generally below the FHWA-defined threshold of 1.50 for defining a segment as unreliable. Its congestion is also not severe in absolute terms, with peak seeds generally above 15mph.



CORRIDOR PROJECTS

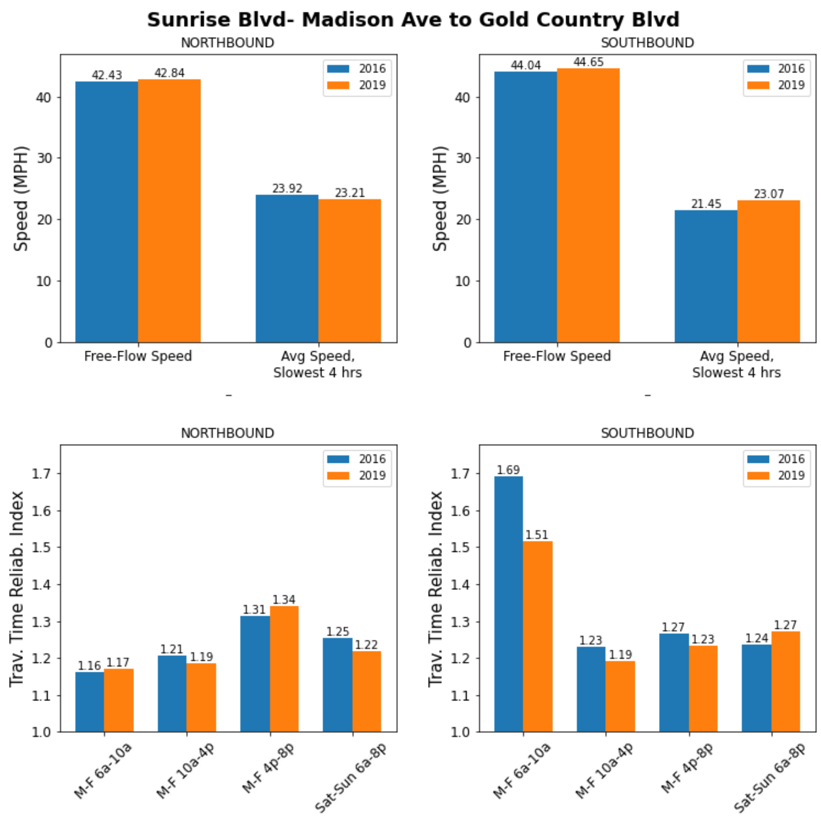
MTP Project ID	Description	Project Category	Est Completion	Status
None	No corridor-specific projects are presently planned or programmed for this location, but its performance is indirectly affected by system-level corridor strategies described in the 2020 CMP report. However, this corridor's deficient performance can serve as a flag to help sponsors and SACOG identify and prioritize congestion relief			

Figure 11-11 Sunrise Bl. From Madison Ave. to Gold Country Bl.

OVERVIEW

Jurisdiction:	Sacramento County
Veh/day:	50,000 - 85,000
Transit:	Local bus
Bike Facilities:	Partial parallel Class 1 bike paths; partial bike lanes

This corridor, which is a key crossing over the American River, has seen little change in congestion and travel time reliability since the 2017 CMP. South of Fair Oaks Bl it has a parallel class 1 bike path, providing a safe alternative route for cycling on the corridor. In the future, this corridor will likely receive enhanced bus service (potentially BRT), encouraging travelers to shift to using transit instead of driving, in turn increasing the corridor's potential person-carrying capacity.



CORRIDOR PROJECTS

MTP Project ID	Description	Project Category	Est Completion	Status
SAC25151	Implement BRT service on 5 key corridors in Sacramento County, including Sunrise Blvd.	Transit	2036-2040	Planned

Figure 11-12 Florin Rd. from Franklin Bl. To South Watt Ave.

OVERVIEW

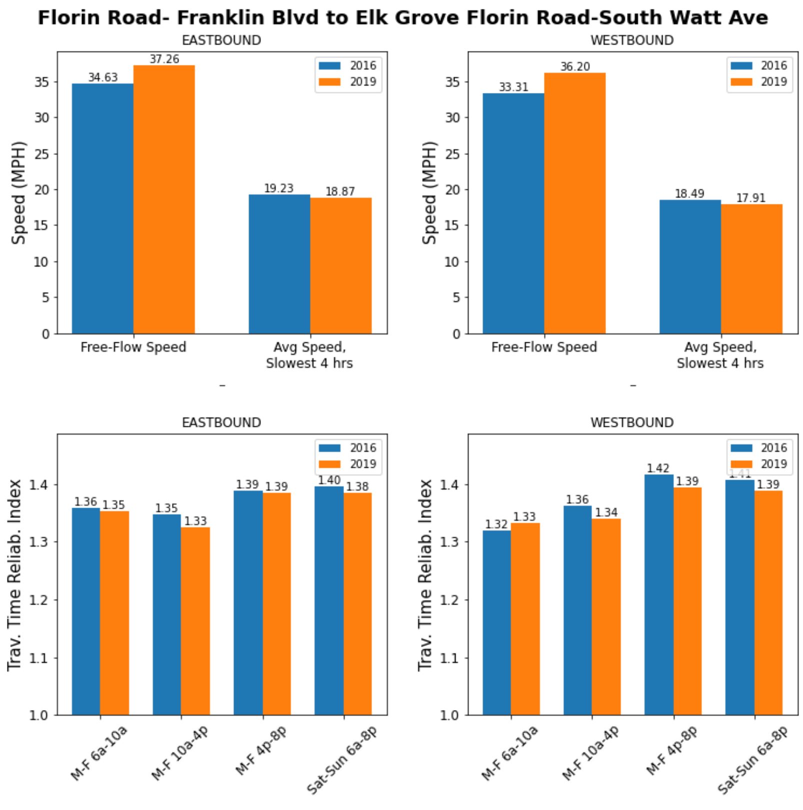
Jurisdiction: Sacramento County

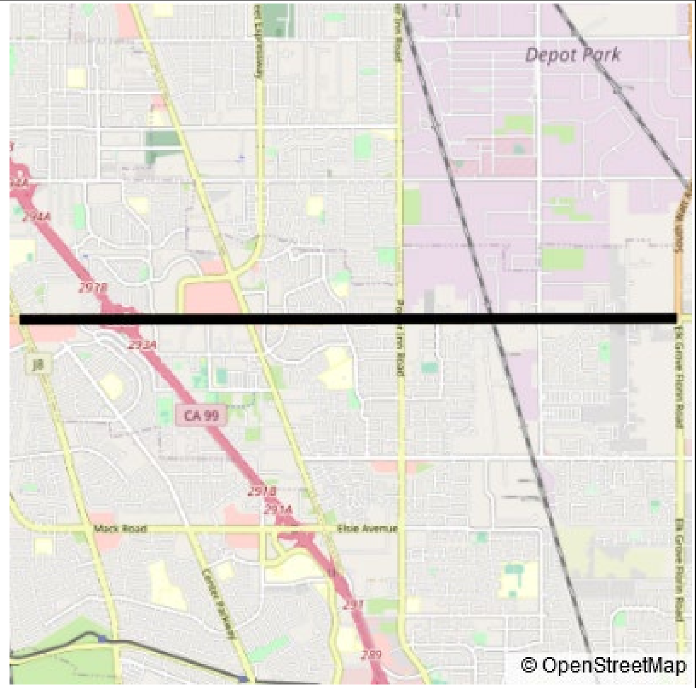
Veh/day: 15,000 - 70,000

Transit: Local bus west of Power Inn Rd

Bike Facilities: Partial coverage with bike lanes

This corridor has seen little change in its congestion and travel time reliability since the 2017 CMP. Traffic volumes and performance vary significantly, with relatively low volumes at the eastern end and high volumes, along with congestion and reliability concerns, on the western half. Projects that will directly affect the congested portions of the corridor include enhanced bus service (possibly BRT), along with additional bike lanes to encourage a shift to more space-efficient modes for travelers using the corridor.





CORRIDOR PROJECTS

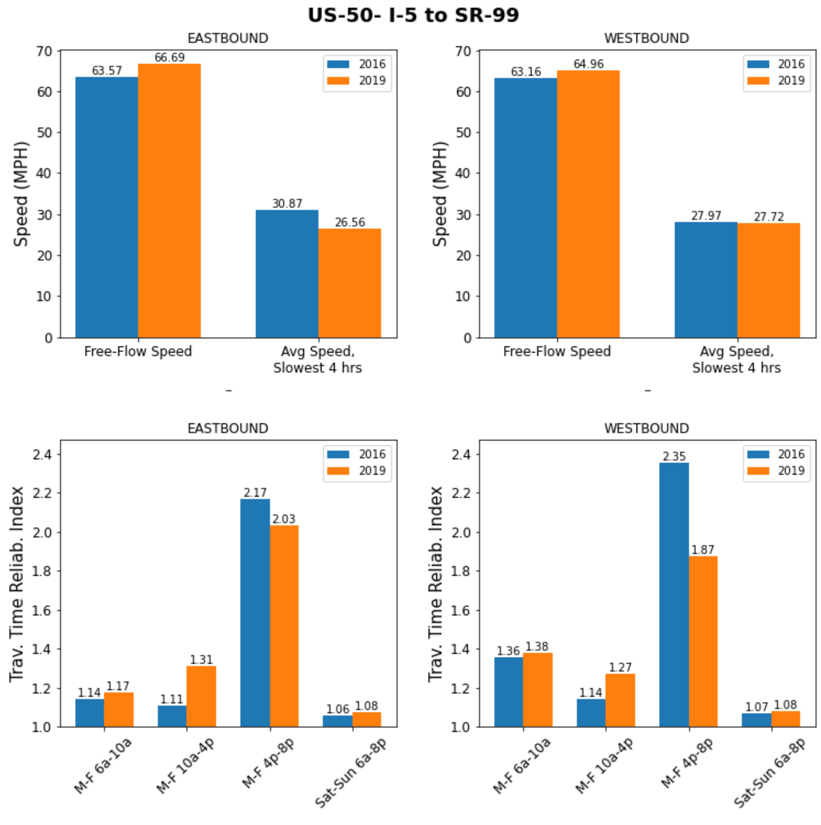
MTP Project ID	Description	Project Category	Est Completion	Status
SAC25060	Florin Rd between Franklin Blvd and Power Inn Rd (excluding the segment at the SR-99 interchange): Install bicycle lanes, upgrade traffic signals to accommodate bicycles at all intersections, construct ADA improvements, install roadway lighting for a segment of Florin Rd.	Bike/ped	2020-2025	Programmed
SAC25151	Implement BRT service on 5 key corridors in Sacramento County, including Florin Rd.	Transit	2036-2040	Planned

Figure 11-13 US-50 from I-5 to SR-99

OVERVIEW

Jurisdiction:	Caltrans D3
Veh/day:	232,000 - 260,000
Transit:	Commuter Bus; parallel LRT
Bike Facilities:	None

Since the 2017 CMP, westbound PM peak travel times improved notably, but congested travel speeds did not. This was due to a decrease in periods of non-recurring "extreme" congestion, though levels of "recurring" congestion remained similar. This corridor will receive several projects that will make more space-efficient alternatives more attractive, including new HOV lanes and more light rail service to areas along the US-50 corridor whose trip generation contributes significantly to demand on this corridor.



CORRIDOR PROJECTS

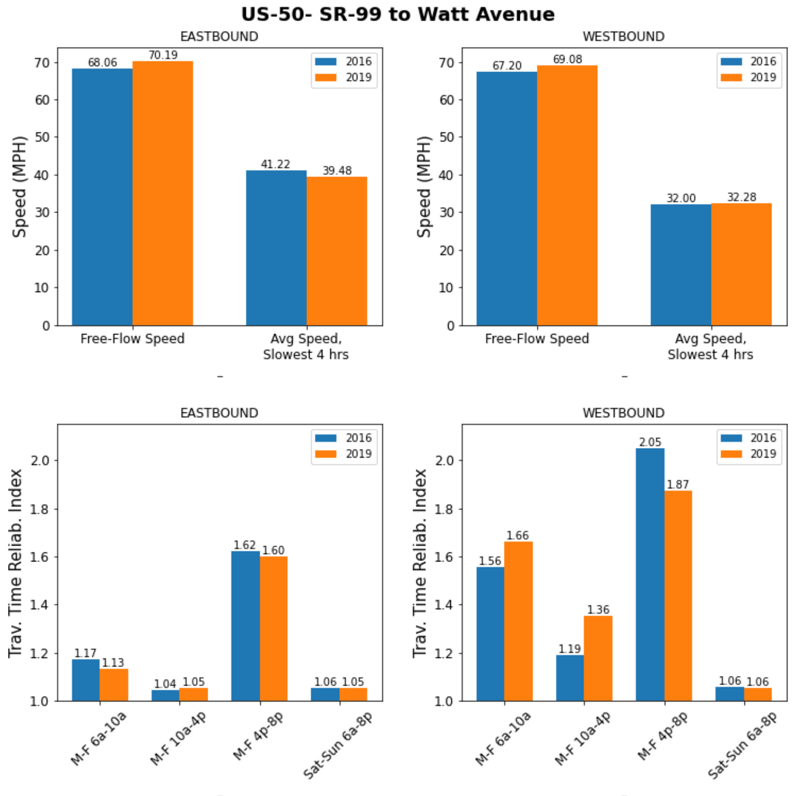
MTP Project ID	Description	Project Category	Est Completion	Status
REG18024	On the Gold Line, between Butterfield and Mather/Mills stations, at Horn Rd. and Old Winery Pl, construct new light	Transit	2020-2025	Programmed
CAL18838	From I-5 to 0.8 mile east of Watt Avenue (PM L0.2/R6.1): Construct High Occupancy Vehicle (HOV) lanes, incorporate Intelligent Transportation System (ITS) elements into the HOV system	HOV capacity, ITS	2025	Programmed
SAC25152	Modifications and enhancements to the Gold Line to enable more frequent service and/or limited stop express service between Folsom and downtown Sacramento including 10 Expansioin LRVs, Side Track, Signal and Crossing Upgrades, LR facility and yard expansions.	Transit	2036-2040	Planned

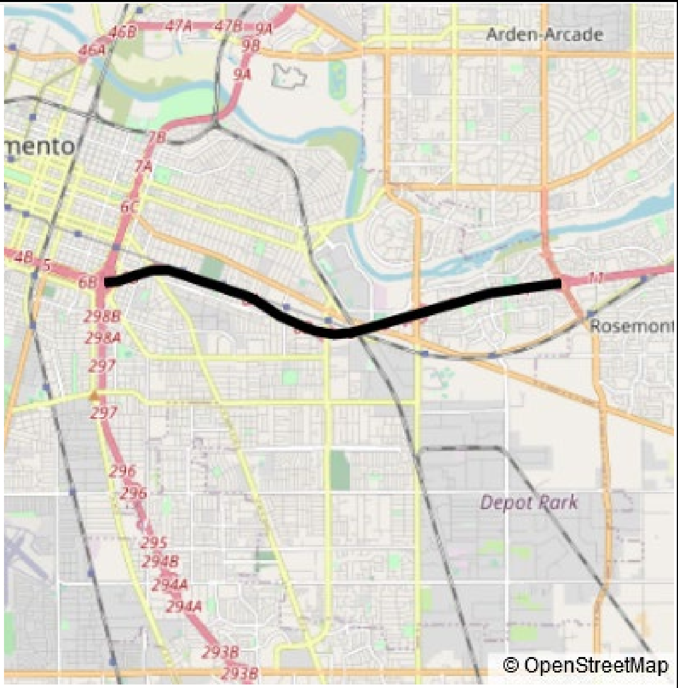
Figure 11-14 US-50 from SR-99 to Watt Ave.

OVERVIEW

Jurisdiction:	Caltrans D3
Veh/day:	180,000 - 220,000
Transit:	Commuter Bus; parallel LRT
Bike Facilities:	None

This corridor has seen little change in its congestion and travel time reliability since the 2017 CMP. As part of the US-50 Integrated Corridor Management (ICM) project, this corridor will receive HOV lanes to improve commuter bus travel times, ITS improvements to alert travelers to real-time traffic conditions and alternative modes, integrated traffic signal timing on parallel surface streets, and increased LRT service to key trip generating areas along the US-50 corridor.





CORRIDOR PROJECTS

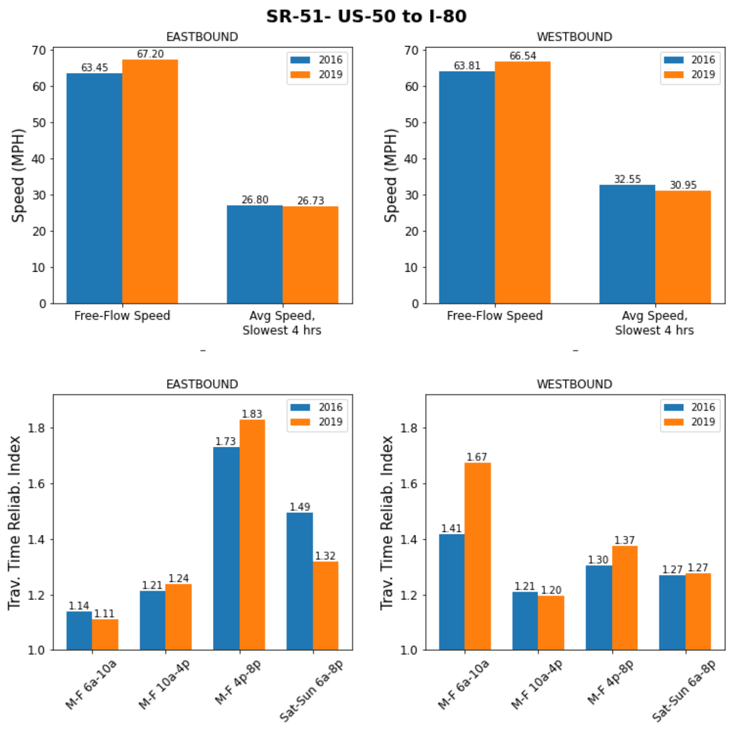
MTP Project ID	Description	Project Category	Est Completion	Status
REG18024	On the Gold Line, between Butterfield and Mather/Mills stations, at Horn Rd. and Old Winery Pl, construct new light	Transit	2020-2025	Programmed
CAL18838	From I-5 to 0.8 mile east of Watt Avenue (PM L0.2/R6.1): Construct High Occupancy Vehicle (HOV) lanes, incorporate Intelligent Transportation System (ITS) elements into the HOV system	HOV capacity, ITS	2025	Programmed
SAC25152	Modifications and enhancements to the Gold Line to enable more frequent service and/or limited stop express service between Folsom and downtown Sacramento including 10 Expansioin LRVs, Side Track, Signal and Crossing Upgrades, LR facility and yard expansions.	Transit	2036-2040	Planned

Figure 11-15 SR-51 (“Business 80”) from US-50 to I-80

OVERVIEW

Jurisdiction:	Caltrans D3
Veh/day:	136,000 - 179,000
Transit:	Commuter Bus; parallel LRT
Bike Facilities:	None

This corridor has seen little change in its congestion and travel time reliability since the 2017 CMP. This is expected given only one of the projects, ramp meters, have been completed since then. However, as listed below, the corridor will be receiving several projects that will both improve traffic operations and provide alternatives to experiencing congestion, including HOV lanes, a bike bridge over the American River, and more Capitol Corridor commuter rail service.



CORRIDOR PROJECTS

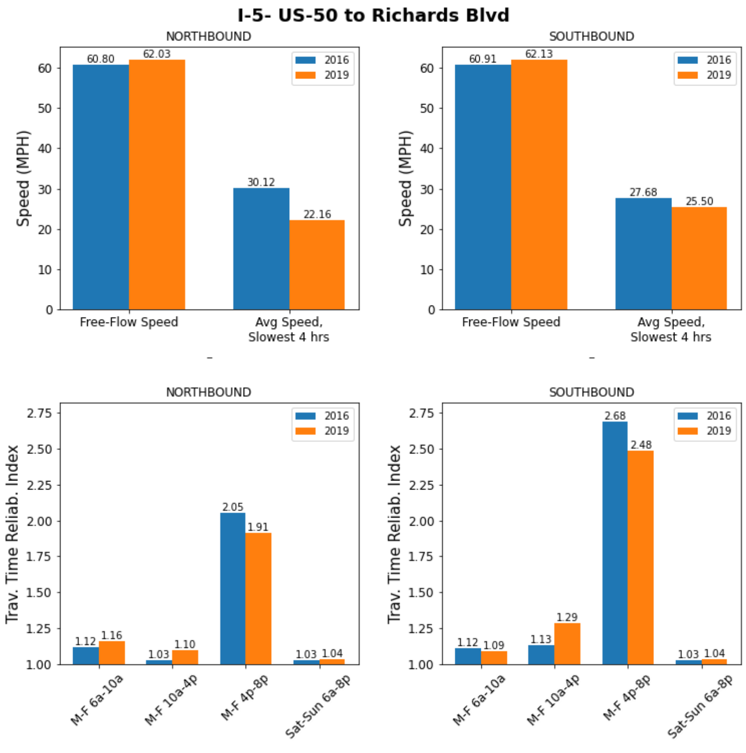
MTP Project ID	Description	Project Category	Est Completion	Status
CAL20502	SR 51 and SR 99 Install Ramp Meters @ Various Locations: In Sacramento County, on SR 51 and SR 99, at various locations - Install ramp meters [CTIPS ID 107-0000-1006] (Toll Credits) [EA 0F351, PPNO 6913] [child project of parent EA 0F350; second child is EA 0F352 PPNO 6913A]. Toll Credits for ENG, ROW	Operations and ITS	2019	Completed
CAL18320	Construct a layover facility, track improvements, required signaling, and construct the most northern eight miles of third mainline track between Sacramento and Roseville (largely all in Placer County), which will allow up to two additional round trips (for a total of three round trips) between Sacramento and Roseville.	Transit	2020-2025	Programmed
VAR56199	Construct third mainline track with bridges and signaling. Project improvements will permit service capacity increases for Capitol Corridor in Placer County, with up to seven additional round trips added to Phase 1-CAL18320 (for a total of ten round trips) between Sacramento to Roseville including track and station improvements.	Transit	2020-2025	Programmed
CAL20642	Bridge Widening: Widen SR51 over the American River NB and SB, to 4 lanes plus a managed lane facility in both directions. New Class I bike path next to the freeway. (project description may change based on results from the Managed Lanes Study. Project is being evaluated for Expressed Toll Lanes, High Occupancy Toll Lanes, HOV lanes)	SOV capacity, HOV, bike/ped	2026-2030	Planned

Figure 11-16 I-5 from US-50 to Richards Bl.

OVERVIEW

Jurisdiction:	Caltrans D3
Veh/day:	192,000 - 193,000
Transit:	Commuter bus, local bus, commuter rail
Bike Facilities:	None

This corridor, carrying some of the highest volumes in the region, has seen little change in its congestion and travel time reliability since the 2017 CMP, but will receive significant investment to increase person-carrying capacity and encourage a shift to more space-efficient modes including new HOV lanes, a new LRT line to Natomas serving some of the corridor's major demand generators, and increased Capitol Corridor commuter rail service to other major demand-generating areas.



CORRIDOR PROJECTS

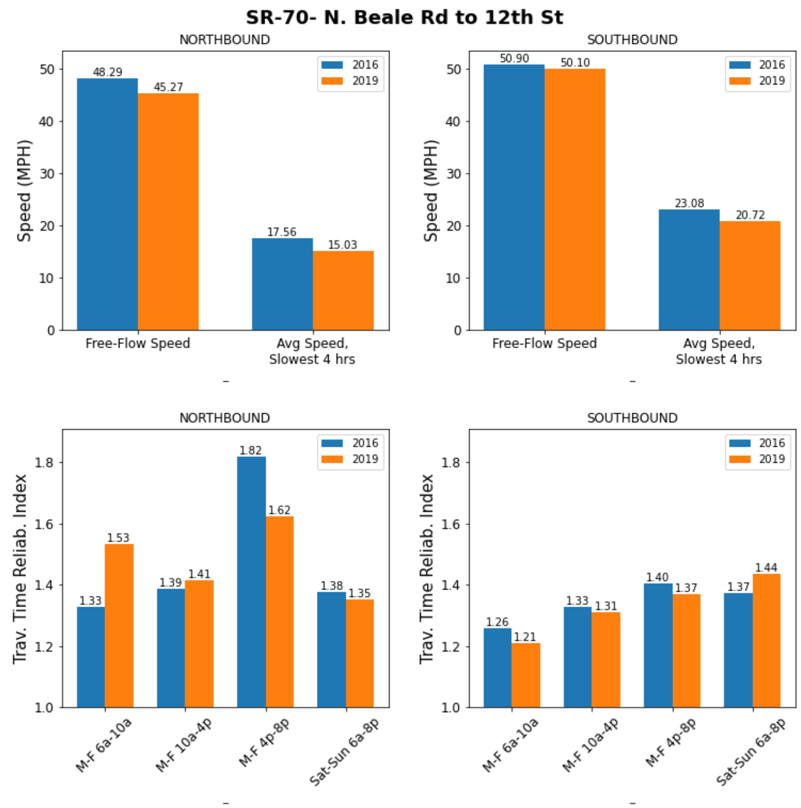
MTP Project ID	Description	Project Category	Est Completion	Status
CAL18320	Construct a layover facility, track improvements, required signaling, and construct the most northern eight miles of third mainline track between Sacramento and Roseville (largely all in Placer County), which will allow up to two additional round trips (for a total of three round trips) between Sacramento and Roseville.	Transit	2020-2025	Programmed
VAR56199	Construct third mainline track with bridges and signaling. Project improvements will permit service capacity increases for Capitol Corridor in Placer County, with up to seven additional round trips added to Phase 1-CAL18320 (for a total of ten round trips) between Sacramento to Roseville including track and station improvements.	Transit	2020-2025	Programmed
CAL21275	In Sacramento County on I-5 from just north of Sutterville Road to the Yolo County line: Construct improvements consisting of managed lanes in each direction, auxiliary lanes, and Intelligent Transportation System (ITS) elements	SOV capacity, ITS, HOV	2026-2030	Programmed
SAC25235	Green Line: Extend rail from Township 9 to North Natomas Town Center	Transit Capital	2030	Planned
SAC24539	Lower American River Crossing: New all-modal Bridge: between downtown Sacramento and South Natomas across the Lower American River. Includes: Auto, transit, bicycle, and pedestrian facilties.	Capacity, Bike-Ped	2031-2035	Planned

Figure 11-17 SR-70 from North Beale Rd. to SR-20

OVERVIEW

Jurisdiction:	Caltrans D3
Veh/day:	45,000 - 63,000
Transit:	Commuter bus, local bus
Bike Facilities:	None

This corridor has seen little change in its congestion since the 2017 CMP. Heading into Marysville ("eastbound"), reliability moderately worsened during the AM peak, but improved in the PM peak. This segment is mix of limited-access freeway and signalized arterial, so its performance is significantly affected by signal delay.



CORRIDOR PROJECTS

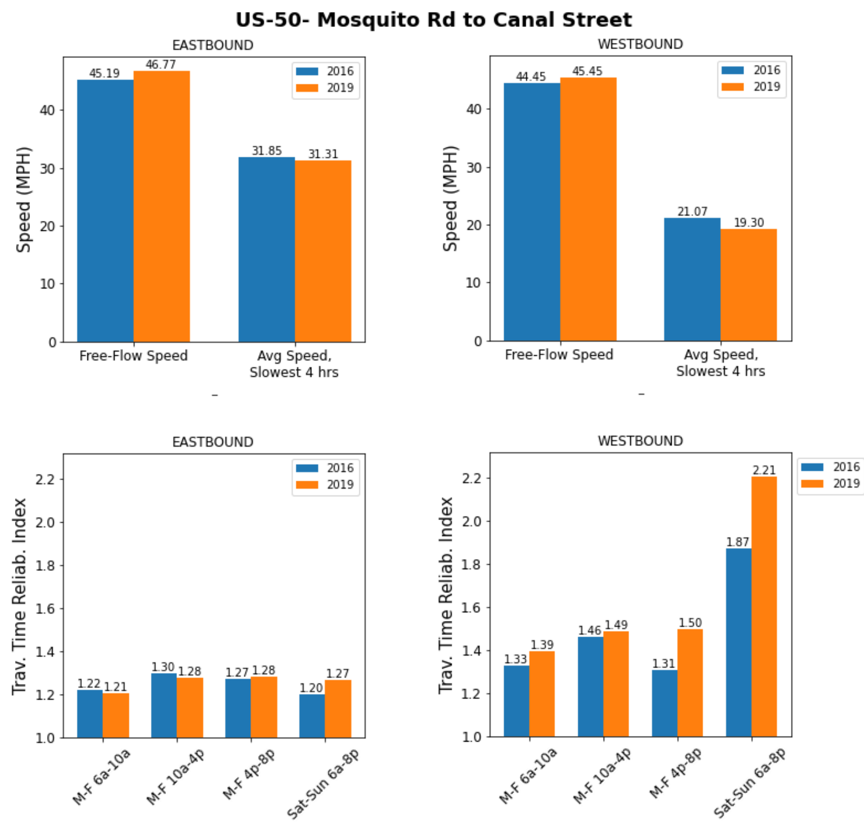
MTP Project ID	Description	Project Category	Est Completion	Status
CAL21214	In Yuba County on SR 70 construct ramp meter at EB North Beale Rd IC	ITS	2026-2030	Planned

Figure 11-18 US-50 from SR-49 to Mosquito Rd.

OVERVIEW

Jurisdiction:	Caltrans D3
Veh/day:	32,000 - 42,000
Transit:	Local bus; commuter bus; daily service to Tahoe Basin.
Bike Facilities:	Parallel C1 path and bike lanes

Since the 2017 CMP, this corridor has seen a slight increase in congestion, and weekend travel times became somewhat less reliable. This corridor's performance is significantly affected by weekend/holiday tourism traffic between Sacramento, the Bay Area, and the Tahoe Basin. This corridor does, however, have convenient parallel Class 1, Class 2, and Class 3 bicycle facilities, as well as daily transit service to the Tahoe Basin.



CORRIDOR PROJECTS

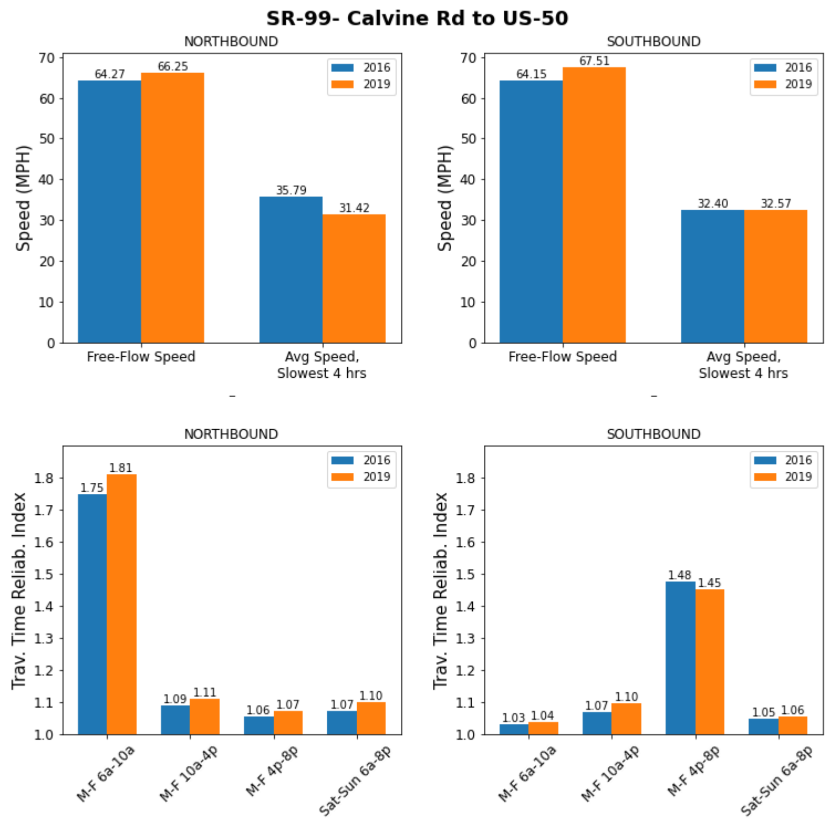
MTP Project ID	Description	Project Category	Est Completion	Status
ELD16070	Placerville Station II: 50-car park and ride lot, bicycle racks and lockers, improved connection to El Dorado Transit and Amtrak Bus Service, realigning the existing segment of the El Dorado C1 bike trail	Transit, bike-ped	2020	Programmed
Non-MTP project	Extend El Dorado Transit bus route 50X eastward to Placerville Station and revise Routes 20 and 60 to avoid unnecessary duplication of service.	Transit	2025	Planned

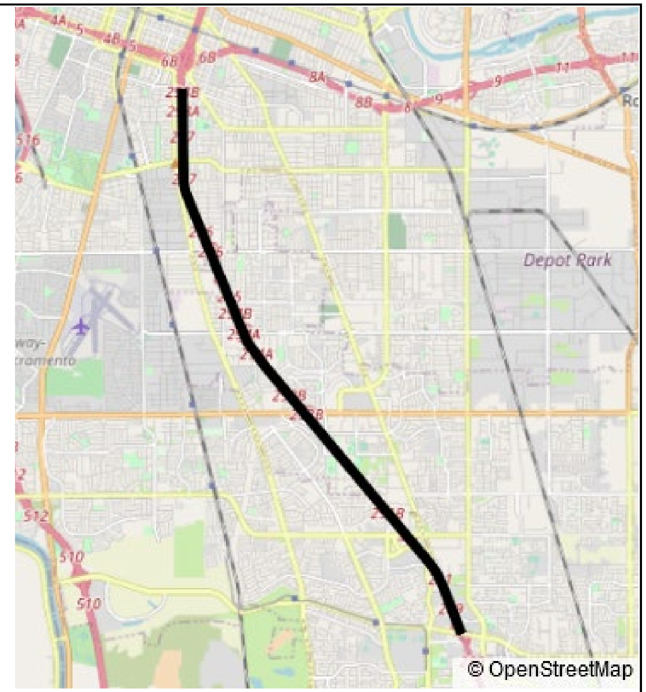
Figure 11-19 SR-99 from Calvine Rd. to US-50

OVERVIEW

Jurisdiction:	Caltrans D3
Veh/day:	140,000 - 235,000
Transit:	Commuter bus, parallel LRT, parallel local bus
Bike Facilities:	None

This corridor, one of the most-traveled in the region, has seen little change in its congestion and travel time reliability since the 2017 CMP. It has various transit options including peak-period commuter bus service, parallel LRT service on the Blue Line, and high-frequency parallel bus service on Stockton Bl. It also has adaptive ramp meters at most locations. In the future, it will receive additional transit service with the Valley Rail project connecting Sacramento, Elk Grove, Stockton, and the Bay Area.





CORRIDOR PROJECTS

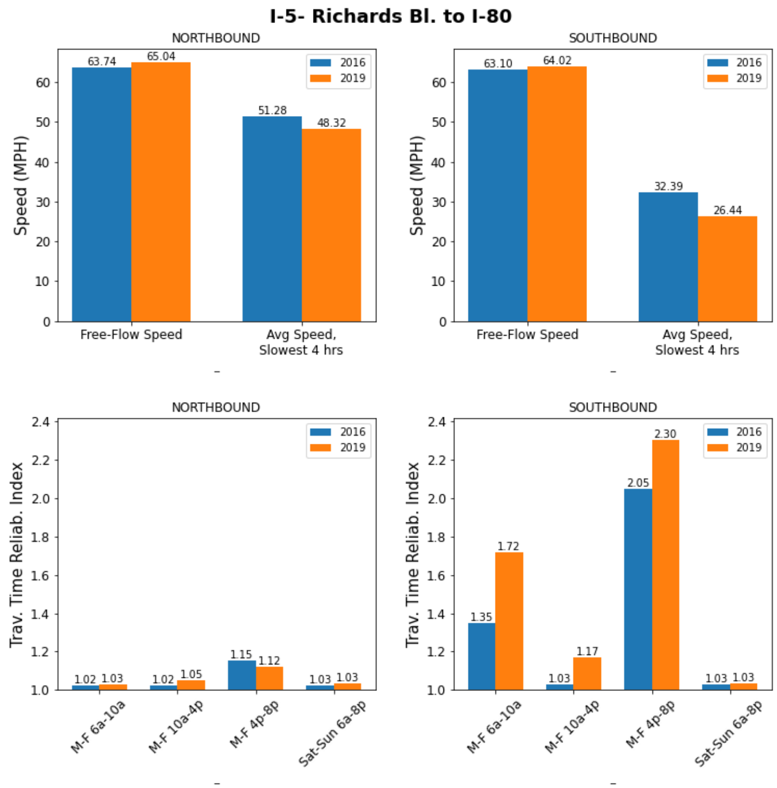
MTP Project ID	Description	Project Category	Est Completion	Status
CAL20502	SR 51 and SR 99 Install Ramp Meters @ Various Locations: In Sacramento County, on SR 51 and SR 99, at various locations - Install ramp meters [CTIPS ID 107-0000-1006] (Toll Credits) [EA 0F351, PPNO 6913] [child project of parent EA 0F350; second child is EA 0F352 PPNO 6913A]. Toll Credits for ENG, ROW	Operations and ITS	2019	Completed
CAL20703	Construct three aux lanes on SR99 between Calvine Rd and Elk Grove Bl. Caltrans SHOPP ID EA 03-1H630.	Operations/SOV capacity	2025	Programmed
CAL21337	On the UPRR Sacramento Subdivision approximately 39.5 miles from Natomas (W. Elkhorn Blvd.) to San Joaquin	Transit	2036-2040	Planned

Figure 11-20 I-5 from Richards Bl. To I-80

OVERVIEW

Jurisdiction:	Caltrans D3
Veh/day:	168,000 - 202,000
Transit:	Commuter bus, local bus
Bike Facilities:	None on bridge; parallel low-traffic bridge.

This corridor's southbound performance has modestly declined since the 2017 CMP, with peak-hour speeds falling and travel times becoming less reliable. However, it will benefit from several major projects that will provide more transit alternatives, such as parallel LRT service to the corridor's major demand generators, HOV lanes to make bus service more reliable, and a new all-modal crossing at Truxel Rd that will provide additional car capacity along with a new, all-season bike connection between this corridor's major trip generators and attractions.



CORRIDOR PROJECTS

MTP Project ID	Description	Project Category	Est Completion	Status
CAL18320	Construct a layover facility, track improvements, required signaling, and construct the most northern eight miles of third mainline track between Sacramento and Roseville (largely all in Placer County), which will allow up to two additional round trips (for a total of three round trips) between Sacramento and Roseville.	Transit	2020-2025	Programmed
VAR56199	Construct third mainline track and required signaling. Project improvements will permit service capacity increases for Capitol Corridor in Placer County, with up to seven additional round trips added to Phase 1-CAL18320 (for a total of ten round trips) between Sacramento to Roseville including track and station improvements.	Transit	2020-2025	Programmed
CAL21275	In Sacramento County on I-5 from just north of Sutterville Road to the Yolo County line: Construct improvements consisting of managed lanes in each direction, auxiliary lanes, and Intelligent Transportation System (ITS) elements	SOV capacity, ITS, HOV	2026-2030	Programmed
SAC25235	Green Line: Extend rail from Township 9 to North Natomas Town Center	Transit Capital	2030	Planned
SAC24539	Lower American River Crossing: New all-modal Bridge: between downtown Sacramento and South Natomas across the Lower American River. Includes: Auto, transit, bicycle, and pedestrian facilties.	Capacity, Bike-Ped	2031-2035	Planned
CAL18410	Reconstruct I-5/I-80 Interchange, including managed lane/HOV connectors, and construction of managed lane facility from the I-5/I-80 Interchange to downtown Sacramento	HOV	2036-2040	Planned

Figure 11-21 I-80 from the Solano County line to US-50

OVERVIEW

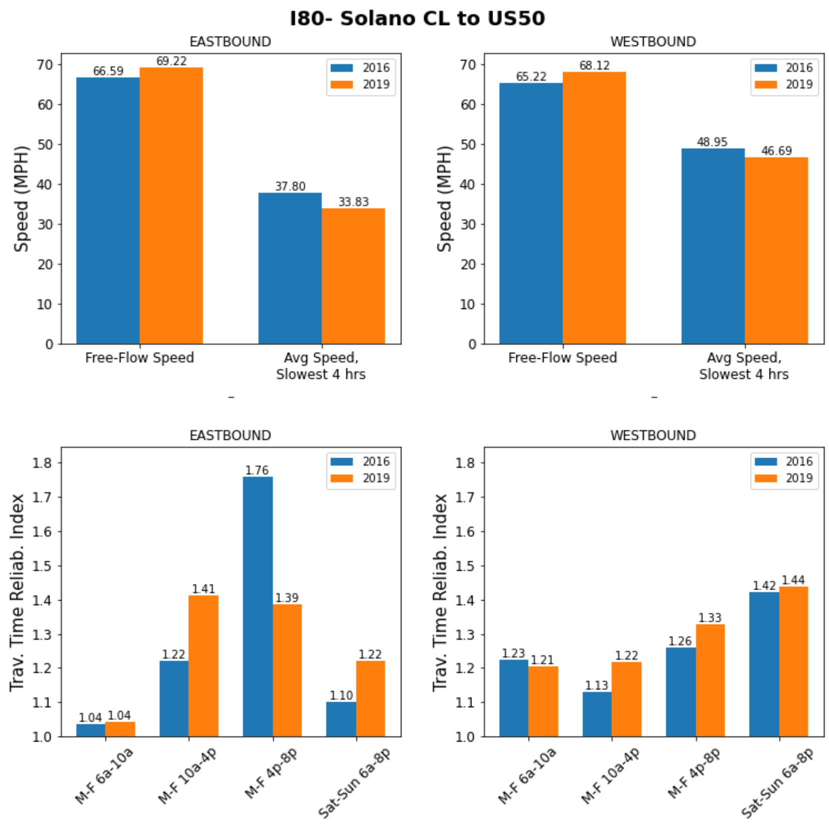
Jurisdiction: Caltrans D3

Veh/day: 131,000 - 155,000

Transit: Commuter bus, commuter rail, local bus

Bike Facilities: Class 1 bike path

This corridor saw little change since the 2017 CMP, except for the eastbound direction in the PM peak, which became more "reliably congested", with congested speeds falling slightly, but less variation in travel time. Being major Bay Area connection, this corridor will benefit from a planned HOV project that will improve local and commuter bus travel times while also providing an improved class 1 bike facility to allow travelers more alternatives to driving in congestion while increasing the corridor's person-carrying capacity.



CORRIDOR PROJECTS

MTP Project ID	Description	Project Category	Est Completion	Status
REG18052	Between UC Davis and UC Davis Medical Center with limited stops in between: Operating assistance for three years.	Transit	2020	Programmed
CAL21276	On I-80 just west of Davis in both directions from the Kidwell Rd IC in Solano County (D4) to the US-50/I-5 interchange and I-80/West El Camino interchange in Sacramento: Construct managed lanes, pedestrian/bicycle facilities and ITS elements	HOV, ITS, bike/ped	2026-2030	Programmed
Various	Install new ramp meters at various interchanges including Mace Bl (CAL21151), Chiles Rd (CAL21152), Richards Bl. (CAL21149)	ITS	2036-2040	Planned

Appendix 3 NPMRDS Data Checking and Validation

A 3.1 Data Completeness

NPMRDS data are provided in 15-minute time periods, called "epochs". NPMRDS data completeness refers to the share of total possible epochs that contain data. For example, in a 24-hour day there are 96 possible epochs (24 hours * 4 15-minute epochs per hour). If the NPMRDS data provide a travel time for all 96 epochs, then the data completeness for that day is 100%. If, however, the travel time data are missing for 48 of those epochs, then the data completeness for that day is only 50%.

Effect of traffic volume on data completeness

Since NPMRDS data come from in-vehicle navigation systems and certain mobile phone applications, data completeness for a given TMC will necessarily depend in part on how many people are traveling on it. Figure 11-22 corroborates this, with data completeness during busier daytime hours being higher than during lower-traffic pre-dawn hours, and higher for freeways, which generally have higher AADT values (traffic volumes) than arterials.

Breaking down the averages for data completeness, Figure 11-23 shows not only more complete data for freeways (considering both interstates and non-interstate freeways), but significantly more variation in data completeness for arterials. E.g., while over 85 percent of freeway segments have data for all possible epochs, the bulk of arterial miles have data for between 50 to 75 percent of possible epochs.

The map, further below in Figure 11-24 corroborates this relationship, showing the spatial distribution of spatial completeness, with major roads generally having more complete data.

Figure 11-22 Data Completeness by Time of Day

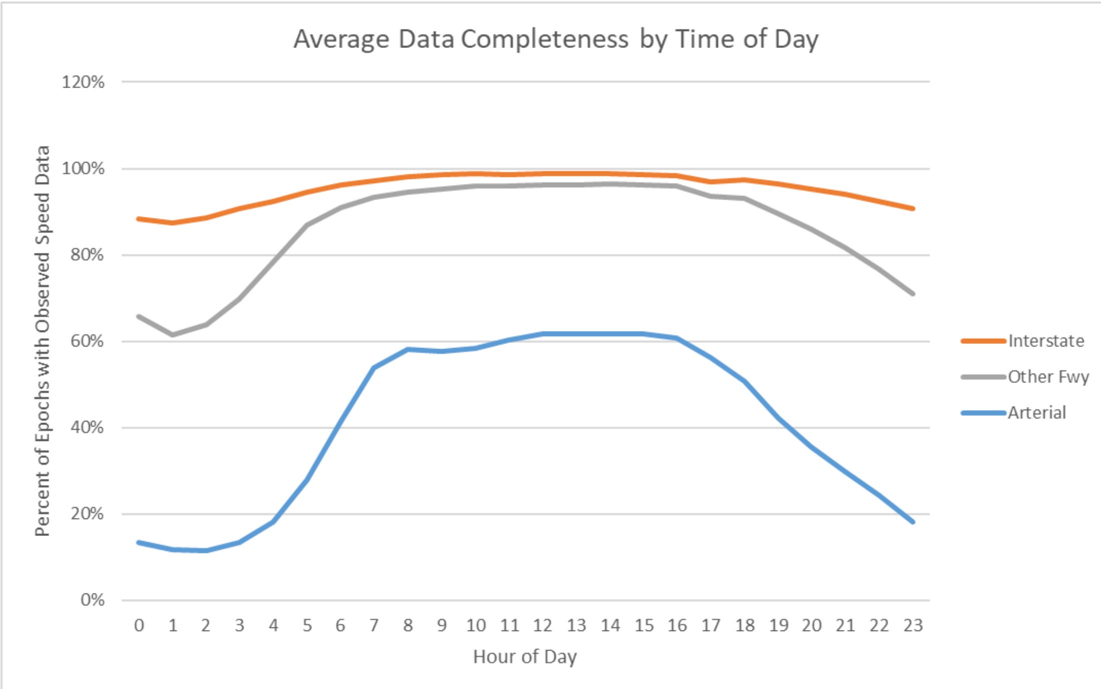


Figure 11-23 Data Completeness by Facility Type

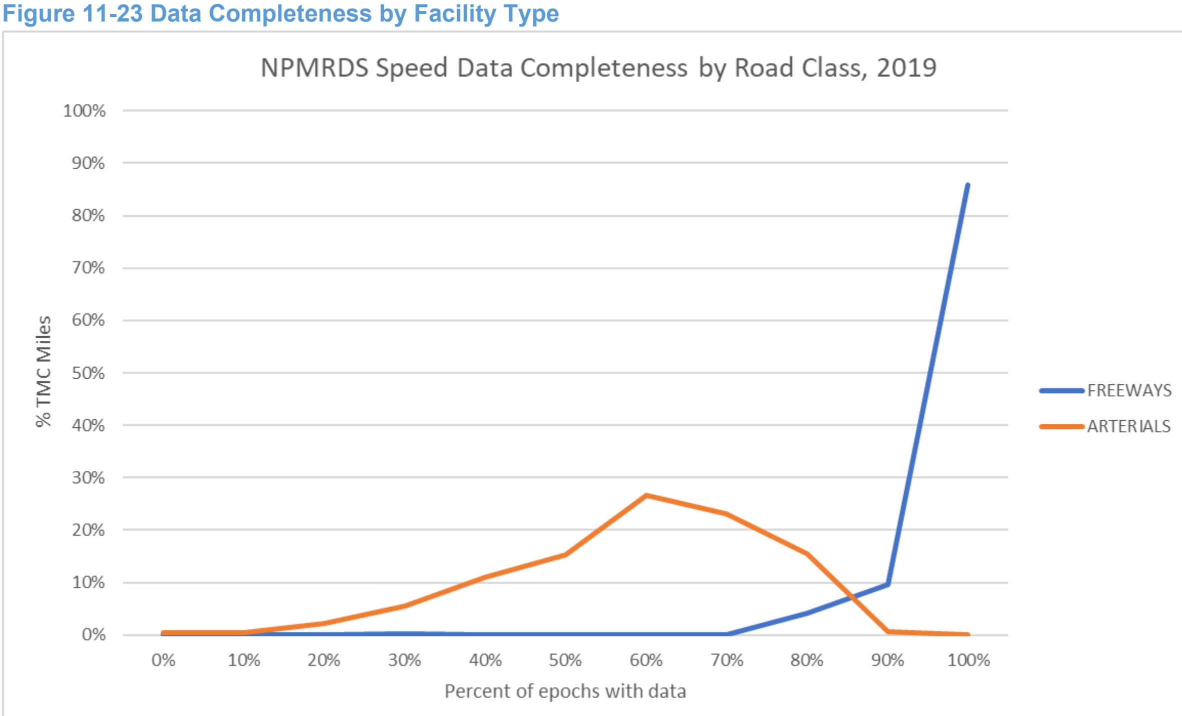
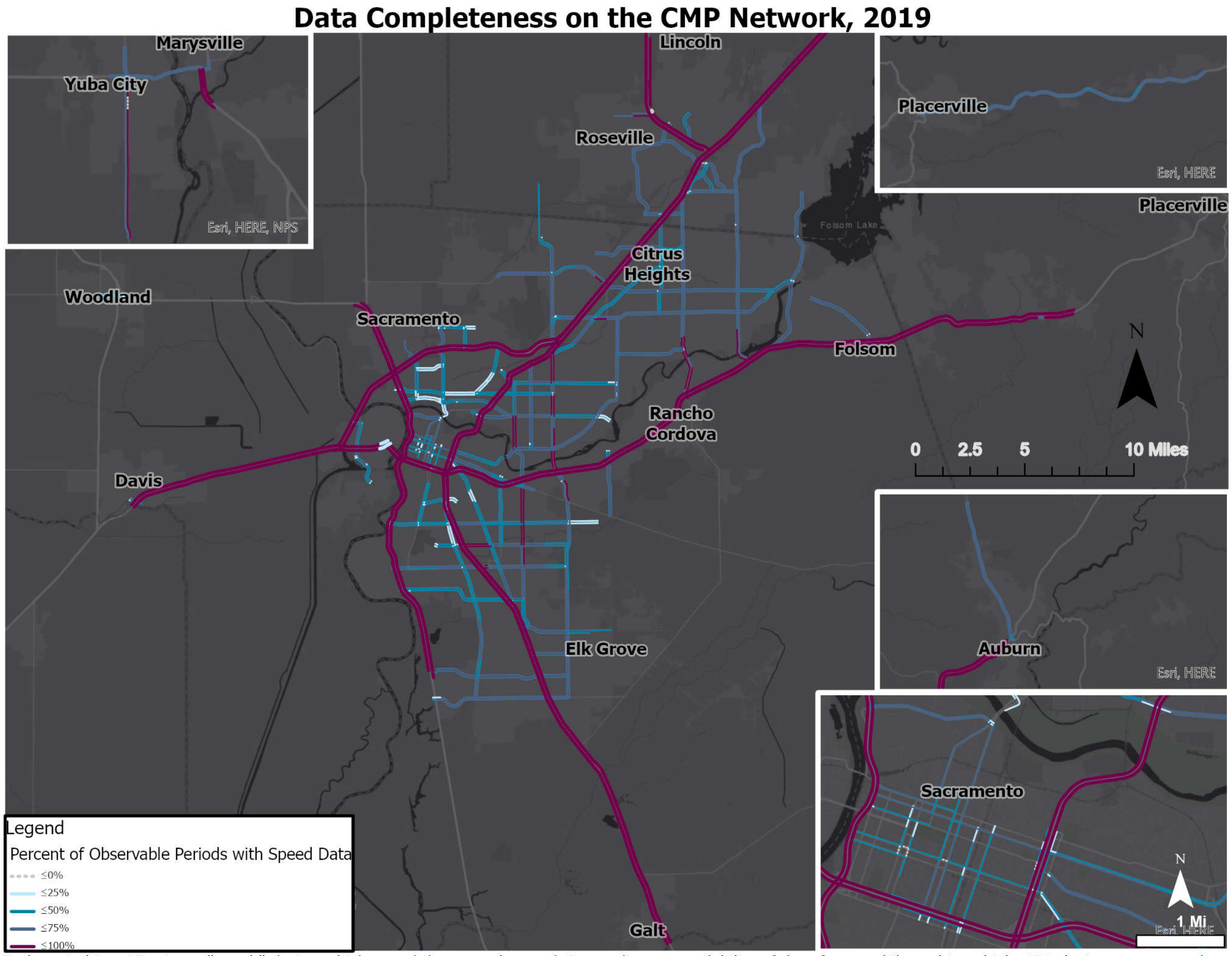


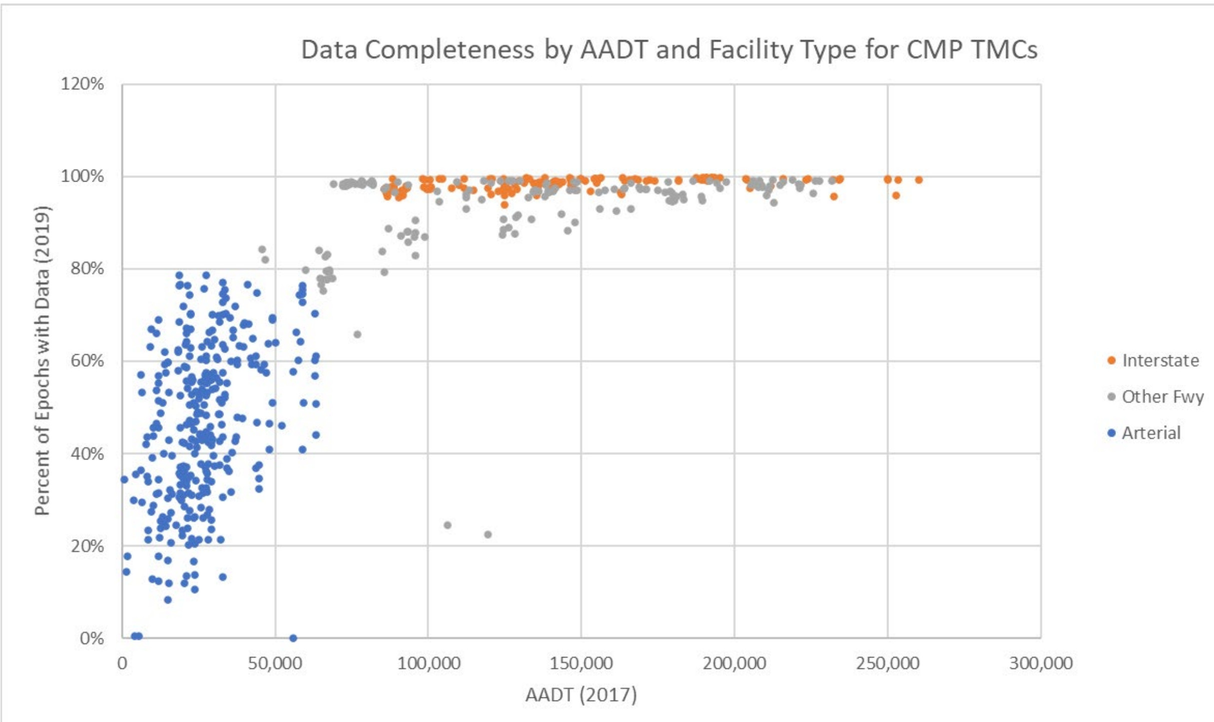
Figure 11-24 Map of Data Completeness on the CMP Network



Each period is a 15-minute "epoch" during which speed data are observed. Depending on availability of data from mobile and in-vehicle GPS devices, many road segments lack observed speed data for one or more epochs. Example: a segment that has speed data in 75% of observable periods means that, out of all the 15-minute epochs in year 2019, 25% did not have speed data, and that segment's congestion and reliability metrics are based on the 75% of epochs with data.

Driving more directly at the relationship between AADT and completeness, Figure 11-25 shows that the relationship is non-linear. Specifically, data completeness drops significantly once AADT drops below roughly 85,000. However, the relationship between AADT and data completeness breaks down at lower volumes and is very noisy, to the point of not showing any significant relationship. Part of this noise is due to incorrect arterial count volumes provided in the RITIS data, particularly on some of the higher-volume arterial segments. E.g., there are some segments where the AADT provided by RITIS data is significantly lower than the real volume, so even though it has a low AADT it has a high level of data completeness.

Figure 11-25 2019 Data Completeness by Traffic Volume (AADT)



A 3.2 Accounting for Incomplete Data in Speed and Reliability Calculations

As data becomes less complete, the average values derived from it become less reliable. E.g., if a TMC has an average weekday speed based on 2,000 observations, we can be more certain that is an accurate representation of the actual average speed than if it is only based on 20 observations. To that end, we built in some minimum data completeness thresholds, described in more detail below.

Completeness Checks for Congested Speed Calculation

As discussed above, congested speed for the CMP is calculated by (1) identifying the four slowest hours of a 24-hour day, only considering weekdays Monday-Friday, then (2) calculating the average of all speeds observed during those four slowest hours.

However, we only included hours for each TMC if they had more than 100 epochs of observed data in a calendar year. Using a single TMC as an example, initially we consider all 24 hours of data, i.e., the average speed for 12am-1am is the average speed for all weekdays between 12am-1am for the entire calendar year. However, if during the entire year there are fewer than 100 epochs observed between 12am-1am on weekdays, then we remove the 12am-1am hour from the 24 hours, and the four slowest hours are selected from the remaining 23 hours that have more than 100 epochs of data.]

While the threshold of 100 is somewhat arbitrary, it seeks to balance the needs of having speeds based on a minimum number of observations while still being able to show data for as much of the CMP network as possible.

Completeness Checks for Congested Speed Calculation

To the extent possible, we copied our reliability metrics (LOTTR and TTTR) from FHWA's MAP-21 PM3 rule, seeking to copy the methodology and parameters as much as possible. In regard to data completeness, the MAP-21 PM3 rule does not specify any minimum threshold for data completeness. For example, a TMC's AM peak reliability (covering all times from 6am-10am Monday-Friday for the calendar year) is still to be calculated as normal even if during the AM peak there were only 1 or 2 epochs of data observed. Fortunately, this affects very few TMCs (even including arterials) and so has a minimal effect on estimated system LOTTR.

A 3.3 Use of 2016 Instead of 2015 as Base Year Data

For the 2017 CMP, we used the 2015 NPMRDS speeds. Ideally, for the 2020 CMP, we would compare 2019 speed data against 2015 speed data. However, 2015 NPMRDS data were provided by HERE, while 2016-2019 NPMRDS data come from INRIX. As detailed in the 2018 CMP Monitoring Report[38], this vendor change does not affect freeways, but it does significantly affect arterials. In that report, we compared

[38] *2018 Congestion Management Process Update*. SACOG, 2018. https://www.sacog.org/sites/main/files/file-attachments/2018_cmp_update_report_forpdf.pdf?1596469267. Accessed December 2020.

HERE-based speeds to INRIX-based speeds for the month of January 2017 and found that when controlling for time period and location, INRIX-based data showed arterials as being significantly more reliable and faster than HERE-based speeds. In addition to the difference being greater for arterials, the difference between HERE- and Inrix-based reliability tended to be larger for TMCs with less observed data (i.e., of the potential total periods in a year, fewer of those periods had observed speeds recorded. Appendix A 3.1 discusses data completeness in more detail).

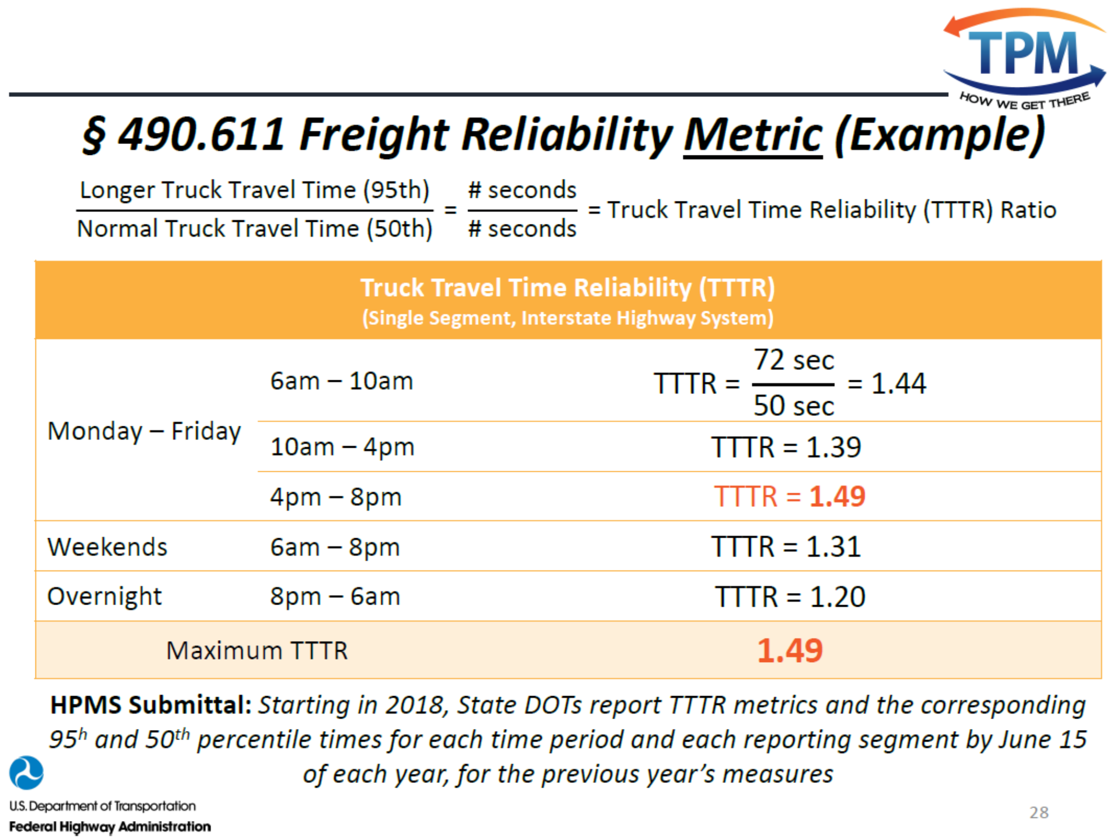
While including data for 2015 is fine for all freeways, the difference to exclusively due to vendor is so great for arterials that it hides all real difference that may have happened. In contrast, because 2016 and 2019 are from the same vendor (INRIX), we have greater confidence that the speed and reliability changes observed between those two years are more likely due to real changes rather than a change in data vendor.

Appendix 4 Reliability Calculation Methodology

A 4.1 Truck Travel Time Reliability TTTR

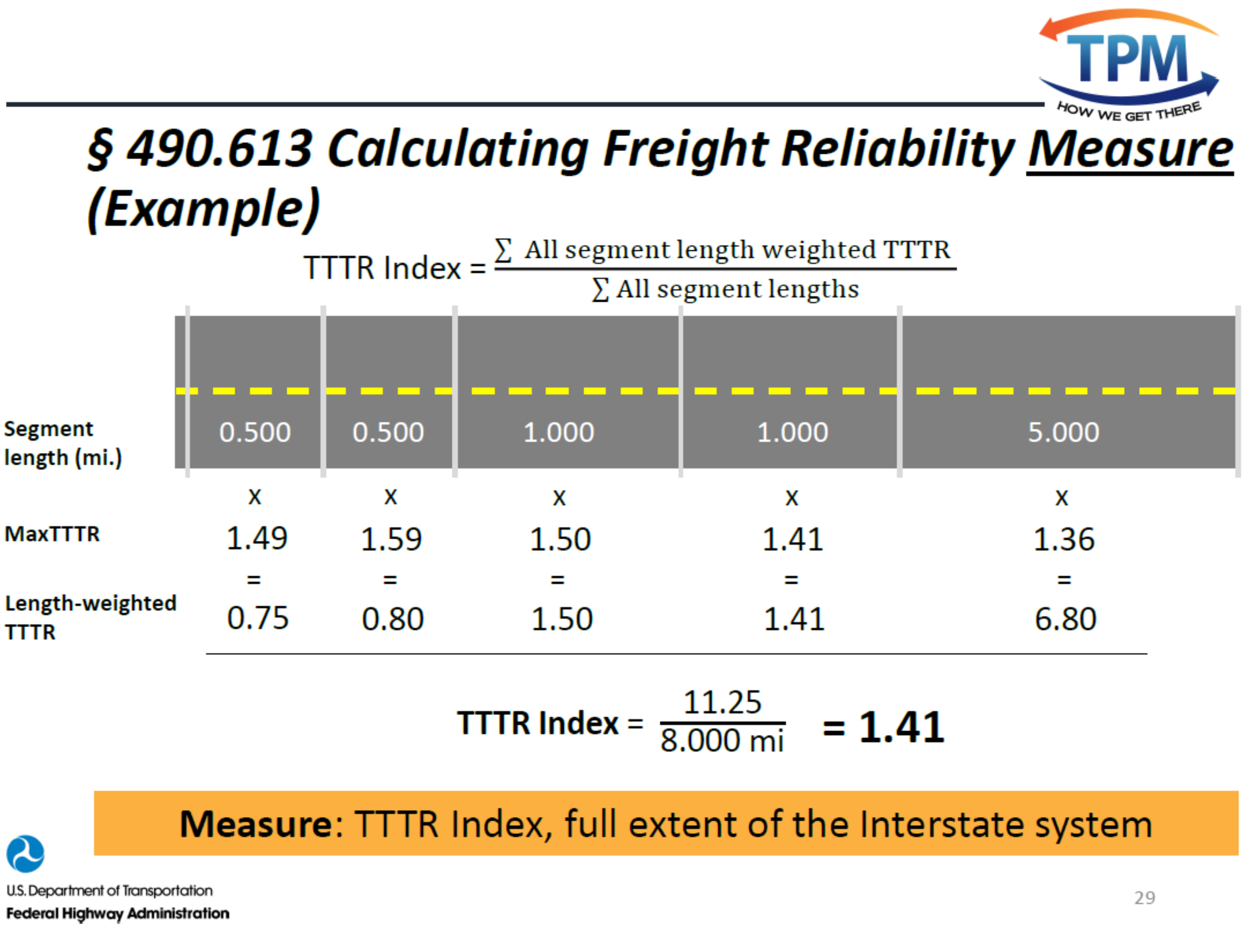
The slide in Figure 11-26, copied from an FHWA slide presentation from June 2017[39], summarizes the method to calculate the TTTR for each road segment (TMC). After calculating the TTTR for each TMC, the overall TTTR for the set of interstates within the CMP network is calculated as being the distance-weighted average TTTR, using the methodology shown in Figure 11-27.

Figure 11-26 Method for calculating TTTR for an individual TMC



[39] *National Performance Management Measures to Assess System Performance, Freight Movement, and CMAQ Improvement Program*. FHWA. 2017. https://www.fhwa.dot.gov/tpm/rule/170601pm3.pdf. Accessed December 2020.

Figure 11-27 Method for calculating average TTTR for all interstates within CMP network



A 4.2 Level of Travel Time Reliability (LOTTR)

The LOTTR has two components: the *segment-level* LOTTR, and the *system-level* metric, "percent of person-miles that are reliable". The slide in Figure 11-28, copied from an FHWA slide presentation from June 2017[39], summarizes the method to calculate the LOTTR for each road segment (TMC). After calculating the LOTTR for each TMC, the percent of person-miles on the CMP network that are reliable is calculated using the methodology shown in Figure 11-29.

Figure 11-28 Method for calculating LOTTR for each link (TMC) and determining link-level reliability

TPM
HOW WE GET THERE

§ 490.511 Level of Travel Time Reliability (LOTTR) Metric (Example)

$$\frac{\text{Longer Travel Time (80th)}}{\text{Normal Travel Time (50th)}} = \frac{\text{\# seconds}}{\text{\# seconds}} = \text{Level of Travel Time Reliability Ratio}$$

Level of Travel Time Reliability (LOTTR) *(Single Segment, Interstate Highway System)*		
Monday – Friday	6am – 10am	$\text{LOTTR} = \frac{44 \text{ sec}}{35 \text{ sec}} = 1.26$
	10am – 4pm	LOTTR = 1.39
	4pm – 8pm	LOTTR = 1.54
Weekends	6am – 8pm	LOTTR = 1.31
Must exhibit LOTTR below 1.50 during **all** of the time periods		**Segment is not reliable**

HPMS Submittal: *Starting in 2018, State DOTs report LOTTR metrics and the corresponding 80th and 50th percentile times for each time period and directional AADT for each reporting segment by June 15 of each year, for the previous year's measures*

U.S. Department of Transportation
Federal Highway Administration

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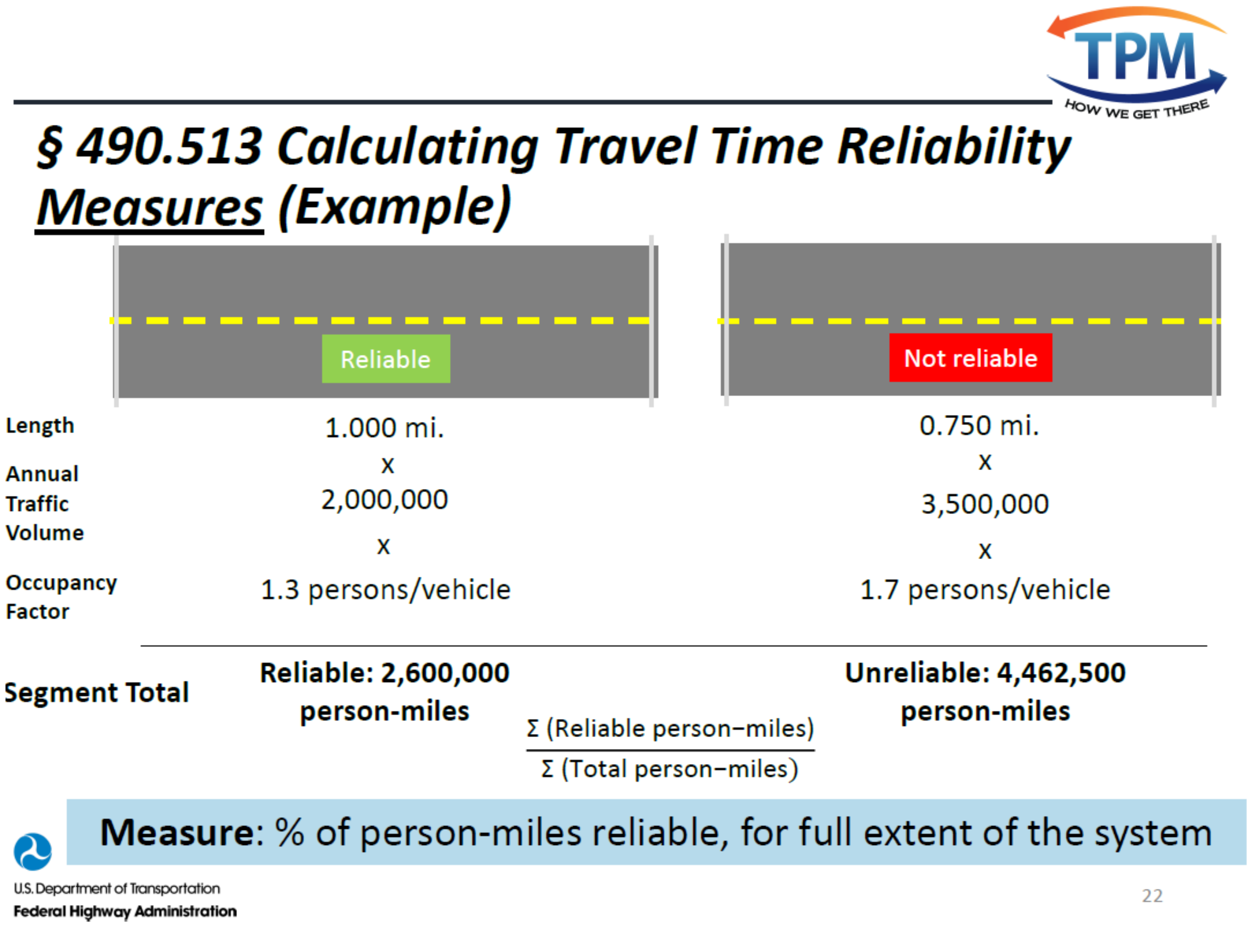
Figure 11-29 Method for calculating percent of person-miles on the CMP network that are reliable



Appendix 5 Congestion Calculation Methodology

A 5.1 Calculating Free-Flow Speed

"Free-flow" speed represents the speed a typical vehicle will travel when it is unimpeded by the presence of other vehicles on the road.

To estimate the free-flow speed for freeways, we took the 85th percentile speed (i.e., speed that was faster than 85% of all other observed speeds) for all epochs of NPMRDS data that were observed between 8pm and 6am.

Estimating arterial free-flow speed is complicated by the presence of traffic signal delay. Ideally, we want arterial free-flow speed to represent the average speed that a vehicle would travel at when unimpeded by other vehicles on the road, yet still factor in delay caused by waiting at traffic signals, which operate even when roads are otherwise under "free-flow" conditions. To very roughly account for signal delay, we adjusted the free-flow speed for arterials to be the 60th percentile speed (instead of the 85th percentile speed) during the hours of 8pm-6am.

To summarize, free-flow speeds are as follows:

- Freeway free-flow speed: 85th percentile speed, measured between 8pm-6am
- Arterial free-flow speed: 60th percentile speed, measured between 8pm-6am

A 5.2 Calculating Congested Speed

As summarized in Section 6.2.2, congested speed is the average speed during the slowest four weekday hours for the entire year. Specific steps to calculate the congested speed are as follows, being applied separately to each TMC:

1. For each hour of a 24-hour day, for weekdays only, calculate the hourly average speed for all weekdays in the year.
2. For each hour's average speed, rank the hours from 1-24, with rank 1 corresponding to the hour with the slowest average speed.
3. Identify the four slowest hours. Which hours are the four slowest will be different for each TMC.
4. Get the average of all speeds observed during those four hours for weekdays during the entire year. This average speed is the "congested speed" for the TMC.

A 5.3 Calculating Percent of TMC Miles That Are Congested

As described above in Section A 5.3, a segment (TMC) was considered "congested" if its average speed during its slowest four weekday hours was less than 60% of its free-flow speed. To computer the system-level metric, we used the formula in Equation 11-1.

Equation 11-1 Percent of CMP TMC miles that are congested

$$N_c = \frac{\sum D_C}{\sum D_T}$$

Where:

- N_c = Percent of CMP network that is congested
- D_c = TMC miles that are congested (speed during slowest 4 weekday hours is less than 60% of the free-flow speed)
- D_T = Total TMC miles

Appendix 6 Fall 2019 Transit Ridership on CMP Transit Routes

As described in Section 5.2, the CMP transit network includes all passenger rail lines, local bus routes serving >800 weekday boardings, and commuter buses averaging >20 boardings per bus trip. All bus routes also must have at least part of their service on the CMP road network.

Table 11-3 Daily boardings on CMP transit lines

Operator	Line Name	Average Weekday Boardings, Fall 2019
Amtrak	Capitol Corridor	2,794
El Dorado Transit	Sacramento Commuter	1,161
Etran (Elk Grove)	10	206
Etran (Elk Grove)	11	244
Etran (Elk Grove)	12	174
Etran (Elk Grove)	14	224
Etran (Elk Grove)	15	139
Etran (Elk Grove)	16	130
Etran (Elk Grove)	17	179
Roseville Transit	10AM	24
Roseville Transit	10PM	18
Roseville Transit	2AM	37
Roseville Transit	2PM	41
Roseville Transit	3 AM	25
Roseville Transit	3PM	29
Roseville Transit	4AM	40
Roseville Transit	4PM	31
Roseville Transit	5AM	39
Roseville Transit	5PM	28
Roseville Transit	6AM	27
Roseville Transit	6PM	30
Roseville Transit	7AM	18
Roseville Transit	7PM	33
Roseville Transit	8AM	33
Roseville Transit	8PM	19
Roseville Transit	9AM	28
Roseville Transit	9PM	24
Sacramento Regional Transit	1	1,986
Sacramento Regional Transit	11	940
Sacramento Regional Transit	21	1,230
Sacramento Regional Transit	23	1,763
Sacramento Regional Transit	25	1,220

Operator	Line Name	Average Weekday Boardings, Fall 2019
Sacramento Regional Transit	26	1,520
Sacramento Regional Transit	30	2,056
Sacramento Regional Transit	51	3,264
Sacramento Regional Transit	56	1,078
Sacramento Regional Transit	61	902
Sacramento Regional Transit	62	1,203
Sacramento Regional Transit	67	1,398
Sacramento Regional Transit	68	1,906
Sacramento Regional Transit	72	1,289
Sacramento Regional Transit	81	3,134
Sacramento Regional Transit	82	1,929
Sacramento Regional Transit	84	1,504
Sacramento Regional Transit	86	1,275
Sacramento Regional Transit	87	1,448
Sacramento Regional Transit	88	813
Sacramento Regional Transit	93	805
Sacramento Regional Transit	109	102
Sacramento Regional Transit	129	111
Sacramento Regional Transit	170	228
Sacramento Regional Transit	172	174
Sacramento Regional Transit	Gold	18,325
Sacramento Regional Transit	Blue	20,578
Sacramento Regional Transit	Green	583
Unitrans	A	901
Unitrans	P	1,045
Unitrans	Q	1,083
Unitrans	W	1,995
Yolo County Transportation District	Route 42	1,365
Yolo County Transportation District	Route 42	1,365
Yolo County Transportation District	Route 215	824
Yolo County Transportation District	Route 215	824
Yuba-Sutter Transit	1	908
Yuba-Sutter Transit	SR70	243
Yuba-Sutter Transit	SR99	285

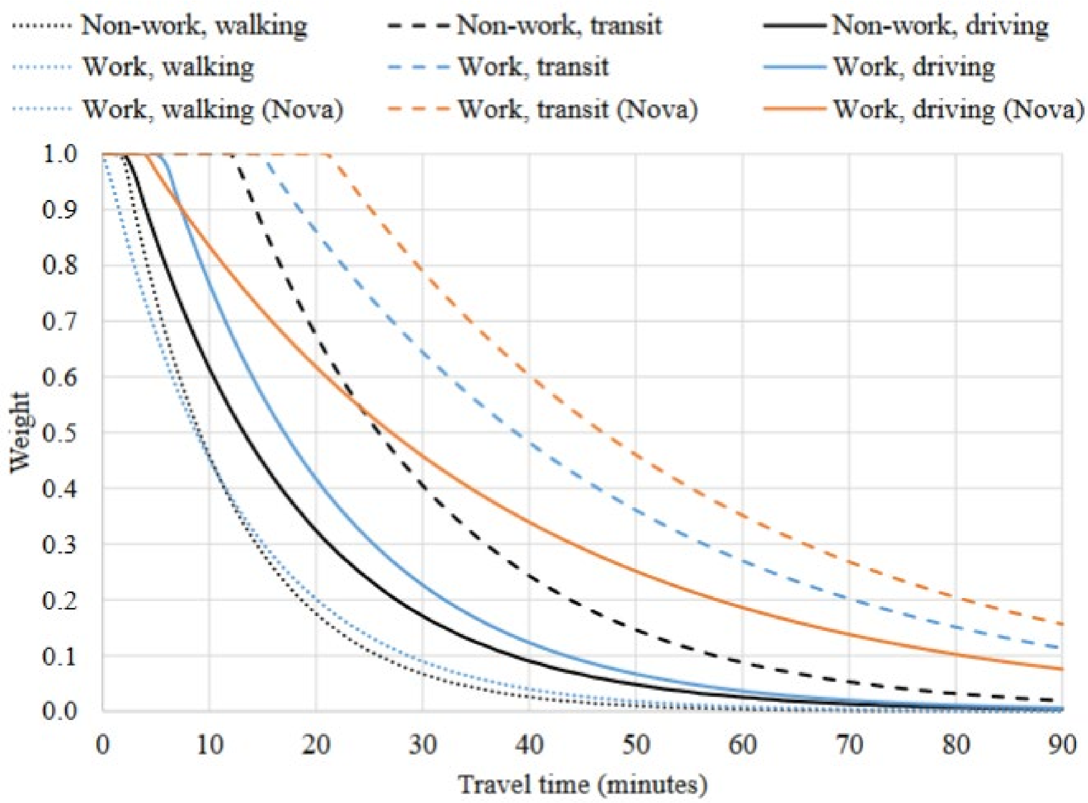
Appendix 7 Accessibility Decay Curves

As discussed in Section 7.1.4, the accessibility numbers in the CMP, calculated using Bentley Systems Sugar Access software, assume that there is a decay curve representing peoples' willingness to travel different distances using different modes. Figure 11-30 shows an example decay curve pulled from the University of Wisconsin's State Smart Transportation Initiative[40].

Using the curve as an example and considering job accessibility, we can look at the "work, transit" curve. You will see that a job that is less than 15 minutes away by transit is still considered to be one job accessible. However, if a job is 40 minutes away by transit, it is only considered about 0.5 jobs, because only about half of people, based on National Household Travel Survey data, are willing to take transit for 40 minutes to reach a job.

Similar decay curves are applied to the accessibility calculations to estimate job and service accessibility in the CMP.

Figure 11-30 Example Travel Time Decay Curve for Estimating Accessibility.



[40] Sundquist et al. *Accessibility in Practice: A Guide for Transportation and Land Use Decision Making*. University of Wisconsin State Smart Transportation Initiative. 2017.

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