

TRANSPORTATION SYSTEM TRANSIT

SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS



TECHNICAL REPORT

ADOPTED ON SEPTEMBER 3, 2020

EXECUTIVE SUMMARY	1
INTRODUCTION	2
REGIONAL SIGNIFICANCE: TRANSIT'S ROLE IN THE REGION'S INTEGRATED MOBILITY SYSTEM	3
REGULATORY FRAMEWORK	6
ANALYTICAL APPROACH	16
EXISTING CONDITIONS	21
TRANSIT STRATEGIES	62
NEXT STEPS	79
CONCLUSION	79
APPENDIX	81



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TRANSPORTATION SYSTEM

Transit

EXECUTIVE SUMMARY

This section will highlight key findings of the existing conditions analysis, the investment plan and performance outcomes of the plan.

As of the end of Fiscal Year (FY) 2015–16, our region’s transit system consisted of approximately 9,000 miles of bus routes and 105 miles of heavy and light rail, in addition to 534 miles route miles of rail utilized by Metrolink. On a typical weekday, transit systems in the SCAG region provided just under two million unlinked passenger trips, or transit boardings. According to data reported to the National Transit Database (NTD), transit agencies in the SCAG region experienced 655 million annual boardings and invested \$2.91 billion in operations and maintenance (O&M) in FY 2015–16. These services were operated by over 100 agencies, involving a wide variety of bus and rail transit modes.

According to the NTD, Southern California has spent \$77.02 billion dollars on transit since 1991. In 2015–16, the region spent a combined \$4.83 billion on transit, including both O&M and capital expenditures. Just over half of the \$2.91 billion expended on O&M were for operations and just under a fifth were for vehicle maintenance. For every transit trip taken in FY 2015–16, the region spent a combined \$7.38.

The region provided just under 20.5 million hours of transit service in 2015–16 or 1.08 hours per resident. Passengers took 655 million trips or 34.7 trips per resident. Total use of the region’s transit services is dropping. Between 2007 and 2017, transit trips declined by 143 million, or 19 percent. SCAG has been

investigating the reasons for this and commissioned the *Falling Transit Ridership: California and Southern California* report by the University of California, Los Angeles (UCLA) Institute of Transportation Studies. UCLA found that increasing vehicle ownership was the most likely cause of the decline.

The Connect SoCal transit investment plan includes service improvements and major capital projects, including corridor improvements and facilities, and funds for operations and maintenance. In response to the ridership decline, many transit providers are reconfiguring their networks and experimenting with technology enhancements and partnerships with private mobility providers. Relevant research and analysis of pilot project outcomes are discussed in this report.

The Connect SoCal investments will lead to 1.6 billion transit trips taken in 2045 or 73 transit trips per resident. This will mean that a total of 10.6 billion passenger miles or 465 miles per resident will be traveled on transit. Additionally, the plan establishes performance targets for the maintenance of transit assets. These targets are shown in **TABLE 11**.

INTRODUCTION

VISION/PURPOSE

The Southern California vision for transportation and transit, in particular, is developed via a cooperative, comprehensive and continuing process where local agencies work with their county transportation commission and with SCAG to identify a program of projects that will deliver the local vision of increased mobility and accessibility and support Connect SoCal goals including congestion reduction and sustainability.

In terms of public policy, transit serves as both a key component of local, regional and state efforts to combat climate change and reduce congestion, and as a critical social service. It is a key way Southern California provides mobility for individuals who cannot provide it for themselves, especially those without

access to automobiles, the very poor, recent immigrants, and the elderly and disabled. It also can provide an important alternative to driving alone and could serve as the backbone of a multi-modal transportation system with an integrated trip planning and payment system, as part of the “mobility as a service” (MaaS) concept.

Each county in the region is slightly different and the investments described here vary to some degree by county. The development of the quadrennial Regional Transportation Plan is an important step in the development of these local projects.

In Imperial County, there is a vision consisting of clock face service between cities, fed by local circulators within local cities and improved transit experience for travelers crossing the international border.

In LA County, the transit investments involve major capital expansion of the Metro Rail system funded primarily with local option sales tax revenues, while localized transit service is supported with local return dollars. LA County intends to use these strategies to provide multi-modal mobility options for residents.

In Orange County, the transit projects seek to provide compelling and competitive transit service that expands transportation choices for current riders, attracts new riders and equitably supports immediate and long-term mobility in Orange County.

In Riverside County, the transit projects include increased service with additional rapid bus routes and new service at local agencies.

In San Bernardino County, the transit vision includes a commitment to key investments such as the Arrow project, new rapid bus services and BRT capital improvements, facilitating inter-county travel, providing transit access for all travelers and expanding commuter rail service.

Ventura County has developed new transit service in the Heritage Valley and is working to create partnerships between agencies in the eastern county, while Gold Coast Transit District (GCTD) seeks to provide service to new communities including sailors at the Naval Base Ventura County.

TABLE 9, in the Transit Strategies section of this report, provides a list of the local plans that further articulate these visions.

ORGANIZATION OF THE REPORT

This report is organized as follows:

1. **Executive Summary**
This section highlights key findings of the existing conditions analysis, the investment plan and the performance outcomes of the plan.
2. **Introduction**
This section discusses the transit vision in Connect SoCal and provides a summary of how the report is organized and a discussion of where transit is discussed in the main body of Connect SoCal.
3. **Regional Significance**
This section contains a discussion of how the factors above create challenges and opportunities for public transportation. It also includes a discussion of the impact that new mobile app-based technologies have had on transportation and impacts of recession as well as increased vehicle ownership.
4. **Regulatory Framework**
This section discusses the regulatory framework affecting the provision of public transportation.
5. **Analytical Approach**
This section discusses data used and the federal performance management framework as it applies to public transportation. It defines key measures and metrics and includes a brief discussion of outreach methods used in preparing this analysis.
6. **Existing Conditions**
This section contains discussions of the existing regional transit system, institutional arrangements and key stakeholders, how the integrated system performs, comparison of that performance to other large regions and analysis of emerging trends.
7. **Transit Strategies**

This section outlines the Connect SoCal transit investment plan. It discusses needs assessment, key projects and the projected future performance of the system.

8. **Next Steps**
This section highlights actions SCAG will take to help implement Connect SoCal's transit strategies.
9. **Conclusion**
10. **Appendix**

LINK TO MAIN PLAN AND TO OTHER REPORTS

Transit is discussed in the main body of Connect SoCal in the following places:

- **Chapter 2:** Challenges in a Changing Region and Creating a Plan for the Future
- **Chapter 3:** Road to Greater Mobility and Sustainability
- **Chapter 5:** Measuring Our Progress
- **Chapter 6:** Leading the way

REGIONAL SIGNIFICANCE: TRANSIT'S ROLE IN THE REGION'S INTEGRATED MOBILITY SYSTEM

The Federal Transit Act of 2012 defines public transportation as:

“Transportation by a conveyance that provides regular and continuing general or special transportation to the public, but does not include school bus, charter, or intercity bus transportation or intercity passenger rail transportation provided by the entity described in chapter 243 (or a successor to such entity).”

As amended by the Moving Ahead for Progress in the 21st Century Act (MAP-21), 49 US Code Section 5302, further defines public transportation as:

“(14) PUBLIC TRANSPORTATION.—The term ‘public transportation’—

(A) means regular, continuing shared-ride surface transportation services that are open to the general public or open to a segment of the general public defined by age, disability, or low-income; and

(B) does not include:

- (i) intercity passenger rail transportation provided by the entity described in chapter 243 (or a successor to such entity);
- (ii) intercity bus service;
- (iii) charter bus service;
- (iv) school bus service;
- (v) sightseeing service;
- (vi) courtesy shuttle service for patrons of one or more specific establishments; or
- (vii) intra-terminal or intra-facility shuttle services.”

In this report, the terms transit and public transportation are used interchangeably. It is important to note that, in accordance with the federal definition of transit, services such as intercity passenger transportation, high-speed rail, university or workplace shuttles, and school buses will not be discussed in this report. Further discussion of the region’s passenger rail system can be found in the Passenger Rail technical report.

The transit system in the six-county SCAG Region comprises an extensive network of services provided by dozens of operators. The network includes fixed-route local bus, community circulators, express bus, bus rapid transit (BRT), demand response, commuter rail, heavy rail and light rail.

As of FY 2015–16, our region’s transit system consisted of approximately 9,000 miles of bus routes and 105 miles of heavy and light rail, in addition to 534 miles of rail utilized by Metrolink. On a typical weekday, transit systems in the region provide just under two million unlinked passenger trips, or transit boardings. According to data reported to the NTD, transit agencies in the SCAG Region experienced 655 million annual boardings and invested \$2.91 billion in O&M in FY 2015–16.

Data was obtained from the Federal Highway Administration’s most recent

National Household Travel Survey (NHTS) conducted in 2017. The data represent a sample of all travel in the Los Angeles–Long Beach–Anaheim and Riverside–San Bernardino–Ontario Metropolitan Statistical Areas, as reported by travelers.

The 2017 NHTS includes 220,430 trips nationally, with an oversampling in California, for a total of 28,785 trips in the Los Angeles–Long Beach–Anaheim and Riverside–San Bernardino–Ontario Metropolitan Statistical Areas.

Transit’s overall role is comparatively small, but it serves an important role in providing modal choice. These services can provide an alternative to driving for many travelers and are a particularly popular way to access job centers where parking is difficult or expensive.

Transit is relatively important for commute trips, as shown in **TABLE 2**. Data obtained from the US Census’s 2016 American Community Survey (ACS) 1-Year Estimate demonstrate that the overall mode share for transit is much higher for commute trips than overall trips. Los Angeles County has a relatively high transit-commute mode share–6 percent of all work trips, which is slightly down from 7.2 percent in the 2009–2011 ACS and 7 percent in the 2014 ACS.

TABLE 1 Travel Mode Share, All Trips

Modal Category	Los Angeles–Long Beach–Anaheim, CA	Riverside–San Bernardino–Ontario, CA
BICYCLE	1.00%	0.50%
MOTOR VEHICLE	82.70%	90.40%
OTHER	1.40%	0.70%
TRANSIT	2.20%	1.00%
WALK	12.70%	7.40%

Source: 2017 National Household Travel Survey

Public Transportation has an important role to play in providing mobility for those residents of the region who cannot provide their own. As documented in the report *Falling Transit Ridership: California and Southern California*, habitual transit riders have historically been recent immigrants from very-low-income households. Transit has provided an important lifeline to these new residents as they acclimatize to living in Southern California.

Transit plays a role in providing modal choice in the SCAG Region but historically has also helped provide mobility for households or travelers with no or limited access to vehicles. The *Falling Transit Ridership* report documents these effects and uses data derived from census PUMS microdata to show that more and

more low-income households are acquiring vehicles. Between 2000 and 2015, the share of households without vehicles fell by 30 percent and the share of households with less vehicles than workers fell by 28 percent.

Additionally, public transportation has also been an important tool in providing access for the elderly and disabled. A variety of services, including the Americans with Disabilities Act (ADA) paratransit and other demand response services provide mobility options for residents who might otherwise not be able to travel.

Historically, transit has been the largest of the second party provided passenger

TABLE 2 Work Trips Mode Share by County

	Imperial County	Los Angeles County	Orange County	Riverside County	San Bernardino County	Ventura County
WORKERS 16 YEARS AND OVER	60,013	4,769,841	1,555,629	976,755	877,712	410,448
Means of Transportation to Work						
DROVE ALONE	81.8%	73.9%	78.4%	78.5%	78.3%	77.5%
CARPOOLED	7.8%	9.6%	9.7%	12%	11.7%	12.7%
PUBLIC TRANSPORTATION	0.2%	6.0%	2.2%	1%	1.6%	1.3%
WALKED	3.1%	2.8%	1.7%	1.5%	1.4%	1.7%
TAXICAB, MOTORCYCLE, BICYCLE, OR OTHER MEANS	1.6%	1.5%	1.1%	1.5%	0.9%	1%
WORKED AT HOME	4.7%	5.4%	6.1%	5.3%	5.8%	5.2%

Source: 2016 American Community Survey

transportation mode in Southern California. In 2015–16, travelers took just over 655 million transit trips, 104 million plane trips and 2.9 million intercity passenger rail trips. In contrast, transit travel is dwarfed by vehicle travel. The SCAG activity-based model estimates that, on an average weekday, residents traveled over 14 million passenger miles on transit in 2016. In comparison, the model also estimates that residents traveled over 627 passenger miles in automobiles in 2016, which exceeds transit by a factor of 44.

CHALLENGES AND OPPORTUNITIES

The key challenge facing public transportation in Southern California is the recent rapid decline in the use of public transportation. As documented in *Falling Transit Ridership: California and Southern California*, habitual transit riders appear to be shifting away towards personal vehicles. If the ridership keeps dropping, service cuts may occur, leading to a vicious cycle of further ridership decline.

Many transit advocates would argue that new technologies and service patterns such as Transportation Network Companies (TNCs), Mobility as a Service (MaaS) and automated vehicles present an opportunity for transit agencies to move away from being service providers to become platform owners and mobility managers. However, transit agencies, and public agencies in general, tend to be resistant to change. In particular, as noted by transit consultant Jarret Walker in January 2018, transit agencies are subject to strict regulatory oversight, rigid labor contracts, occasionally conflicting or confusing direction from elected officials, and a focus on day-to-day operations. These conditions often cause transit agencies to focus on stability and predictability.

REGULATORY FRAMEWORK

The following regulations and statutes affect the implementation of Connect SoCal. These regulations and statutes were selected given that they meet one or more of the following criteria:

- The regulations and statutes have been adopted, altered, amended or finalized since the last RTP

- The continued implementation of these regulations and statutes affects trends that are identified in this report, including imposing regulatory mandates on SCAG or partner agencies
- The regulations and statutes will need to be monitored
- Complying with the mandates contained in these regulations and statutes will provide outputs that can be used to monitor progress in implementing Connect SoCal.

FEDERAL REQUIREMENTS

The following statutes and regulations affect the provision of public transportation, specify requirements for providers or specifically affect the way public transportation must be considered in the federally defined metropolitan transportation planning process.

TRANSIT ASSET MANAGEMENT (TAM) FINAL RULE

The FTA issued the TAM Final Rule (49 CFR §625 et seq.), effective October 1, 2016, to implement the asset management provisions of MAP-21. This Final Rule mandates the development of a National TAM System, defines “state of good repair” (SGR) and requires transit providers to develop TAM plans. It further requires states, Metropolitan Planning Organizations (MPOs), and transit providers to develop locally coordinated performance targets and to report on progress towards meeting the targets. The Metropolitan Transportation Planning Final Rule (23 CFR §450.206), outlines the timelines and processes by which states, MPOs and transit providers must coordinate in target setting. The Final Rule (49 CFR §625 et seq.) establishes a National TAM System to monitor and manage public transportation capital assets to enhance safety, reduce maintenance costs, increase reliability and improve performance. The FTA defines SGR as the condition in which a capital asset is able to operate at a full level of performance. SGR standards must be met in order for an asset to achieve a state of good repair. These SGR standards include:

- The asset can perform its designed function,

- Use of the asset in its current condition does not pose a known and unacceptable safety risk, and
- Life-cycle investment needs of the asset have been met or recovered, including all scheduled maintenance, rehabilitation and replacements.

The FTA identifies four categories of assets—equipment, rolling stock, infrastructure and facilities—and a performance measure for each class. These categories and measures are further discussed in **TABLE 3**. TAM requirements apply to all recipients and sub-recipients of federal financial assistance under Federal Transit Act Chapter 53 (49 USC, Chapter 53) that own, operate or manage capital assets used in providing public transportation.

Under the rule, transit providers are separated into two tiers. All tier I providers (having 101 or more vehicles in peak revenue service or operating rail fixed-guideway service) must develop and implement an individual TAM plan. Group TAM plans are to be developed by a State or a direct recipient to cover tier II transit providers (those with 100 bus vehicles or less and which do not operate any rail service) and all subrecipients under the 5311 Rural Area Formula Program. Native American tribes can elect to participate in a group plan or develop their own TAM plan. Tier II providers must carry out the TAM plan. Transit providers that are also direct recipients of FTA Section 5307 funds must develop their own tier I or tier II TAM plan.

Requirements for TAM plans include:

- TAM plans must include an inventory of capital assets and a condition assessment,
- TAM plans must include a project-based prioritization of investments by year,
- TAM plans must cover at least four years, be updated every four years, and coincide with the Federal Transportation Improvement Program and the Federal Statewide Transportation Improvement Program (FTIP/FSTIP),
- An initial TAM plan must be developed within two years of the effective date of the rule, and
- Tier I providers have additional requirements, including asset

TABLE 3 Transit Ridership (Annual Unlinked Passenger Trips, in Millions)

Fiscal Year	Total	Bus	Demand Response	Light Rail	Heavy Rail	Commuter Rail
2004-05	704.4	611.3	8.1	38.0	36.3	10.7
2005-06	739.4	637.5	7.9	42.0	40.3	11.7
2006-07	757.1	655.0	7.8	41.3	40.9	12.0
2007-06	735.4	627.6	8.3	43.1	43.6	12.7
2007-08	744.0	630.0	8.8	46.0	46.9	12.2
2008-09	707.7	593.7	7.7	46.4	47.9	12.0
2010-11	698.8	583.8	7.9	49.3	46.5	11.3
2011-12	710.8	587.8	8.3	53.8	47.7	13.2
2012-13	722.7	587.6	8.5	63.7	49.5	13.4
2013-14	723.1	586.7	8.9	63.7	50.4	13.4
2014-15	696.2	562.9	9.1	62.8	47.5	14.0
2015-16	655.0	525.4	7.8	62.1	46.0	13.8
2016-17	613.6	478.6	7.2	67.8	45.6	14.4

Source: National Transit Database

management and SGR policy, implementation strategy, list of key annual activities, identification of resources and evaluation plan.

Requirements for target setting include:

- SGR performance targets must be set for the following fiscal year for each asset class and this must be done within three months of the effective date of the rule,
- At least once every fiscal year, every transit provider or group plan sponsor must set performance targets for the following fiscal year, and
- To the maximum extent practicable, a transit provider or group plan sponsor must coordinate with the State and MPO in selecting the State and MPO performance targets

Requirements for documentation and reporting include:

- A transit provider or group plan sponsor must make its TAM plan and any supporting documents available to the State and MPO to aid in the planning process, and
- Annual reports must be submitted to NTD including targets for the following fiscal year, a current assessment of the condition of the provider’s system and a narrative description about the progress made to meet targets set in the previous year

TAM plans are self-certified by the transit provider’s designated Accountable Executive examples could include the Chief Executive Officer, City Manager, or General Manager, who is responsible for ensuring that the necessary resources are available to carry out the plan. FTA will review TAM plans and progress during Triennial and State Management Reviews as well as during MPO Certification Reviews.

TABLE 4 contains the asset categories to be tracked in an asset management plan and the measures the FTA will require. All vehicles will be measured with Useful Life Benchmarks, and facilities will require a condition assessment and the use of the FTA TERM model or a similar tool. Only two agencies, Metro and Metrolink, are currently expected to address the infrastructure category.

PUBLIC TRANSPORTATION AGENCY SAFETY PLAN

On July 19, 2018, the FTA published the Public Transportation Agency Safety Plan Final Rule (49 CFR §673.15) regulating how Chapter 53 grantees would have to implement federally mandated safety standards. The effective date of the rule is July 19, 2019 and the compliance date is July 20, 2020.

The Public Transportation Agency Safety Plan Final Rule identifies new responsibilities for transit providers, states and MPOs. Since MAP-21, FTA has adopted five safety specific rules that establish safety regulatory powers and responsibilities, guide training, and spell out roles, responsibilities and performance measures:

1. Public Transportation Agency Safety Plan Final Rule
2. National Public Transportation Safety Plan
3. State Safety Oversight (SSO) Final Rule
4. Public Transportation Safety Program Final Rule
5. Public Transportation Safety Training Certification Program Final Rule

The Public Transportation Agency Safety Plan Final Rule specifically requires transit agencies employing federal funds to develop a safety plan and annually self-certify compliance with that plan (exceptions are made for commuter rail agencies regulated by FRA, ferries and recipients that only receive section 5310 or 5311 funds). The National Public Transportation Safety Plan adopted four performance measures that must be included in transit agency safety plans:

1. Fatalities
2. Injuries
3. Safety Events
4. System Reliability

These safety performance measures are intended to reduce safety events, fatalities and injuries. These measures are broad so that they will be relevant to all public transportation modes. They are also intended to focus transit

agencies on the development of specific and measurable targets as well as the actions each agency would implement.

Each transit agency must make its safety performance targets available to MPOs to aid in the planning process, and coordinate to the maximum extent practicable with the MPO in the selection of MPO safety targets.

The Final Rule will not take effect until after Connect SoCal is formally adopted. The 2024 RTP/SCS will be the first plan update to comply with this mandate.

METROPOLITAN TRANSPORTATION PLANNING FINAL RULE

MPO requirements for the development of performance measures and target setting are included in the Metropolitan Transportation Planning Final Rule (23 CFR §450.206). Transit safety and TAM targets must be set every four years in the MPO’s Regional Transportation Plan (RTP).MPOs must integrate into their RTP, either directly or by reference, the goals, objectives, performance measures and targets from the transit providers’ TAM plans.

The RTP must include a system performance report evaluating the condition

TABLE 4 Transit Asset Management Requirements

Category	Asset Inventory	Condition Assessment	Performance Targets	Measure
EQUIPMENT	All non-revenue service vehicles and equipment >\$50K used in the provision of public transit, except 3rd-party equipment assets (construction, service vehicles, maintenance)	Only equipment with direct capital responsibility, no 3rd-party assets	Only non-revenue service vehicles	Age (ULB) % of vehicles that have met or exceeded their ULB
ROLLING STOCK	All revenue vehicles used in the provision of public transit (railcars, buses, ferries)	Only revenue vehicles with direct capital responsibility	Only revenue vehicles by vehicle class/mode	Age (ULB) % of revenue vehicles within a particular asset class that have met/exceeded their ULB
INFRASTRUCTURE	All infrastructure used in the provision of public transit (fixed guideway, signal systems, structures, power)	Only infrastructure with direct capital responsibility	Only fixed rail guideway with direct capital responsibility	Performance (%)% of track segments with performance restrictions by class
FACILITIES	All facilities used in the provision of public transit (excluding bus structures) (support, parking, passenger facilities)	Only facilities with direct capital responsibility (excluding bus structures)	Maintenance and administrative facilities, passenger stations, and parking facilities with direct capital responsibility	Condition (TERM)% of facilities with a condition rating below 3.0 on the FTA TERM scale

Source: Federal Transit Administration

and performance of the transportation system with respect to the performance targets, including the progress achieved in meeting the performance targets in comparison with system performance recorded in previous reports including the baseline data. Similarly, the FTIP must include, to the maximum extent practicable, a description of the anticipated effect of the FTIP toward achieving the targets identified in the RTP, which links the investment priorities to those performance targets.

The Metropolitan Transportation Planning Final Rule includes requirements that MPOs, the State and the transit providers cooperatively determine mutual responsibilities in carrying out the metropolitan transportation planning process and that these responsibilities be clearly identified in written agreements among the MPO, the State and the transit providers. Under MAP-21, these metropolitan planning agreements may include jointly agreed upon, specific written provisions for cooperatively developing and sharing information related to transportation performance data and the selection and reporting of performance targets. Otherwise, the written provisions must be documented in some other means, as collectively determined by the MPO, State and transit providers.

The Connect SoCal TAM targets are discussed in the Transit Strategies section of this report.

STANDING FTA REQUIREMENTS OF TRANSPORTATION PROVIDERS

AMERICANS WITH DISABILITIES ACT

Perhaps the most important statutory change to the provision of public transportation over the last 40 years is the Americans with Disabilities Act (ADA) and the Complementary Paratransit Mandate.

The FTA's rulemaking, 49 CFR §37.131 specifies the service criteria for complementary paratransit as:

- (a) *Service Area*—(1) *Bus*.

(i) The entity shall provide complementary paratransit service to origins and destinations within corridors with a width of three-fourths of a mile on each side of each fixed route. The corridor shall include an area with a three-fourths of a mile radius at the ends of each fixed route.

(ii) Within the core service area, the entity also shall provide service to small areas not inside any of the corridors but which are surrounded by corridors.

(iii) Outside the core service area, the entity may designate corridors with widths from three-fourths of a mile up to one and ONE half miles on each side of a fixed route, based on local circumstances.

(iv) For purposes of this paragraph, the core service area is that area in which corridors with a width of three-fourths of a mile on each side of each fixed route merge together such that, with few and small exceptions, all origins and destinations within the area would be served."

In previous analysis of transit system performance, SCAG identified that average demand response trip lengths were growing rapidly and SCAG has initiated further study to produce tools to better forecast, and plan for, long-term changes in demand for paratransit.

METROPOLITAN PLANNING AGREEMENTS

In 23 CFR § 450.314(a), the FTA requires metropolitan planning agreements to be executed between MPOs and providers of public transportation. Specifically, the FTA requires that:

The MPO, the State(s), and the providers of public transportation shall cooperatively determine their mutual responsibilities in carrying out the metropolitan transportation planning process. These responsibilities shall be clearly identified in written agreements among the MPO, the State(s), and the providers of public transportation serving the MPA. To the extent possible,

a single agreement between all responsible parties should be developed. The written agreement(s) shall include specific provisions for the development of financial plans that support the metropolitan transportation plan (see § 450.324) and the metropolitan TIP (see § 450.326), and development of the annual listing of obligated projects (see § 450.334).

In Southern California, there are seven agreements in place, one for each of the six counties including the county transportation commission (CTC) and transit operators, and one with the multi-county commuter rail provider. These agreements acknowledge the important role the county transportation commissions play in the region’s bottom-up transportation planning practice. The agreements specify that local transit agencies will work with their county transportation commission to include projects and programs in SCAG’s RTP/SCS and FTIP.

In 2018, SCAG updated its agreements with following changes:

Metropolitan Transportation Planning Final Rule

- Specific provisions for the development of financial plans that support the metropolitan transportation plan (see § 450.324) and metropolitan TIP (see § 450.326),
- Specific provisions for the development of the annual listing of obligated projects (see § 450.334), and
- Specific written provisions for cooperatively developing and sharing information related to transportation performance data and targets.

TAM Final Rule

- To aid in the planning process, a provider must make available to the MPO its:
 - TAM plan
 - any supporting records or documents
 - performance targets
 - investment strategies, and

- annual condition assessment report

The process outlined in these agreements was used to develop this report.

FTA CERTIFICATIONS AND ASSURANCES AND THE TRIENNIAL REVIEW

The FTA consolidates the certifications and assurances required by federal law or regulations for its programs (49 U.S.C. §5323(n)) into a single document that an applicant for or recipient of federal assistance under 49 U.S.C. Chapter 53 must submit annually or as part of its application for federal assistance. FTA is also required to publish a list of these certifications and assurances annually. These documents are necessary to apply for any federal transit assistance.

Similarly, the Triennial Review is a key tool the FTA uses to establish adherence to federal policies and requirements, as well as grantee performance. Mandated by Congress in 1982, the Triennial Review occurs once every three years. It examines how recipients of Urbanized Area Formula Program funds meet statutory and administrative requirements. The review currently examines up to twenty-one areas. In addition to helping evaluate grantees, the review gives FTA an opportunity to provide technical assistance on FTA requirements and aids FTA in reporting to the Transportation Secretary, Congress, other oversight agencies and the transit community on the Urbanized Area Formula Program.

To assist grantees in preparing for the Triennial Review, FTA conducts workshops, provides training materials, procedural guides and other supporting materials. Useful resources for grantees can be found in the Triennial Review Workshop workbooks.

SCAG supports transit agencies undergoing their Triennial Reviews by providing documentation of regional collaboration in the metropolitan planning and programming processes. None of the strategies in a Metropolitan Transportation Plan requiring FTA funds would be possible to implement without complying with these requirements.

The Triennial Review and the Certifications and Assurances are areas

where SCAG could partner with local agencies to improve the monitoring of plan implementation.

NATIONAL TRANSIT DATABASE (NTD)

The National Transit Database (NTD) is the primary source for information and statistics on transit systems in the United States. Congress requires the NTD to collect financial and service information annually from public transportation agencies that benefit from FTA grants (49 USC §5335(a) and (b)). Each year, the FTA uses performance factors derived from NTD data to apportion over \$9 billion to urbanized areas (UZAs) and states through funding programs such as:

- Section 5307 Urbanized Area Formula Grants
- Section 5311 Formula Grants for Rural Areas
- Section 5329 State Safety Oversight Grants
- Section 5337 State of Good Repair Grants

Transit agencies employing Section 5037 or 5311 federal funds to provide services must report on a broad range of performance data to the NTD. These reports must be consistent with Generally Accepted Accounting Principles (GAAP) and the Uniform System of Accounts and are required to be submitted within four months of the conclusion of a reporting agency's fiscal year.

5307 Program Recipients: Recipients or beneficiaries of the FTA's Urbanized Area Formula Program (FTA 5307) must file annual reports, monthly ridership and safety and security reports with the NTD. These reporters are also called Urban Reporters. Beginning in FY 2011, transit agencies with 30 or fewer vehicles became eligible for reduced reporting requirements, including reporting exemptions for passenger miles, mode-specific capital and operations costs, employee counts, maintenance performance, energy consumption, monthly ridership, and safety data. This is referred to as the Small Systems Waiver and agencies receiving automatic Small Systems Waivers are referred to as Reduced Reporters.

5311 Program Recipients: Recipients or beneficiaries of the FTA's Rural Area Formula Program (FTA 5311) must file annual reports to the rural module of the NTD. These recipients are also called Rural Reporters. States and Indian Tribes report directly to the NTD. States file reports on behalf of their sub-recipient rural transit agencies who do not report directly to the NTD.

Voluntary NTD Reporters: The FTA accepts voluntary NTD reports from other transit systems, both public and private, that serve both urbanized and non-urbanized areas. Voluntary reporters must provide public transportation services and meet the same reporting obligations as mandatory reporters. Some agencies report to the NTD but do not operate transit service. Build Reporters are agencies that benefit from federal funding and are in the process of building transit infrastructure but do not yet operate service. Planning Reporters do not operate transit service but instead receive federal funding and distribute the funds among transit operators in their area.

STATE STATUTORY AND REGULATORY REQUIREMENTS

The following state statutes and regulations affect the provision of public transportation, are requirements for providers or specifically affect the way public transportation must be considered as part of the regional transportation planning process.

SENATE BILLS 375 AND 743

The Sustainable Communities and Climate Protection Act of 2008, Senate Bill (SB) 375 [California Government Code §65080(b)(2)(B)] requires that MPOs develop a Sustainable Communities Strategy (SCS) to reduce per capita greenhouse gas emissions through integrated transportation, land use, housing and environmental planning. SB 375 creates incentives for residential or mixed-use residential projects that may be exempt from, or subject to a limited review of, the California Environmental Quality Act (CEQA), provided they are

consistent with the MPO's adopted SCS. These "transit priority projects" must, among other criteria, be located within one-half mile of a major transit stop or high-quality transit corridor (HQTC).

SB 743, signed into law in 2013, provides further opportunities for CEQA exemption and streamlining to facilitate transit-oriented development (TOD). Specifically, certain types of projects within "transit priority areas" (TPAs) can benefit from a CEQA exemption if they are consistent with an adopted specific plan and the SCS. A TPA is an area within one-half mile of a major transit stop that is existing or planned, if the planned stop is scheduled to be completed within the planning horizon included in a Federal Transportation Improvement Program (FTIP).

SCAG developed a technical methodology for identifying HQTCs and major transit stops based on input from the Regional Transit Technical Advisory Committee (RTTAC), as well as consultation with local agencies, other large MPOs in California, and the Governor's Office of Planning and Research. SCAG's methodology is included as an Appendix to this technical report.

CALIFORNIA AIR RESOURCES BOARD INNOVATIVE CLEAN TRANSIT RULE

In December 2018, the California Air Resources Board (CARB) unanimously voted to adopt the Innovative Clean Transit Rule, which mandates the purchase of zero-emissions buses by transit agencies. The rule takes effect in 2020, but the implementation is phased and the requirements impact agencies differently based on fleet size and air basin.

The rule mandates that agencies must produce a Zero-Emissions Bus Rollout Plan and must begin purchasing zero-emissions buses by either 2023 or 2026, depending on agency size.

A transit agency must submit a Zero-Emission Bus Rollout Plan (Rollout Plan) to the Executive Officer that meets the following requirements.

- A goal of full transition to zero-emission buses by 2040 with careful planning that avoids early retirement of conventional internal

combustion engine buses;

- Identification of the types of zero-emission bus technologies a transit agency is planning to deploy, such as battery electric or fuel cell electric bus;
- A schedule for construction of facilities and infrastructure modifications or upgrades, including charging, fueling, and maintenance facilities, to deploy and maintain zero-emission buses. This schedule must specify the general location of each facility, type of infrastructure, service capacity of infrastructure and a timeline for construction;
- A schedule for zero-emission and conventional internal combustion engine buses purchases and lease options. This schedule for bus purchases must identify the bus types, fuel types and number of buses;
- A schedule for the conversion of conventional internal combustion engine buses to zero-emission buses, if any. This schedule for bus conversion must identify the number of buses, bus types, the propulsion systems being removed and converted to;
- A description on how a transit agency plans to deploy zero-emission buses in disadvantaged communities as listed in the latest version of CalEnviroScreen
- A training plan and schedule for zero-emission bus operators and maintenance and repair staff; and
- Identification of potential funding sources.

Large transit agencies must submit their Rollout Plan by July 1, 2020, and small transit agencies by July 1, 2023.

Per the final rule, a "Large Transit Agency" means either:

- A transit agency that operates either in the South Coast or the San Joaquin Valley Air Basin and operates more than 65 buses in annual maximum service; or
- A transit agency that does not operate in the South Coast or San Joaquin Valley Air Basin and has at least 100 buses in annual maximum

service in an urbanized area with a population of at least 200,000 as last published by the Bureau of the Census before 12/31/2017.

A “Small Transit Agency” means a transit agency that is not a large transit agency.

In any given calendar year, transit agencies must purchase or operate a minimum number of zero-emission buses as determined by the following schedules:

- For a large transit agency:
 - Starting January 1, 2023, 25 percent of the total number of new bus purchases in each calendar year must be zero-emission buses;
 - Starting January 1, 2026, 50 percent of the total number of new bus purchases in each calendar year must be zero-emission buses; and
 - Starting January 1, 2029, all new bus purchases must be zero-emission buses
- For a small transit agency:
 - Starting January 1, 2026, 25 percent of the total number of new bus purchases in each calendar year must be zero-emission buses; and
 - Starting January 1, 2029, all new bus purchases must be zero-emission buses

Based on 2016 and 2017 NTD data, ten transit operators in the SCAG region would be considered large agencies under this requirement: LA Metro, Orange County Transportation Authority, Foothill Transit, City of Los Angeles Department of Transportation, Long Beach Transit, Riverside Transit Agency, Santa Monica’s Big Blue Bus, Omnitrans, Santa Clarita Transit, and Montebello Bus Lines.

CALIFORNIA TRANSPORTATION PLAN 2040 AND STATEWIDE TRANSIT STRATEGIC PLAN

The California Transportation Plan (CTP) 2040 identifies a vision that California’s transportation system is safe, sustainable, universally accessible, and globally

competitive. It provides reliable and efficient mobility for people, goods, and services, while meeting the State’s greenhouse gas emission reduction goals and preserving the unique character of California’s communities. The CTP 2040 goals of improving multi-modal mobility and accessibility, preserving the system, supporting the economy, improving public safety and security, fostering livable and healthy communities/promoting social equity, and practicing environmental stewardship reflect and complement the overall goals of Connect SoCal including the transit element.

The California Statewide Transit Strategic Plan is one of the modal plans under the umbrella of the California Transportation Plan 2040. The Statewide Transit Strategic Plan will highlight a sustainable transportation system that supports the outcomes of the California Transportation Plan, the California State Rail Plan, and the California State Bike and Pedestrian Plan. At this time Caltrans has not published the final Statewide Transit Strategic Plan and it is undetermined when the report will be released.

IMPLICATIONS OF NEW TECHNOLOGY RULES ON THE PROVISION OF PUBLIC TRANSPORTATION

AUTOMATED VEHICLE RULEMAKINGS

In January 2018, the FTA released the Strategic Transit Automated Research Plan. This plan outlines the FTA research agenda for transit bus automation over five years. The plan provides a framework for the transit industry to pursue transit bus automation in a safe, efficient and economically sound manner. Built on a foundation of stakeholder engagement, use case analysis and an extensive literature review, the plan defines activities in the areas of Enabling Research, Integrated Demonstrations and Strategic Partnerships. The plan’s continued emphasis on stakeholder engagement, knowledge transfer and technical assistance ensures that complementary work being done by the public sector, the private sector and academia is effectively communicated and leveraged.

The goal of the effort is to advance transit readiness for automation by:

- Conducting enabling research to achieve safe and effective transit

automation deployments

- Identifying and resolving barriers to deployment of transit automation
- Leveraging technologies from other sectors to move the transit automation industry forward
- Demonstrating market-ready technologies in real-world settings
- Transferring knowledge to the transit stakeholder community

In October 2018, the FHWA released guidance entitled “Preparing for the Future of Transportation: Automated Vehicles 3.0 (AV 3.0).” This document enhances the voluntary guidance provided in AV2.0 and provides a stakeholder input-based policy framework for a broad range of actors considering AV pilots, potentially including manufacturers and technology developers, infrastructure owners and operators, commercial motor carriers, bus transit, and State and local governments. The FHWA’s guidance also provides multi-modal safety guidance, reduces policy uncertainty and clarifies roles, and outlines a process for working with USDOT as technologies evolve.

AV 3.0 also announces and discusses several upcoming rulemakings and other actions being taken in the near future by the Department’s operating administrations, including:

- The National Highway Traffic Safety Administration (NHTSA) will request public comment on a proposal to streamline and modernize the procedures it will follow when processing and deciding exemption petitions.
- The Federal Motor Carrier Safety Administration (FMCSA) will initiate an Advance Notice of Proposed Rulemaking to address automated vehicles, particularly to identify regulatory gaps, including in the areas of inspection, repair and maintenance for ADS.
- The Federal Highway Administration (FHWA) announces plans to update the 2009 Manual on Uniform Traffic Control Devices (MUTCD), taking into consideration new connected and automated vehicle technologies.
- The Federal Railroad Administration (FRA) is initiating research to develop and demonstrate a concept of operations, including system

requirements, for the use of automated and connected vehicles to improve the safety of highway–rail crossings.

- The Maritime Administration (MARAD) and FMCSA are evaluating the regulatory and economic feasibility of using automated truck queuing as a technology solution to truck staging, access and parking issues at ports.
- The Pipelines and Hazardous Materials Administration (PHMSA) is researching the ability to enable the digital transmission of information to first responders before they arrive at an incident that involves hazardous materials.
- The Federal Transit Administration (FTA) has published a five-year research plan on automating bus transit.

MASS TRANSIT EMPLOYEE PROTECTIONS 49 U.S.C. §5333(B)

(Formerly Section 13c of the Urban Mass Transit Act)

When federal funds are used to acquire, improve or operate a mass transit system (public transportation), federal law requires arrangements to protect the interests of mass transit employees (49 U.S.C. § 5333(b), formerly Section 13(c) of the Urban Mass Transportation Act). Section 5333(b) specifies that these protective arrangements must provide for the preservation of rights and benefits of employees under existing collective bargaining agreements, the continuation of collective bargaining rights, the protection of individual employees against a worsening of their positions in relation to their employment, assurances of employment to employees of acquired transit systems, priority of reemployment, and paid training or retraining programs.

The Department of Labor (DOL) must certify that protective arrangements are in place and meet the above requirements for all grants of assistance under the Federal Transit Law before the FTA can release funds. The FTA includes the terms and conditions of the certification and protective arrangements in its contract of assistance with the grant recipient. There is no basis for a waiver or

exemption from the requirements of section 5333(b). A protective arrangement is not a collective bargaining agreement and does not create a collective bargaining relationship where one does not already exist.

In reaction to labor's concern that technology and automation would be particularly harmful to transit employees, Section 13(c)(3) requires that an employee whose position is worsened as a result of federal assistance should receive benefits not "less than those established pursuant to section 5(2)(f) of the Interstate Commerce Act." This language, which was borrowed from railroad labor protections, reflects the basic policy determination that employees should be compensated in the event of any "worsening" (i.e., economic harm, such as loss of a job or reduction in compensation) resulting from their employer's receipt of federal assistance. While the concept of worsening is clearly reflected in the statute, the scope of that protection (that is, what types of employee impacts are covered under a "worsening") remains a subject of debate.

The impacts of this statute are subject to debate but it may establish legal liability for transit properties who replace employees with automated services using federal funds.

SCAG'S ROLE IN PROGRAMMING AND COMPLIANCE

In addition to conducting a cooperative, comprehensive and continuing transportation planning and programming process, SCAG also assists local agencies with grant applications, fund balance tracking, public outreach and a variety of regulatory compliance activities.

FEDERAL TRANSIT ADMINISTRATION GRANT PROGRAMS

SCAG is the Designated Recipient of FTA Urbanized Area Formula Grants under 49 U.S.C. §5307 for the large urbanized areas (UZAs) with populations of 200,000 or more in the SCAG region. As the Designated Recipient of Section 5337 and Section 5339 funds for large UZAs, SCAG is responsible to allocate

the funds to eligible Direct Recipients and track grant activity at the UZA levels. Additionally, SCAG may apply for and pass-through competitive Section 5339 and 5312 funds for specialized transportation programs and projects.

SCAG also plays an important role in the distribution and administration of FTA formula funds to the CTCs. SCAG is responsible for distributing 5307 formula funds to the CTCs for two of the multi-county urbanized areas (UZAs), the Los Angeles – Long Beach – Anaheim UZA and the Riverside – San Bernardino UZA. SCAG works with the CTCs to compile the allocation of 5307 funds to the transit operators and provides a concurrence letter to FTA that demonstrates a grant recipient's project is programmed in a federally approved FTIP. In addition to the formula allocations and concurrences, SCAG also monitors 5307 grant awards within the UZAs in which SCAG is the Designated Recipient through quarterly reports to the CTCs that ensure available funds do not lapse.

ANALYTICAL APPROACH

This report is a summary of the work performed in the development of Connect SoCal. Three key efforts provided the backbone of the existing conditions analysis:

- **2015–16 System Performance Analysis:** an analysis of transit performance at the regional level, focused on service provided and consumed and measures of efficiency and cost-effectiveness over a ten-year period up to 2016, Connect SoCal's "base year" of analysis.
- **2015–16 Peer Regions Performance Benchmarking Analysis:** a comparison of Southern California's transit systems system performance to that of 11 other large metropolitan regions.
- **Emerging Trends in Public Transportation Analysis:** analyses of demographic change, the new technologies and declining demand for transit use.

Additional SCAG efforts include the SCAG/UCLA study titled *Falling Transit Ridership: California and Southern California*, the TAM target setting effort, and adaptation and resilience planning for transit operators.

This section will discuss the performance-based planning analytical framework, the selection of performance measures for this effort and the data used in this report.

PERFORMANCE-BASED PLANNING

In the *National Cooperative Highway Research Program Report 446: A Guidebook for Performance Based Transportation Planning (2000)*, the US DOT defines performance-based planning and programming as an approach to applying performance management principles to transportation system policy and investment decisions. It is a data-driven process that can identify strategies and investments at the system or corridor levels and can “provide a nuanced means of assessing progress toward meeting the intent of the RTP.”

Within the context of transportation planning, the FHWA defines performance-based planning as “selecting investments to most effectively and efficiently achieve desired outcomes, as determined through public input and agency strategic direction. A Performance-Based Planning and Programming (PBPP) process becomes cyclical with information on the performance of the system and the expected benefits of system improvements strategically directing investments.”

The FHWA sees performance-based planning processes as potentially integrated into all of the processes of MPOs. The text below, quoted from the FHWA’s *Performance-Based Planning and Programming Guidebook*, outlines the benefits of integrating performance-based processes into statewide and metropolitan planning processes.

Performance-based planning and programming (PBPP) refers to the application of performance management within the planning and programming processes of transportation agencies to achieve desired performance outcomes for the multimodal transportation system. This includes a range of activities and products undertaken by a transportation agency together with other agencies, stakeholders and the public as part of a 3C (cooperative, continuing, and comprehensive) process. It includes development

of: long-range transportation plans (LRTPs), other plans and processes (including those Federally-required, such as Strategic Highway Safety Plans, Asset Management Plans, the Congestion Management Process, Transit Agency Asset Management Plans, and Transit Agency Safety Plans, as well as others that are not required), and programming documents, including State and Metropolitan Transportation Improvement Programs (STIPs and TIPs). PBPP attempts to ensure that transportation investment decisions are made – both in long-term planning and short-term programming of projects – based on their ability to meet established goals.

The FTA’s Policy on Performance Measurement provides a framework for refining the administration’s performance measures and ensuring consistency in measures. The policy stresses the importance of linking measures to goals, providing clear, concise measures and starting from a validated baseline. The integration of goals, targets, indicators, and a validated background is important to accurately measure the impact of plans and policies in the transportation planning process.

SCAG has incorporated performance-based planning aspects of performance management into the RTPs since 1998 and encouraged performance-based planning throughout the region. For the 2004 RTP, SCAG developed a set of measurable goals and outcomes that included the principal of sustainability, which is not limited only to the environment and the transportation-land use connection but also has important implications on how the region meets its critical system preservation needs.

MAP-21 AND PERFORMANCE-BASED PLANNING

MAP-21 continues to reinforce the importance of performance-based planning in the RTP process, while also reinforcing the importance of maintaining a state of good repair for transportation infrastructure and assets. MAP-21 mandates state and local target setting in the following national goal areas:

- Safety

- Infrastructure Condition
- System Reliability
- Freight Movement and Economic Vitality
- Environment sustainability; and
- Reduced project delivery delays

The legislation amends 23 U.S.C §150(c) to require MPOs to work in collaboration with transit agencies and state DOTs to establish performance measures consistent with performance targets related to TAM and transit safety, as set forth in 49 U.S.C. §5326(c) and §5329(d).

MAP-21 also mandates RTPs must employ performance-based planning, that RTPs must include a System Performance Report, and that FTIPs must include “a description of the anticipated progress brought about by implementing the FTIP towards achieving the performance targets.”

SUBSEQUENT FEDERAL ACTIONS

Subsequent to the enactment of MAP-21, several new laws have been enacted that will affect future transit performance measurement at SCAG.

Statutory Action: The most notable was the Fixing America’s Surface Transportation Act (FAST ACT) was signed into law by President Obama on December 4, 2015. This statute amends Chapter 53 of Title 49 reauthorizing surface transportation programs through the end of Federal Fiscal Year 2019-20. Key provisions of the FAST Act include an increase in transit program funding, increased Buy America requirements, discretionary bus programs and funding towards improving the nation’s transit systems’ state of repair.

Regulatory Action: The second set of Federal Actions to affect performance-based planning are a series of federal rulemaking mandated by MAP-21. These are further discussed in the Regulatory Framework section of this technical report.

PERFORMANCE MEASURE SELECTION

Staff conducted a review of planning documents, reports and resources to assess what types of performance measures should be analyzed on an annual basis, what modes should be analyzed and which transit properties should be included in the analysis. The input was also sought from the RTTAC, consisting of representatives from the region’s transit providers and county transportation commissions.

The *Transit Cooperative Research Program Report 88: A Guide Book for Developing a Transit Performance Measurement System* divides transit performance measures into eight distinct categories: availability, service delivery, community/transit impact, travel time, safety and security, maintenance and construction, economic and capacity. These performance measurement categories can also be broken into four levels of analysis: agency, customer, vehicle/driver and community.

The measures used in this analysis focus on travel time, maintenance and economic categories – particularly cost effectiveness and cost efficiency. Data reported to NTD by transit agencies allow for analysis to be conducted most easily at the agency level. NTD data is not an effective tool for measuring service as it is experienced by the passenger.

Cost-efficiency measures evaluate the ability of an agency to provide service given existing funding constraints, without examining the consumption of service. These measures simply demonstrate the ability of an agency to provide outputs of transit service (revenue hours, revenue miles) given certain inputs (labor, operating expenses). These measures are used by most transit agencies to track system performance.

Cost-effectiveness measures assess both supply and demand. How well is a system meeting community demand for transit service within existing financial constraints? Given the demand-side characteristics of these measures, they more clearly represent the individual conditions of any particular service area since transit demand varies widely over space. These measures are therefore less useful for inter-agency benchmarking than cost efficiency measures.

The ratio of passenger volume to service provided forms the basis for most

productivity measures. Typically measured in passengers per hour or per mile, these figures are affected by demand, service area size and characteristics, vehicle speeds, and the amount of service provided.

Maintenance measures analyze the state of an agency's capital stock and the effectiveness of its maintenance programs. Fleet average-vehicle-age measures the age of an agency's fleet and allows for medium-term planning assumptions about maintenance and vehicle replacement needs. These data are reported in fleet average age in years in this resource.

Mobility, the ability of travelers to move between a variety of origins and destinations, is one of the key goals of regional planning at SCAG. The average speed at which a transit vehicle moves is a useful proxy variable for travel time, a component of mobility. While this variable does not compare travel speeds to other modes, or assess individual trip times, it does assess the impact of congestion, route directness, dwell and boarding/alighting times, signal times, and other variables on providing relatively quick transit trips.

NTD PERFORMANCE DATA USED IN THIS REPORT

The NTD data and used in this report are listed below, along with the NTD definitions.

Capital: Expenses related to the purchase of capital equipment and financing capital projects. Equipment means an article of non-expendable tangible personal property having a useful life of more than one year and an acquisition cost, which equals the lesser of the capitalization level established by the government unit for financial statement purposes or \$5,000. Capital expenses are non-annually recurring and do not include operating expenses (OE) that are eligible to use capital funds, such as preventative maintenance.

Directional Route Miles (DRM): The mileage in each direction over which public transportation vehicles travel while in revenue service. DRM are a measure of the route path over a facility or roadway, not the service carried on the facility; the number of routes, vehicles or vehicle revenue miles. Computed with regard to the direction of service but without regard to the number of traffic lanes or rail tracks existing in the right-of-way (ROW). DRM do not

include staging or storage areas at the beginning or end of a route.

Fare Revenues: All income received directly from passengers, paid in cash, through pre-paid tickets or with passes. It includes donations from those passengers who donate money on the vehicle. It includes the reduced fares paid by passengers in a user-side subsidy arrangement.

Passenger Miles Traveled (PMT): The cumulative sum of the distances ridden by each passenger.

Operating Expenses (OE): The expenses associated with the operation of the transit agency, classified by function or activity and the goods and services purchased. The basic functions and object classes are defined in Section 5.2 and 6.2 of the Uniform System of Accounts (USOA). These are consumable items with a useful life of less than one year or an acquisition cost of which equals the lesser of the capitalization level established by the government unit for financial statement purposes, or \$5,000.

Revenue Service (Miles, Hours, and Trips): The time when a vehicle is available to the general public and there is an expectation of carrying passengers. These passengers either:

- Directly pay fares
- Are subsidized by public policy
- Provide payment through some contractual arrangement

Vehicles operated in fare-free service are considered in revenue service. Revenue service includes layover/recovery time. Revenue service excludes:

- Deadhead
- Vehicle maintenance testing
- School bus service
- Charter service

Vehicles Operated in Annual Maximum Service (VOMS): The number of revenue vehicles operated to meet the annual maximum service requirement. This is the revenue vehicle count during the peak season of the year, on the

week and the day that maximum service is provided. VOMS exclude atypical days and one-time special events.

Vehicle Revenue Hours (VRH): The hours that vehicles are scheduled to or are actually travel while in revenue service. Vehicle revenue hours include layover/ recovery time. Vehicle revenue hours exclude:

- Deadhead
- Operator training
- Vehicle maintenance testing
- School bus and charter services

Vehicle Revenue Miles (VRM): The miles that vehicles are scheduled to or are actually travel while in revenue service. Vehicle revenue miles include layover/ recovery time but exclude:

- Deadhead
- Operator training
- Vehicle maintenance testing
- School bus and charter services

Unlinked Passenger Trips (UPT): The number of passengers who board public transportation vehicles. Passengers are counted each time they board vehicles no matter how many vehicles they use to travel from their origin to their destination.

EVOLVING NTD REPORTING

Over the past several years, three key trends have affected the NTD time series data. These are:

1. New modes reported
2. Reduced reporting categories for small reporters
3. New reporters in the SCAG Region

NEW MODES REPORTED

In the past ten years, the NTD has added new modes to the database. In the SCAG region, two new modes have had a significant impact on the time series – Bus Rapid Transit and Commuter Bus. The Commuter Bus mode first appears in FY 2010–11 and the Bus Rapid Transit mode first appears in FY2011–12. Most of the data for these modes was previously reported in the Motor Bus mode and there are several places in this report where the two new modes are combined with the motor bus mode to maintain the time series. This is referred to as the “Combined Bus” mode.

REDUCED REPORTERS

Prior to 2011, agencies operating less than ten revenue vehicles were granted a waiver from reporting financial and service data. Agencies receiving this waiver, called the “9 or Fewer Vehicles Waiver”, were still required to report basic information about their agency, including the number of vehicles operated in maximum service (VOMS) for each mode of service they offered. In 2011, the “9 or Fewer Vehicles Waiver” was eliminated and replaced by the “Small Systems Waiver” (SSW). This policy required all agencies receiving FTA Urbanized Area Formula Program funding to report financial and service data. Agencies operating 30 or fewer VOMS and no fixed guideway or high-intensity busway can report a condensed version of the full NTD report with only basic financial and service data. In 2014, SSWs were renamed Reduced Reporters. Unlike Full Reporters, Reduced Reporters do not estimate passenger miles traveled and do not provide monthly reports.

NEW REPORTERS

Local circulator and demand-response services are provided by a variety of transit properties throughout LA County. More localized providers are referred to as the “local operators.” They are typically municipally-owned and provide demand-response or circulator services within jurisdictional boundaries. These operators are represented in the planning process via Metro’s Local Transportation Systems Subcommittee (LTSS) of the Technical Advisory Committee. Historically, these agencies reported as one combined line item

in the urban database. In FY 2015–16, these agencies began reporting their performance data directly to NTD.

OUTREACH

Outreach for Connect SoCal has been performed through a framework established by the SCAG in its Public Participation Plan. This document was adopted by SCAG’s Regional Council on September 6, 2018. It is a federally mandated document and outlines a variety of strategies for reaching out to the general public, community organizations, public agencies, the business community and elected officials. Further description of the Connect SoCal outreach efforts is included in the Public Participation technical report.

Interagency coordination for the transit element of Connect SoCal was primarily conducted through the Regional Transit Technical Advisory Committee (RTTAC). This group, made up of representatives of transit agencies, the six CTCs and Caltrans, meets quarterly to discuss transit issues including regulatory compliance, performance, and technology and mobility innovations.

Additionally, outreach was performed as a part of the development of TAM targets for Connect SoCal. This has included meetings with the CTCs, TAM Workshops, and presentations to local committees including the LA County Bus Operators Subcommittee, the Ventura County Transit Operators Committee and FTA workshops.

EXISTING CONDITIONS

INSTITUTIONAL ARRANGEMENTS AND STAKEHOLDERS

SCAG is the largest MPO in the United States, consisting of approximately 38,000 square miles and bounded by Mexico, Arizona, and Nevada, in addition to Kern, Inyo, San Diego and Santa Barbara counties. The region is home to approximately 19 million residents and contains 14 urbanized areas (UZAs), as designated by the United States Census Bureau.

These UZAs are important to understanding transit governance as federal funds for transit distributed under Chapter 53 of the United States Code are typically apportioned by UZA.

The SCAG Region is divided into 15 subregional units, most of which are represented by subregional Councils of Government. Two subregions are also CTCs, the Imperial County Transportation Commission and the San Bernardino County Transportation Authority.

Each of the six counties in the SCAG Region is served by a state–designated CTC, created pursuant to California Public Utilities Code Sections 130050 and 132800. These entities were created to further the goal of local control over transportation planning and are key partners in developing SCAG’s plans and programs:

- Imperial County Transportation Commission (ICTC)
- Los Angeles County Metropolitan Transportation Authority (Metro)
- Orange County Transportation Authority (OCTA)
- Riverside County Transportation Commission (RCTC)
- San Bernardino County Transportation Authority (SBCTA)
- Ventura County Transportation Commission (VCTC)

The CTCs play an important role in selecting transit projects for inclusion in the RTP and FTIP, apportioning local, state and federal transit funds amongst the various transit properties, and guiding the local vision for public transportation in their respective counties. The CTCs help to build local support and consensus for long–range projects, and fund, design and build projects in the short range.

There are 68 fixed route operators in the region and over 100 providers of various specialized services, including community circulators, ferries, dial–a–rides, ADA mandated paratransit and specialized services operating beyond the ADA. These agencies are administered through a wide variety of governance structures. The three most significant types are wholly–owned municipal transit properties (both fixed route and demand response), joint powers structures, and four CTCs who also operate transit service. Two of the CTCs, Metro and OCTA, are also designated as transit districts by the State of California. VCTC

and ICTC also operate transit service.

Seven Joint Powers Authority (JPA) operators provide fixed route bus service at a subregional scale through multiple jurisdictions. These include the Antelope Valley Transit Authority (AVTA), Foothill Transit, Gold Coast Transit District, Omnitrans, Riverside Transit Agency (RTA), SunLine Transit Agency and Victor Valley Transit Authority (VVTa). Additionally, the Southern California Regional Rail Authority (SCRRA) operates commuter rail service under the Metrolink service brand at a regional scale.

TRANSIT SYSTEMS BY COUNTY

Within Imperial County, the bulk of service is operated by Imperial Valley Transit (IVT), a service brand of ICTC. IVT currently operates service between municipalities in the Imperial Valley and is seeking to establish a series of local circulators. The services are a mix of small urban and rural transit services. Circulator services are also historically provided within the City of Calexico by the Calexico Transit System.

Los Angeles (LA) County is one of the most robust transit markets in the nation. The Los Angeles–Long Beach–Anaheim CA UZA, composed primarily of LA and Orange Counties, provided the second largest share of transit trips of all UZAs nationally in FY2013–14. Agencies in the Los Angeles–Long Beach–Anaheim CA UZA also provided the third largest total of passenger miles traveled nationally. Given the size and productivity of transit service in LA County, it's no surprise that transit service provision is extraordinarily complex.

Transit service in LA County can be divided into three categories—Metro service, the LA County Municipal Operators and local and specialized providers.

Metro: Metro is typically the third or fourth largest provider of transit trips in the nation in any given year and provides the vast bulk of all transit trips in the SCAG Region. Their service area includes the portions of Los Angeles County south of the Angeles National Forest. Metro operates multiple transit modes, including light rail, heavy rail, bus rapid transit and fixed route bus services. In cities or subregions where there are local operators, Metro often

operates trunk routes and serves long-distance markets. Metro funds Metrolink service in LA County.

Metro is a designated transit district per Chapter 4, Article 1, Section 99213 of the California Public Utilities Code.

LA County Municipal Operators: The municipal operators of transit, called the Munis, consist of 13 municipal transit properties and two joint powers operators. These operators are designated as eligible recipients of federal formula funds via Chapter 4, Article 1, Section 99207.5 of the California Public Utilities Code. Most offer fixed route services between jurisdictions, though the municipal operators' service areas tend to be centered around the jurisdiction that owns them. In most cases, these operators provide the bulk of local trips within their service area while Metro service is overlaid to support longer distance trips.

Some of the Munis have fairly small service areas, such as Beach Cities or Culver City Transit. Others, including Long Beach Transit and Foothill Transit, have very large service areas. Foothill is a JPA operator serving as the primary fixed route operator in the San Gabriel Valley, an LA County subregion with two million residents. AVTA is a JPA and the sole provider of fixed route bus service in the Lancaster–Palmdale UZA.

Specialized and local operators: Local circulator and demand–response services are provided by a variety of transit properties throughout LA County. Access Services of Los Angeles, Incorporated (ASI), is the largest provider of ADA paratransit trips in the county and provides some or all complementary ADA paratransit service for Metro and various municipal bus operators. ASI's service area includes the entire county and they are unique in that respect. Similarly, the Pomona Valley Transit Authority is a JPA providing demand–response service in eastern Los Angeles County.

More localized providers are referred to as the “local operators.” They are typically municipally owned and provide demand–response or circulator services within jurisdictional boundaries.

These operators are represented in the planning process via Metro's Local Transportation Systems Subcommittee (LTSS) of the Technical Advisory Committee. In FY 2015–16, these agencies began reporting their performance data directly to NTD.

Within Orange County, OCTA operates the second largest fixed-route bus transit fleet in the SCAG Region. Additionally, OCTA operates ADA paratransit and funds Metrolink commuter rail service. OCTA will soon be starting construction of the OC Streetcar in the cities of Santa Ana and Garden Grove. The City of Laguna Beach and the Anaheim Transportation Network operate local circulator services using local transportation funds. Several cities in Orange County operate seasonal shuttles using mostly OCTA funding. OCTA also operates the City of Irvine iShuttle, which is funded cooperatively between the City and OCTA.

OCTA is a designated transit district per Chapter 4, Article 1, Section 99213 of the California Public Utilities Code.

In Riverside County, RTA and SunLine Transit primarily operate fixed route bus service. RTA's service area is the western half of Riverside County and SunLine's service area is the Coachella Valley. RCTC funds the county's participation in regional commuter rail service via Metrolink and the cities of Riverside and Corona respectively operate demand response and local circulator service.

Rural transit service in southwestern Riverside County is provided by the Reservation Transportation Authority, a collaborative of 18 federally recognized tribal groups. The cities of Banning and Beaumont also provide service via the Pass Transit service brand, and Desert Roadrunner service is provided in the City of Blythe and unincorporated eastern Riverside County by the Palo Verde Valley Transit Agency.

Omnitrans is the largest agency in southern San Bernardino County and the Victor Valley Transit Authority (VVT) provides fixed route service in the Victorville–Hesperia UZA. SBCTA funds the county's participation in Metrolink.

Rural fixed route transit is provided by several operators in San Bernardino County, including Mountain Transit, Morongo Basin Transit Authority (MBTA), Needles Area Transit and VVT.

The largest operator of fixed route bus service in Ventura County is the Gold Coast Transit District (GCTD). Their service area is centered on the western end of the county and extends as far north as the city of Ojai. Simi Valley Transit, Thousand Oaks Transit, Moorpark City Transit and Camarillo Area Transit are municipally owned transit properties providing service within their respective jurisdictions. The Ventura Intercity Service Transit Authority (VISTA) operates service between jurisdictions. VCTC owns and operates VISTA and funds Ventura County's participation in Metrolink. The Ojai Trolley provides rural transit service in and around the City of Ojai and Valley Express provides service to Fillmore, Santa Paula and Piru.

GCTD is a designated transit district pursuant to Chapter 4, Article 1, Section 99213 of the California Public Utilities Code.

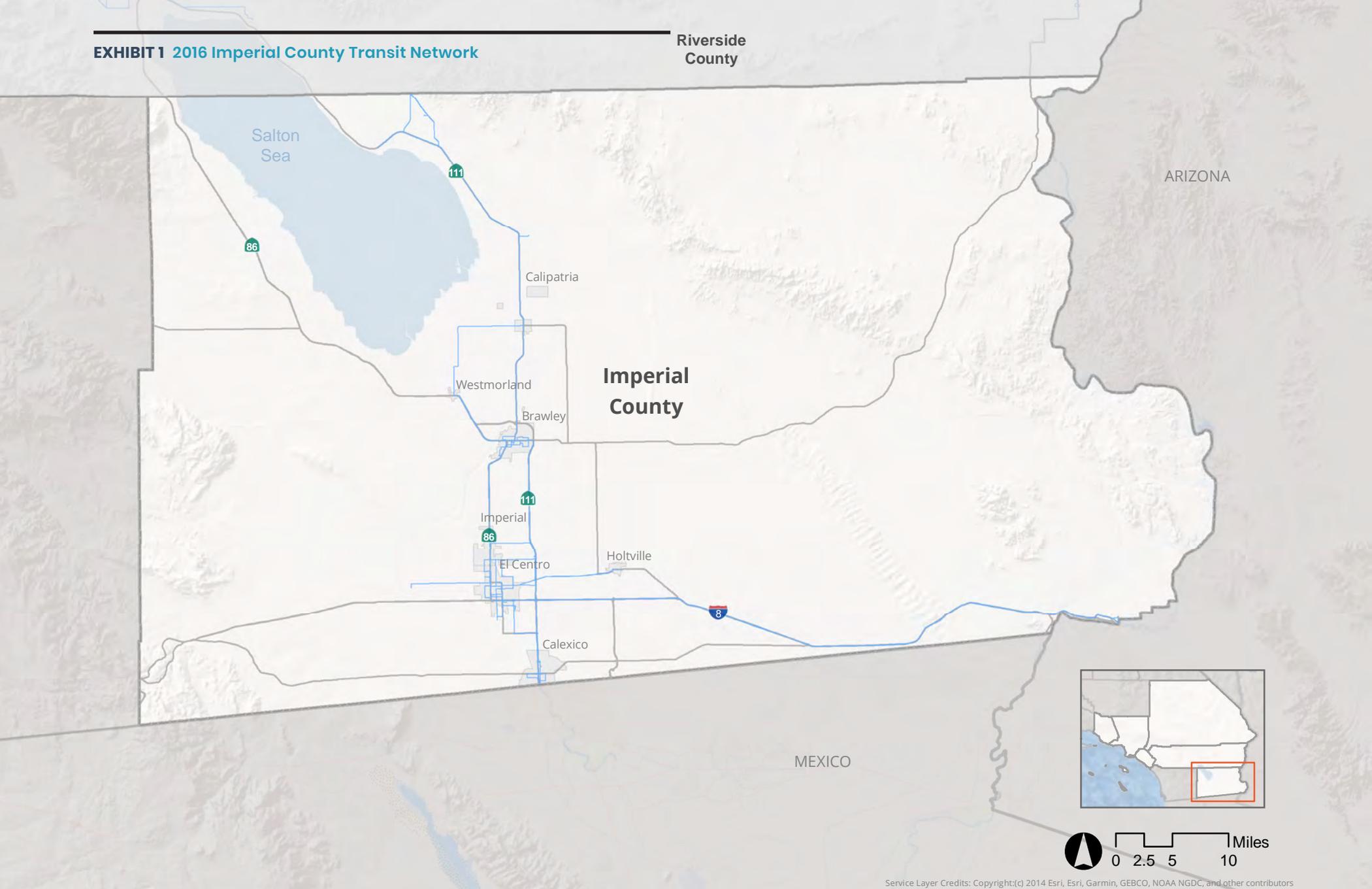
Metrolink is the commuter rail operator in the SCAG region, operating 165 daily trains on seven different lines on 536 route miles. These lines are the Antelope Valley Line, connecting Los Angeles to Palmdale and Lancaster in the Antelope Valley; the Inland Empire/Orange County Line (IEOC), connecting San Bernardino and Riverside with Oceanside via Orange County; the Orange County Line, operating between Los Angeles and Oceanside through Orange County; the Riverside Line from Los Angeles to downtown Riverside; the San Bernardino Line, between Los Angeles and the City of San Bernardino; the Ventura County Line, operating between Los Angeles and East Ventura via the San Fernando Valley; and the 91 Line, operating between downtown Los Angeles to downtown Riverside via Fullerton and along the SR 91 corridor. The Orange County Line extends south to Oceanside in San Diego County, where it connects with the COASTER commuter rail service to San Diego and the SPRINTER rail service inland to Escondido. Both of these services are operated by the North County Transit District (NCTD).

Metrolink is discussed in greater detail in the Passenger Rail Technical Report.

In addition to the services listed above, several transit agencies provide service outside the boundaries of the SCAG Region. VISTA in Ventura County provides service into neighboring Santa Barbara County. The Eastern Sierra Transit Authority provides thrice-weekly service to Mammoth via the Owens Valley, with connections to Reno, Nevada and Yosemite National

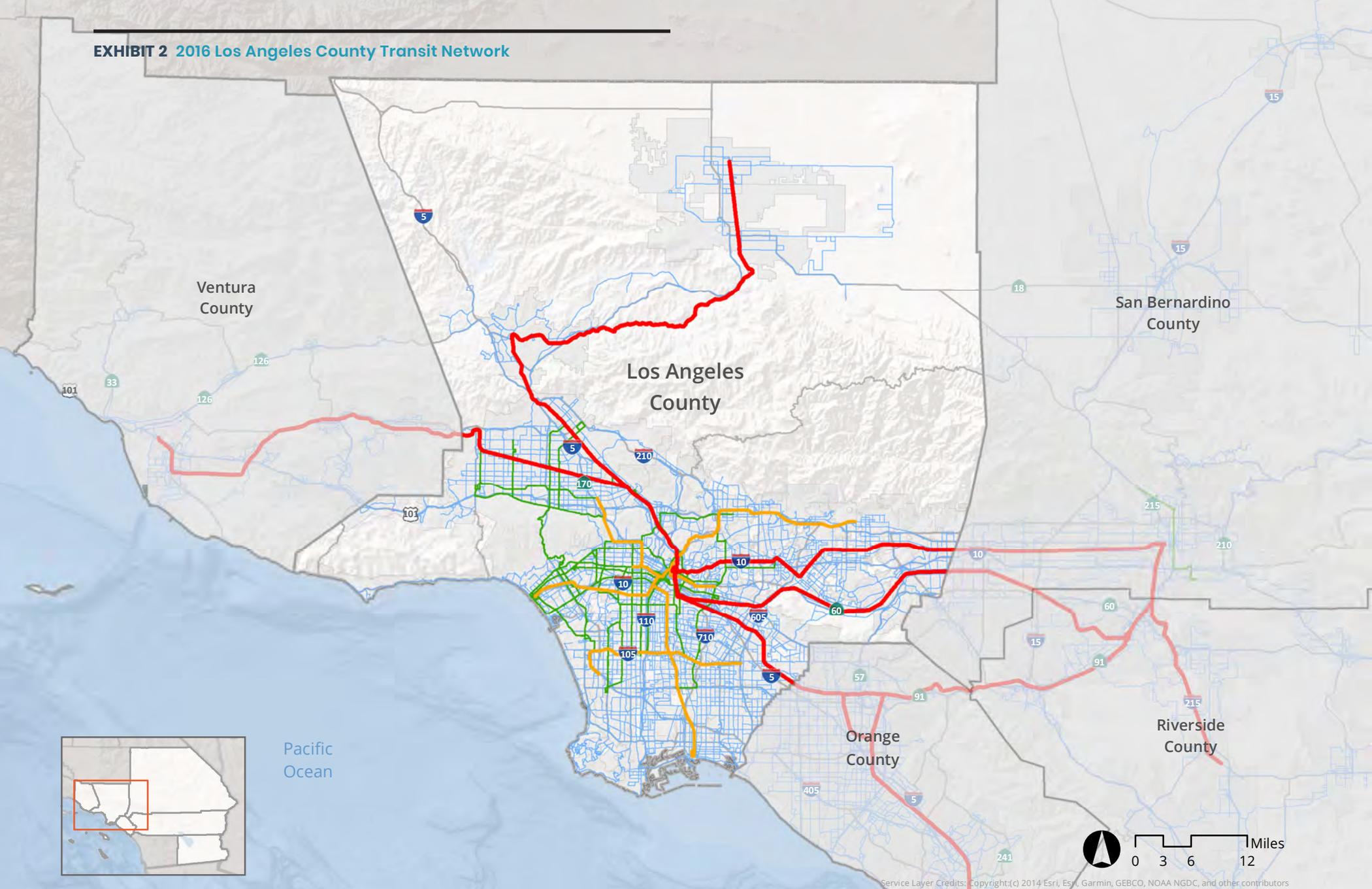
EXHIBIT 1 2016 Imperial County Transit Network

Riverside
County



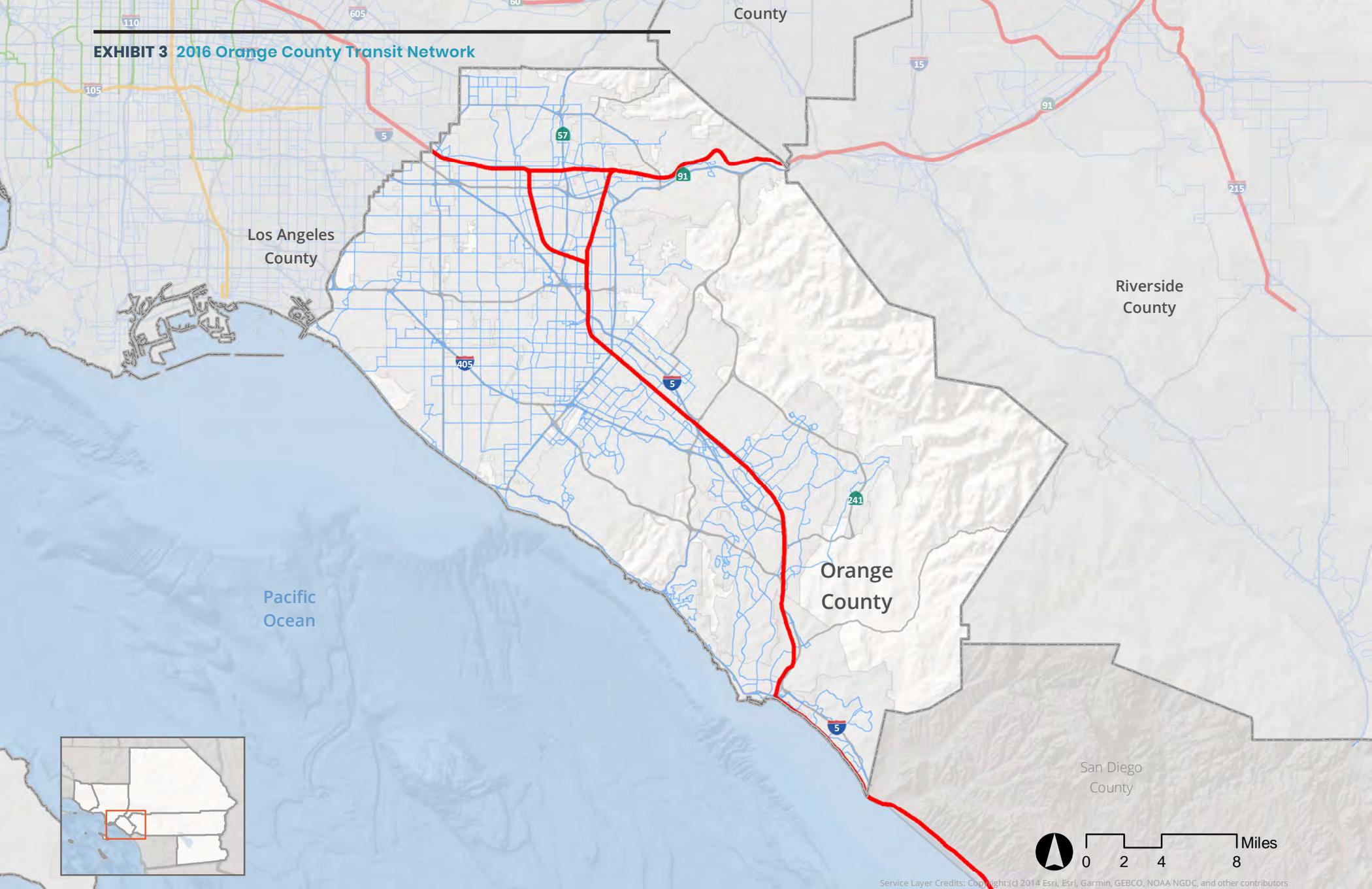
Metrolink (2016) Urban Rail (2016) Rapid Bus and Bus Rapid Transit (2016) Bus Routes (2016)

EXHIBIT 2 2016 Los Angeles County Transit Network



 Metrolink (2016)  Urban Rail (2016)  Rapid Bus and Bus Rapid Transit (2016)  Bus Routes (2016)

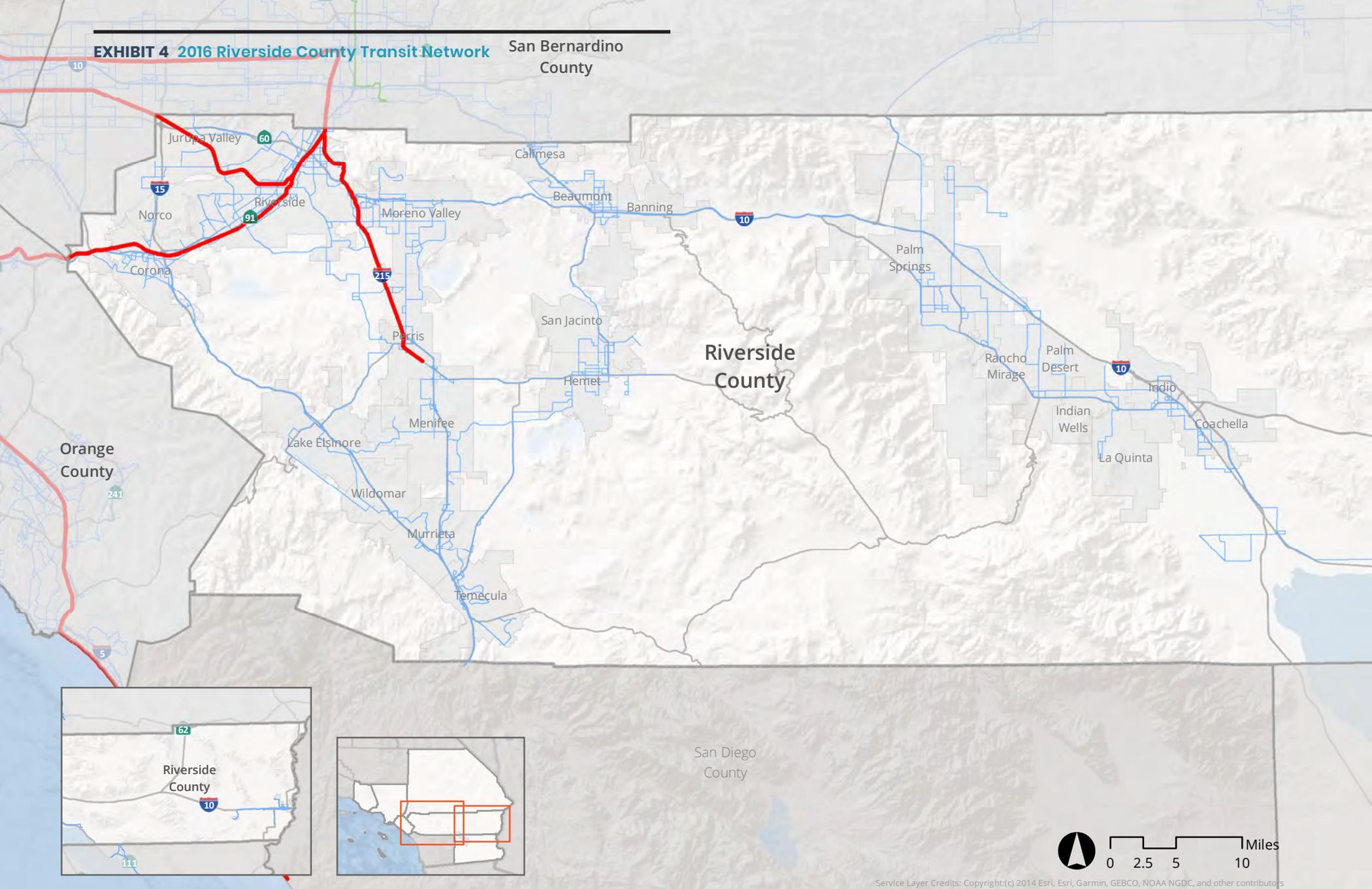
EXHIBIT 3 2016 Orange County Transit Network



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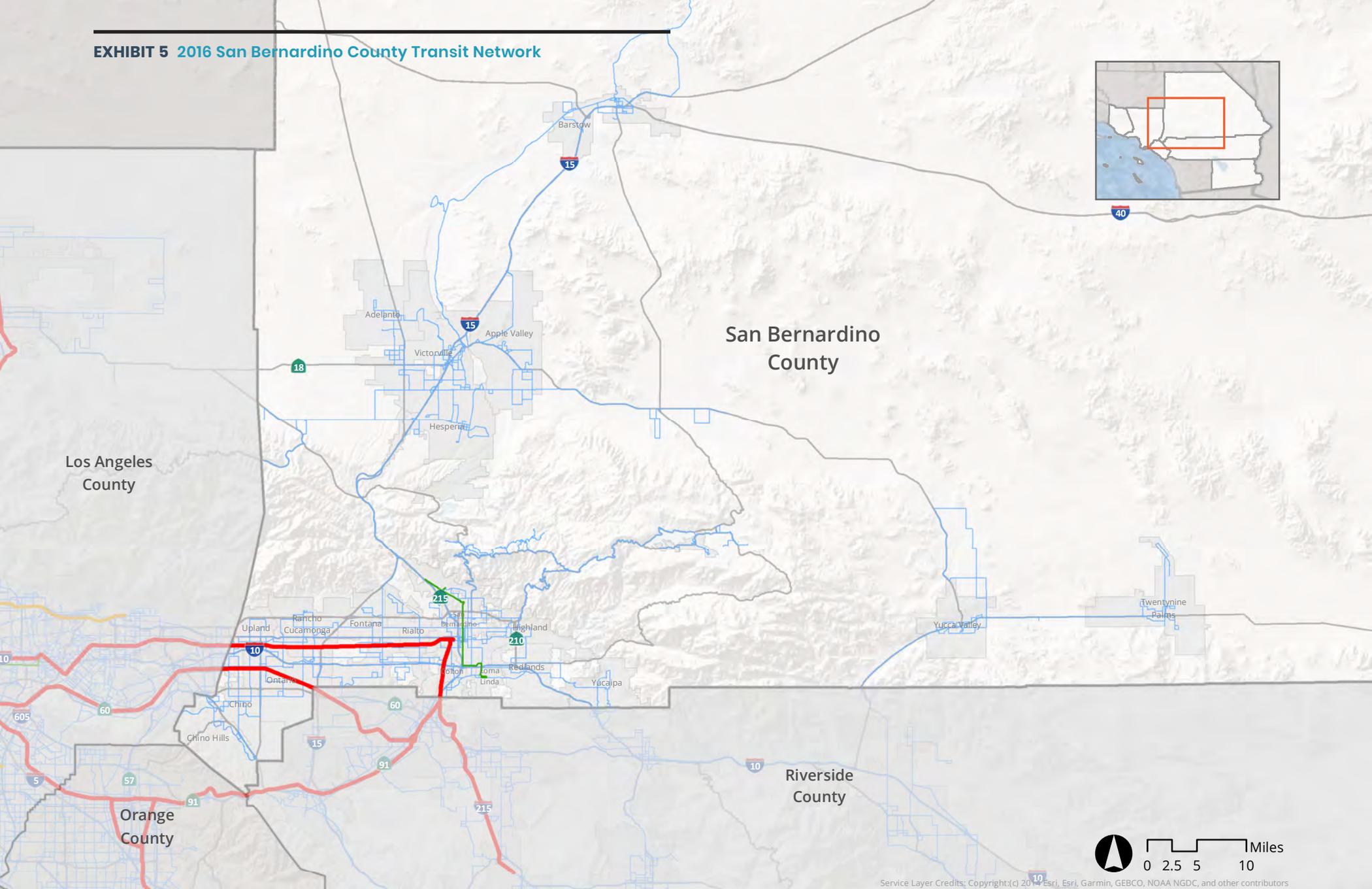
-  Metrolink (2016)
-  Urban Rail (2016)
-  Rapid Bus and Bus Rapid Transit (2016)
-  Bus Routes (2016)

EXHIBIT 4 2016 Riverside County Transit Network



↗ Metrolink (2016)
 ↗ Urban Rail (2016)
 ↗ Rapid Bus and Bus Rapid Transit (2016)
 ↗ Bus Routes (2016)

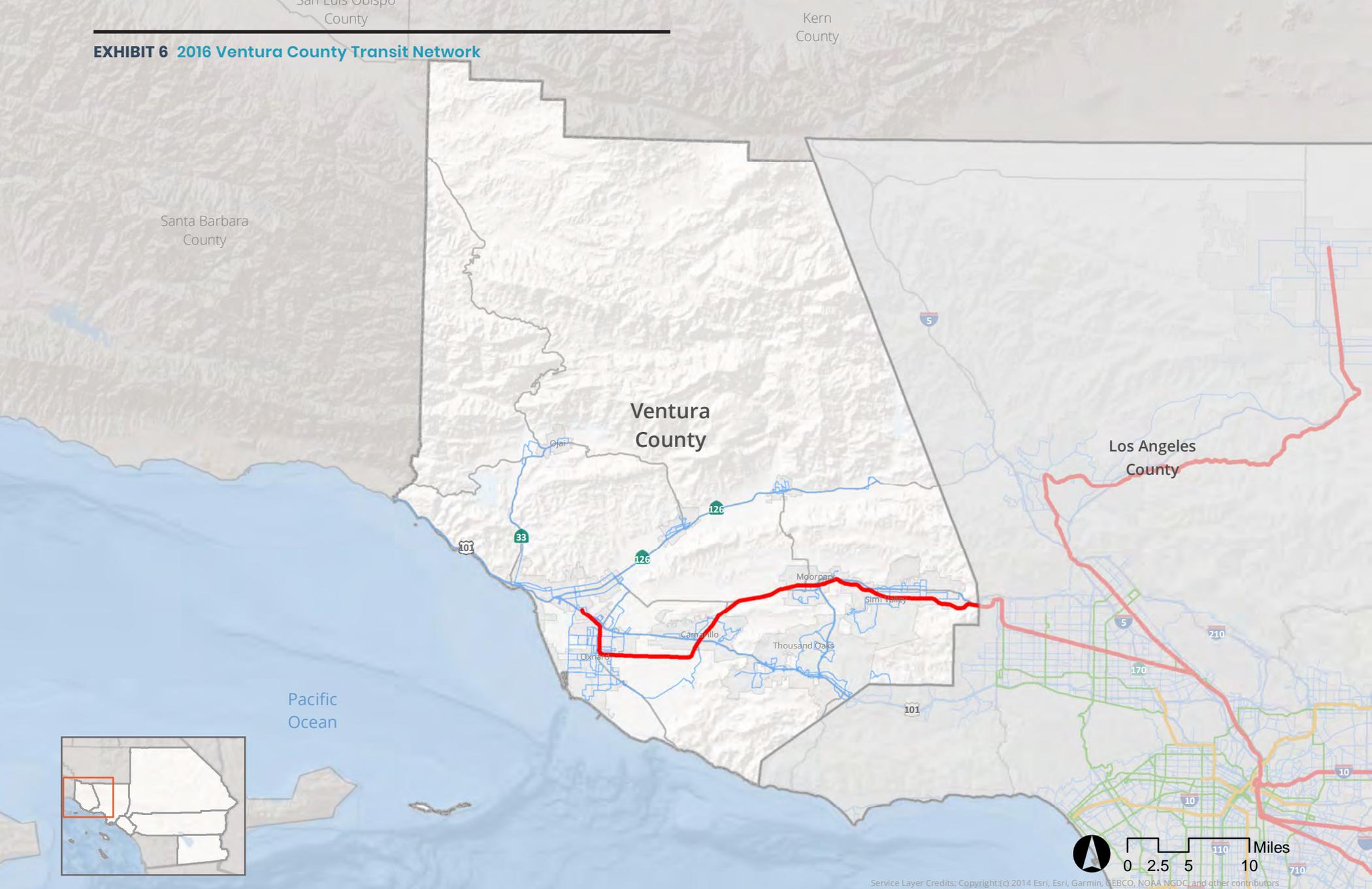
EXHIBIT 5 2016 San Bernardino County Transit Network



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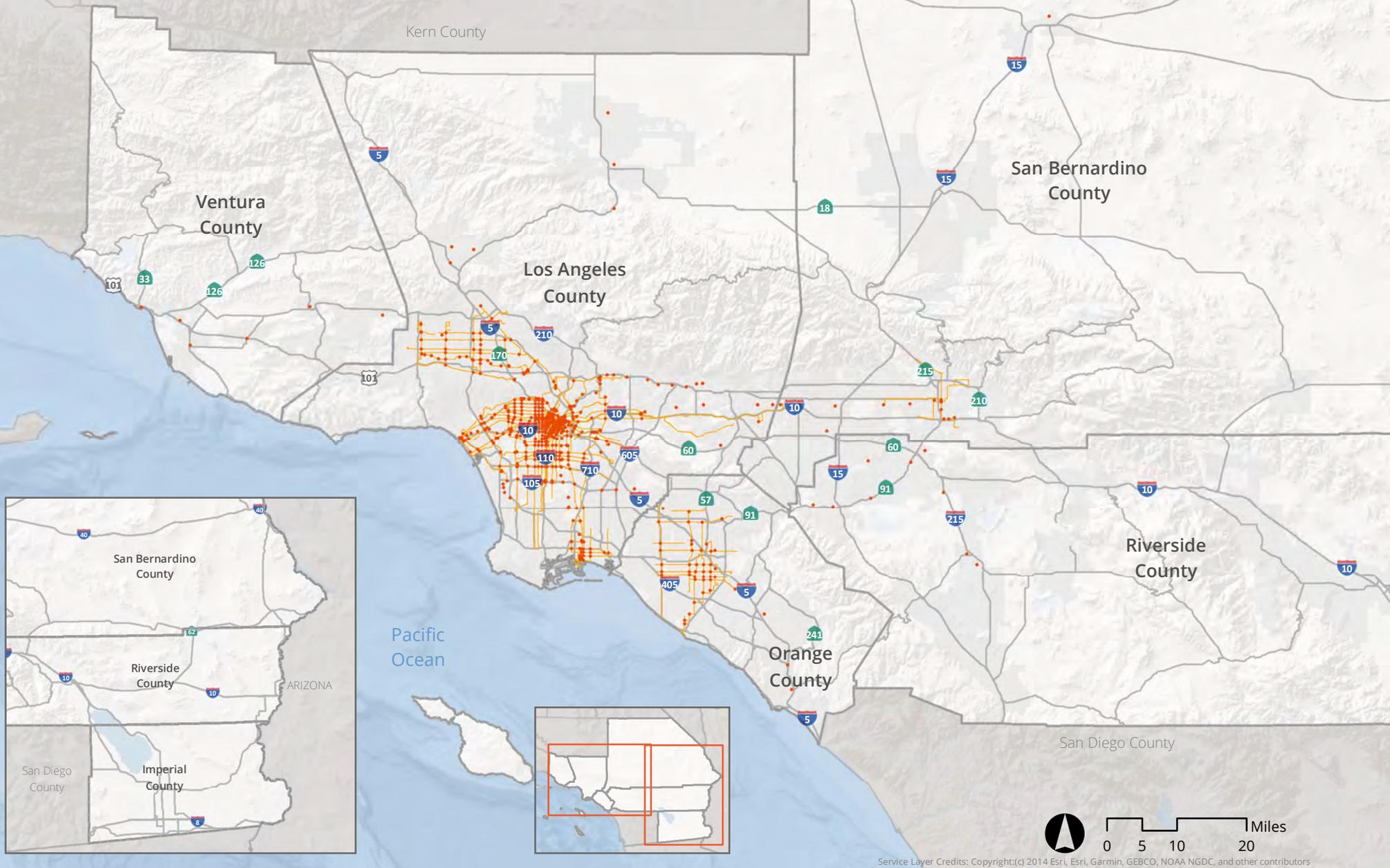
 Metrolink (2016)  Urban Rail (2016)  Rapid Bus and Bus Rapid Transit (2016)  Bus Routes (2016)

EXHIBIT 6 2016 Ventura County Transit Network



Metrolink (2016) Urban Rail (2016) Rapid Bus and Bus Rapid Transit (2016) Bus Routes (2016)

EXHIBIT 7 2016 Existing High Quality Transit Corridors



- Major Transit Stops (2016) High Quality Transit Corridors (HQTCs) (2016)

Note: SCAG identifies Major Transit Stops and HQTCs using the methodology described in the Transit Technical Report. In summary, these maps and data are intended for planning purposes only. SCAG shall incur no responsibility or liability as to the completeness, currentness, or accuracy of this information, and assumes no responsibility arising from use of this information by individuals, businesses, or other public entities. The information is provided with no warranty of any kind, expressed or implied. Local jurisdictions should consult with the appropriate transit provider(s) to obtain the latest information on transit routes, stop locations, and service intervals before making determinations regarding CEQA exemption or streamlining.

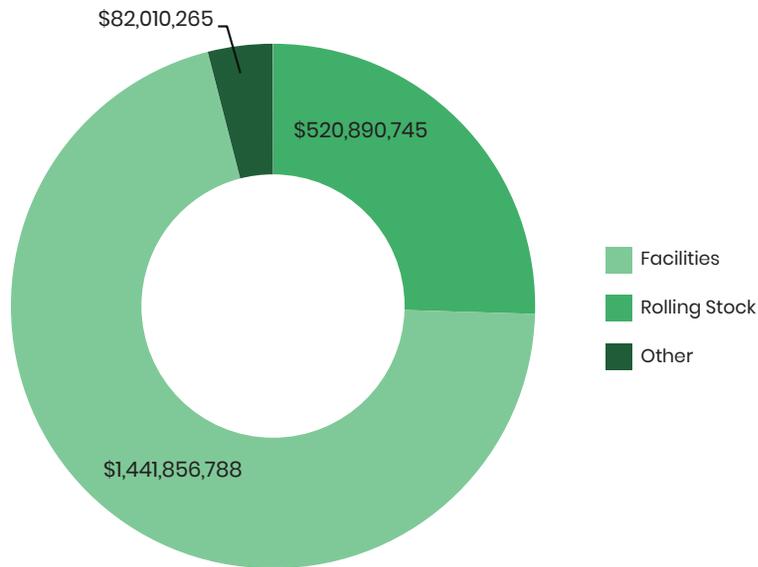
Park. RTA and Metrolink provide service south into San Diego County. The Yuma County Intergovernmental Public Transportation Authority (YCIPTA) provides express service between Yuma, Arizona and El Centro on Mondays, Wednesdays, and Fridays.

The Chemehuevi Indian Tribe of the Chemehuevi Nation also operates an interstate ferry service. This service connects the Havasu Landing Resort and Casino in San Bernardino County with the Havasu Landing Ferry Boat Terminal in Arizona.

EXISTING HQTCS

Existing HQTCS are identified using Base Year 2016 data and SCAG’s HQTCS methodology, which is included as an Appendix to this technical report. SCAG updates its inventory of existing HQTCS with the adoption of a new RTP/SCS, once every four years. **EXHIBIT 7** identifies the Base Year 2016 HQTCS

FIGURE 1 Transit Capital Expenditures, SCAG Region



Source: National Transit Database, Fiscal Year 2015–16

included in Connect SoCal.

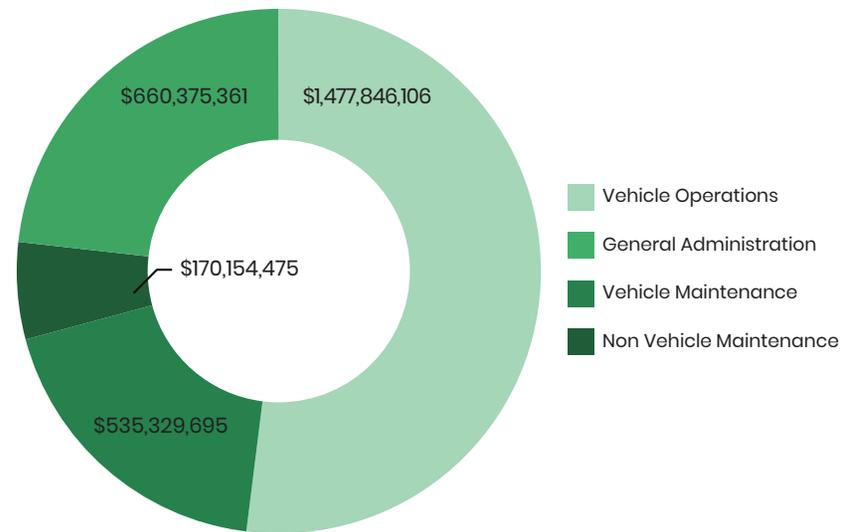
PERFORMANCE

This section includes a discussion of the performance of the existing system, with a special focus on Connect SoCal’s Base Year of 2016. The analysis uses NTD report years, based on the fiscal year. Therefore, the Base Year of 2016 is shown as 2015–16 when using NTD data.

EXPENDITURES

Southern California continues to spend an extra ordinate amount on public transportation—since 1991, the region has spent a combined \$77.02 billion on transit (in 2016 dollars). This trend is expected to continue into the future—transit capital and operations and maintenance costs total roughly half of the

FIGURE 2 Transit Operating Expenditures, SCAG Region



Source: National Transit Database, Fiscal Year 2015–16

investments in the RTP/SCS.

On an annual basis, the costs are still very significant. In the NTD Report Year 2015–16, the region spent a combined \$4.83 billion on transit capital, operations, and maintenance expenses. Of that sum, operating costs totaled almost \$2.91 billion and capital investments were slightly over \$2.06 billion.

Between 2005–06 and 2015–16, capital expenditures roughly tripled from \$627 million to \$1.92 billion, in 2016 constant dollars. This is a continuance of the growth trend from the 1990s—in 1990–91, total spending was \$427 million, in 2016 constant dollars. **FIGURE 1** details the proportions of capital funds spent on facilities and the proportions spent on vehicles. Facility capital costs are almost three times as large as vehicle purchases.

FIGURE 2 displays operating expenditures by function. Just over half of all operating expenditures are on vehicle operations, and just under a fifth are spent on vehicular maintenance. Nonvehicle maintenance makes up about six percent of all investments. General administration is the second largest function and is four percent larger than vehicular maintenance.

FUND SOURCES

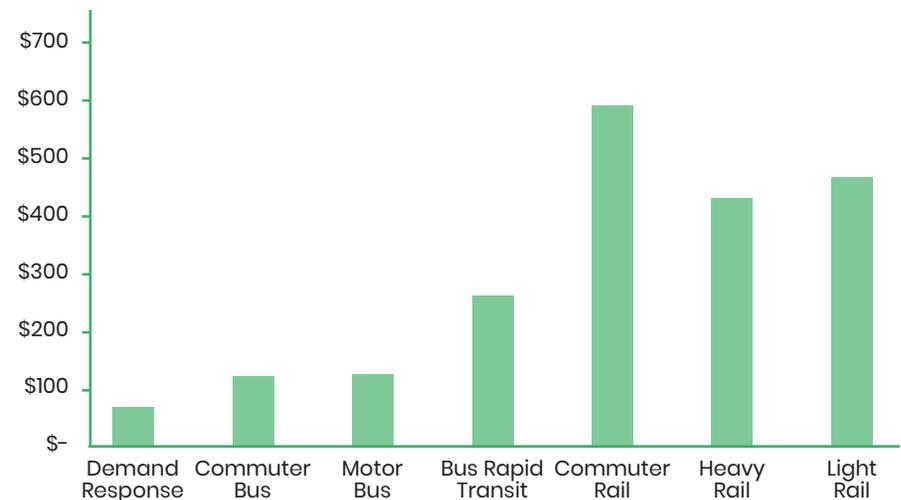
As of 2015–16, local funding makes about 58 percent of all transit capital funds in the SCAG Region. This is consistent with the national trend of diminishing federal shares in transportation funding. However, it should also be noted that one reason the SCAG Region is able to fund over half of its capital budget locally is the success of local sales taxes for transportation. Five of the six counties in the SCAG Region are self-help counties, and Los Angeles County has passed a total of four sales tax measures.

In 2015–16 only 29 percent of transit O&M revenues were generated outside the region, with the remaining coming from farebox revenues or other local sources. The 20-year trend for O&M funding is more stable than for capital funding, mostly reflecting the federal government’s reluctance to directly support operations in urbanized areas in the post–1991 Intermodal Surface Transportation Efficiency Act (ISTEA) era.

Declining state revenues in recent years reflect similar trends as declining capital funds. The importance of Local Transportation Fund (LTF) funds to transit agencies’ operating budgets continues to hold. As state revenues grew beginning in 1999–2000, local monies were freed up for other uses. However, decreases in state funds in the period between 2006–07 and 2010–11 have meant that local funds are increasingly important. These state funding cuts also caused many transit agencies to cut service.

In 2015–16, the majority of all funds are expended on bus operations, but demand response transit and rail expenses make up an increasing share. Demand response and commuter rail, in particular, account for a larger share of expenditures than they do trip taking. As shown in **FIGURE 3**, this can be ascribed to higher costs per hour for commuter rail and lower passengers per hour for demand response.

FIGURE 3 Operations Expenditures by Mode (Cost per Hour)



Source: National Transit Database, Fiscal Year 2015–16

SERVICE PROVIDED AND CONSUMED

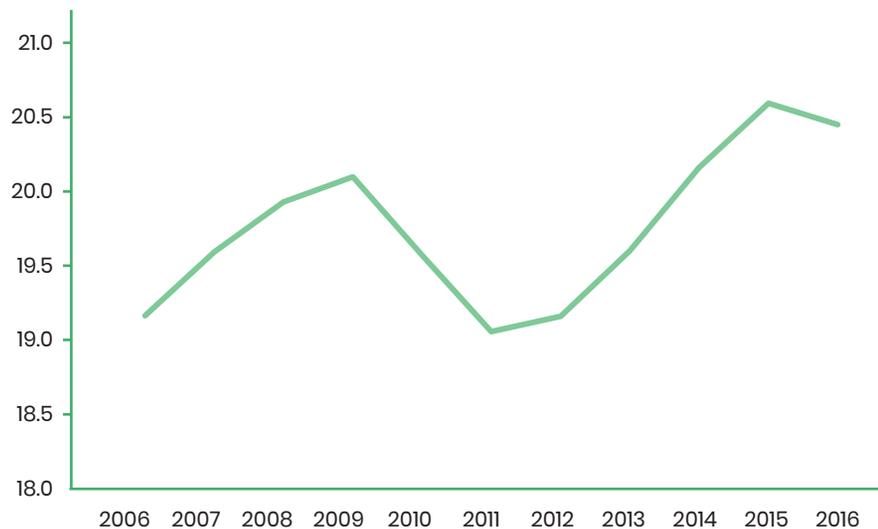
TRANSIT SERVICE PROVIDED

In 2015–16, transit agencies in the region provided 20,450,060 hours of service operating over 18,987 directional route mile network. Total transit service, measured in vehicle revenue hours, appears to be rebounding from the Great Recession of 2008–09. By 2015–16, service levels had exceeded their pre-recessionary levels.

FIGURE 4 displays total vehicle revenue hours for the period between 2005–06 and 2015–16. By 2013–14, total service hours rose above 20 million hours, which is consistent through 2015–16. In the 10-year period between 2005–06 and 2015–16, service hours rose by 1.3 million hours, a growth of 6.71 percent. The changes in revenue hours are dominated by four trends:

- Evolving bus service: Local bus service declined by 145,000 hours, led by declines in bus service at Metro and OCTA bus service. However, new reporting for commuter bus and rapid bus service means that the three combined bus modes actually grew by 280,992 hours.
- Growth in nontraditional modes: Almost 80 percent of growth in service between 2005–06 and 2015–16 was from nontraditional modes, including commuter rail, light rail, and demand-response. Non-bus modes added a million service hours between 2005–06 and 2015–16, growing by about 25 percent. These modes grew from 21 percent to 24.3 percent of all service offered.
- Diminution of LA Metro's share of all service offered: LA Metro's role as the leading provider of service continued, but their overall share declined from 42.8 percent to 39.3 percent of all service offered
- Growth in Riverside County: Between 2005–06 and 2015–16, Riverside

FIGURE 4 Vehicle Revenue Hours (millions)



Source: National Transit Database

FIGURE 5 Total Boardings (millions)



Source: National Transit Database

County added almost 305,000 hours of service. Two-thirds of that service were fixed route and one third demand-response.

TRANSIT SERVICE CONSUMED

FIGURE 5 displays total unlinked passenger trips between 2005–06 and 2015–16. In 2015–16, passengers in the region took 655,017,452 transit trips, travelling over 3.3 billion miles. The average resident took 34.7 transit trips and traveled 179 miles on the region’s transit systems. Total demand continues to substantially decline. Between those years, total unlinked passenger trips fell by 84.4 million, a decline of 11 percent. Further discussion of the transit ridership decline can be found in the SCAG/UCLA report, *Falling Transit Ridership*.

TABLE 5 Trips by Mode

	2006	2011	2016
TOTAL TRIPS	739,436,833	698,763,975	655,017,452
Mode Share			
COMMUTER BUS	–	0.3%	0.6%
COMMUTER RAIL	1.6%	1.6%	2.1%
DEMAND RESPONSE	1.1%	1.1%	1.2%
HEAVY RAIL	5.4%	6.6%	7.0%
LIGHT RAIL	5.7%	7.0%	9.5%
MOTOR BUS	86.2%	83.3%	78.4%
BUS RAPID TRANSIT	–	–	1.2%

Source: National Transit Database

DIFFERENCES BETWEEN MODES

Since 1985, transit agencies in the SCAG Region have provided about 20 billion transit trips, with about 7.89 billion of those trips occurring since 2006. Since 2006, 83 percent of all trips occurred on buses, 7.28 percent on light rail, 6.43 percent on heavy rail, and below two percent on both demand response and commuter rail.

Rail transit trips grew from approximately 13 percent in 2005–06 to 18 percent of trips in 2015–16. Conversely, bus trips have declined from 86 percent of trips to 80.2 percent of trips. Rail transit supplied only 11.6 percent of all vehicle revenue miles, since the vehicle person capacity of various rail modes is much higher than that of buses. However, rail transit services also constituted 23 percent of all operating expenses in the SCAG Region in 2015–16.

DIFFERENCES BETWEEN COUNTIES

In the last 50 years, transit service in the SCAG Region has been dominated by LA Metro, and its predecessor, the Southern California Rapid Transit District. In the 1990s, LA Metro typically supplied more than half of all service, but by 2005–06 this had declined to just under 43 percent. By 2015–16, LA Metro supplied 39 percent of all service. However, other agencies in Los Angeles County continue to offer a significant amount of service—6.6 million hours in 2015–16. Municipal and local operators in LA County have consistently offered over 30 percent of all service hours in the region since 1999–2000. While LA Metro’s role may be declining, LA County’s role is declining much more slowly due to offerings by the municipal and local operators.

Los Angeles and Orange counties added 500,000 and 208,000 hours, respectively, between 2005–06 and 2015–16. This represented an increase of 3.4 percent and 8.5 percent. San Bernardino County added 67,000 hours, an increase of 7 percent. Imperial County began service, now offering a total of 58,000 hours or 0.3 percent of the region’s total.

Riverside and Ventura Counties added a significant amount of service between 2005–06 and 2015–16. While both started from smaller base service levels, this growth does warrant some analysis. Ventura added 146,000 hours, increasing

total service by 43.5 percent. In Ventura County, Camarillo Area Transit (CAT) (20 percent), the Gold Coast Transit District (GCTD) (51 percent) and Thousand Oaks Transit (18 percent) accounted for most of the change. Additional service hours in Ventura County were roughly three-fourths fixed route and one-quarter demand-response.

Riverside added 35.8 percent more service—a total of 305,000 additional hours. Most of this service was added in the last five years, and in that time, Riverside overtook San Bernardino the third highest provider of hours. Riverside's growth was roughly two-thirds fixed route, and one-third demand-response. About 38 percent of the growth occurred at SunLine and about 58.5 percent at RTA.

Los Angeles County is the largest and densest county in the region, and it is no surprise that the largest percentage of transit services provided and consumed occurs there. Los Angeles County represents slightly more than half of the total population of the SCAG Region. It has historically represented over 80 percent of total transit ridership. In 2015–16, Los Angeles County accounted for 86 percent of all transit trips.

Orange County, while having roughly 17 percent of the Region's population, provided only 8.5 percent of the region's total trips in 2015–16. Riverside and San Bernardino Counties provided just over two percent each. However, in 2005–06, San Bernardino was carrying about 53 percent more trips than Riverside. In the subsequent 10 years, Riverside added 31.4 percent more trips, while San Bernardino lost 9.4 percent, meaning that San Bernardino is now only six percent more productive. As discussed above, Riverside County increased service by 35.8 percent during the period in question.

Ventura and Imperial Counties represent fairly small portions of the region's overall transit trips, about 0.2 percent and 0.1 percent, respectively.

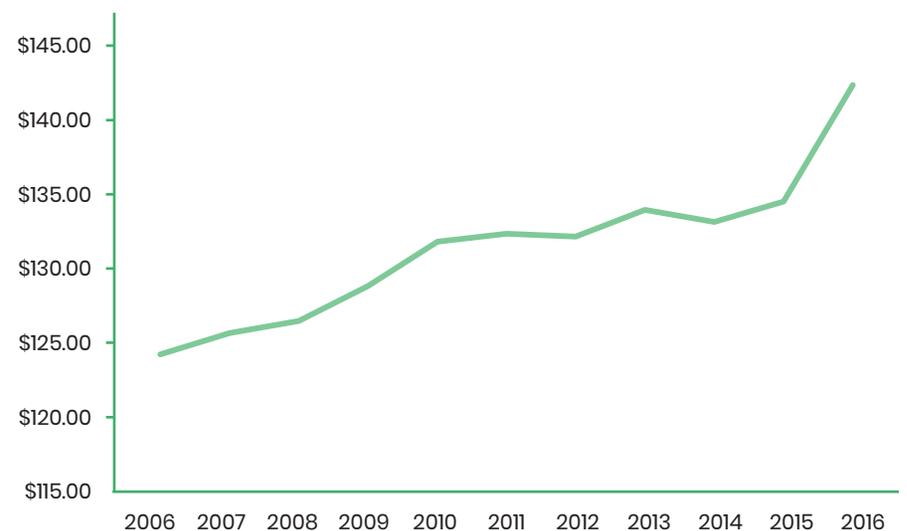
KEY PERFORMANCE METRICS

As was noted earlier, the dominant trend in the transit system's performance is the recent drop in ridership and the stagnation in per capita ridership that preceded it. The region's transit system's performance in measures of productivity and cost-effectiveness is deeply affected by these two trends.

Cost Efficiency (Cost per Vehicle Hour): A key trend is growing operating expenses. Between 2005–06 and 2015–16, operating cost grew by 15 percent, as bus costs grew by nine percent and heavy rail by 24 percent. This trend seems mostly driven by increases in the per hour costs of the bus and heavy rail service. The impact of large increases in bus operating costs is significant because bus service makes up the bulk of all service offered, even though the bus service is relatively less costly. The impact of the large growth in rail operations costs is significant since rail service is roughly three times costlier to provide than bus service.

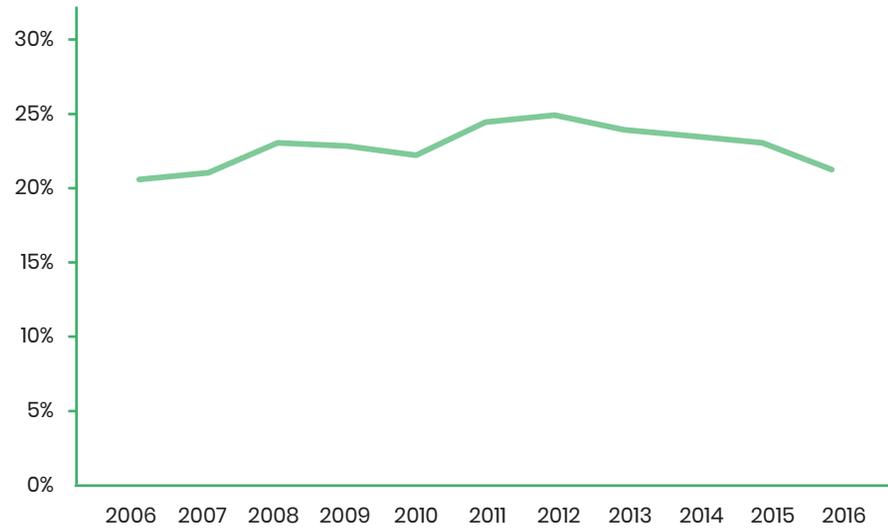
Cost Effectiveness (Farebox Recovery): As service was cut in the wake of the recession of 2008–09, farebox recovery improved. It has since fallen as service levels have expanded while ridership has declined. The region's total farebox recovery rate has grown by three percent since 2005–06, though it is down four percent since 2012. The demand-response mode's farebox recovery has fallen

FIGURE 6 Operating Cost per Hour



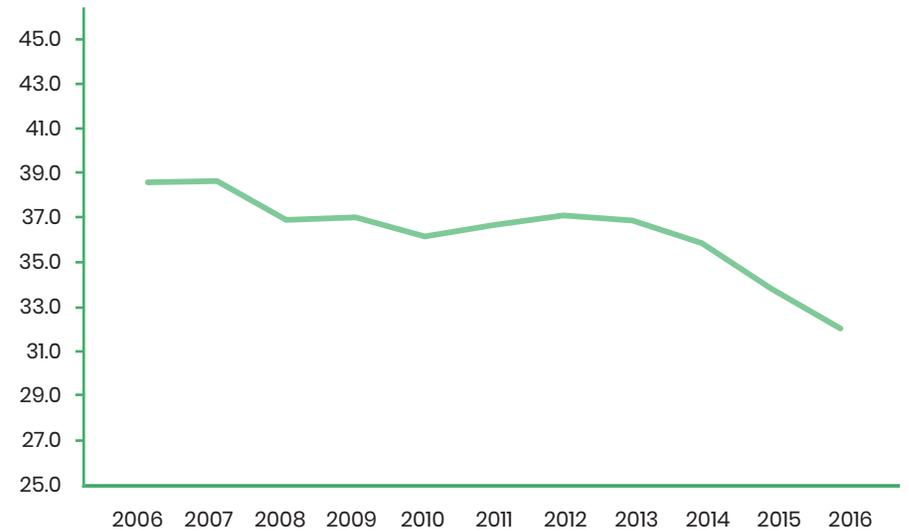
Source: National Transit Database

FIGURE 7 Farebox Recovery



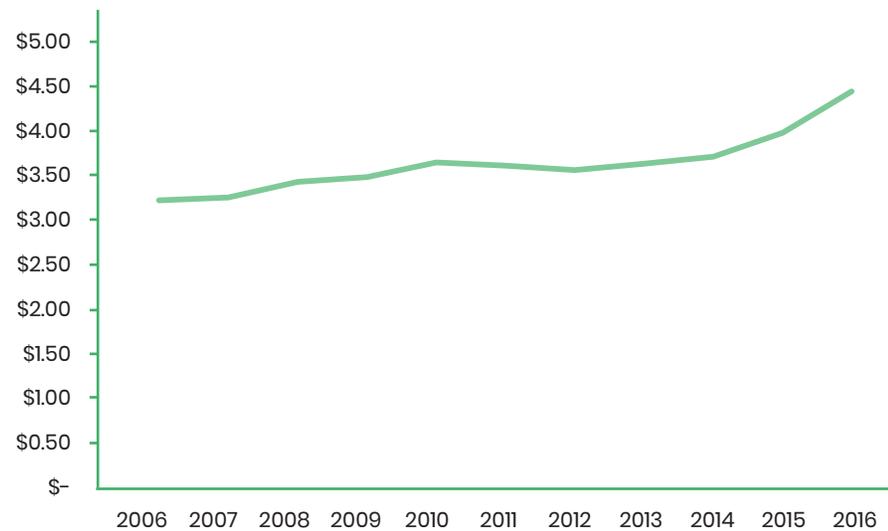
Source: National Transit Database

FIGURE 9 Passenger Trips Per Revenue Hour



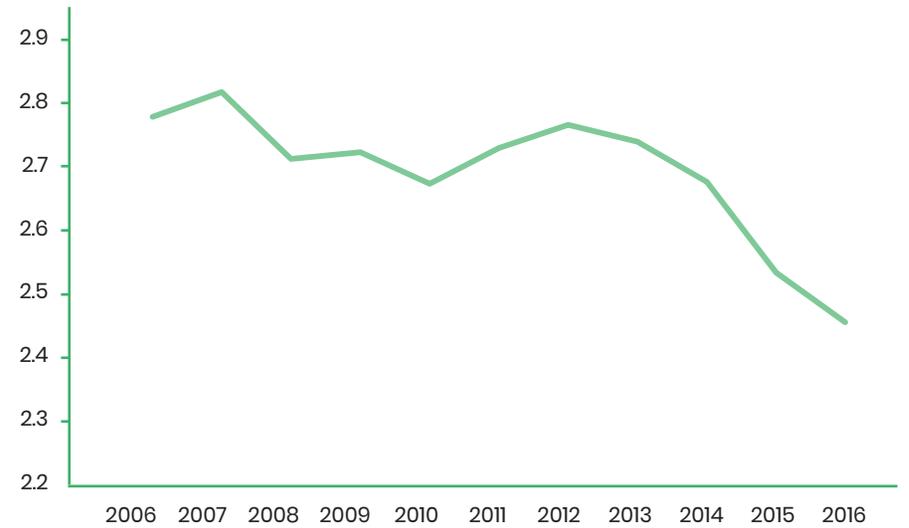
Source: National Transit Database

FIGURE 8 Operating Cost per Passenger Trip



Source: National Transit Database

FIGURE 10 Passengers Per Revenue Mile



Source: National Transit Database

from 12 percent in 2005–06 to seven percent in 2015–16.

Cost Effectiveness (Cost per Passenger Trip): FIGURE 8 displays the 10-year trend in operating cost per passenger trip in inflation-adjusted 2016 dollars. As the total cost of providing service has increased, so too has the cost of providing a passenger trip. Generally, cost per trip is a factor of the cost efficiency of providing service and the effectiveness of that service in attracting riders. Services that are very expensive to provide or are less productive in attracting riders will have higher costs per trip.

Productivity (Passengers per Revenue Hour and Passengers per Revenue Mile): The key productivity metrics used in this analysis are passenger trips per revenue hour and passenger trips per revenue mile. The trend in productivity is downward. The overall productivity trend that emerges is one where productivity drops during the recession, is slightly buoyed by service cuts and then continues to drop during the recent ridership losses. Trips per hour have declined by 17 percent since 2005–06 and trips per mile declined by 12 percent.

CONTEXTUALIZING TRANSIT PERFORMANCE: PERFORMANCE BENCHMARKING

Comparing performance to peers is an important and widely used process improvement practice in manufacturing and technology sectors. It is also a growing practice in the transit industry. Since the 2012–2035 RTP/SCS, SCAG has used a performance benchmarking methodology to establish how the region’s integrated transit system is performing when compared to other very large metropolitan regions.

These efforts allow two key questions to be asked:

1. How do the investments that Southern California has made in public transportation compare to that of other comparative regions? How do those investments manifest as transit service?
2. How do the returns on those investments compare to those of other comparative regions, in terms of transit use and productivity?

This analysis focuses on these two questions by comparing the region’s transit

system performance with that of 10 other regions with more than five million residents. It does so by examining expenditures on transit, transit service deployment, transit use and productivity, key performance metrics, and a special focus on demand–response and motor bus transit.

PEER REGIONS

The analysis utilizes the Combined Statistical Areas delineated by the Office of Management and Budget (OMB), pursuant to 44 U.S.C. 3504(e) (3) and 31 U.S.C. 1104(d) and Executive Order No. 10253. The OMB characterizes CSAs as “representing larger regions that reflect broader social and economic interactions, such as wholesaling, commodity distribution, and weekend recreation activities, and are likely to be of considerable interest to regional authorities and the private sector.” They are intended for use by regional authorities but do not immediately map onto the Metropolitan Planning Areas used in regional transportation planning. However, since they combine metropolitan statistical areas and UZAs, they are useful amalgamations to use when analyzing NTD data. CSAs are very large, not 100 percent contiguous, and contain rural as well as urbanized areas. These factors make them a valuable comparison geography for large metropolitan areas such as the SCAG Region.

There are 171 delineated CSAs in the United States and three additional in Puerto Rico. These regions vary widely in both geographic area and population. The most populous is New York–Newark, NY–NJ–CT–PA, with 23.8 million residents. The least populous is Steamboat Springs–Craig CO, with 38,351 residents. For the purposes of this analysis, the New York–Newark, NY–NJ–CT–PA CSA was omitted, as its disproportionate size with respect to ridership, service levels and transit system investment when compared to the rest of the nation would obscure comparisons between similar regions.

The peer regions considered in the analysis are listed below. For the ease of comparison, they were broken into two groups:

- Los Angeles–Long Beach, CA (Southern California)
- Comparison Group #1
 - Chicago–Naperville, IL–IN–WI

- Washington–Baltimore–Arlington, DC–MD–VA–WV–PA
- San Jose–San Francisco–Oakland, CA
- Boston–Worcester–Providence, MA–RI–NH–CT
- Philadelphia–Reading–Camden, PA–NJ–DE–MD
- Comparison Group #2
 - Dallas–Fort Worth, TX–OK
 - Houston–The Woodlands, TX
 - Miami–Fort Lauderdale–Port St. Lucie, FL
 - Atlanta—Athens–Clarke County—Sandy Springs, GA
 - Detroit–Warren–Ann Arbor, MI

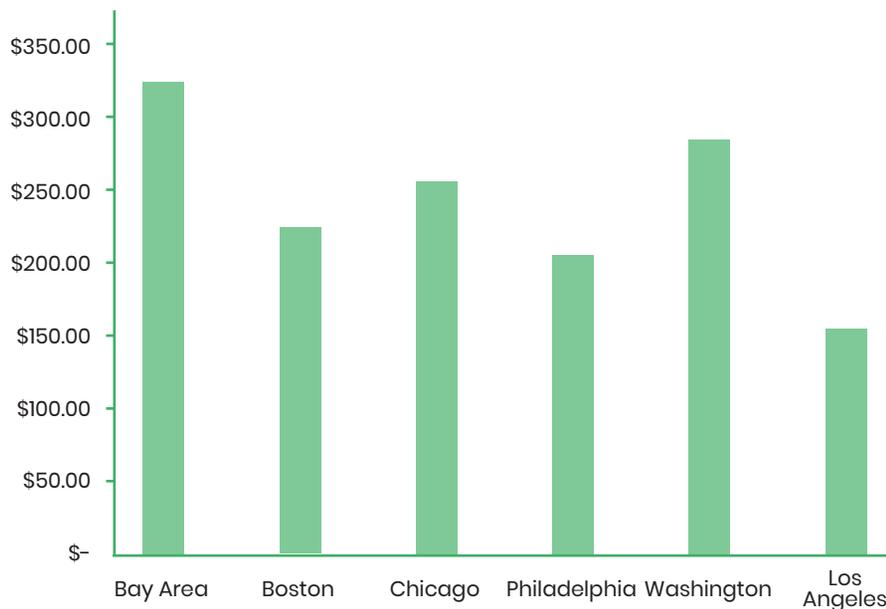
The Los Angeles–Long Beach, CA CSA does not include Imperial County;

however, for the purposes of this report Imperial County’s data have been added to that of the Los Angeles–Long Beach, CA so that the entire SCAG Region is compared to other large regions. In the text, any mention of Los Angeles–Long Beach, CA or Southern California should be interpreted to mean the entire SCAG Region.

TRANSIT EXPENDITURES AND SERVICE PROVIDED

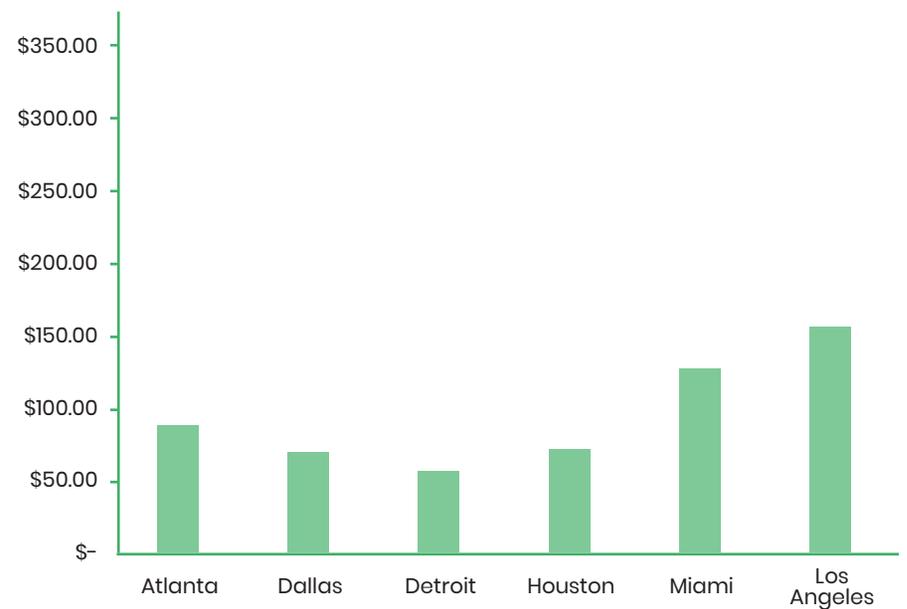
Transit Expenditures: The peer regions spent a combined total of \$17,190,880,860 on transit operations and maintenance in 2015–16. **FIGURES 11 and 12** compare per capita operations and maintenance spending. Per Capita operating expenditures in the Bay Area were more than twice as high. Southern California spent \$46 million more, or roughly 1.6 percent, than the

FIGURE 11 Per Capita Regional Operations and Maintenance Spending



Source: National Transit Database, Fiscal Year 2015–16

FIGURE 12 Per Capita Regional Operations and Maintenance Spending



Source: National Transit Database, Fiscal Year 2015–16

Bay Area on operations and maintenance. However, Southern California has more than twice as many residents as the Bay Area. Southern California had the highest per capita operations and maintenance expenditures in the second comparison group, though still roughly comparable with the Miami-Fort Lauderdale-Port St. Lucie, FL CSA.

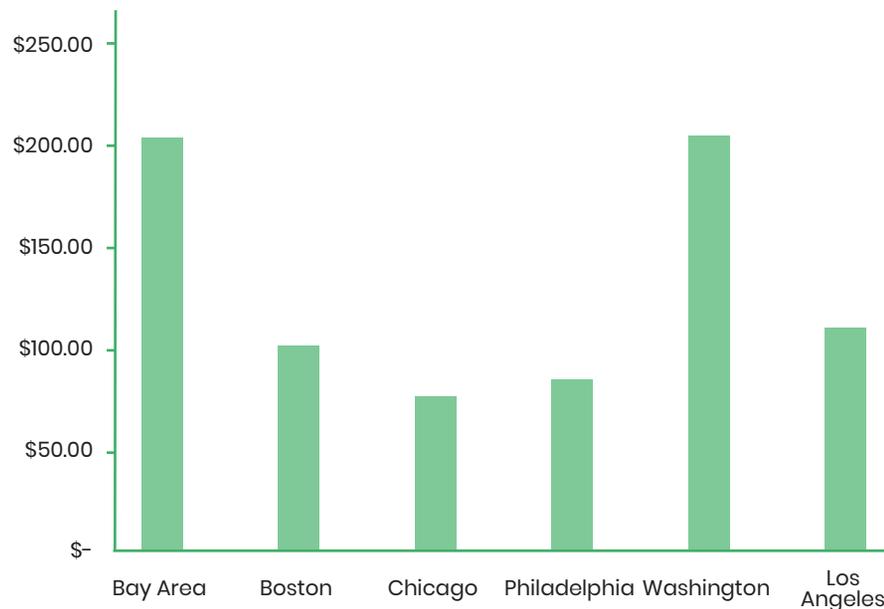
Southern California spent the most of any region on transit capital expenditures in 2015-16. It was the only region to spend more than \$2 billion on transit capital in that year, though Washington-Baltimore-Arlington, DC-MD-VA-WV-PA and San Jose-San Francisco-Oakland, CA came relatively close. Southern California also spent more than \$2 billion in 2014-15, and was the only region to have broken the \$2 billion mark in any year.

FIGURES 13 and 14 display per capita spending on transit capital in 2015-16. The population size effects that lowered per capita spending for transit

operations and maintenance also affect per capita spending on capital. While Southern California spent the third highest amount per capita, that amount is slightly over half what was spent in Washington-Baltimore-Arlington, DC-MD-VA-WV-PA and San Jose-San Francisco-Oakland, CA. Southern California spent more than three times as much as any of the second group of regions.

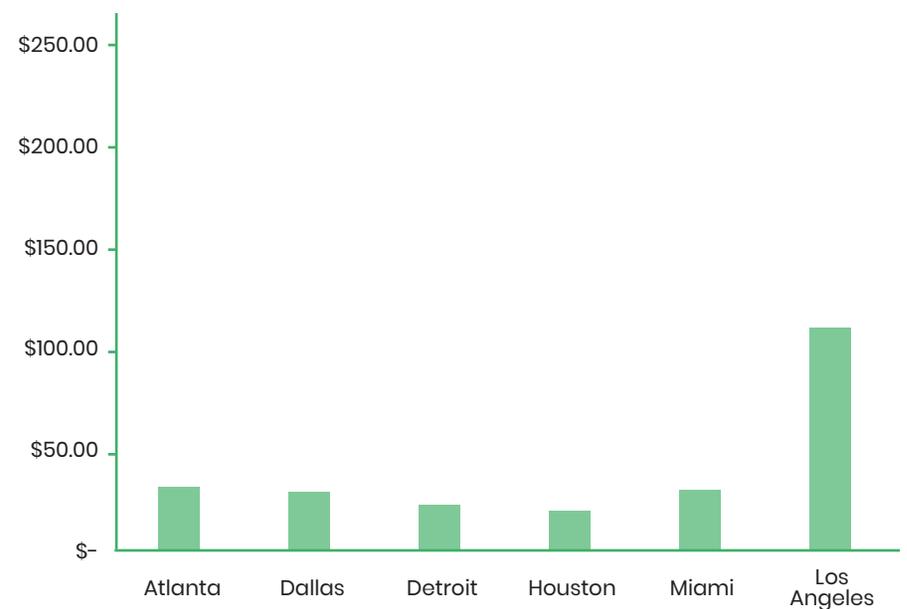
Service Provided: The peer regions group offers just over 38 percent nation's transit service in 2015-16. This added up to a total of 106,892,355 revenue hours of service. This was a growth of seven percent for this group when compared with 2011-12. Southern California provided the most service by far, with just over 20 million hours. Southern California's service levels were 25.5 percent higher than the next region, Washington-Baltimore-Arlington, DC-MD-VA-WV-PA. Chicago-Naperville, IL-IN-WI, Washington-Baltimore and the greater Bay Area (San Jose-San Francisco-Oakland, CA CSA) were the only other regions also providing more than 10 million revenue hours of service.

FIGURE 13 Per Capita Regional Capital Spending



Source: National Transit Database, Fiscal Year 2015-16

FIGURE 14 Per Capita Regional Capital Spending



Source: National Transit Database, Fiscal Year 2015-16

Detroit–Warren–Ann Arbor, MI provided the least service in the second group, with just less over 2.5 million revenue hours. Miami–Fort Lauderdale–Port St. Lucie, FL was the only region providing more than five million hours, with just over 7.2 million hours.

On a per capita basis, the two peer regions groups provided an average of 1.06 revenue hours of transit service in 2015–16. With 1.09 hours per resident, Southern California provided about three percent more service. Compared to the first group regions, Southern California provided the least per capita service hours. With the exception of Miami–Fort Lauderdale–Port St. Lucie, FL CSA, Southern California provided significantly more per capita revenue hours than the second group of regions.

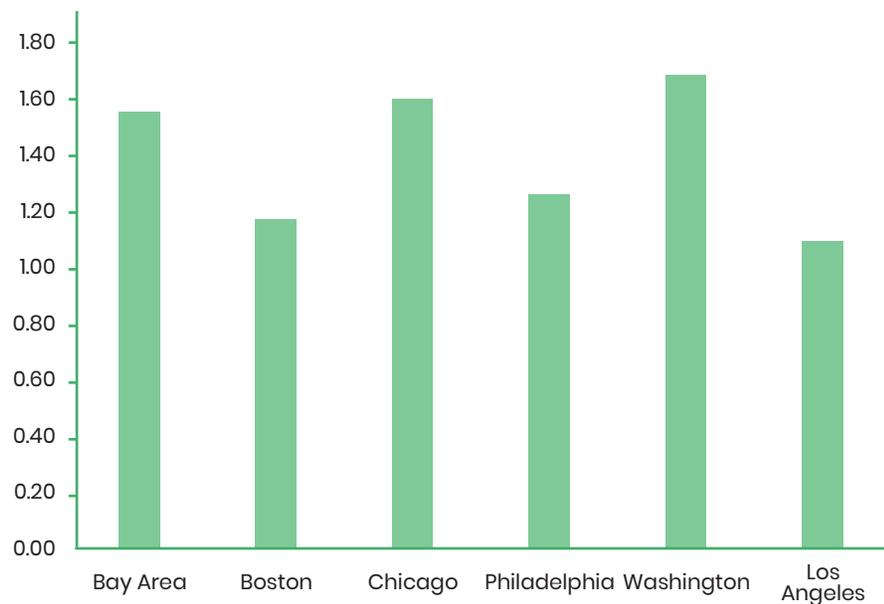
Service Consumed: The 11 peer regions carried a combined 3,705,170,065 unlinked passenger trips in 2015–16, representing 37 percent of the national

total. With 655 million boardings, Southern California provided more trips than any other region and was 7.5 percent higher than the next highest region, Chicago–Naperville, IL–IN–WI. All of the first comparison group provided more than 400 million trips, and only Boston–Worcester–Providence, MA–RI–NH–CT and Philadelphia–Reading–Camden, PA–NJ–DE–MD provided less than 500 million.

Southern California provided substantially more unlinked passenger trips than any of the regions in the second comparison group. Only two of these regions, Atlanta–Athens–Clarke County–Sandy Springs, GA and Miami–Fort Lauderdale–Port St. Lucie, FL provided more than 100 million trips, compared to 655 million in Southern California.

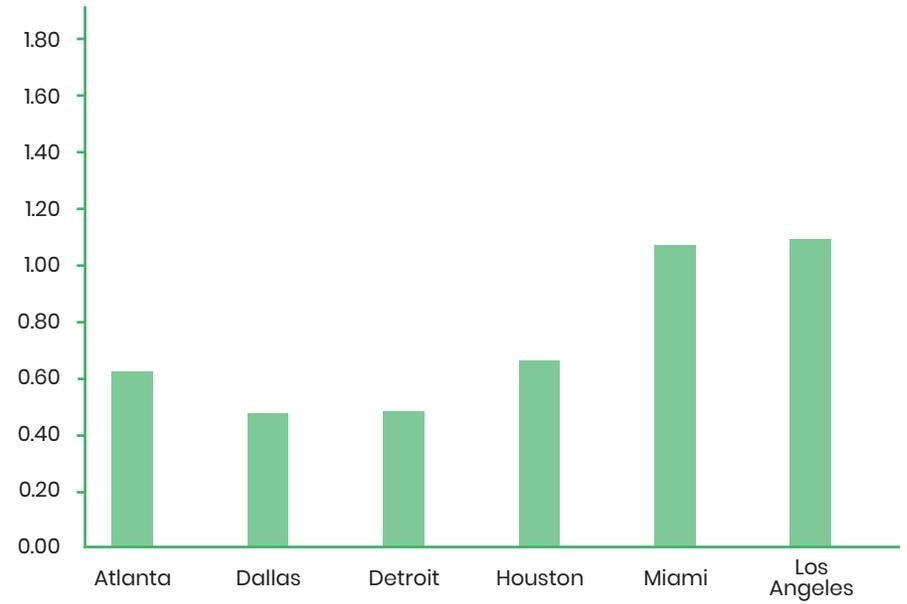
The 11 peer regions averaged 36.3 per capita transit trips in 2015–16. As displayed in **FIGURE 17** Southern California’s 34.9 per capita trips were just

FIGURE 15 Per Capita Revenue Hours



Source: National Transit Database, Fiscal Year 2015–16

FIGURE 16 Per Capita Revenue Hours



Source: National Transit Database, Fiscal Year 2015–16

below that average, but was significantly lower than all of the regions in the first comparison group. Southern California is 17.9 trips per resident lower than the next lowest, Philadelphia–Reading–Camden, PA–NJ–DE–MD CSA, a difference of almost 34 percent. These calculations were made using population estimates at the CSA level from the US Census.

FIGURE 18 displays per capita trip making in the second comparison group. Southern California is 12 trips per resident higher than the next highest, Atlanta—Athens—Clarke County—Sandy Springs, GA, a difference of over 50 percent.

Similar trends occur when this trip making is translated into passenger miles. In 2015–16, Southern California’s transit agencies provided 383.35 billion passenger miles of travel. This was the third highest total, after Chicago–Naperville, IL–IN–WI and San Jose–San Francisco–Oakland, CA. These regions

are respectively much more invested in commuter and heavy rail. All of the other regions provided at least a billion passenger miles traveled and all but one provided over two billion. Compared to the second group, Southern California provided an enormous number of passenger miles in 2015–16. The region’s total passenger miles traveled were more than three times higher than the region with the next highest total, Miami–Fort Lauderdale–Port St. Lucie, FL. None of the other regions provided more than a billion passenger miles traveled.

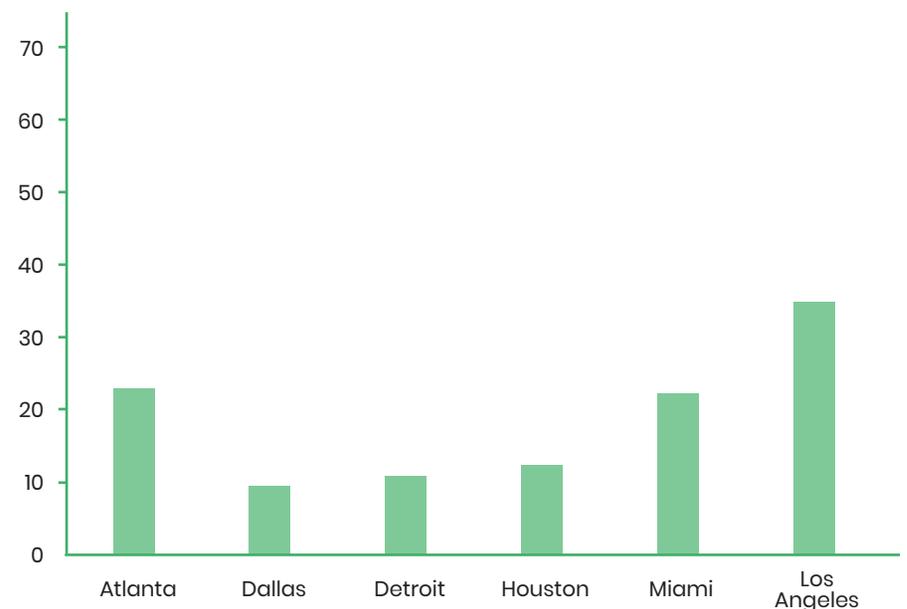
When adjusted for population size, however, Southern California’s passenger miles traveled are not as competitive. Southern California’s 179.5 per capita passenger miles traveled were substantially lower than all of the other regions in the first comparison group. Chicago–Naperville, IL–IN–WI and San Jose–San Francisco–Oakland, CA provided over twice as many per capita passenger miles. The region with the next lowest total, Boston–Worcester–Providence, MA–RI–

FIGURE 17 Per Capita Transit Trips



Source: National Transit Database, Fiscal Year 2015–16

FIGURE 18 Per Capita Transit Trips



Source: National Transit Database, Fiscal Year 2015–16

NH-CT, was still 40 percent higher.

Southern California provided substantially more per capita passenger miles traveled than the regions in the second comparison group; however, the difference in the order of magnitude is striking. In 2015–16, Southern California was providing over three times as many total passenger miles traveled as Miami–Fort Lauderdale–Port St. Lucie, FL, but only 31 percent more per capita passenger miles traveled.

KEY PERFORMANCE METRICS

A set of key performance metrics were developed for analyzing transit system performance at SCAG in 2013. The findings for those metrics when compared to other regions are presented below. For the sake of brevity, some metrics have graphic representation and some are only discussed.

Cost Efficiency (Cost per Hour): Southern California operates some of the most cost-effective services in the peer regions group. The 2015–16 operating cost per vehicle revenue hour was substantially lower than any of the other regions in the first comparison group; this was likely due to the heavier reliance on the motor bus mode. Southern California was the only region in the first group with a cost per hour below \$150.

Southern California's cost per hour was the roughly similar to Atlanta—Athens–Clarke County—Sandy Springs, GA, at \$142 per hour. This was slightly less than the \$146 in Dallas–Fort Worth, TX–OK. The other three regions were all below \$120 per hour.

Cost Effectiveness (Farebox Recovery): Farebox Recovery is the ratio of fares collected to total operations expenditures. Southern California's farebox recovery is significantly below those of the first comparison group. All of the other regions in this group have farebox recovery ratios over 35 percent, while Southern California is 21.9 percent. The Bay Area has the highest recovery with 47.4 percent. However, Southern California is much more competitive with the second comparison group. It is second, behind Atlanta—Athens–Clarke County—Sandy Springs, GA, which has a farebox recovery of 29.1 percent.

Cost Effectiveness (Cost per Trip): In the first group, Southern California had the third highest cost per trip with \$4.45. Only Philadelphia–Reading–Camden, PA–NJ–DE–MD had a cost per passenger trip below \$4, at \$3.91. Southern California's operating cost per unlinked passenger trip was substantially lower than the entire second group, with the exception of Atlanta—Athens–Clarke County—Sandy Springs, GA.

Cost Effectiveness (Cost per Passenger Mile): In the first group, Chicago–Naperville, IL–IN–WI was the top performer, likely due to the region's focus on commuter rail. That region reported providing 1.5 million hours of commuter rail service in 2015–16, almost 10 percent of its total vehicle revenue hours. Southern California's cost was the third highest in the first group, just below that of Washington–Baltimore–Arlington, DC–MD–VA–WV–PA and Boston–Worcester–Providence, MA–RI–NH–CT.

In the second comparison group, Southern California's operating cost per passenger mile traveled was the second lowest after Atlanta—Athens–Clarke County—Sandy Springs, GA. At \$0.68 per passenger mile, Atlanta—Athens–Clarke County—Sandy Springs, GA's cost was surprisingly the second lowest in the peer regions as a whole. This may be due to the region's reliance on heavy rail, which accounted for almost 21 percent of vehicle revenue hours in 2015–16.

Productivity (Passengers per Hour): Boston–Worcester–Providence, MA–RI–NH–CT provided the most productive service, with 46.2 trips per hour. By contrast, Southern California provided 32 passenger trips per revenue hour, which is almost one-third less productivity. Within the second comparison group, Southern California's service was more productive than four of the five regions, but still less productive than Atlanta—Athens–Clarke County—Sandy Springs, GA. Southern California carried 5.35 fewer trips per hour than Atlanta—Athens–Clarke County—Sandy Springs, GA, making its service 14 percent less productive.

Productivity (Passengers per Vehicle Mile): This time productivity is measured in passenger trips per vehicle revenue mile. Southern California was the least productive and was substantially less productive than all other regions, excepting Washington–Baltimore–Arlington, DC–MD–VA–WV–PA. In the

second group, Atlanta—Athens—Clarke County—Sandy Springs, GA was more productive, but this time only slightly more.

Maintenance (Maintenance Cost per Mile): Maintenance costs were measured by dividing vehicle maintenance expenditures by vehicle revenue mile across. Southern California spent much less on vehicle maintenance per mile than any of the other regions in the first comparison group. In contrast, Southern California’s per mile expenditures on maintenance were the highest in the second comparison group, \$0.03 higher than Miami—Fort Lauderdale—Port St. Lucie, FL.

DEMAND RESPONSE PERFORMANCE BENCHMARKING

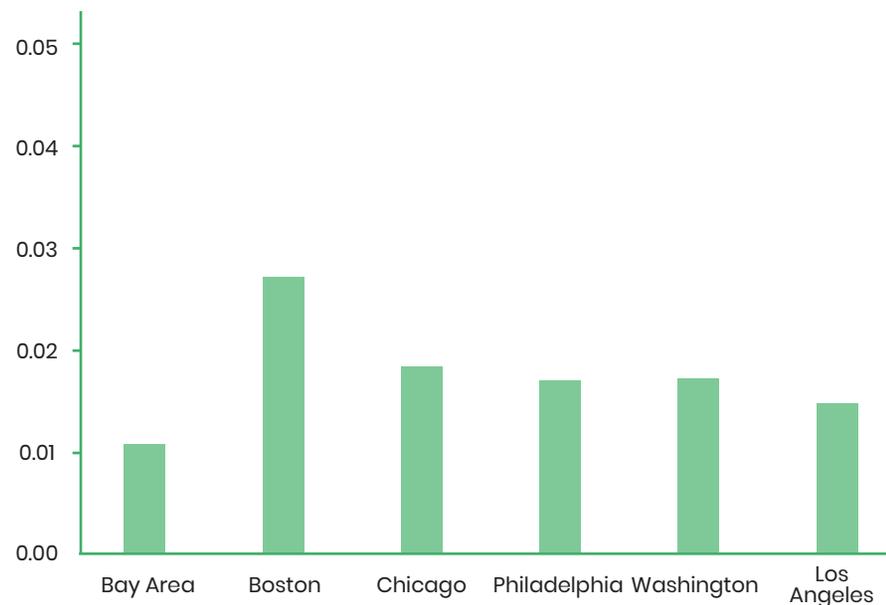
Southern California provided the second fewest per capita demand-response

trips in 2015–16, behind San Jose–San Francisco–Oakland, CA. Southern California provided 12.8 percent fewer per capita demand-response trips than the median rate of 0.48. This finding is counterintuitive, given that Southern California is much more dependent on bus service than the other large regions, and that there are so many transit properties providing demand response service in the Region.

Southern California provided the second least per capita demand-response passenger miles in the first comparison group; however the total per capita passenger miles were less than 0.3 percent fewer than Washington–Baltimore–Arlington, DC–MD–VA–WV–PA and less than two percent fewer than Philadelphia–Reading–Camden, PA–NJ–DE–MD. Overall, Southern California’s 3.93 per capita passenger miles traveled are relatively near the middle of the pack.

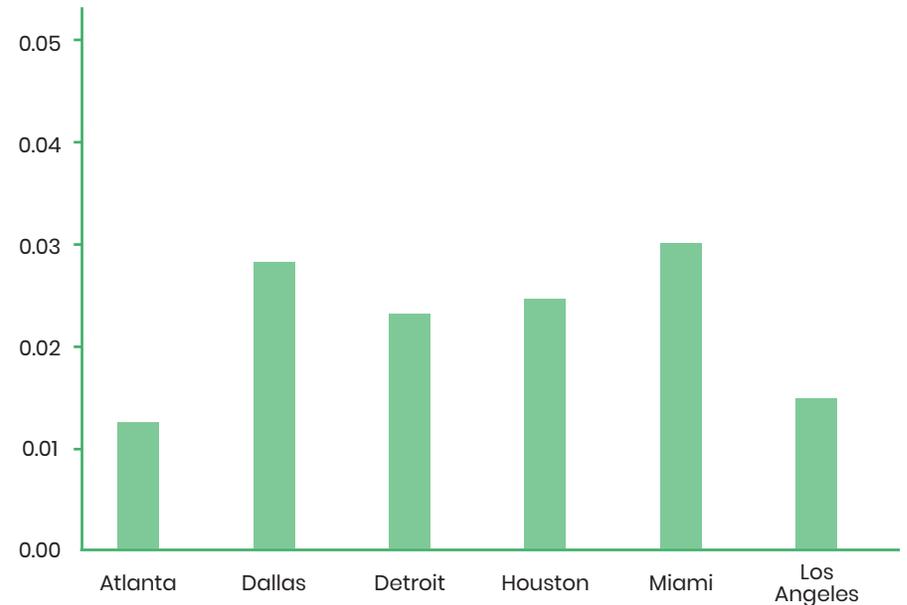
FIGURES 19 and 20 display the ratio of demand response trips to combined

FIGURE 19 Demand Response Trips per Bus Trip



Source: National Transit Database, Fiscal Year 2015–16

FIGURE 20 Demand Response Trips per Bus Trip



Source: National Transit Database, Fiscal Year 2015–16

fixed route bus trips among the peer regions in 2015–16. Developed in coordination with the RTTAC, this measure compares total demand–response use against the modes that trigger the Americans with Disability Act Complimentary Paratransit mandate.

Southern California has the second lowest ratio in the first comparison group, after San Jose–San Francisco–Oakland, CA. Southern California also has the second lowest ratio in the second comparison group, this time after Atlanta—Athens–Clarke County—Sandy Springs, GA. The highest ratio in the two groups is that of Miami–Fort Lauderdale–Port St. Lucie, FL, which is more than twice as high as Southern California’s.

The fact that demand–response trip lengths have nearly doubled in the last twenty years, has also been a cause for concern among stakeholders. However, demand response trip lengths in the SCAG region do not seem exceptionally long when compared to the peer regions. The SCAG Region’s average trip length is only seven percent higher than the aggregated total for the peer regions group.

Southern California’s average demand–response trip lengths were substantially longer than any of the first comparison group. Chicago–Naperville, IL–IN–WI had the next highest total but was still 5.5 percent lower than Southern California. In the second group, Dallas–Fort Worth, TX–OK and Detroit–Warren–Ann Arbor, MI had smaller average trip lengths, but the rest were much longer than Southern California.

RANKING THE REGION’S PERFORMANCE

TABLE 6 presents a ranking of the region’s performance among the various CSAs examined here, along with seven categories of measures. Given that the SCAG Region is the second largest in the country, we should expect that its performance would be in the top half on measures that are impacted by population. Therefore, most of the selected measures have been adjusted for population size, by using per capita figures. The two comparison groups from the previous discussion are also maintained, to maintain the ease with which this table can be compared to earlier charts and tables. Generally speaking,

Southern California performs poorly against the first group and very well in comparison to the second.

TRANSIT USE

The region carried more trips than any other, beating Chicago–Naperville, IL–IN–WI by 46 million trips in 2015–16. In terms of per capita trips, Southern California was the lowest performer in the first group and the top performer in the second.

COST EFFICIENCY

Southern California spent less than any other region in the first group in terms of per capita operations expenditures and spent more than all of the second group of regions. The region was very competitive in terms of per capita capital expenditures, spending the third most in the first group and more than all of the second.

One area where Southern California performed well is in operating costs. The region had the lowest operating cost per vehicle revenue hour of the first group and the second lowest cost in the second group.

COST EFFECTIVENESS

However, cost–effectiveness was an area where the region was not as competitive. Southern California was in the bottom half of the first group for both operating cost per unlinked passenger trip and per passenger mile traveled. In the second group, Southern California had the second lowest cost for both measures. Farebox recovery was an area where Southern California was the lowest performer in the first group, but the second–best performer in the second group.

PRODUCTIVITY

Southern California’s productivity was also an area where the region was the

lowest performer in the first group, and the second highest in the second group.

MAINTENANCE

In terms of vehicle maintenance expenditures, Southern California spent less per mile than any of the first group and more than any other member of the second group.

SPECIAL FOCUS AREA—DEMAND RESPONSE

The region's demand response providers delivered the second lowest per capita trips, per capita passenger miles, and demand response trips per bus trip of any of the first group of regions. This should be surprising given the region's higher reliance on bus transit, which triggers an ADA complementary paratransit mandate.

Compared to the second group of regions Southern California delivered the second highest per capita demand response trips and per capita demand response passenger miles. However, the ratio of demand response trips to combined bus trips was the lowest in the second group.

SPECIAL FOCUS AREA—MOTOR BUS

The national trend toward declining ridership has hit Southern California bus providers very hard. The region's decline in per capita bus trips between 2010–11 and 2015–16 was the second most precipitous of the first comparison group; only Chicago–Naperville, IL–IN–WI had a more drastic loss in per capita trips. Southern California's loss in per capita motor bus passenger miles traveled was the most drastic in the first comparison group.

For the second comparison group, declines in per capita bus trips and passenger miles traveled have been much steeper. Southern California's rate of loss in per capita trips was lower than all of the second group and the region had the third lowest rate of loss in per capita passenger miles traveled.

Based on the performance benchmarking analysis, the answers to the initial

two questions posed in this section can be described as follows.

FINANCIAL PERFORMANCE AND SERVICE PROVIDED

Southern California operates one of the most robust transit networks in the nation. Particularly, the motor bus and light transit are among the nation's largest and most costly. None of the regions in either group spent as much on transit as Southern California, though none is as populous. On a per capita basis, many other regions are spending much more than Southern California on public transportation.

Southern California's spending is more capitalized than any other region, except for Washington–Baltimore–Arlington, DC–MD–VA–WV–PA; and then the difference in operations to capital spending is only 1.40 vs 1.41. The region has engaged in a massive capital construction program over the last 28 years and has spent \$6.66 billion dollars to build the nation's second most expansive light rail network.

The region uses the funds to provide a significant level of transit service. In aggregate, Southern California provides millions more hours of service than any member of either comparison group. However, this is the result of the difference in population size between southern California and the members of the first comparison group.

When we measure the cost of service provision at the unit cost level, we begin to see several trends. The first of which is that on a per hour basis, Southern California's transit service is especially cost-effective.

RETURN ON INVESTMENT

TABLE 7 presents an analysis of the total number of trips per combined capital and operating dollar invested, as total passenger tips per dollar invested in operations. Southern California ranks seventh among the regions in trips per dollar of combined expenditure but third in trips per dollar of operating investment.

TABLE 6 SCAG Region Performance Ranking

Performance Concept	Performance Indicator	Rank Among First Comparison Group	Rank Among Second Comparison Group
TRANSIT USE	Per Capita Trips	Least Provided	Most Provided
COST EFFICIENCY	Per Capita Operating Expenditures	Lowest	Highest
	Per Capita Capital Expenditures	Third Highest	Highest
	Operating Cost per Vehicle Revenue Hour	Lowest Cost	Second Lowest Cost
COST EFFECTIVENESS	Operating Cost per Unlinked Passenger Trip	Third Highest	Second Lowest
	Operating Cost per Passenger Mile Travelled	Third Highest	Second Lowest
	Farebox Recovery	Lowest Farebox Recovery	Second Highest Farebox Recovery
PRODUCTIVITY	Unlinked Passenger Trip per Vehicle Revenue Hour	Least Productive	Second Most Productive
MAINTENANCE	Vehicle Maintenance Expense per Vehicle Revenue Mile	Least Expended	Most Expended
SPECIAL FOCUS AREA —DEMAND RESPONSE	Demand Response per Capita Unlinked Passenger Trips	Second Lowest	Second Highest
	Demand Response per Capita Passenger Miles Travelled	Second Lowest	Second Highest
	Demand Response Unlinked Passenger Trips per Combined Bus Unlinked Passenger Trips	Second Lowest	Second Lowest
SPECIAL FOCUS AREA —MOTOR BUS	Percent Change in per Capita Unlinked Passenger Trips compared to 2011	Second Biggest Loss	Smallest Loss
	Percent Change in per Capita Passenger Miles Travelled compared to 2011	Biggest Loss	Third Lowest Loss

Source: SCAG

Those regions that have recently made heavy in capital investments tend to fare worst in the first measure; San Jose–San Francisco–Oakland, CA and Washington–Baltimore–Arlington, DC–MD–VA–WV–PA are also among the bottom performers in this metric. This is the result of policy decisions made by these regions, and in a sense can be thought of as a measure of the planning process itself.

Southern California’s large number of trips and relatively cost-effective operating costs seem to compensate for comparatively lower productivity levels and low per capita transit use. These factors keep the region very competitive in terms of the total number of trips per operating expenditure. Overall, we can say that the region’s investments in service seem to be comparatively very efficient.

TABLE 7 Return on Investment – Unlinked Passenger Trips per Dollar Invested

Region	Unlinked Passenger Trips per Combined Capital and Operating Dollar Expended	Unlinked Passenger Trips per Operating Dollar Expended
LOS ANGELES	0.159	0.263
CHICAGO	0.196	0.261
MIAMI	0.174	0.211
PHILADELPHIA	0.199	0.264
DALLAS	0.094	0.145
HOUSTON	0.105	0.183
WASHINGTON	0.138	0.22
ATLANTA	0.205	0.29
BOSTON	0.182	0.259
DETROIT	0.157	0.199
SAN JOSE	0.124	0.202

Source: National Transit Database

However, the Region's productivity is lower than six of the peer regions. Given the size of the region, and the sheer amount of service offered, this should be troubling. Southern California's cost per passenger trip is competitive, but less competitive than cost per vehicle revenue hour would have suggested.

EMERGING TRENDS

INCREASING VEHICLE OWNERSHIP

A key finding of the *Falling Transit Ridership* report was that the total number of household vehicles was increasing in Southern California. The region added 2.1 million vehicles between 2000 and 2015, or just under one vehicle for every new resident. During this time, the share of households with no vehicles fell by 30 percent, and the share of households with fewer vehicles than adults fell by 14 percent.

The decline in zero-car households was particularly high among immigrant populations. Among foreign-born residents of Southern California, there were 42 percent fewer zero-car households, while the number of households with fewer vehicles than adults fell by 22 percent. The decline in zero-car households was even more pronounced among immigrants from Mexico. Among this group, the number of zero-car households declined by 66 percent, while the number of households with fewer cars than adults dropped by 27 percent.

These trends mirror national trends documented by the Transit Center in their report, *Who's on Board 2019: How to Win Back America's Transit Riders*. They found that new car sales reached a new national high in 2016 and that used car sales reached a new national high in 2017. They also found that total national VMT has been increasing since 2011 and that per capita VMT has been increasing since 2014. The authors document that 56 percent of respondents found it easier to get an auto loan than they expected and that loans are being offered to borrowers with lower credit scores on longer terms with lower interest rates. They also report that one out of five auto loans is now sub-prime.

NEIGHBORHOOD CHANGE

When looking at dense neighborhoods that produce high levels of transit ridership, the UCLA ITS team noted that there seem to be patterns of changing demographics within these neighborhoods. They compiled a network of high quality transit corridors combined with a neighborhood typology they produced for the FHWA and examined changes in the neighborhoods selected between 2000 and 2015 using data from the US Census.

The researchers followed changes in the high transit areas, "Old Urban" neighborhoods and the group of combined census tracts that house 60 percent of respondents who report using transit to commute to work. In addition to 2000 and 2015, they also documented the year 2010 for the Top 60 percent of Transit Commuting Tracts. They found large declines in the number of zero-car households in the Top 60 percent group, and declines in foreign-born population for each. SCAG and UCLA have initiated a follow-up study to examine more closely the potential role of neighborhood change in transit ridership decline.

POVERTY AND EQUITY

In the 2016 RTP/SCS transit analysis, SCAG found that the LA-LB-Anaheim MSA was losing jobs, while the Riverside-San Bernardino and Oxnard-Thousand Oaks-Ventura MSAs were adding them. Additionally, it found that there was a trend towards more low-income households, and more geographically dispersed low-income households.

This trend has continued. Between 2000 and 2016, the subregions of the Southern California with the highest growth in low-income households were Coachella Valley, Imperial Valley, San Bernardino, Orange County and San Fernando Valley. The lowest rates of growth were in the City of Los Angeles, Gateway Cities, Western Riverside, Westside and South Bay. These are areas of the region that have traditionally operated high levels of bus service and where LA Metro has invested in major capital projects, and they are less likely to have rapidly growing proportions of low-income households. Areas where transit investment has been relatively lower, with exceptions, appear have faster-

growing rates of low-income households.

The Los Angeles Equity Atlas Framework, a study conducted by the California Community Foundation and Reconnecting America, used GIS mapping to analyze the equity impacts of the Measure R expenditure package. They found that roughly 90 percent of transit commuters in Los Angeles County had incomes under \$50,000 and 70 percent had incomes below \$25,000. They also found that 31 percent of households with incomes under \$25,000 who live near frequent transit take it to work, versus 13 percent of workers in households earning between \$25,000 and \$50,000.

Moreover, a key finding of the study was that low and middle-wage jobs are increasingly decentralized throughout the county, while higher wage jobs are increasingly centralized in locations that are easily served by frequent transit, and often located near fixed guideway station stops. Given that low-income commuters are a key part of any transit market, this trend indicates that future transit service in the region will have to find better ways to serve dispersed jobs and residences with frequent service. Increased frequent bus service along productive corridors can be a key strategy to serve those areas.

One of the key themes of the 2016 RTP/SCS was the region's evolving age demographics. Per that growth forecast in 2040, 18.1 percent of the region will be over the age of 65, and 2.93 percent will be over the age of 85. Typically, travel patterns change drastically after retirement, and the trip types best served by fixed route transit, such as commuting, are no longer made. The trend between 2000 and 2016 was towards fewer young residents and many older residents. No subregions had a growth in the share of young residents during that period. The Westside Cities and Western Riverside County had relatively lower growth in older residents, but most of the subregions have seen growth in the share of residents over 65 percent.

DECLINING USE OF PUBLIC TRANSPORTATION

The region provides a large and growing amount of transit service. In 2017, the region supplied 22.5 million hours of service, or roughly 1.18 hours for every resident. However, transit ridership has declined significantly over the last

10 years, even as service levels have grown. Total use of the region's transit system is declining precipitously. Between 2007 and 2017, total passenger trips declined by 143 million, or 19 percent. This works out to a decline of over 10 trips per person, or just under 25 percent. This trend impacts agencies' ability to continue to provide these levels of service, as declining fare revenues will eventually lead to budgetary challenges.

EXPLAINING THE DECLINE IN DEMAND FOR PUBLIC TRANSPORTATION

The impacts of the recession of 2008–09 on travel behavior were profound. Prior to the recession, aggregate national VMT growth peaked in 2007 and per capita growth peaked in 2004. The period following these years was one where VMT levels remained relatively flat. Analysts have differed as to whether this represents a cultural shift or a reaction to macroeconomic conditions including retail fuel prices and the recession of 2008–09.

In subsequent years, many analysts have suggested that those born between 1980 and 1996 had radically different modal preferences than previous generations. However, aggregate VMT steadily rose after the end of the recession and transit use declined. It now appears likely that this age cohort was responding to economic pressures in reducing vehicle travel, not expressing innate preferences. As this generation has aged and the economy has recovered, transit use has declined. Many analysts are attempting to ascertain why.

The Transit Center, in their report *Who's on Board 2019: How to Win Back America's Transit Riders*, conducted a survey of transit travelers and labeled them as occasional users, commute users, all-purpose users, increasing users and decreasing users. The authors found that access to an automobile played a strong role in explain declining transit use among survey respondents. Among those whose transit use declined, those with increased vehicle access reported using transit on 7.2 fewer days; those whose access to autos did not increase reported using transit on 1.4 fewer days. Foreign-born respondents report declining transit use. In 2016, foreign-born respondents reported an average of 15 trips per month; by 2018 this decreased to 10. This is a lower figure than

native-born respondents, who reported just over 10 trips in 2018.

As discussed previously, another factor that the UCLA ITS team investigated was neighborhood change. The researchers hypothesized that since transit use is highly localized, changes to residential location patterns among likely transit users could explain declines in use. Additionally, there does seem to be some movement of low-income households from central locations where transit has high utility to less central locations where transit has less utility.

A research team associated with the University of Davis Institute for Transportations Studies analyzed surveys of residents of seven major cities between 2014 and 2016. Their findings were published as *Disruptive Transportation: The Adoption, Utilization, and Impacts of Ride-Hailing in the United States*. The report sought to provide insight on the adoption, use and travel behavior impacts of the ride-hailing industry. The authors investigated the impacts of ride-hailing on transit use. They argued that, “Some are more frequent, reliable, and operate in environments where they may be the most convenient choice, while others are not. In short, the question of whether ride-hailing competes with or complements transit depends on the circumstances.” Most respondents reported that ride-hailing did not affect their transit use, though it appears that central city services were more likely to be negatively affected than suburban services. Those that reported substituting ride-hailing for transit also reported that travel time was one of the most important considerations.

Another effort to understand the causes behind the recent ridership declines was produced by researchers at the University of Kentucky. The team looked at monthly NTD data from 22 agencies across four modes, between 2002 and April 2018. They focused only on one agency per Metropolitan Statistical Area. The authors found that TNCs correlate with declines in heavy rail use by 1.3 percent and bus ridership by 1.7 percent and that bike shares correlate with increased heavy and light rail ridership while decreasing bus use by 1.8 percent. However, the statistical model they produced is based only on the largest agency in each MSA and may be subject to uncertainty.

EMERGENCY PREPAREDNESS

Metro and 14 other providers are entering into a Transit Mutual Assistance Compact (TransMAC) to establish a formal process whereby they may receive and provide mutual assistance to each other in the form of personnel, services and equipment as deemed to be necessary or advisable in an emergency. This agreement has undergone revisions and upon implementation it can be a way for transit agencies to respond to the service disruptions that can accompany natural disasters.

ADAPTATION AND RESILIENCE PLANNING FOR PROVIDERS OF PUBLIC TRANSPORTATION

The planet’s climate is changing, which is producing impacts on local transportation systems such as sea level rise, changes in temperature and precipitation, and increased flood risk. In order to maintain the resilience of the transportation system in light of these challenges, local agencies will have to analyze the potential impact of these challenges in their long-range capital planning.

In FY 2017–18, SCAG prepared resources for providers of public transportation in the region to respond to expected challenges as a result of global climate change. This work, funded by a Caltrans Statewide and Urban Transportation Planning Grant, sought to assist transit providers with incorporating climate change adaptation into their existing processes.

The consultant team produced a toolbox of resources to be used to identify critical assets and routes; integrate climate considerations into local and regional planning processes; and implement adaptation practices to improve transit system resilience while complying with state and federal regulations. These resources were developed via a collaborative process with local agencies, through in-person workshops and panel reviews to develop a toolbox of resources that will assist transit agencies in completing these activities with limited resources. This project, including the final “Climate Resilience Toolbox”, achieved the following five objectives through engagement with transit agencies:

- **Objective 1 – Provide an actionable climate adaptation and resilience plan.** The Toolbox empowers transit agencies to conduct their own–high–level criticality and vulnerability assessments efficiently and cost–effectively, enabling them to quickly move to adaptation planning and implementation.
- **Objective 2 – Identify critical assets and routes.** Through collaboration workshops with local transit agencies, resources for determining the criticality of existing transit assets were developed.
- **Objective 3 – Integrate climate change forecast data.** The Toolbox provides guidance for transit agency staff seeking to access and apply local climate change projection data. The toolbox also includes a summary of projected changes in climate in the SCAG Region, reducing the need for transit agencies to locate and interpret projected climate trends themselves.
- **Objective 4 – Increase regional transit system disaster recovery and resilience.** Collaborative workshops allowed us to work with local transit agencies to begin and continue to promote transit system resilience. The Toolbox also includes resources to assist agencies in pursuing climate resiliency initiatives.
- **Objective 5 – Support local planning efforts.** The Toolbox includes guidance for integrating climate change information and considerations into existing processes, including those required by local or federal standards.

The final adaptation toolbox includes 11 different elements, based on input from the workshop process, and helps guide transit providers to improve their resilience to climate change–related stresses.

1. **Projected Changes in Climate in the SCAG Region**
Overview of projected changes in sea level, extreme precipitation, inland flooding, and extreme heat across the SCAG region.
2. **Assessing Vulnerability and Consequences: Getting Started**
Guidance on articulating goals, refining the assessment focus, and using available frameworks and other resources.

3. **Integrating Climate Change into Transit Planning Processes**
Overview of how climate change resiliency can be worked into three key transit processes: procurement/contracting, TAM, and short–range transit plans.
4. **How to Obtain Detailed Climate Projection Data**
For some analyses, detailed data are needed. This resource provides guidance on where and how to obtain this information.
5. **Assessing Criticality**
Some agencies may wish to focus efforts on the most critical components of their system. Different approaches for assessing criticality are discussed and a scoring system to rank assets based on criticality is presented. The accompanying Excel spreadsheet helps automate criticality calculations.
6. **Sensitivity Matrix**
Simple to use Excel matrix discusses how common transit assets may be sensitive to changes in climate.
7. **Example Adaptation Measures**
Discusses different categories of adaptation measures, and gives examples of actual adaptation measures being implemented by transit agencies.
8. **Tips for Selecting and Implementing Adaptation Measures**
Provides suggestions to consider when determining which adaptation measures are right for your agency.
9. **Climate Resilience Planning Template**
Simple template that outlines roles, responsibilities, timelines and key next steps in the resiliency planning process.
10. **Contingency Plan Template**
Template for developing a contingency plan in advance of adverse climate events.
11. **Transit Resiliency Funding Opportunities**
Profiles five state and federal grant programs that could be used to fund resiliency efforts.

NEW TECHNOLOGIES AND SERVICE DELIVERY INNOVATION

TRADITIONAL TRANSIT ITS APPLICATIONS

Computer Aided Dispatch/Automatic Vehicle Location (CAD/AVL) is the package of ITS Applications that has the most potential to affect how transit agencies monitor and control their operations. AVL consists of a GPS unit that tracks vehicles, integrating their locations with GIS systems for display and analysis purposes. This auto-location technology is the data that is used for almost all-location-based transit ITS applications. The CAD portion of systems provide data of special interest to the dispatcher, including run assignments and communications, and can be a key tool for implementing recovery strategies or in emergency response situations. These systems can also aid in implementing timed transfers. Some more advanced CAD/AVL systems allow for the monitoring of boardings, alightings and fare collection in real time. Other agencies rely on an Automated Passenger Counter System as part of their farebox systems.

Two Transit ITS applications that have been developed in the last twenty years often employ CAD/AVL location data to project the arrival of individual transit vehicles at particular locations on their routes. These are Transit Signal Priority (TSP) technologies and Real Time Passenger Information (RTPI) systems.

TSP technologies react to the location of individual transit vehicles and based on detection or communications technologies, employ an algorithm to predict the time of arrival of the vehicle at a particular intersection, and send a message to the traffic control device at that intersection. The traffic control device would then adjust its phasing to reduce the oncoming transit vehicle's exposure to a red phase. Eric Bruun, in the book "Better Public Transit Systems," estimated that TSP could reduce transit vehicle travel times by 10 percent to 25 percent.

Metro initiated its first TSP solution in January 1999 with one corridor on a Metro Rapid Line that traverses through multiple jurisdictions. It has now expanded to multiple corridors on various Metro Rapid Lines and is considered one of the largest implementations of multi-jurisdictional signal priority systems

in the nation. Known as Metro's Countywide Signal Priority (CSP) program, it is highly dependent upon a combination of in-house technical expertise and external professional services, and follows a distributed architecture in which bus signal priority (BSP) requests are sent directly from the bus to the local traffic controller at intersections along a BSP corridor. Metro's CSP system is integrated with Metro buses' Advanced Transportation Management System (ATMS) which incorporates automated vehicle location (AVL), automated passenger counting (APC), automated voice annunciation (AVA), fare payment, head-signing, and video surveillance. Metro's CSP program conducted a next generation study of BSP technologies in 2017, and a new architecture and system may be considered, especially in light of Metro's NextGen Bus Plan, which reimagines Metro's bus system to better meet the needs of current and future riders.

In addition to its own CSP system, Metro also operates buses running on the City of Los Angeles Department of Transportation (LADOT) centralized BSP system. This system is active for select Metro routes within the boundaries of the City of Los Angeles and traversing LADOT signalized intersections, and makes use of in-pavement loops ("smart loops") and transponders on the underside of the bus for vehicle presence detection and identification.

Progress has also been made in developing integrated fare media using smart fare media. Ventura County was among the earliest adopters of smart fare media in the Country. Subsequently, Metro's TAP program was instituted. It is a contactless, chip-based smart card system that is used throughout LA County. Twenty-seven agencies accept TAP, achieving 29 million regional transactions per month in 2018, on over 750 fare products. Residents of Southern California purchase 1.5 million passes on TAP cards every month and \$12 million in stored value. A total of 440 outlets sell \$16 million a month and Metro's website sells over \$1 million per month.

Metro also introduced an on-street RTPI system, based on the arrival predictions generated through its TPS system. This information was pushed to a website hosted by LADOT, and to changeable message signs as station stops. Metro found the O&M costs of these signs to be particularly high.

The Joint Committee on National Transportation Communications for Intelligent

Transportation Systems Protocols, a joint project of AASHTO, ITE and the National Electrical Manufacturers Association, funded by the US DOT Joint Program on ITS, is developing a data protocol to define data elements for information management and operations of signal control and prioritization (SCP). This standard will organize functional user requirements and facilitate the installation of TSP across jurisdictional lines.

A brief literature review suggests that Real Time Passenger Information Systems have had a minimal observed impact on travel behavior. Continued data collection and analysis is needed to determine whether transit ITS applications will have a statistically significant impact on travel behavior.

OPEN TRANSIT DATA

There is a growing trend toward transit agencies sharing the data feeds produced by their ITS and run cutting systems. Portland TriMet and Google Incorporated pioneered the notion that transit agencies should share schedule information with third parties via a common data format, the General Transit Feed Specification (GTFS), allowing third parties to supply trip planning applications to the general public. The GTFS format is a collection of files containing schedule data that can be pushed to a trip planning application or used to power a predictive arrival algorithm. As of 2011, GTFS can also package vehicle location, schedule adherence and incident management data.

The American Public Transportation Association (APTA) is developing a standard for transit data transmission, the APTA Transit Communications Interface Protocol. This work is sponsored by the USDOT ITS Joint Program Office and will include a concept of operations, model architecture, dialog definitions and a modular approach to conformance. This standard will address scheduling, passenger information, TSP, control center operations, onboard systems, spatial referencing and possibly fare collection.

Open data practices are growing rapidly among the largest transit systems. Wong, Reed, Watkins, and Hammond found that in 2010, approximately 85 percent of transit passenger miles were on systems with open data, and 49 of the 50 largest providers of passenger miles are supplying open data

feeds. Traditionally, hesitation to provide open data feeds has revolved around the issue of legal exposure, brand protection, advertising revenue and loss of control of transit information dissemination, but these concerns appear to be waning.

At this point, there is very little empirical evidence for the role of transit data in increasing transit ridership. A University of Washington stated preference study found that riders reported making 10–15 percent more trips, but RTPIS systems have proven difficult to assess via stated preference methods. Roger Teal of DemandTrans Solutions, in a 2013 presentation to the Lake Arrowhead Symposium, stated that there is “no evidence yet that real-time data leads to major increases in ridership, or ‘market penetration’.”

An enormous variety of third-party applications utilize open transit feeds to push schedule data to passengers’ computers or mobile phones. Map applications have been especially popular; Google maps have been the most expansive and successful, but Bing maps and Mapquest also incorporate some transit schedule data. OpenTrip Planner is an open source trip planner currently in beta-testing, incorporates multimodal trip planning, including transit, non-motorized transportation and driving. Other applications develop regularly and are of varying quality.

Open data platforms, feeds, and APIs can be the basis for integrating transit information and ticketing into other platforms, such as Mobility as a Service. This will be discussed separately in the next section.

NEW SERVICE DELIVERY STRATEGIES

TRANSPORTATION NETWORK COMPANY PARTNERSHIPS

Over the last 10 years, one of the leading new mobility practices has been ride-hailing. This practice marries the livery model used in the taxi industry with mobile and GPS applications to provide on-demand point-to-point livery service. Use of these services, particularly those offered by Uber and Lyft, has grown exponentially over the last 10 years.

In 2012 and 2013, the California Public Utilities Commission (CPUC) took the first step in defining and regulating these services. The PUC designated providers of these services Transportation Network Companies (TNCs). The CPUC defines a TNC as “a company or organization operating in California that provides pre-arranged transportation services for compensation, using an online-enabled platform to connect passengers with drivers using their personal vehicles.”

Data about the use of these services are not easy to come by, but both Uber and Lyft have recently filed S-1 forms with the US Securities and Exchange Commission, in advance of initial public offerings of stock. Uber’s S-1 form provides a graphic of the rate of growth in consumption of its service.

Revenue from Uber Ridesharing grew from \$3.5 billion in 2016 to \$9.2 billion in 2018. Gross bookings grew from \$18.8 billion in 2016 to \$41.5 billion in 2018. Consumers traveled approximately 26 billion miles on Uber in 2018. In the second quarter of 2018, passengers took 1.5 billion trips, provided by 3.9 million vehicle operators. Despite this, Uber still posted a \$3 billion operating loss in 2018.

Uber is a global service, however, 24 percent of Uber bookings occur in 5 metropolitan areas:

1. New York–Newark
2. Southern California
3. Greater London
4. The San Francisco Bay Area
5. Sao Paolo

Lyft’s S-1 filing also documents rapid growth. Revenues tripled between 2016 and 2017 and doubled again by 2018. Total bookings grew from \$1.9 billion in 2016 to \$8.1 billion in 2018.

As the TNC business model evolves, the impacts will be felt in Southern California. One of the ways that local transit providers are responding to that growth is by partnering with Uber, Lyft, and other companies to provide first-mile/last-mile services or replace low performing bus routes.

The Transit Cooperative Research Program has a new analysis of the impact of new mobility technologies and strategies on public transportation. Two of these efforts were produced by the Shared Use Mobility Center, an advocacy group promoting shared mobility modes. Both reports incorporate analyses of the impact of TNCs on public transportation use. The reports’ methodologies and findings are briefly summarized below.

TCRP Research Report 188: Shared Mobility and the Transformation of Public Transit, published in 2016, examines the relationship of public transportation to shared modes, including bikesharing, carsharing, microtransit and TNCs. The authors conducted surveys and interviews with staff and passengers in seven cities – Austin, Boston, Chicago, Los Angeles, San Francisco, Seattle and Washington, DC. In addition, the authors provide an assessment of transit and ridesourcing capacity, demand and comparative travel times; practices and regulations relating to paratransit provision; and of current business models and public-private partnerships that build on new technologies from the emerging shared mobility sector.

The report’s key findings:

1. Among survey respondents, greater use of shared modes is associated with a greater likelihood to use transit frequently, own fewer cars, and less transportation spending.
2. Shared modes largely complement public transit, enhancing urban mobility.
3. Because shared modes are expected to continue growing in significance, public entities should identify opportunities to engage with them to ensure that benefits are widely and equitably shared.
4. The public sector and private mobility operators are eager to collaborate to improve Paratransit using emerging approaches and technology.
5. A number of business models are emerging that include new forms of public-private partnership for provision of mobility and related information services.

TCRP Research Report 195: Broadening Understanding of the Interplay among

Public Transit, Shared Mobility, and Personal Automobiles, published July 2018, extends the research presented in TCRP Research Report 188: Shared Mobility and the Transformation of Public Transit. It broadens understanding of the interplay between emerging and established modes of transportation by further exploring how shared modes, particularly transportation network companies, are being incorporated into the mix of transportation options. This report will help transit agencies and other public entities to better understand the opportunities and challenges of technology-enabled mobility services.

The report features an analysis of survey data, model outputs origin and destination data provided by a transportation network company.

Key findings from this research include:

1. The heaviest TNC use across the regions in this study is during the evening hours and weekends.
2. Most TNC trips in the study regions are short and concentrated in the downtown core neighborhoods.
3. There is no clear relationship between the level of peak-hour TNC use and the longer-term changes in the study regions' public transit usage.
4. Among survey respondents, people who use transit or commute by driving solo do so as part of a routine; TNCs are used on occasional basis.
5. Transit travel and wait times were the top concerns of survey respondents who replaced transit trips with TNC trips.
6. TNC usage takes place in communities of all income levels.
7. TNC use is associated with decreases in respondents' vehicle ownership and single-occupancy vehicle trips.

TCRP 204 Partnerships between Transit Agencies and Transportation Network Companies is designed to help transit agencies that have decided to pursue partnerships with one or more TNCs. The report provides information on where, when, and how partnerships between transit agencies and TNCs should be considered and pursued. Published in 2019, the report surveys the implementation of TNC partnerships at transit agencies to enhance

understanding of project development and structure and how those were achieved. While partnerships between transit agencies and private mobility providers are not new, partnerships with TNCs create unique opportunities and challenges as both parties work toward mutually beneficial program models. Dozens of transit agency surveys and follow-up interviews, past literature, and interviews with TNC policy staff and industry experts as well as FTA representatives inform this research.

The report focuses on "partnership design" or the contractual models that these new services are deployed under. There is also a discussion of regulatory compliance issues that arise when working with TNCs. In synthesizing the findings of the research project, the authors offer a "Partnership Playbook," informed by lessons learned by transit agencies working with TNCs, so that the transit industry can be more deliberate in its approach to working with TNCs.

MOBILITY AS A SERVICE

The concept behind Mobility as a Service (MaaS) proposals is that a shared platform, possibly consisting of a mobile application, can be used to dispense traveler information or collect payment for a variety of modes or services. These services could include transit, scooters, bikeshare, ride-hailing, or taxis, among others. MaaS platforms in the United States are relatively less common than in Europe, where there have been greater efforts towards shared platforms.

In the 2017 article "Mobility as a Service: A Critical Review of Definitions, Assessments of Schemes, and Key Challenges," authors Jittrapirom et al. studied various pilots and trials in Europe and North America. Their efforts led them to propose a definition for MaaS consisting of the factors in **TABLE 8**.

In addition to the core characteristics identified in **TABLE 8**, the authors also established three additional MaaS attributes, which are:

1. **Decision influence** – Certain MaaS schemes have features to influence users' trip decisions, ranging from a less active approach, such as SMILE's comparison of carbon dioxide emission by each mode to a more active approach in UbiGo, which promotes PT mode, and an incentive-based of Whim, which rewards users for their 'green'

TABLE 8 Defining Mobility as a Service (MaaS)

Core Characteristic		Description
1	Integration of transport modes	A goal of MaaS schemes is to encourage the use of public transport services, by bringing together multi-modal transportation and allowing the users to choose and facilitating them in their intermodal trips. Following transport modes may be included: public transport, taxi, car-sharing, ride-sharing, bike-sharing, car-rental, on-demand bus services. Envisioning a service beyond the urban boundaries, it will embrace also long-distance buses and trains, flights, and ferries.
2	Tariff option	MaaS platform offers users two types of tariffs in accessing its mobility services: “mobility package” and “pay-as-you-go”. The package offers bundles of various transport modes and includes a certain amount of km/minutes/points that can be utilized in exchange for a monthly payment. The pay-as-you-go charges users according to the effective use of the service.
3	One platform	MaaS relies on a digital platform (mobile app or web page) through which the end-users can access to all the necessary services for their trips: trip planning, booking, ticketing, payment, and real-time information. Users might also access to other useful services, such as weather forecasting, synchronization with personal activity calendar, travel history report, invoicing and feedback
4	Multiple actors	MaaS ecosystem is built on interactions between different groups of actors through a digital platform: demanders of mobility (e.g. private customer or business customer), a supplier of transport services (e.g. public or private) and platform owners (e.g. third party, PT provider, authority). Other actors can also cooperate to enable the functioning of the service and improve its efficiency: local authorities, payment clearing, telecommunication and data management companies.
5	Use of technologies	Different technologies are combined to enable MaaS: devices, such as mobile computers and smartphones; a reliable mobile internet network (WiFi, 3G, 4G, LTE); GPS; e-ticketing and e-payment system; database management system and integrated infrastructure of technologies (i.e. IoT).
6	Demand orientation	MaaS is a user-centric paradigm. It seeks to offer a transport solution that is best from customer’s perspective to be made via multimodal trip planning feature and inclusion of demand-responsive services, such as taxi.
7	Registration requirement	The end-user is required to join the platform to access available services. An account can be valid for a single individual or, in certain cases, an entire household. The subscription not only facilitates the use of the services but also enables the service personalization.
8	Personalization	Personalization ensures end users’ requirements and expectations are met more effectively and efficiently by considering the uniqueness of each customer. The system provides the end-user with specific recommendations and tailor-made solutions on the basis of her/his profile, expressed preferences, and past behaviors (e.g. travel history). Additionally, they may connect their social network profiles with their MaaS account.
9	Customization	Customization enables end users to modify the offered service option in according to their preferences. This can increase MaaS’ attractiveness among travelers and its customers’ satisfaction and loyalty. They may freely compose a specified chained trip or build their mobility package with a different volume of usage of certain transport modes to better achieve their preferred travel experiences.

Source: Jittrapirom, P. et al. (2017, June). *Mobility as a Service: A Critical Review of Definitions, Assessments of Schemes, and Key Challenges*. *Urban Planning*, 2(2) 13-35.

trips. These features can be beneficial in ensuring MaaS positive contribution to sustainability. On the other hand, it also points toward a need for a monitoring system to ensure that such feature is utilized for societal benefits.

2. **The inclusion of other services** – SMILE included access to parking, park and ride service, e-vehicle, and regional ship demonstrates the result of including a broad range of stakeholders in MaaS. Tuup's inclusion of Piggybaggy, a crowdsourcing freight transport service and My Cicero's municipality services are also unique examples of how MaaS can open the possibility for other transport related services.
3. **Mobility 'currency'** – Whim is the only scheme considered here that employs this feature, which can be a step toward a truly integrated multimodal transport system. It enables users to customize their monthly mobility budget to best suit their preferences and not 'locked in' by any sunk cost, such as annual PT subscription or car rental membership. On the other hand, it also increases platform provider influence toward pricing of service. A Whim point purchase through its most expensive subscription (€389 for 10,000 points) is more than 50 percent cheaper than a Whim point purchase through its most basic package (€89 for 1,000 points). The economy of scale of such basic commodity can have implications on equity aspects.

Metro is in the process of upgrading its TAP card program with an open integration platform to support a regional account system and unified payment across multimodal programs. The mobile app is anticipated to be released by early 2020. Metro's TAP system now integrates transit and bike share, with potential for future integration of Express Lanes, electric vehicle car share and parking, forming the foundation for a MaaS system in Southern California. The system also allows for providing incentives and cross-program discounts.

At the state level, the California State Transportation Agency is leading an initiative called the California Integrated Travel Project (Cal-ITP) to facilitate multi-modal trip planning and payment to support state goals of increasing transit ridership, reaching environmental targets, lowering costs, creating efficiencies, improving customer experience and promoting equity. Current efforts focus on incentivizing statewide trip planning and fare payment

standards and other integrated travel improvements over time. A future phase will involve a multi-agency pilot of integrated travel planning and fare payment.

MICROTRANSIT

Over the past 10 years, providers of public transportation have conducted significant experiments with smaller vehicles and dynamic routing. Perhaps the most significant is what is being called microtransit. There is no consistent uniform definition of the term, though generally it seems to involve one or more of the following characteristics: flexible routing, smaller vehicles, on-demand dispatch, and public-private partnerships.

Since at least 2014 private sector providers have experimented with shared-ride on-demand service. The most famous of these companies was Bridj, which provided on-demand service in Boston, Washington, and Kansas City before ceasing operations in April 2017. Another company, Chariot, provided service in San Francisco, New York City, and Austin before ceasing operations in February 2019. According to Andrew J. Hawkins, writing for The Verge, the service had averaged five passengers per vehicle per day in New York City, the nation's most robust transit market.

Subsequent to the initial wave of private sector experiments, transit agencies also began to experiment with these service innovations. One of the initial efforts to track the impacts of these pilots was *UpRouted: Exploring Microtransit in the United States*, produced by the Eno Transportation Center in partnership with LA Metro and FTA. The report sought to define and categorize microtransit pilot projects. The authors also presented a definition of microtransit, based on the US DOT definition:

Defining Microtransit: The U.S. Department of Transportation (U.S. DOT) defines microtransit as "a privately owned and operated shared transportation system that can offer fixed routes and schedules, as well as flexible routes and on-demand scheduling. The vehicles generally include vans and buses.

Microtransit can be operated on a fixed or flexible route, and by a preset schedule or on-demand schedule.

The report surveyed three public-private partnership pilot projects. These were:

- Kansas City Area Transportation Authority and Bridj
- Santa Clara Valley Transportation Authority (VTA) and RideCell
- Alameda-Contra Costa Transit District (AC Transit) and DemandTrans

The pilots were structured in various fashions. AC Transit used their own vehicles and operators to provide the service while contracting out the information technology and real-time dispatch functions to DemandTrans. VTA also supplied vehicle operations while contracting out the information technology development.

The authors found that two of the agencies had not done enough work to identify the transportation problem to be solved by the pilot service. They found that AC Transit used its pilot to substitute for existing low ridership bus service and that it was the most successful of the three pilots. Microtransit is generating significant attention due to its novelty and many agencies are experiencing pressure to experiment with it. However, many pilots have not been designed to meet a specific transportation need and are not heavily used.

While the authors do note that the performance of these pilots should be measured by more than just productivity, they do note that none of the pilots met its stated productivity goals:

Within each of the pilots, the vendor selected was not able to meet the requirements of the RFPs set out by the agencies. This is in part due to the emerging nature of these types of technologies, in addition to the need for better understanding the needs and applications of the end user.

TCRP Synthesis 141: Microtransit or General Public Demand-Response Transit Services: State of the Practice, published in 2019, provides an overview of the current state of the practice of transit systems that are directly providing general public demand-response or microtransit with their own vehicles and personnel or using a traditional contractor.

The authors conducted surveys of 22 transit agencies that have experimented with microtransit, or general public demand response transit (DRT). Case

examples of five transit systems are provided – Denver Regional Transportation District, Houston METRO, Sacramento Regional Transit District, Central Florida Regional Transportation Authority and Salem Area Mass Transit District. These case examples present in-depth analyses of the processes and considerations, challenges, lessons learned, and keys to success.

This synthesis report provides an overview of the current state of the practice of providers of general public demand-response services. This includes review and summary of many facets of these services, including the following:

- Service history and design
- ADA, Title VI, and other equity considerations
- Costs and revenues
- Fare policy and payment methods
- Fleet considerations
- Funding
- Implementation process, including planning and marketing of the service
- Labor considerations
- Performance metrics
- Technology

In their conclusions, the authors noted that the pilots were not very productive, and tended to carry relatively few passengers per hour. They stated:

1. Public microtransit is emerging as an on-demand service that aims to fill in gaps between traditional fixed route services, ride-hailing, and other point-to-point options, to efficiently serve areas or times of lower demand for service.
2. Microtransit can also greatly help people faced with bus commutes between two and three hours if they need to transfer more than once to complete their trip; a quick microtransit trip could take them to a route that would provide direct service to their final destination and thereby reduce their travel time substantially.

3. General public DRT tends to carry an average of between three and five passengers per hour, though some flex zones with more trip generators or attractors experience higher ridership numbers. The total number of passengers carried on DRT services usually make up far less than 1 percent of a transit system's total ridership.
4. It might not be unreasonable to ask if transit agencies' interest in general public DRT is much ado about relatively little. As transit consultant Jarrett Walker noted, 'So far, microtransit is doing no better than demand-response transit has always done, generally worse than three passenger trips per driver hour, compared to 10 for the typical outer suburban fixed and 20-100 for fixed routes in dense and walkable places.'

The authors perceive a tradeoff between flexibility and productivity. They state that:

The more structured DRT becomes, the more likely it is to increase productivity in terms of passengers per mile or per vehicle service hour, assuming there is a market to support the service within the DRT zone... DRT service operating in feeder service mode is governed by a cycle time, which is the round-trip time, including layover for the vehicle to return to its cycle point/checkpoint. The cycle time determines the boundary limits or size of the DRT service area.

Essentially, the size of the flexible service area, in combination with the absence or presence of fixed routes, schedules, and stops, help determine how many stops a vehicle can make to board or alight passengers in any given revenue hour; formalizing a route pattern or stops can help to increase the number of passengers that can be served. However, at some point, this formalization affects the flexibility that microtransit proponents argue is a key benefit of the proposed service.

In the SCAG region, a number of operators are piloting microtransit services, including OCTA (OC Flex), the City of Los Angeles Department of Transportation (LANow), Metro (Mobility on Demand pilot with Via), and Anaheim Transit Network (Free Ride Around the Neighborhood). Data and results from these

pilot projects will inform future planning for microtransit in the region.

NAVIGATION TECHNOLOGIES

Transit systems in Southern California have been using transitional ITS navigation aids such as a GPS based Computer Aided Dispatch / Automatic Vehicle Location (CAD/AVL) for almost two decades. Rail vehicles in southern California operating in closed environments on fixed guideways have had the capacity to operate without human assistance for some time as well. A newer generation of navigation aids is emerging in the form of Connected Vehicle/Automated Vehicle applications.

Autonomous vehicles are capable of using advanced sensing technology to operate without human supervision. Many private sector, public sector and university actors are currently testing autonomous passenger vehicles and trucks. The CV/AV range of technologies run from driver assist to fully automated operations.

The Society of Automotive Engineers, a professional and standards developing organization for the automotive design industry, has promulgated standards for autonomous vehicle operations. Automated transit systems are still in the research phase. FTA's Office of Research, Demonstration and Innovation is exploring the use of vehicle automation technologies in bus transit operations by:

- Conducting research to achieve safe and effective transit automation deployments
- Identifying and resolving barriers to transit automation deployment
- Leveraging technologies from other sectors to advance the transit automation industry
- Demonstrating market-ready technologies in real-world settings
- Transferring knowledge to the transit stakeholder community

To support the development and deployment of automated bus transit services, FTA has developed a five-year Strategic Transit Automation Research Plan that outlines FTA's research agenda on automation technologies. The plan is built

upon extensive stakeholder consultation, use case analysis and is informed by a rigorous literature review. Autonomous services may be tested in closed environments such as university and hospital campuses throughout the life of Connect SoCal. They may even enter into service in open environments before 2045, if the testing goes well.

PROPULSION TECHNOLOGIES

As was discussed in the preceding section on Regulatory Framework, the ARB’s Innovative Clean Transit Rule requires that transit agencies convert to Zero Emissions Bus Fleets in stages based on their fleet size and location by air basin.

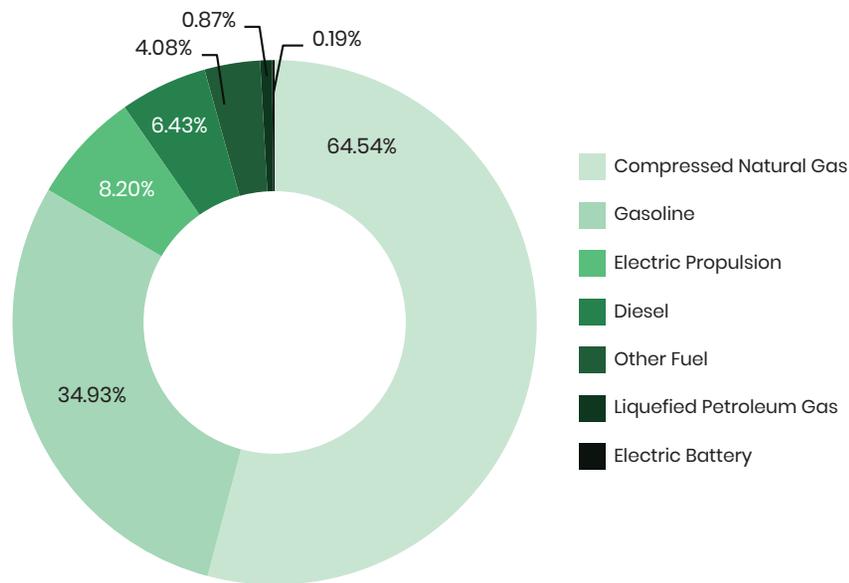
The existing fleet in Southern California is mixed. **FIGURE 21** below contains a breakdown of total vehicle revenue miles by fuel source. Many of the key

differences in propulsion systems are due to mode. Urban rail transit in the region is primarily powered by overhead direct contact electricity. The region’s commuter rail provider, Metrolink, accounts for 71 percent of all diesel miles. Demand response revenue miles predominate among gasoline miles. However, by far, the majority of revenue miles are provided via bus and the majority of those buses are powered by compressed natural gas. The majority of all miles traveled are conveyed via compressed natural gas (CNG) bus vehicles. In 2016, the region’s providers operated 172.4 million miles of service using compressed natural gas propulsion systems, almost 65 percent of all revenue miles.

Southern California has been a leader in clean fuels development. SunLine Transit was one of the first agencies in the country to experiment with CNG, having converted its fleet to CNG in 1994. Today, LA Metro operates the nation’s largest CNG fleet.

Several agencies in Southern California have partnered with the U.S. Department of Energy’s National Renewable Energy Laboratory (NREL) to perform Zero Emissions Bus demonstration projects. Two local demonstration projects of note were performed by the SunLine Transit Agency and Foothill Transit.

FIGURE 21 Transit Service Provided by Fuel Type



Source: National Transit Database, Fiscal Year 2015-16

NEW FUNDS FOR ZEBs

Since the passage of Senate Bill 1, new fund sources have been available for agencies seeking to purchase Zero Emissions Buses. In particular, the Transit and Intercity Rail Capital Program (TIRCP) has had more funds to program. TIRCP was created by Senate Bill (SB) 862 (Chapter 36, Statutes of 2014) and modified by Senate Bill 9 (Chapter 710, Statutes of 2015) to provide grants from the Greenhouse Gas Reduction Fund to support transformative capital improvements that modernize California’s intercity rail, bus, and ferry and rail transit systems to achieve the following objectives:

- Reduction in greenhouse gas emissions;
- Expand and improve rail service to increase ridership;
- Integrate the rail service of the state’s various rail operations, including integration with the high-speed rail system; and

- Improve safety

Additional funds for ZEB purchase are available from the FTA 5339(c) Low or No Emission Competitive grant program. This program provides funding to state and local governmental authorities for the purchase or lease of zero-emission and low-emission transit buses as well as acquisition, construction and leasing of required supporting facilities. Under the FAST Act, \$55 million per year is available until the fiscal year 2020.

INVESTMENTS FROM THE 2016 RTP/SCS

Many of Metro’s Measure R projects have made significant construction activates progress since the adoption of the 2016 RTP/SCS, including the Crenshaw/LAX Transit Corridor, the Regional Connector and the Purple Line Extension Phase 1. Additionally, work concluded on the Exposition Transit Corridor Phase 2 to Santa Monica and the Metro Gold Line Foothill Extension Phase 2A. Both of those projects entered revenue service in 2016.

On the November 2016 ballot, Los Angeles County voters approved Measure M, a fourth and permanent local option sales tax to fund both capital and operations within Los Angeles County. The tax is estimated to deliver \$120 billion of revenue over 40 years, adding new transit projects and expediting others previously approved under Measure R. Measure M passed with over 70 percent of the vote, clearing the two-thirds majority required. The expenditure plan identifies \$23.9 billion for transit operations, \$41.9 billion for capital construction of corridor improvements and facilities and \$2.4 billion for capital replacement to achieve a state of good repair. Additionally, the expenditure plan programs \$19.1 billion in local return funds, which are often used to fund transit operations.

SBCTA continues to work with local transit properties to provide more travel options in the San Bernardino Valley. Of note, the Downtown San Bernardino Passenger Rail Project opened in late 2017, which extended Metrolink service into Downtown San Bernardino. Similarly, RCTC began operations on the Perris Valley Line, a 24-mile extension of Metrolink’s 91 Line service to South Perris.

TABLE 9 Adopted or Draft County Plans

Commission	Short Range or Strategic Plan	Long Range Plan	Coordinated Human Services Transportation Plan
ICTC	2019 Draft Short Range Transit Plan	2013 Long Range Transportation Plan	2014 Coordinated Human Services Transportation Plan
Metro	2014 Short Range Transportation Plan	"2009 Long Range Transportation Plan 2019 LRTP Update in Progress"	2016–2019 Coordinated Public Transit–Human Services Transportation Plan for Los Angeles County
OCTA	OC Transit Vision	Designing Tomorrow – 2018 Long-Range Transportation Plan; OC Transit Vision	Public Transit–Human Services Transportation Coordination Plan
RCTC	2016 Strategic Assessment; Short Range Transit Plans	2019 Long Range Transportation Study	2016 Public Transit–Human Services Transportation Coordination Plan
SBCTA	2016 Short Range Transit Plan	2015 Countywide Comprehensive Transportation Plan; 2010 Long Range Transit Plan	2016–2020 Public Transit–Human Services Transportation Coordination Plan
VCTC	Ventura County Short Range Transit Plan (SRTP) (2015)	Ventura County Comprehensive Transportation Plan	Coordinated Public Transit–Human Services Transportation Plan, 2016 Revision

Source: SCAG

TRANSIT STRATEGIES

The Connect SoCal fiscally constrained plan is the culmination of work with a diverse group of stakeholders including CTCs, transit agencies, local government, advocacy groups and the general public. Many of the projects contained are derived from local corridor planning efforts or local long-range plans, reflecting SCAG's fifty-year commitment to local control in planning efforts, and constitute a combined regional vision for public transportation as it will exist in 2045.

NEEDS ASSESSMENT / EXISTING PLANS

As previously discussed, the CTCs play an important role in submitting to SCAG transit projects for inclusion in the RTP and FTIP, apportioning local, state, and federal transit funds amongst the various transit properties, and guiding the local vision for public transportation in their respective counties. The CTCs help to build local support and consensus for long-range projects and design, fund, and construct transportation projects in the short run.

In Los Angeles County, three additional key efforts may impact Connect SoCal during its life. The first of these is Metro's NextGen Bus Study. This study seeks to design a new bus network that is more relevant, reflective of and attractive to the residents of Los Angeles County. Specific objectives of the study include:

- Understand transit market demand in LA County
- Study the agency's current bus system and how well it serves current and potential customers
- Recommend how best to reimagine the system to be more relevant to what people need today

This study may result in major changes to Metro's bus service. All aspects of Metro bus service are on the table for study, including speed, distance, frequency, time of day, reliability as well as quality of service, and safety. The study may also result in major changes to the Metro bus network's routes.

The second effort is the Twenty-Eight by '28 Initiative which highlights 28 Metro projects for potential completion by the 2028 Summer Olympic and

Paralympic Games to be held in Los Angeles and surrounding areas. The Metro Board approved a list of projects, which includes projects already slated for completion by 2028, as well as projects with later delivery dates with potential for acceleration. Project acceleration would be considered on a case-by-case basis according to the adopted Early Project Delivery strategy. Not all Measure M investments scheduled for completion by 2028 are included in the Twenty-Eight by '28 list, and the list does not replace commitments made in the Measure M Ordinance. Metro reports quarterly on project delivery and funding status of the Twenty-Eight by '28 list.

The third planning effort is the City of Los Angeles's Mobility Plan 2035: An Element of the General Plan. This document provides the policy foundation for achieving a transportation system that balances the needs of all road users. As an update to the City's General Plan Transportation Element (last adopted in 1999), Mobility Plan 2035 incorporates "complete streets" principles and lays the policy foundation for how future generations of residents interact with their streets. This plan includes the Transit-Enhanced Network (TEN), a series of transit and active transportation investments on key corridors throughout the City of Los Angeles, including peak hour bus lanes, all day bus lanes and mixed flow lanes with improved bus service.

COORDINATED HUMAN SERVICES TRANSPORTATION PLANS

The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) required metropolitan regions to produce a Coordinated Human Services Transportation Plan. Congress intended the Coordinated Plan to begin communication between the transportation industry and human service providers about the special mobility needs of particular target populations, especially low income workers and the elderly and disabled community.

Under MAP-21, the Section 5310 Program is the only program that still has this Coordinated Plan requirement. However, recipients with unobligated JARC and New Freedom funds must continue to certify that projects are included in a Coordinated Plan. The FTA provides guidance via FTA Circular 9070.1G that,

“Projects may be identified as strategies, activities and/or specific projects addressing an identified service gap or transportation coordination objective articulated and prioritized within the plan.”

In the SCAG region, the CTCs are responsible for producing Coordinated Plans at the county level. The CTCs incorporate those strategies and recommendations, as appropriate, into the metropolitan transportation planning and programming process through their role in developing countywide project submittals to SCAG for the development of the RTP and FTIP. In this manner, the CTCs and SCAG ensure consistency between the Coordinated Plan process and the metropolitan planning process.

IMPERIAL COUNTY

The 2014 Public Transit–Human Services Transportation Coordination Plan Update, adopted by ICTC, addresses the following four objectives on behalf of Imperial County:

1. To ensure compliance with law by Imperial County, including FTA Circular 9070.1G that requires the regular conduct of a Coordinated Plan.
2. To validate past or identify new unmet transportation needs and mobility gaps of the target groups: older persons, persons with disabilities and persons of low-income. Veterans are also included as their mobility needs may differ from the general public.
3. To engender dialogue between two service sector public transportation and human services for purposes of identifying coordinated projects to address unmet needs and mobility gaps. The populations of interest here overlap with those of many Imperial County human service agencies. And trip needs described are often those most difficult to make or cannot be made on public transportation. Seeking solutions to these trip needs for Imperial County’s older adults, persons with disabilities and those of low income will require solutions that go beyond what public transportation can do alone, hence the need for this Coordinated Plan.

4. To establish a list of responsive and prioritized mobility projects and strategies, positioning Imperial County stakeholders to pursue grant and specialized transportation funding opportunities that support such strategies over the next four to five years.

This effort includes analysis on the changes to and distribution of this Plan’s target populations throughout Imperial County. The County’s 2012 population of almost 173,500 persons had grown considerably over the previous decade, a 22 percent increase from 2000, adding an additional 142,000 persons. There were changes among groups within the overall population that will impact the mobility of individuals.

- Older adults in Imperial County are 10.6 percent of the population, at 18,360 persons. The proportion of older adults is increasing at rates faster than for the general population and three times that of the national growth rate for persons age 65 and older.
- Persons of low income, specifically adults who are at 100 percent of the federal poverty levels, are 11 percent of the total population, or 19,000 adults and an additional 3,100 adults age 65 and older. Persons living at 150 percent of the federal poverty level are sometimes a better measure of low income. These low-income persons total nearly 64,000, or 39 percent of the County’s 2012 population.
- Persons with disabilities are difficult to compare with year 2000 demographics because the U.S. Census changed its reporting on disabilities. Individuals are now asked to identify functional areas with which they have difficulty. Among adults ages 18 to 64, almost 2,300 or 5 percent of the County’s population report ambulation difficulties, while almost 2,000 adults aged 65 and older report ambulation difficulties. Combined, these 4,300 persons are just under 10 percent of the County’s overall population and reporting varying mobility problems.
- U.S. military veterans number 6,631 persons. Vietnam-era veterans are the largest group, now beginning to age and some having increasing health-related difficulties. Working-age veterans in Imperial County have an unemployment rate of almost 15 percent, more than double

the national veteran unemployment rate of 7 percent.

- LEP populations, or limited English proficiency are 49,398 individuals, or 31 percent of the County's total population, predominately Spanish speakers who speak English less than very well, according to the 2012 American Community Survey. This third of the population are residents only and do not include those who travel daily into Imperial County from Mexico and may also be of limited English proficiency.
- Persons in households without vehicles are almost 3,400 households or 11 percent of Imperial Counties 49,000 households.

LOS ANGELES COUNTY

The 2016–2019 Coordinated Public Transit–Human Services Transportation Plan for Los Angeles County was adopted by the Metro Board of Directors in July 2015. The Coordinated Plan was developed through a process that included participation by seniors, individuals with disabilities, persons of low income, military veterans, other members of the public, and representatives of public, private, nonprofit transportation and human service providers. The Coordinated Plan includes the following four elements:

1. An assessment of available transportation services identifying current providers (public, private and nonprofit) for the Target Populations
2. An assessment of transportation needs for the Target Populations;
3. Regional and subregional goals and strategies to address the identified gaps between current services and needs, as well as opportunities to improve efficiencies in service delivery; and
4. Priorities for implementation based on resources (from multiple program sources), time, and feasibility for implementing specific strategies and/or activities identified.

Key findings of the needs assessment include:

- Los Angeles County residents enjoy a wealth of public transportation option.
- The North County communities have additional transit needs.

- Specific mobility challenges exist in using the established transportation network effectively.
- Changes in demographics are increasing the challenges of providing needed transportation.
- Difficulty in accessing medical trips.
- Challenges in meeting operational needs within their communities.
- Seniors are using a diversity of transportation services to meet their needs.
- Persons with disabilities also are using a mix of services.
- Military veterans' access to quality health care and adequate housing.
- Importance of station and stop facilities.
- Better options for inter-county paratransit trips.
- Roadblocks to further coordination.

The Coordinated Plan identifies a set of 38 strategies to address the Target Populations' needs and gaps. These strategies are grouped around five main goals:

1. Fund Mobility Options
2. Address Mobility Gaps
3. Provide Support Services
4. Promote and Improve Information Portals
5. Enhance Accountable Performance Monitoring Systems

ORANGE COUNTY

The OCTA's Coordinated Public Transit–Human Services Transportation Plan for Orange County, or the Coordinated Plan, is mandated by FTA and brings together human service organizations and public transit agencies to identify and meet mobility needs of older adults, persons with disabilities and persons of low income. Building upon a history of coordination requirements within its Section 5310 program, Enhanced Mobility of Seniors and Individuals with

Disabilities, the Coordinated Plan aims to 1) identify the transportation needs of individuals with disabilities, seniors, veterans and people with low income; 2) provide strategies for meeting those needs; and 3) prioritize transportation services and projects for funding and implementation.

The Plan's development process helps to identify, leverage and extend scarce transportation resources by coordinating often separate "siloe" service systems around the mobility needs of the target populations. In 2012, new transportation authorizing legislation, MAP-21, included changes that impacted the Coordinated Plan. MAP-21 repealed both the Job Access and Reverse Commute and New Freedom programs, both of which had been tied to the Coordinated Plan. MAP-21 retained and strengthened the 5310 program, restating the requirement of the Coordinated Plan and providing funding support for the strategies and projects identified in and recommended through the Coordinated Plan process.

The 2015 Coordinated Plan addresses the following three objectives:

1. Ensure compliance with law by Orange County, including FTA Circular 9070.1G that requires the regular conduct of a Coordinated Plan;
2. Validate past or identify new unmet transportation needs and mobility gaps of the target groups; Engender dialogue between two service sectors—the public transit provider and the human service agencies—for purposes of identifying and supporting coordinated projects by which unmet needs and mobility gaps can be addressed; and
3. Establish a list of responsive and prioritized strategies and projects by which to meet unmet needs and mobility gaps, positioning Orange County stakeholders to pursue grant and specialized transportation funding opportunities that support these efforts during the next four years.

RIVERSIDE COUNTY

RCTC's 2016 Update to the Public Transit-Human Services Transportation Coordination Plan for Riverside County identifies and addresses transportation needs and gaps of seniors, persons with disabilities and persons of low-

income. Through mobility goals, strategies and projects, it provides direction to a number of Riverside County stakeholders that include the Commission, the county's public transit providers, human service agencies and city and County personnel.

The Coordinated Plan describes the groups of interest among the County's almost 2.3 million persons, and includes the 12.5 percent or 282,000 persons age 65 and older, growing in number and proportion. Persons with disabilities comprise 5.4 percent of the adult population, less than 1 percent of children or youth under age 17; just 4.4 percent of seniors report that they are disabled. Combined, the represents 242,000 individuals reporting disabilities. Low-income persons, living at or below 100 percent of the Federal Poverty Level, total just under 240,000 persons. U.S. military veterans are also of concern to this Plan. The 132,000 Riverside County veterans comprise 5.8 percent of the County's population, as reported in the 2014 American Community Survey 5-Year Estimates.

The Coordinated Plan identifies 10 key mobility needs and gaps:

1. Expanded transit service area needs exist throughout the County.
2. Improved connectivity will shorten trips and contribute to increased frequency of trips.
3. Expanded hours of service and days of service will help to meet additional trip needs.
4. Long-distance regional medical trip needs exist in all areas of the County.
5. Safe and comfortable rides can improve riders' experience.
6. Safe pedestrian and bicyclist experiences will improve mobility choices.
7. Transit affordability and fare policies can be barriers to use.
8. Information topics and mobility management opportunities address transit promotion.
9. Coordination opportunities with human service agencies, specialized transportation providers and public transit can meet more trip needs.
10. Securing funding is critical to maintain, enhance and

expand transit services.

To respond to the identified needs, the Coordinated Plan identifies 23 strategies organized within five overall goals:

1. Grow Mobility Options – Sustain, fund and continue to expand the array of public, human service and private transportation services available in Riverside County.
2. Connect and Coordinate Services – Improve connectivity among public transportation services and coordination with human service transportation to address identified mobility gaps.
3. Promote Safety and Comfort – Ensure safety through new and well-maintained rolling stock, attention to passenger safety and physical environments that promote safety for pedestrians and bicyclists.
4. Improve Health Access – Promote transportation solutions, including new partnerships, to improve the ability of Riverside residents to travel to and from local and regional medical services and treatments.
5. Promote and Improve Communication – Promote, improve and expand information portals that are multi-cultural and embrace technology and mobility management tools to increase mobility options.

SAN BERNARDINO COUNTY

SBCTA's adopted Public Transit-Human Services Transportation Coordination Plan for San Bernardino County, 2016-2020, examined demographic and socioeconomic changes between the census periods of 2000 and 2014. Of note, the County's share of lower income seniors increased dramatically by 89.6 percent, from 11,822 in 2000 to 22,412 in 2014. Persons with disabilities make up 11 percent of the total population overall. Among low-income persons, 30 percent of the total population (630,922 residents) is at 150 percent of the Federal Poverty Level. Eleven percent of seniors are at the Federal Poverty Level and the low-income adult population grew to more than 215,500 individuals, or 16.7 percent of the adult population in the 2014 ACS, a 56.3 percent increase during the two reporting periods. The military veteran population composes 4.9 percent of the County's total population, with the largest group composed of

veterans aged 65 years and older. Per the ACS, 15 percent of residents, a total of 311,336 residents, are Limited English Proficient (LEP).

In terms of needs, the Coordinated Plan identified nine key themes:

1. Underserved and unserved areas exist throughout the County.
2. Expanding service hours, days of service, and increasing frequencies can fill some gaps.
3. Long-distance regional, medical and work trip needs exist throughout the County.
4. Affordability can be a barrier to use.
5. Increased awareness and training about existing services, programs, and resources will help meet trip needs.
6. Increased access to transit / safe path-of-travel / safe and comfortable rides will help fill gaps.
7. Maintain and develop creative solutions / Support existing mobility options.
8. Improving coordination between public transit and specialized transit providers, health and medical agencies, human and social services and non-profit agencies can fill gaps in service and avoid duplication.
9. Encourage enhanced mobility management strategies, such as developing regional brokerages

The mobility needs and gaps are proposed to be addressed through 32 strategies organized around five goals:

1. Grow Mobility Choices – Increase the geographic reach, frequency and types of public transit, human services and private transportation choices available to San Bernardino residents as demand warrants and resources allow.
2. Promote and Coordinate Transportation Services – Promote, improve and expand information portals, ensuring multi-cultural strategies, embracing technology and employing mobility management tools to improve mobility and access.

3. Connect and Speed Transit – Improve connectivity among public transportation services and between modes, embracing innovations that speed travel or coordinate trips through trip brokerages, as funding allows.
4. Improve Health Care Transportation Access – Promote transportation solutions that improve the ability of San Bernardino residents to travel to and from local and regional medical services and treatments.
5. Promote Safe and Comfortable Mobility – Ensure safety through new and well-maintained rolling stock, attention to passenger safety and to physical environments that promote safety for pedestrians and bicyclists.

- There is a confusing array of information resources
- Some human service transportation projects can fill some mobility gaps
- There is inconsistency of span of service for weekday and weekend service
- Coordination issues and mobility gaps exist related to fixed route services
- Unserved areas exist
- There are fare coordination and affordability issues
- There is need for more pedestrian facilities, bus stop amenities, and vehicles
- Coordination issues and mobility gaps exist related to dial-a-ride services

VENTURA COUNTY

The Ventura County Coordinated Public Transit–Human Services Transportation Plan, 2016 Revision, was prepared by VCTC to identify and address transportation needs and gaps of three target populations: seniors, persons with disabilities and persons of low-income.

Of Ventura County's 835,790 residents, almost 105,600 are seniors, 12.6 percent aged 65 and older, on par and growing in number and proportion by 11 percent since 2000. Persons with disabilities include 4 percent of children or youth under age 17, 5.9 percent of the adult population, and an impressive 34 percent of older adults. Together these total 47,500 persons reporting some type of disability. Among low-income persons, 7.3 percent of seniors are living at Federal Poverty levels, an increase of 66 percent over 2000. Currently 11 percent or 92,000 residents are living at or below Federal Poverty Levels. U.S. military veterans make up 5.6 percent or 46,500 individuals. Limited English Proficient persons, number 127,000 persons and 16 percent of the County's population, while 13.6 percent of residents are Spanish-speaking with limited English proficiency.

Through a public involvement process including stakeholder workshops and focus groups, intercept surveys, operator interviews, testimony, and an agency/organization survey, several common themes emerged:

In response to the identified needs and gaps, the Coordinate Plan outlines 26 strategies organized around six key themes:

1. Responses to information gaps
2. Capacity building of human service transportation can fill some mobility gaps
3. Fixed route schedule coordination and service levels
4. Transit affordability
5. Capital and infrastructure investment to enhance safety and mobility
6. Dial-A-Ride service coordination

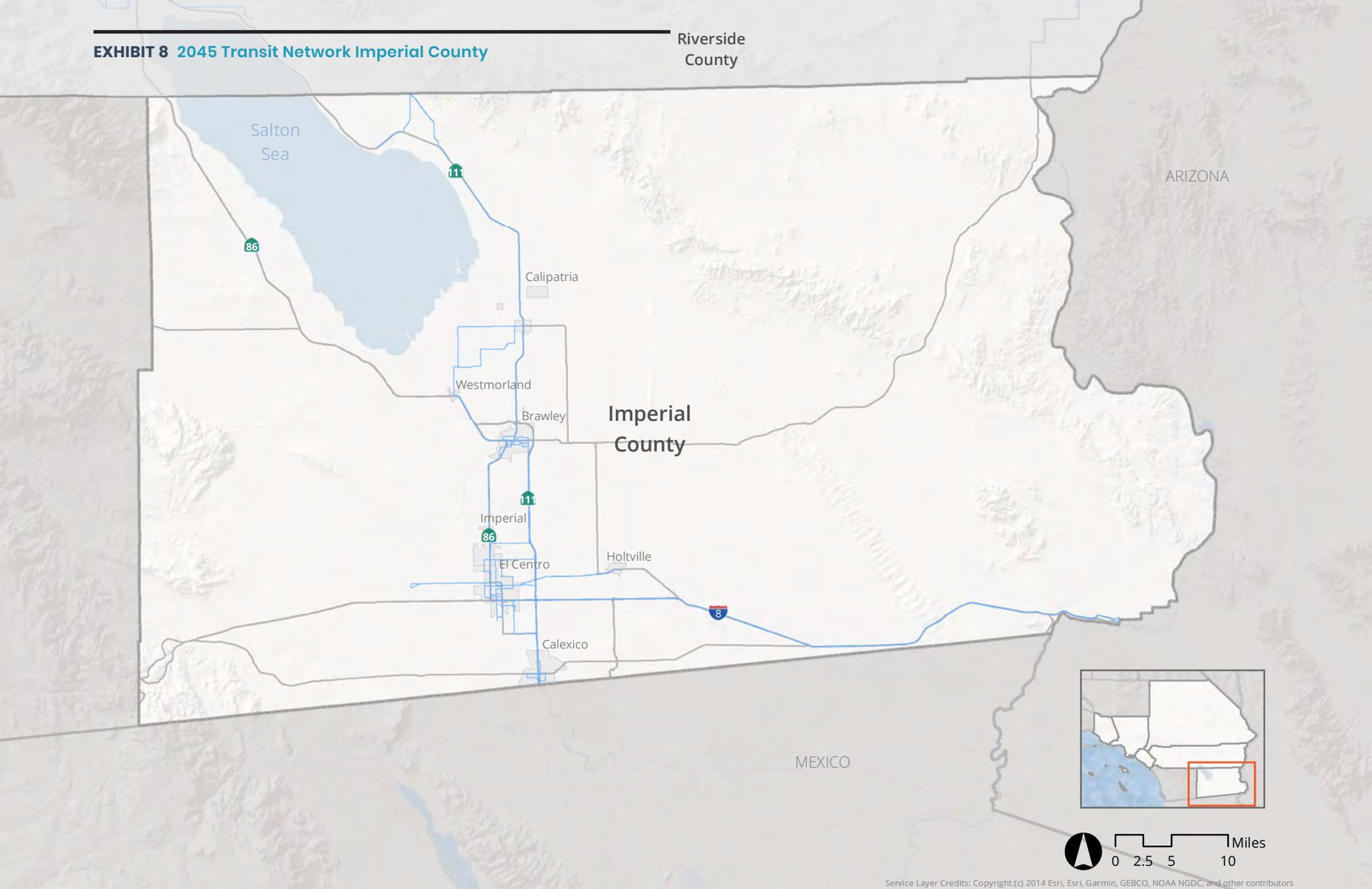
TABLE 10 Selected Transit Capital Projects

County	Project
Los Angeles	Airport Metro Connector
Los Angeles	BRT Connector – Orange/Red Line to Gold Line
Los Angeles	Crenshaw/LAX Transit Corridor
Los Angeles	Historic Los Angeles Streetcar
Los Angeles	East San Fernando Valley Transit Corridor
Los Angeles	Gold Line Eastside Extension Phase 2 to South El Monte
Los Angeles	Gold Line Foothill Extension – Azusa to Claremont
Los Angeles	Green Line Extension to Torrance
Los Angeles	LAX Automated People Mover
Los Angeles	North San Fernando Valley Transit Corridor
Los Angeles	Orange Line BRT Improvements
Los Angeles	Purple Line Westside Subway Extension to La Cienega, Century City, Westwood
Los Angeles	Regional Connector
Los Angeles	Sepulveda Pass Transit Corridor (Phase 2)
Los Angeles	Vermont Transit Corridor
Los Angeles	West Santa Ana Branch Transit Corridor
Los Angeles	Green Line Extension to Norwalk/Santa Fe Springs Metrolink Station
Los Angeles	Red Line Extension to Hollywood Burbank Airport
Los Angeles	Slauson Light Rail – Crenshaw/LAX Transit Corridor to Blue Line
Orange	OC Streetcar
Orange	OC Transit Vision
Riverside	Coachella Valley Quick Bus
Riverside	Rapid Commuter Corridor from Perris to San Jacinto
Riverside	RapidLink Service – Riverside, Moreno Valley, Perris
San Bernardino	Redlands Passenger Rail
San Bernardino	West Valley Connector Phase 1
San Bernardino	Gold Line Extension to Montclair
San Bernardino	Passenger Rail Service from San Bernardino Metrolink Line to Ontario Airport

Source: SCAG

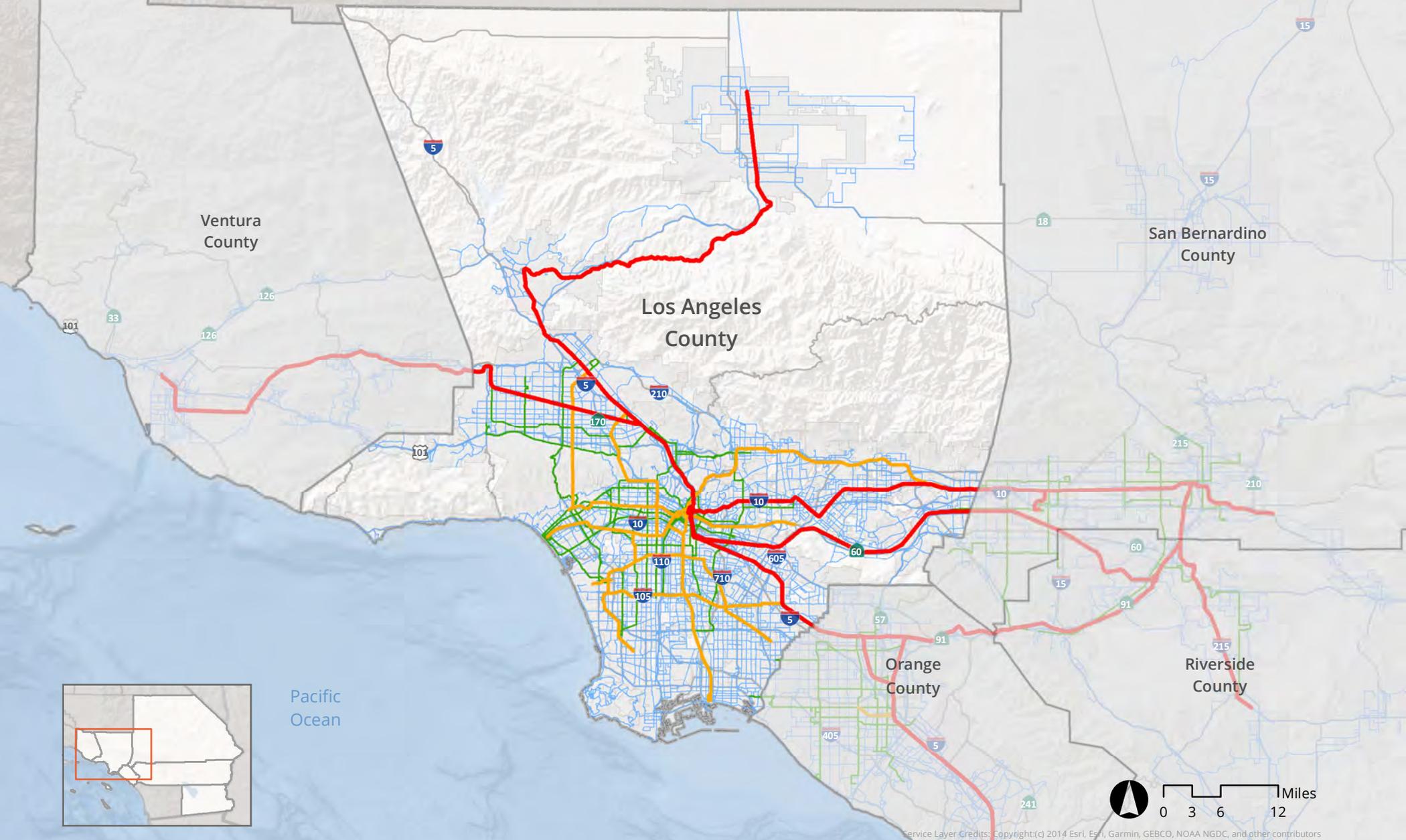
EXHIBIT 8 2045 Transit Network Imperial County

Riverside
County



 Metrolink (2045)  Urban Rail (2045)  Rapid Bus and Bus Rapid Transit (2045)  Bus Routes (2045)

EXHIBIT 9 2045 Transit Network Los Angeles County

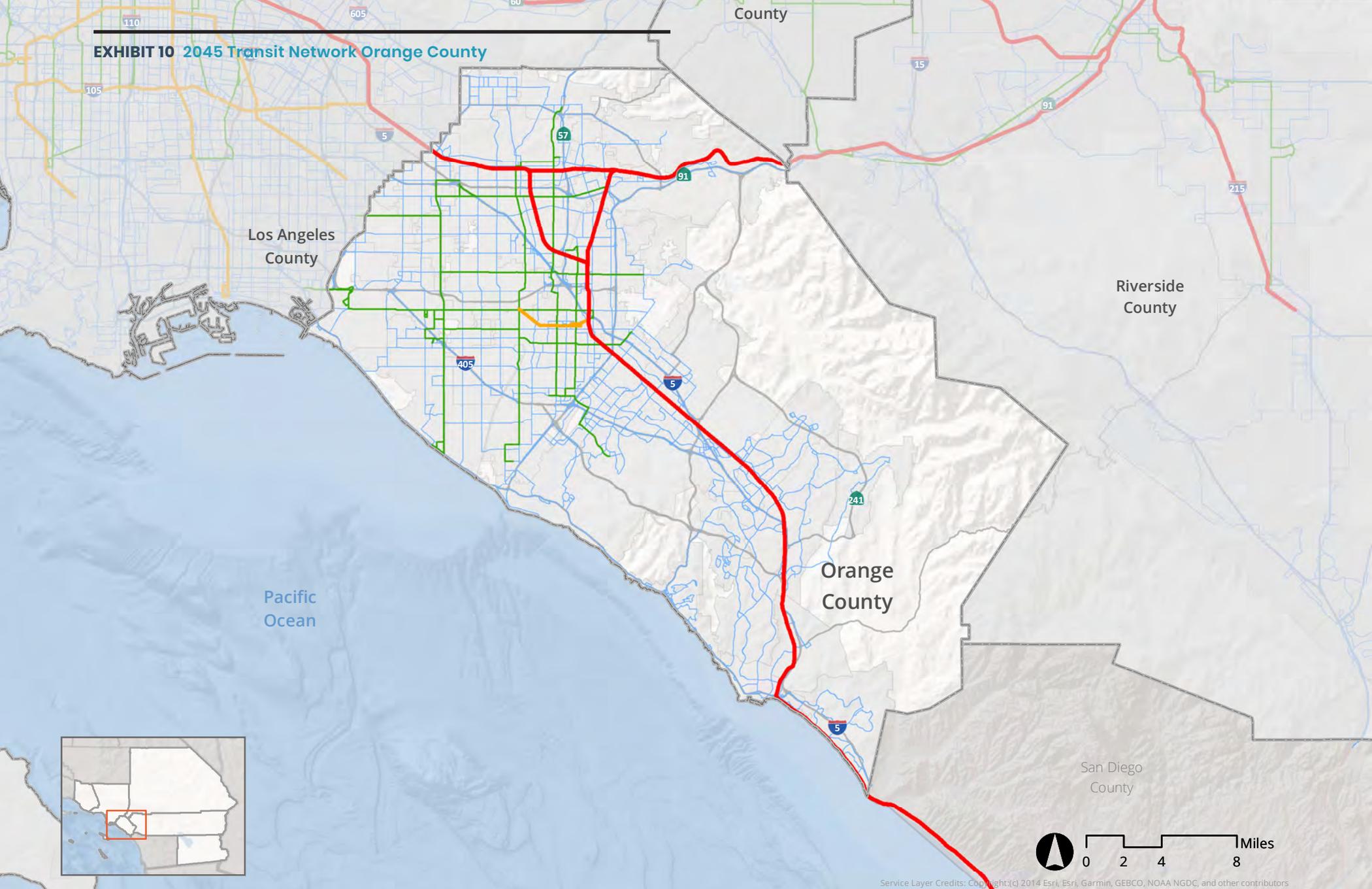


Metrolink (2045) Urban Rail (2045) Rapid Bus and Bus Rapid Transit (2045) Bus Routes (2045)

Note: Planned project alignments shown on this map are not intended to represent preferred alternatives where local planning and environmental processes are still ongoing. Maps provided in future updates to Connect SoCal will reflect locally preferred alternatives, once they are formally adopted by the local lead agency.

Source: SCAG, 2019

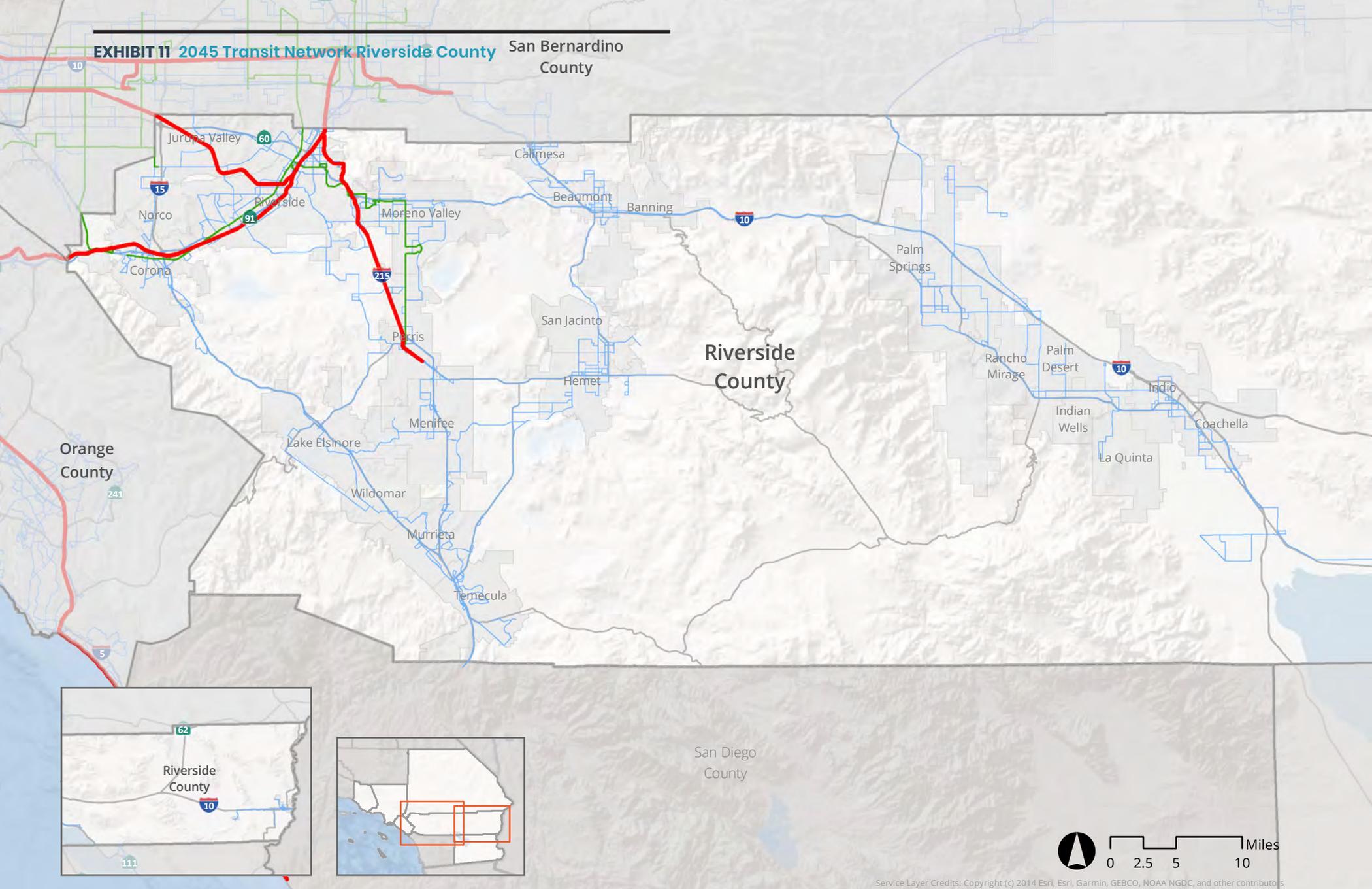
EXHIBIT 10 2045 Transit Network Orange County



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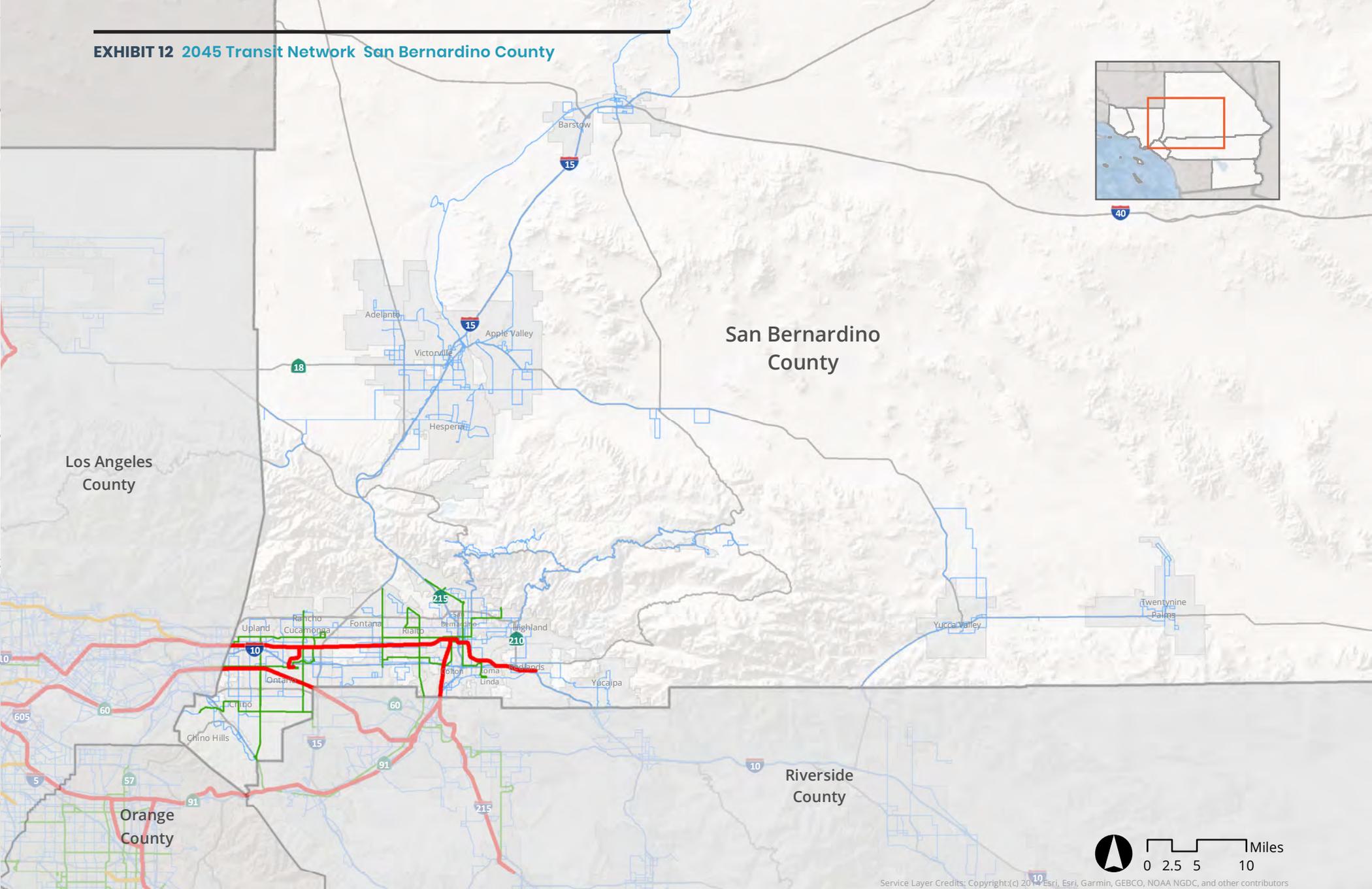
- Metrolink (2045)
- Urban Rail (2045)
- Rapid Bus and Bus Rapid Transit (2045)
- Bus Routes (2045)

EXHIBIT 11 2045 Transit Network Riverside County



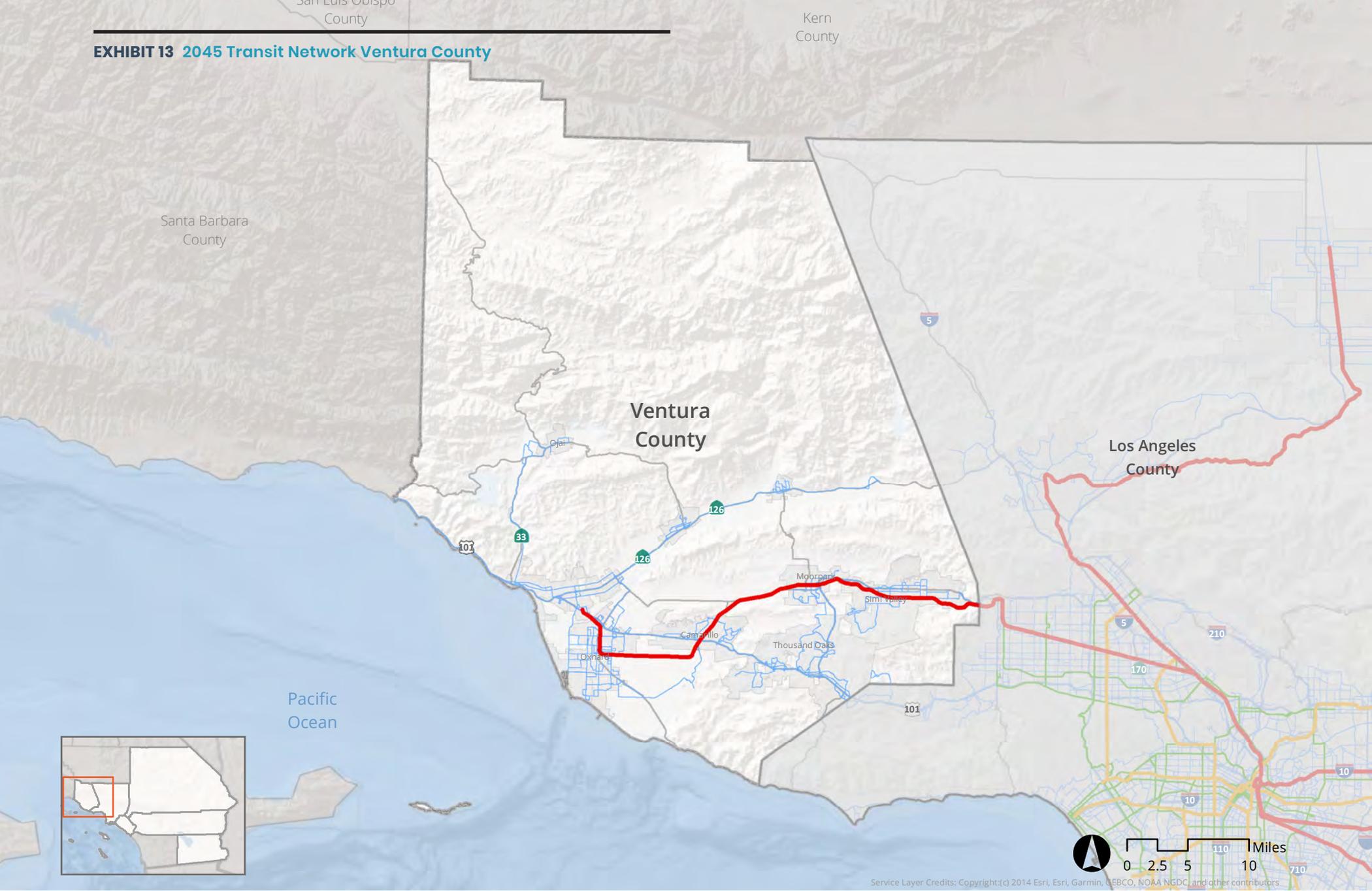
 Metrolink (2045)  Urban Rail (2045)  Rapid Bus and Bus Rapid Transit (2045)  Bus Routes (2045)

EXHIBIT 12 2045 Transit Network San Bernardino County



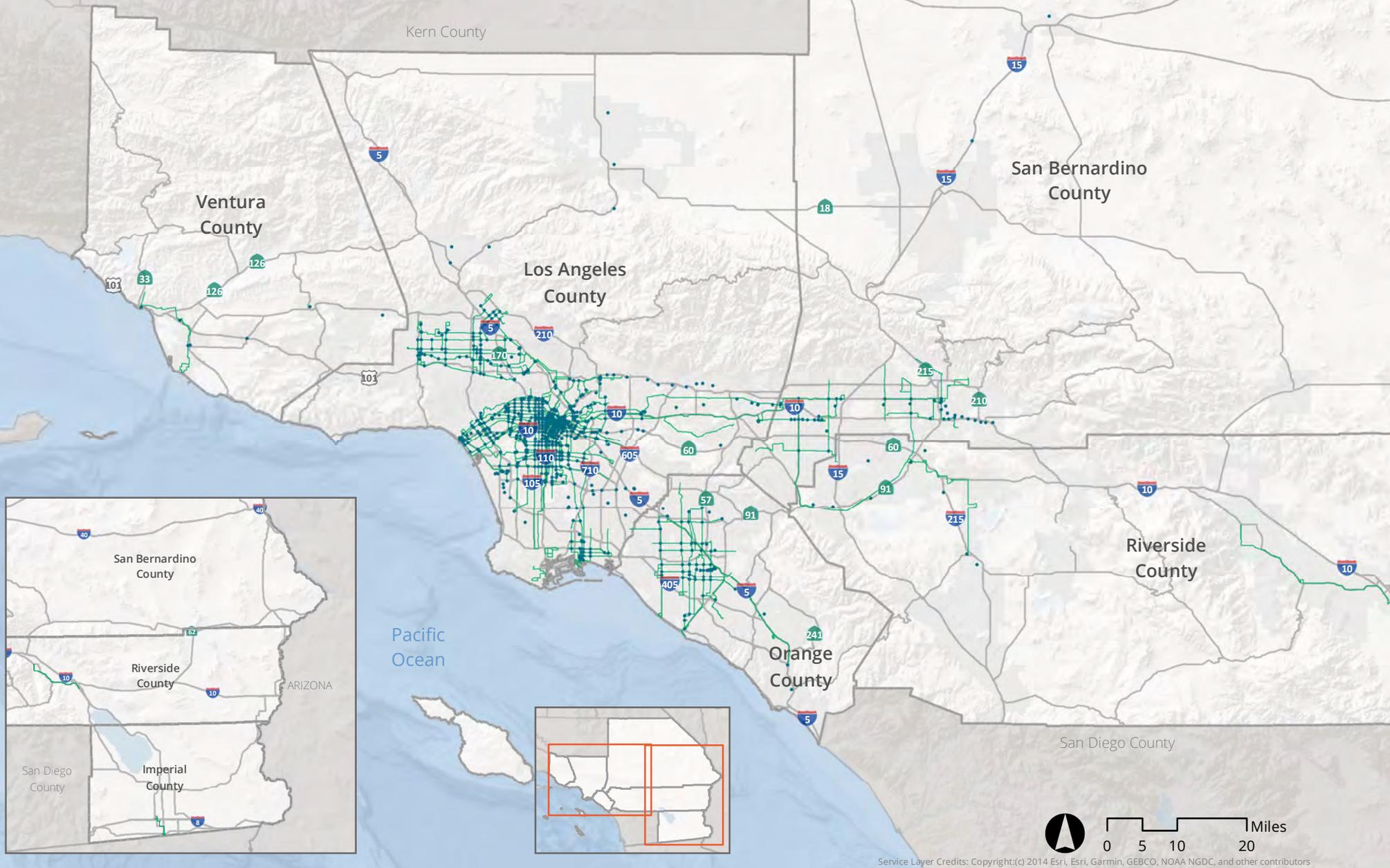
 Metrolink (2045)  Urban Rail (2045)  Rapid Bus and Bus Rapid Transit (2045)  Bus Routes (2045)

EXHIBIT 13 2045 Transit Network Ventura County



Metrolink (2045) Urban Rail (2045) Rapid Bus and Bus Rapid Transit (2045) Bus Routes (2045)

EXHIBIT 14 2045 Plan High Quality Transit Corridors



- Major Transit Stops (2045) ↗ High Quality Transit Corridors (HQTCs) (2045)

Note: SCAG identifies Major Transit Stops and HQTCs using the methodology described in the Transit Technical Report. In summary, these maps and data are intended for planning purposes only. SCAG shall incur no responsibility or liability as to the completeness, currentness, or accuracy of this information, and assumes no responsibility arising from use of this information by individuals, businesses, or other public entities. The information is provided with no warranty of any kind, expressed or implied. Local jurisdictions should consult with the appropriate transit provider(s) to obtain the latest information on transit routes, stop locations, and service intervals before making determinations regarding CEQA exemption or streamlining.

PLAN PROJECTS AND STRATEGIES

Connect SoCal includes significant investment in public transit across all transit modes. It includes a \$67 billion investment in transit capital and a \$174 billion investment in transit operations and maintenance. Transit represents 55 percent of total operations and maintenance in Connect SoCal and 23 percent of capital investments. **TABLE 10** displays selected major transit capital projects included in Connect SoCal. These investments include new rail transit facilities, vehicle replacements, bus system improvements and capitalized maintenance projects.

Through its metropolitan planning process, SCAG will continue to support local efforts to redesign transit systems to better support travelers' needs, such as Metro's NextGen Study and OCTA's OC Bus 360 and Transit Master Plan. SCAG will also continue to share best practices and promote regional coordination and consistency in how transit agencies can leverage technology and innovation to promote seamless multimodal travel, improve first/last mile connections and provide shared on-demand services where and when fixed route transit isn't cost effective.

EXHIBITS 8 through **13** depict each county's local transit network as the plan envisions it in 2045.

PLANNED HQTCS

Planned HQTCS are future improvements that are expected to be implemented by transit agencies by the RTP/SCS horizon year of 2045. These are assumed by definition to meet the statutory requirements of HQTCS. SCAG's methodology is included as an Appendix to this technical report.

SCAG updates its inventory of planned HQTCS with the adoption of a new RTP/SCS, once every four years. **EXHIBIT 14** identifies the planned future HQTCS included in Connect SoCal.

FIXED GUIDEWAY GAP CLOSURES

The previous 2016 RTP/SCS included as regional initiatives five fixed guideway

gap closures, funded by the Plan's innovative financing strategies. These projects are included above and beyond locally funded CTC investments, providing important links in the future transit network. They leverage existing investments to expand the connectivity of the regional rail system and support seamless transferability throughout the network. Three of the projects, the Gold Line Foothill Extension to Montclair, Vermont Corridor, and Metro Green Line Norwalk extension to the Norwalk/Santa Fe Springs Metrolink Station, are now included Metro's Measure M expenditure plan. All of these fixed guideway gap closures, including the Slauson Corridor and Metro Red Line extension to Burbank Airport, are carried forward into Connect SoCal.

DEDICATED MULTIMODAL LANES

As previously noted, the City of Los Angeles's Mobility Plan 2035 calls for a Transit-Enhanced Network that includes peak-hour and dedicated all day bus-only lanes. While Connect SoCal recognizes that the network identified in the City of Los Angeles Mobility Plan is subject to further local planning and project development, including environmental impact analysis, implementation of such a network would support regional and statewide environmental goals, including a reduction in greenhouse gas emissions. SCAG therefore estimates "off-model" greenhouse gas emissions reductions in 2035 from such a network as part of the Connect SoCal Sustainable Communities Strategy.

PLAN PERFORMANCE

Our region's investment in transit and passenger rail, coupled with its commitment to attaining sustainable communities, result in significant growth in transit trips and passenger miles by 2045. The output from the travel demand model indicates a 144 percent increase in, or more than doubling of, transit and rail boardings. This includes a 104 percent increase for bus, and a fourfold increase for rail (light, heavy, and commuter). Passenger miles are also up significantly for bus service including BRT and local, and especially for rail, reflecting a higher percentage of transit trips on rail due to the new rail facilities to be built between now and 2045. On a per capita level, transit ridership will double, outpacing the region's growth in population (19.5 percent) and

employment (19.8 percent) from 2016 to 2045.

Transit Asset Management Targets: As described in the Regulatory Framework section of this technical report, MPOs in coordination with the state and transit operators must develop regional TAM targets as part of the development of Connect SoCal. The targets in **TABLE 11** were produced in a collaborative fashion with transit agencies and the CTCs, based on their agency TAM plans and local targets. (Refer to **TABLE 4** for more detail on the FTA required performance measures.) SCAG will report on progress towards meeting these targets in future updates of the RTP and FTIP.

The TAM targets reflect a desire to maintain current (2019) conditions through the Connect SoCal horizon period through 2045. This is an aspirational target, as it is unlikely the region would meet all of these targets unless substantial additional funding is identified, or funding cuts are made in other areas such as operations. Additionally, the funding uncertainty is further impacted by the CARB Innovative Clean Transit Rule. The TAM target setting analysis does not currently incorporate the impacts from the CARB requirement to purchase zero

emission buses. However, once the transit agencies complete their bus rollout plans, this information can be incorporated into the TAM target setting analysis in a future RTP update.

In developing the targets, SCAG reviewed and considered the transit operators' TAM plans (including identified goals, objectives, measures and targets), thereby incorporating them into the metropolitan planning process. These agency TAM plans are identified in **TABLE 12**.

As part of this process, SCAG identified a significant unfunded need of over \$10 billion to address the estimated state of good repair backlog across the six-county region. Connect SoCal is the first RTP for which TAM targets were developed, and SCAG will continue to work with the region's transit operators and county transportation commissions to seek ways to improve the methodology, data collection and analysis for future RTP updates, and to continue engaging in a regional discussion about transit state of good repair and the need for the additional funding.

TABLE 11 Transit Asset Management Targets

County/Agency	Rolling Stock (% of revenue vehicles that meet/exceed ULB)	Equipment (% of non-revenue vehicles that meet/exceed ULB)	Facilities (% of facilities rated below 3.0 on TERM scale)	Infrastructure (% of track segments with performance restrictions)
Imperial	0.0%	n/a	n/a	n/a
Los Angeles	16.0%	27.7%	6.4%	1.5%
Orange	11.7%	18.6%	0.0%	n/a
Riverside	3.8%	17.9%	22.1%	n/a
San Bernardino	22.2%	27.7%	26.3%	n/a
Ventura	6.3%	25.0%	0.0%	n/a
Metrolink	10.0%	22.7%	33.3%	15.0%
SCAG Region	14.8%	26.1%	10.3%	11.5%

Source: SCAG
Notes: ULB = Useful Life Benchmark; TERM = Transit Economic Requirements Model

TABLE 12 Transit Asset Management Plans

County	Agency	Plan Date
Imperial	Imperial County Transportation Commission	9/28/2018
Los Angeles	Access Services Los Angeles County	9/30/2018
Los Angeles	Antelope Valley Transit Authority	September 2018
Los Angeles	City of Commerce Municipal Bus Lines	12/20/2018
Los Angeles	City of Gardena's Gtrans	October 2018
Los Angeles	City of La Mirada	1/30/2019
Los Angeles	City of Los Angeles Department of Transportation	September 2018
Los Angeles	City of Redondo Beach, Beach Cities Transit	9/26/2018
Los Angeles	Culver City Municipal Bus Lines	October 2018
Los Angeles	Foothill Transit	9/28/2018
Los Angeles	Los Angeles County Metropolitan Transportation Authority	October 2018
Los Angeles	Los Angeles County Tier II Providers (Metro Group Plan)	10/1/2018
Los Angeles	Long Beach Transit	11/1/2018
Los Angeles	Montebello Bus Lines	10/30/2018
Los Angeles	Norwalk Transit	September 2018
Los Angeles	Santa Clarita Transit	2018
Los Angeles	Santa Monica's Big Blue Bus	10/1/2018
Los Angeles	Torrance Transit	10/1/2018
Orange	Anaheim Transportation Network	October 2018
Orange	Orange County Transportation Authority	9/21/2018
Riverside	City of Corona Transit Service	10/26/2018
Riverside	City of Riverside Special Transit	2019
Riverside	Riverside County Transportation Commission	9/26/2018
Riverside	Riverside Transit Agency	10/1/2018
Riverside	SunLine Transit Agency	9/21/2018
San Bernardino	City of Needles	10/1/2018
San Bernardino	Morongo Basin Transit Authority	9/21/2018
San Bernardino	Mountain Area Regional Transit Authority	10/1/2018
San Bernardino	Omnitrans	December 2018
San Bernardino	Victor Valley Transit Authority	9/28/2018
Ventura	Gold Coast Transit	November 2018
Ventura	Ventura County Transportation Commission Group Plan	October 2018

Source: SCAG

NEXT STEPS

SCAG will implement the transit element of Connect SoCal through four key strategies:

1. Performing analytical studies to move forward the strategies described here. Several key efforts are already underway, including the Gold Coast Transit District Naval Base Ventura County First-Mile/ Last-Mile Study, the development of an Asset database to comply with the FTA's TAM Final Rule and the development of new tools to forecast demand for ADA paratransit trips. Additional planning efforts with respect to transportation demand management (TDM), intelligent transportation systems (ITS), active transportation and pricing will also support and complement the advancement of Connect SoCal transit strategies.
2. Programming local projects into the FTIP. Entering into the FTIP is a key step in the project development pipeline, particularly for projects using federal funds, requiring federal approvals or that are regionally significant.
3. Monitoring implementation progress. SCAG will continue to partner with local agencies in the development of local plans and environmental clearances and will continue to seek new ways to monitor implementation progress. One key strategy could be to monitor the FTA Triennial and Certifications and Assurances progress on the part of local providers.
4. SCAG will continue to assist in the distribution and administration of key FTA formula funds. In particular, SCAG will continue to serve as the designated recipient for large UZAs for FTA 5307, 5337, and 5339 funds, as well as assisting with the pass-through of competitive 5312 and 5339 grants.

CONCLUSION

In 1985, the region's transit system carried an average of 45.8 trips per resident. By 2016, this had fallen to 34.7 trips per resident, despite adding over six million residents and making significant investments in transit system expansion. It was

not a linear decline, as the region saw rapid growth in per capita transit trips in early 2000s as fuel prices rose quickly. However, the decline in transit use since 2014–15 seems to have accelerated. While it is clear that voters will endorse sales tax proposals that fund transit, it is not clear that they are equally eager to ride those transit systems. These are related but not coterminous issues.

The transit element of Connect SoCal and this technical report outline a series of investments that have been approved by voters in county sales tax expenditure plans. These projects range in size, duration and scope, but they constitute a sizable commitment to the continued operation of an extensive transit network. However, only residents choosing to ride these services can establish them as financially worthwhile.

Local jurisdictions and transit providers are working to offer useful transportation services for residents of the region. As communications technologies develop, this may include providing platforms for the use of third-party services or other “mobility as a service” applications. Transit agencies are piloting improvements using emerging technologies and innovations, such as partnerships with private sector companies to provide first/last mile service to transit, or on-demand service where traditional fixed-route transit may not be cost-effective. Transit agencies are also using big data to better understand travel markets and redesign their bus networks to better serve travelers' needs. Tapping into technology and innovation may help transit agencies continue to meet their dual roles as both a social service and as the backbone of a sustainable multi-modal transportation system. However, as noted by UCLA in *Falling Transit Ridership*, a critical and unquestionably more difficult part of the solution to improving transit ridership lies outside of the purview of transit operators, and within the realm of policy decisions regarding the use of private automobiles.

APPENDIX 1 OF 1

High Quality Transit Corridors and Major Transit Stops

BACKGROUND

The Sustainable Communities and Climate Protection Act of 2008, Senate Bill (SB) 375, requires that Metropolitan Planning Organizations (MPOs) develop a Sustainable Communities Strategy (SCS) to reduce per capita greenhouse gas emissions through integrated transportation, land use, housing and environmental planning. SB 375 creates incentives for residential or mixed-use residential projects that may be exempt from, or subject to a limited review of, the California Environmental Quality Act (CEQA), provided they are consistent with the MPO's adopted SCS. These "transit priority projects" must, among other criteria, be located within one-half mile of a major transit stop or high-quality transit corridor (HQTC).

SB 743, signed into law in 2013, provides further opportunities for CEQA exemption and streamlining to facilitate transit oriented development (TOD). Specifically, certain types of projects within "transit priority areas" (TPAs) can benefit from a CEQA exemption if they are consistent with an adopted specific plan and the SCS. A TPA is an area within one-half mile of a major transit stop that is existing or planned, if the planned stop is scheduled to be completed within the planning horizon included in a Federal Transportation Improvement Program (FTIP).

STATUTORY DEFINITIONS

Definitions of "major transit stop" and "high quality transit corridor" are set forth under California law as follows:

CA Pub. Res. Code § 21155(b)

For purposes of this chapter, a transit priority project shall (1) contain at least 50 percent residential use, based on total building square footage and, if the project contains between 26 percent and 50 percent nonresidential uses, a floor area ratio of not less than 0.75; (2) provide a minimum net density of at least 20 dwelling units per acre; and (3) be within one-half mile of a major transit stop or high-quality transit corridor included in a regional transportation plan. A major transit stop is as defined in Section 21064.3, except that, for purposes of this section, it also includes major transit stops that are included in the applicable regional transportation plan. For purposes of this section, a high-quality transit corridor means a corridor with fixed route bus service with service intervals no longer than 15 minutes during peak commute hours. A project shall be considered to be within one-half mile of a major transit stop or high-quality transit corridor if all parcels within the project have no more than 25 percent of their area farther than one-half mile from the stop or corridor and if not more than 10 percent of the residential units or 100 units, whichever is less, in the project are farther than one-half mile from the stop or corridor.

CA Pub. Res. Code § 21064.3

“Major transit stop” means a site containing any of the following:

- (a) An existing rail or bus rapid transit station.
- (b) A ferry terminal served by either a bus or rail transit service.
- (c) The intersection of two or more major bus routes with a frequency of service interval of 15 minutes or less during the morning and afternoon peak commute periods.

CA Pub. Res. Code § 21060.2

(a) “Bus rapid transit” means a public mass transit service provided by a public agency or by a public-private partnership that includes all of the following features:

- (1) Full-time dedicated bus lanes or operation in a separate right-of-way dedicated for public transportation with a frequency of service interval of 15 minutes or less during the morning and afternoon peak commute periods.
- (2) Transit signal priority.
- (3) All-door boarding.
- (4) Fare collection system that promotes efficiency.
- (5) Defined stations.

(b) “Bus rapid transit station” means a clearly defined bus station served by a bus rapid transit.

METHODOLOGY

SCAG’s technical methodology for identifying HQTs and major transit stops is based on input from the Regional Transit Technical Advisory Committee (RTTAC), as well as consultation with local agencies, other large MPOs in California, and the Governor’s Office of Planning and Research. The methodology and assumptions are discussed below. This methodology may be periodically updated to incorporate revisions or clarifications. Questions should be directed to Steve Fox, at fox@scag.ca.gov, or Philip Law, at law@scag.ca.gov.

SCAG maps and data depicting HQTs and major transit stops are intended for planning purposes only. SCAG shall incur no responsibility or liability as to the completeness, currentness, or accuracy of this information. SCAG assumes no responsibility arising from use of this information by individuals, businesses, or other public entities. The information is provided with no warranty of any kind, expressed or implied, including but not limited to the implied warranties of merchantability and fitness for a particular purpose.

For the methodology SCAG uses to identify “high quality transit areas,” see the Sustainable Communities Strategies Technical Report.

EXISTING HQTCs AND MAJOR TRANSIT STOPS

SCAG updates its inventory of existing major transit stops and HQTCs with the adoption of a new Regional Transportation Plan (RTP) and SCS, once every four years. Data for the existing (“base year”) condition for the RTP/SCS are typically obtained several years before plan adoption. The base year transit network for *Connect SoCal*, the 2020 RTP/SCS, is based primarily on data for 2016. This inventory of existing major transit stops and HQTCs is therefore only a snapshot in time as of 2016, and does not reflect the existing levels of transit service for any other timeframe.

See **EXHIBIT 7**, 2016 Base Year “existing” major transit stops and high quality transit corridors.

Transit agencies make adjustments to bus service on a regular basis. Therefore, given the limitations of the RTP/SCS base year transit network, local jurisdictions should consult with the appropriate transit provider(s) to obtain the latest information on existing transit routes, stop locations, and service intervals before making determinations regarding CEQA exemption or streamlining. It is the responsibility of the lead agency under CEQA to determine if a project meets statutory requirements.

STOP-BASED ANALYSIS

SCAG calculates peak commute bus service intervals at the stop level using schedule data published by transit agencies in the General Transit Feed Specification (GTFS) format (see for example, www.transitfeeds.com). An HQTC therefore comprises or is determined by the qualifying stops on an individual bus route.

PEAK PERIOD BUS SERVICE INTERVAL (FREQUENCY)

To determine whether the peak commute bus service interval (also called frequency) meets the statutory threshold of 15 minutes or less, SCAG uses the peak period defined in its regional travel demand model. The morning peak

is defined as 6am to 9am and the afternoon peak is defined as 3pm to 7pm. A transit operator may have a different, board-adopted or de facto peak period; in such cases SCAG will accept requests to use operator-specific peak-hour periods on a case-by-case basis.

SCAG uses the total population of bus trips during the combined seven-hour morning and afternoon peak periods to determine the peak frequency at a bus stop. This is done for each bus route, by direction. The peak frequency is calculated by dividing 420 minutes (the seven-hour peak converted to minutes) by the total peak bus trips. This average frequency should be 15 minutes or less in order to qualify. The threshold is strict, at 15.0 minutes.

DIRECTIONAL FREQUENCY

A bus route must only meet the 15-minute service interval threshold in one direction to qualify as an HQTC. This is based on RTTAC feedback that transit agencies often operate very peak-directional service or operate predominantly one-way service on a corridor.

CORRIDORS WITH MULTIPLE OVERLAPPING BUS ROUTES

Separate but overlapping bus routes that do not individually meet the 15-minute threshold may not be combined in order to qualify as an HQTC. However, based on RTTAC feedback, there are certain corridors where overlapping “line families” or local/bus rapid transit (BRT) lines are intended to function as one bus route. On these corridors, transit riders typically board the first bus available, whether it be a local, express, or BRT line. For these line families or local/BRT corridors, SCAG uses the combined routes to calculate the frequency.

ROUTE ALIGNMENT

The entire alignment of a bus route, based on the stops that meet the 15-minute peak frequency threshold, is considered an HQTC. This would include,

for example, express bus services that operate along freeways where there are no stops along the freeway right-of-way.

BUS RAPID TRANSIT

As defined in statute, a BRT must include full-time dedicated bus lanes. In the SCAG region, there are existing and proposed BRT projects that have only a portion of their alignment in a full-time dedicated bus lane. For these BRT projects, only those stations that are adjacent to a full-time dedicated bus lane are considered major transit stops. For the BRT projects that have a full-time dedicated bus lane on their entire route, all of the stations are considered major transit stops.

MAJOR TRANSIT STOPS AND INTERSECTING SERVICE TRANSFER ZONES

As defined in statute, major transit stops include the intersection of two or more HQTCS. For purposes of transferring between intersecting service, SCAG uses a 500-foot buffer to determine a major transit stop. In other words, two intersecting HQTCS must have stops that are within 500 feet of each other to qualify as a major transit stop. A 500-foot buffer is assumed to be a reasonable limit to the distance that a transit patron would walk to transfer between bus routes. It is also consistent with the Metro Transfers Design Guide definition of a transfer zone.

AMTRAK STATIONS AND FERRY STATIONS

Amtrak intercity passenger rail stations with only limited long-distance service are not automatically included as a major transit stop unless requested by a local agency. Similarly, ferry stations with seasonal and/or non-commuter based service (and that are served by bus or rail transit) are not automatically included as a major transit stop unless requested by a local agency.

PLANNED HQTCS AND MAJOR TRANSIT STOPS

Planned HQTCS and major transit stops are future improvements that are expected to be implemented by transit agencies by the RTP/SCS horizon year of 2045. These are assumed by definition to meet the statutory requirements of an HQTC or major transit stop. SCAG updates its inventory of planned major transit stops and HQTCS with the adoption of a new RTP/SCS, once every four years. However, transit planning studies may be completed by transit agencies on a more frequent basis than the RTP/SCS is updated by SCAG. Local jurisdictions should consult with the appropriate transit provider(s) to obtain the latest information on planned transit routes, stop locations, and service intervals/frequencies before making determinations regarding CEQA exemption or streamlining.

See **EXHIBIT 14**, *planned (year 2045) major transit stops and high quality transit corridors*.



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TECHNICAL REPORT

TRANSIT

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