DIRECTIONS 2045

LONG RANGE TRANSPORTATION PLAN

Sustainable, Equitable, and Innovative Transportation Solutions

OCTA

May 2023

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Abbreviations and Acronyms

BRT	Bus Rapid Transit
Caltrans	California Department of Transportation
CAPTI	Climate Action Plan for Transportation Infrastructure
CARB	California Air Resources Board
CASP	Climate Adaptation and Sustainability Plan
CDR	Center for Demographic Research
CEQA	California Environmental Quality Act
CO_2e	carbon dioxide equivalent
EMFAC	California Air Resources Board Emission Factors model
FTIP	Federal Transportation Improvement Program
GHG	greenhouse gas
HOT	high-occupancy toll
HOV	high-occupancy vehicle
HPI	Healthy Places Index
IIJA	Infrastructure Investment and Jobs Act
lbs/day	pounds per day
LOSSAN	Los Angeles – San Diego – San Luis Obispo Rail Corridor
LRTP	Long Range Transportation Plan
MaaS	Mobility as a Service
Measure M2	See OC Go
Metro	The Los Angeles County Metropolitan Transportation Authority
MPAH	Master Plan of Arterial Highways
OC Go	Orange County's half-cent sales tax for transportation improvements
OCP-2018	Orange County Projections-2018
OCTA	Orange County Transportation Authority
OCTAM	Orange County Transportation Analysis Model
PCI	Pavement Condition Index
RTP/SCS	Regional Transportation Plan and Sustainable Communities Strategy
SB	Senate Bill
SCAG	Southern California Association of Governments
SOV	single-occupant vehicle
TDM	Transportation Demand Management
TCA	Transportation Corridor Agencies
VHD	vehicle hours of delay
VHT	vehicle hours of travel
VMT	vehicle miles traveled
ZEV	zero-emission vehicle

Chapter 1: Introduction

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Through the years, Orange County has evolved from a suburb of Los Angeles to one of the most densely populated counties in the nation. Challenges arise as our population and employment continue to grow and our transportation system is required to adapt to meet future mobility needs. The challenges are compounded by the 2041 sunset of Measure M2 (also known as OC Go), Orange County's half-cent sales tax for transportation improvements, which will be the end of a significant funding source for essential transportation projects and programs. Orange County will travel differently in 2045 than we did in 2006, when voters approved OC Go. Our actions and investments now will benefit residents and employees in the future and ensure the continued success of Orange County. This Long Range Transportation Plan (LRTP), Directions 2045, aims to understand these challenges and identify strategies necessary to meet Orange County's changing mobility needs.

LRTP Purpose

Directions 2045 is designed to provide answers to key questions about the future: What will Orange County look like in 2045? How will our population change and how will this affect commuting patterns and choices? Where will jobs and homes be concentrated and how will this affect congestion? What transportation services will be needed, and what is the most cost-effective way to meet them? Directions 2045 charts a course and establishes milestones to measure progress and refine strategies along the way as Orange County moves toward improving mobility, protecting transportation resources, and enhancing quality of life.

The Orange County Transportation Authority (OCTA) is the state-designated County Transportation Commission. In this role, OCTA prepares an LRTP every 4 years to provide a system-level vision for Orange County. The LRTP is also used to provide Orange County's input into the State and federally required Regional Transportation Plan and Sustainable Communities Strategy (RTP/SCS) prepared by the Southern

California Association of Governments (SCAG). Similar to the LRTP, SCAG's RTP/SCS provides a system-level vision but at a larger scale, covering the counties of Orange, Los Angeles, Riverside, San Bernardino, Ventura, and Imperial. Projects must be included in an approved RTP/SCS to be eligible for State and federal funding and project-level approvals. The OCTA planning process is a continuous process. Figure 1.1 shows the general relationship between the LRTP, RTP/SCS, and the Federal Transportation Improvement Program (FTIP), which is used to program State and federal funding for project-level planning, design, and implementation.

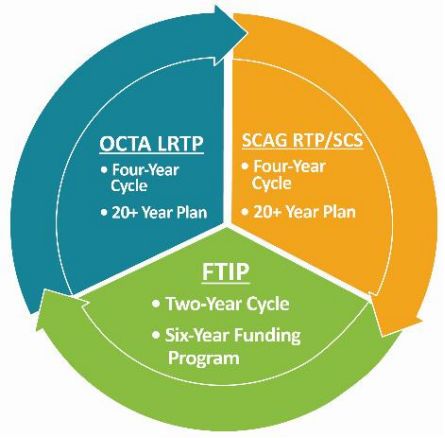
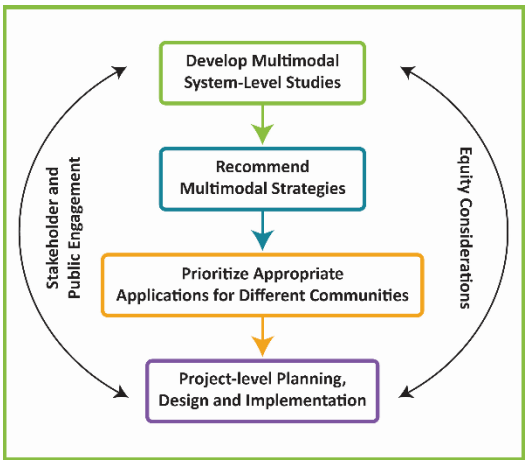


Figure 1-1: Continuous Planning

While the LRTP identifies the long-term countywide vision and goals, it generally reflects many other OCTA studies, plans, and policies that are continuously being developed or evolving. Some of these studies, plans, and policies make minor course corrections from the previous LRTP to reflect the changing conditions and needs of Orange County. The typical planning process begins with developing multimodal system-level studies that identify the long-term mobility needs of a defined area within Orange County and recommend multimodal strategies. The recommended strategies are then further studied to locate and prioritize appropriate applications, recognizing that different communities within Orange County have different needs. Once locations and priorities are established, project-level planning, design, and implementation can proceed. It is important to note that stakeholder and public engagement, along with equity considerations, are essential throughout each step of the planning process.



Using this Document

This LRTP is presented in the following chapters:

- **Chapter 2: Planning for 2045** describes the anticipated impacts and challenges associated with the following five key factors influencing transportation in Orange County:
  - **Key Factor 1:** Growing Travel Demand and Built-Out Roadways
  - **Key Factor 2:** Evolving Travel Trends
  - **Key Factor 3:** Increasing Climate-Related Risks
  - **Key Factor 4:** Changing Funding Outlook
  - **Key Factor 5:** Diversity, Equity and Inclusion
- **Chapter 3: Paths to Success** outlines the following seven Paths to Success that provide responses and solutions to the five key factors listed above. This chapter also describes the methodology for incorporating equity metrics into the LRTP.
  - **Path 1:** Extend or Modify Programs Funded by OC Go
  - **Path 2:** Expand Transit Services
  - **Path 3:** Enhance Active Transportation
  - **Path 4:** Explore Mobility Integration
  - **Path 5:** Eliminate Freeway Chokepoints
  - **Path 6:** Embrace Technology
  - **Path 7:** Elevate Maintenance and Resilience Priorities
- **Chapter 4: 2045 Preferred Plan** identifies specific capital investments and strategies that fulfill commitments made through OC Go and that address the Paths to Success. The performance of the Preferred Plan is also reported, which includes an analysis of mobility equity.
- **Chapter 5: A Living Document** provides a list of OCTA planning efforts that aim to advance the Paths to Success and address short-term planning needs that will inform the next iteration of the LRTP.

Chapter 2: Planning for 2045

Chapter 2: Planning for 2045

Many factors affect how people travel and how to plan for reliable and accessible mobility. The following five key factors were identified as being particularly influential in the development of this LRTP:

- **Key Factor 1:** Growing Travel Demand and Built-Out Roadways
- **Key Factor 2:** Evolving Travel Trends
- **Key Factor 3:** Increasing Climate-Related Risks
- **Key Factor 4:** Changing Funding Outlook
- **Key Factor 5:** Diversity, Equity and Inclusion

The discussions in this chapter dive into each of the key factors and look at why they matter and the influences they may have on travel behavior and the transportation system.

Key Factor 1: Growing Travel Demand and Built-Out Roadways

Where people travel daily are often related to their housing and employment locations. To understand how population, housing, and employment will change by 2045, this LRTP examines socioeconomic data developed by the Center for Demographic Research (CDR). The CDR, operating in partnership with California State University, Fullerton, coordinates with various local jurisdictions within Orange County to develop demographic forecasts. This LRTP establishes pre-pandemic conditions in 2019 as the base year. SCAG's 2024 RTP/SCS will use the same 2019 base year. Preparation of the LRTP began in mid-2021 and utilized the OCTA transportation model, OCTAM, for base year and future year projections. The current OCTAM incorporates socioeconomic data based on the Orange County Projections-2018 (OCP-2018) dataset, released in September 2018, which was the latest approved dataset at the time of the model development and closest to the 2019 base year. Year 2019 OCTAM model was developed specifically for this LRTP and was based on OCP-2018 and SCAG RTP 2020 demographics data. OCP-2018 demographic data was interpolated between the 2016 base year and 2020 forecast to arrive at an estimate for 2019 conditions. The model was then validated by screenline analysis, comparing modeled volumes and actual observed traffic counts across 28 screenlines throughout Orange County. The OCP-2018 report contains housing, population, and employment projections in five-year intervals up to 2045.

Based on OCP-2018, Orange County's population is projected to surpass 3.5 million residents by 2045, slightly fewer than the state of Connecticut. This is over a quarter million more residents than in 2019, a 9% increase. Housing is also projected to increase by 9%; however, this does not yet reflect increases in planned housing that are required by the State through the Regional Housing Needs Assessment. Figures 2-1 through 2-6 show population and housing density within Orange County for 2019 and 2045, and highlight those areas where growth is concentrated.

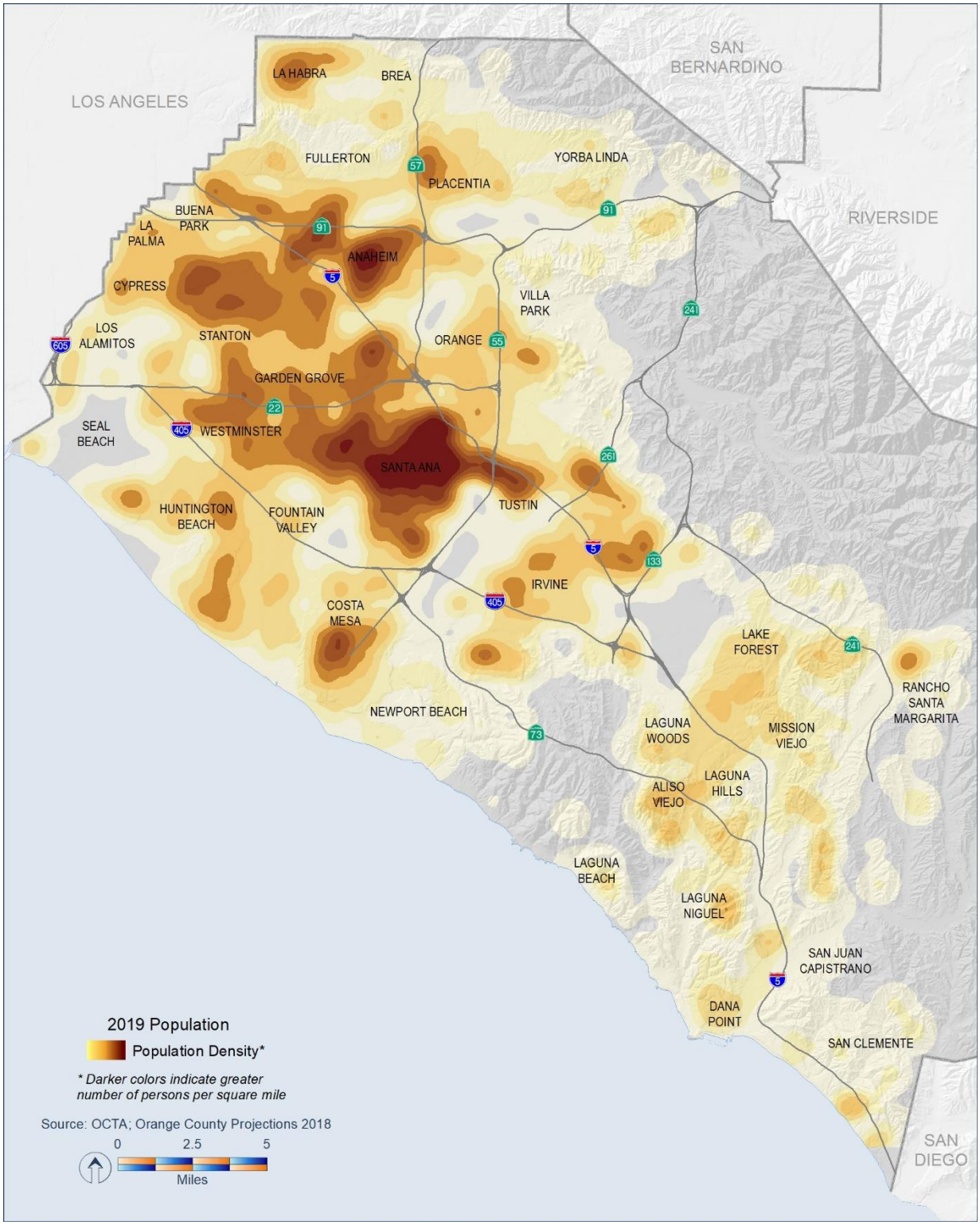


Figure 2-1: 2019 Orange County Population Density

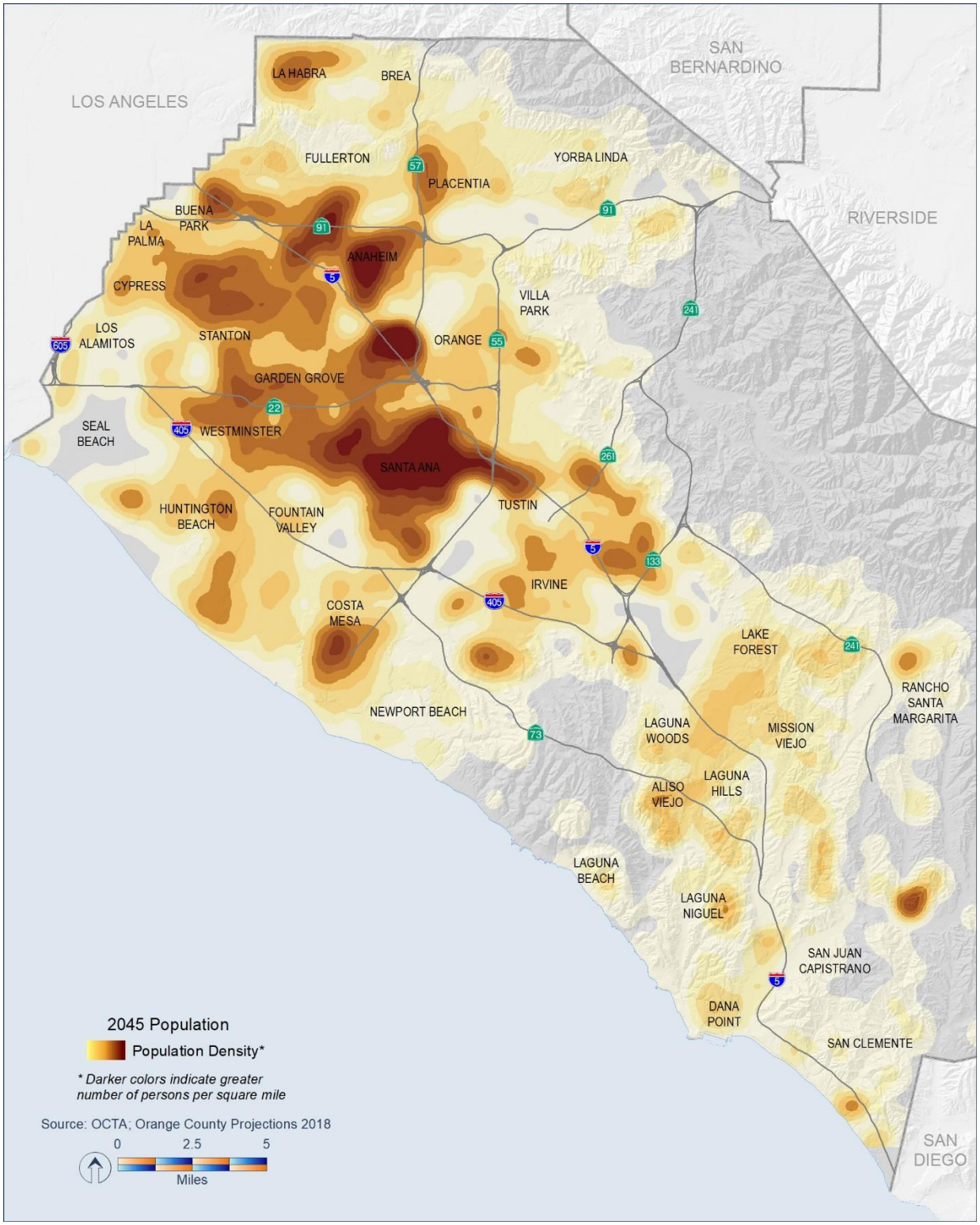


Figure 2-2: 2045 Orange County Population Density

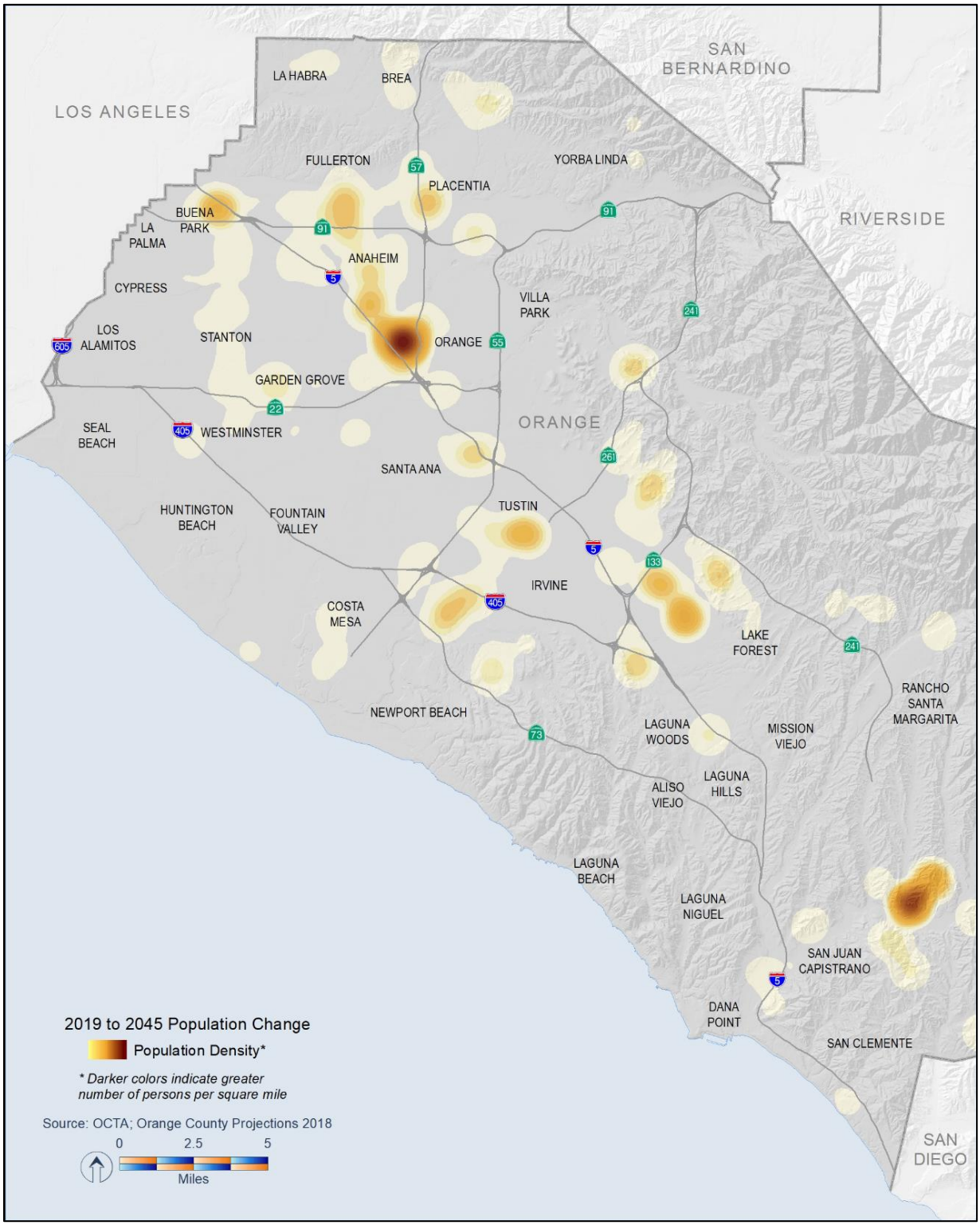


Figure 2-3: 2019 to 2045 Orange County Population Change

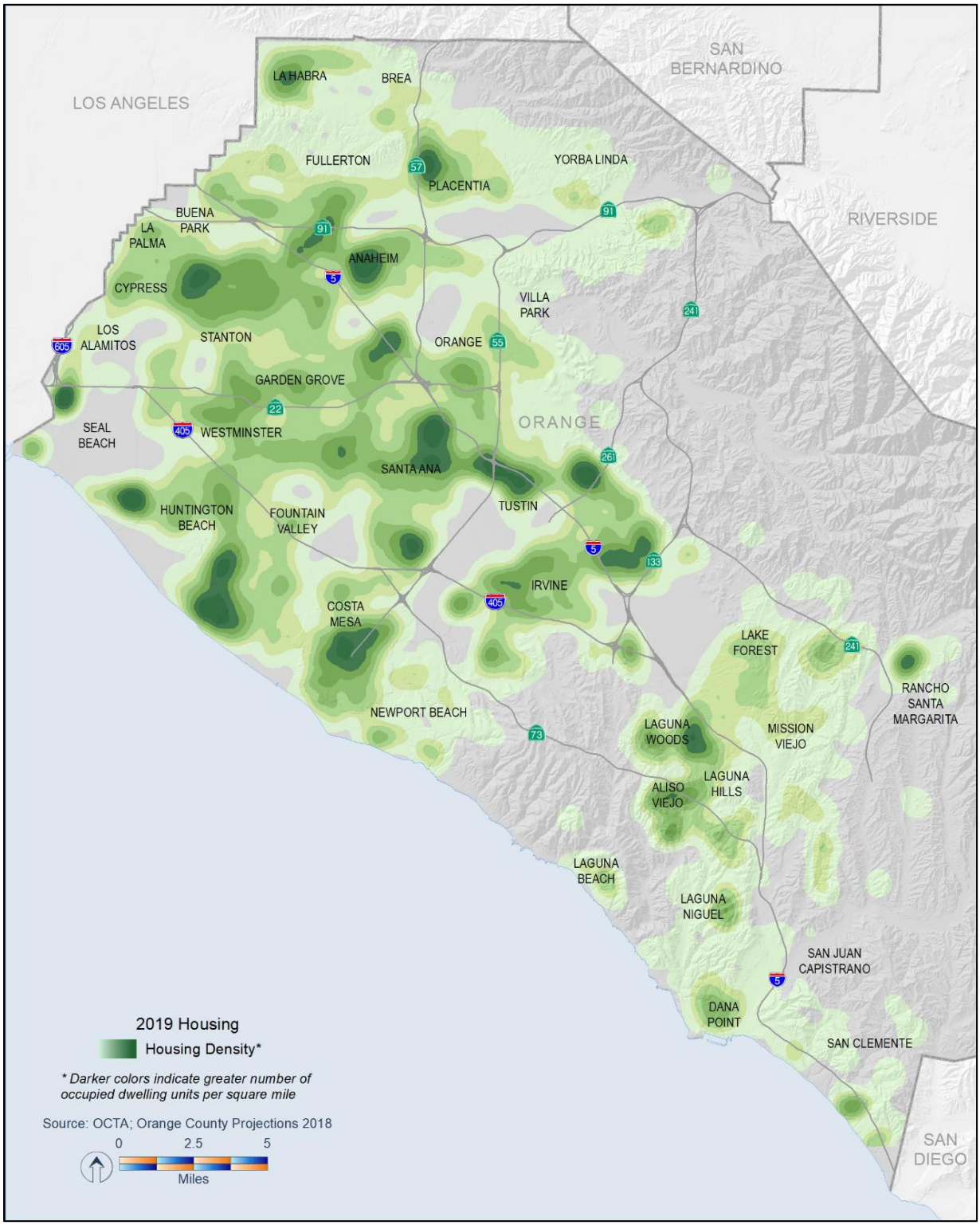


Figure 2-4: 2019 Orange County Housing Density

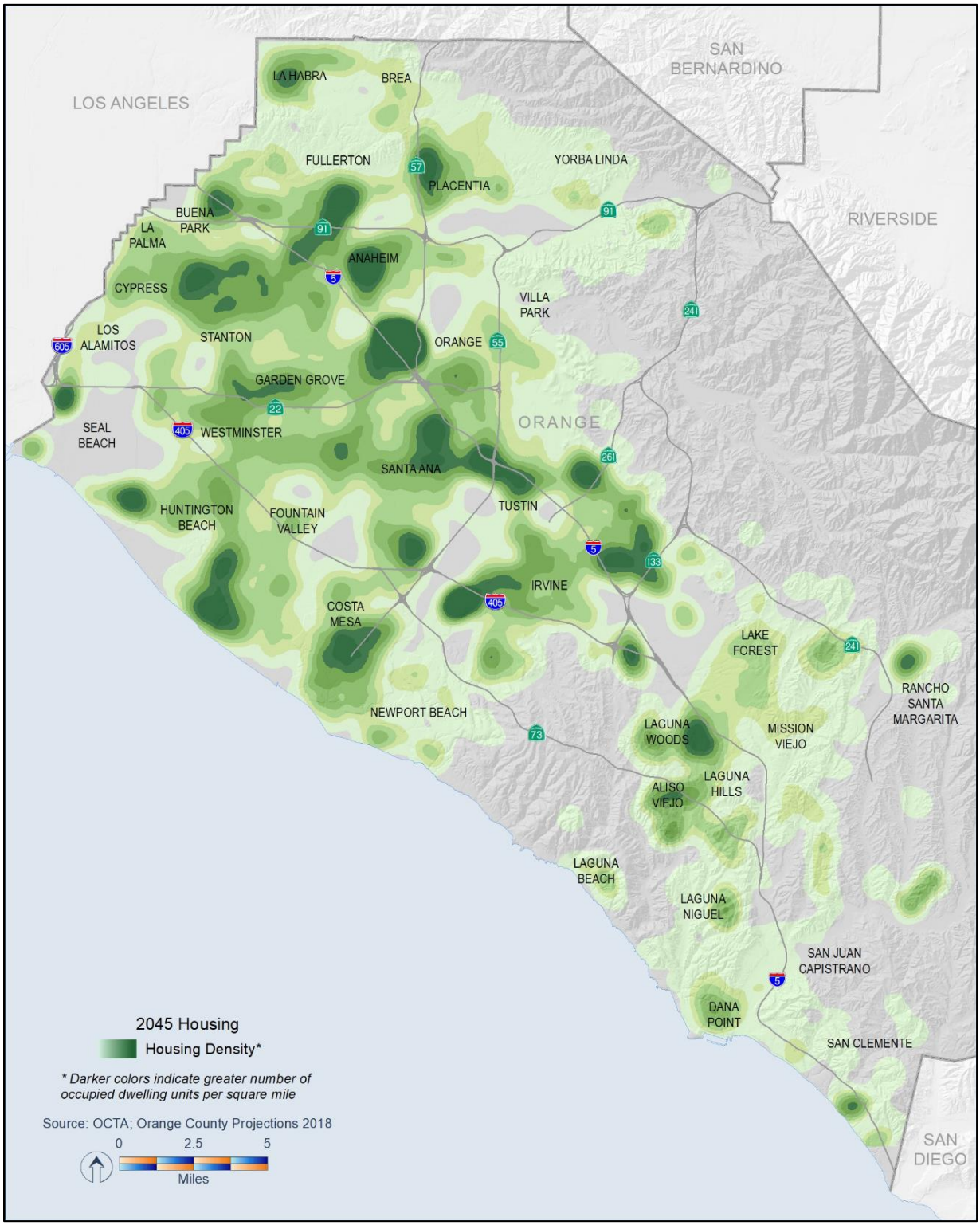


Figure 2-5: 2045 Orange County Housing Density

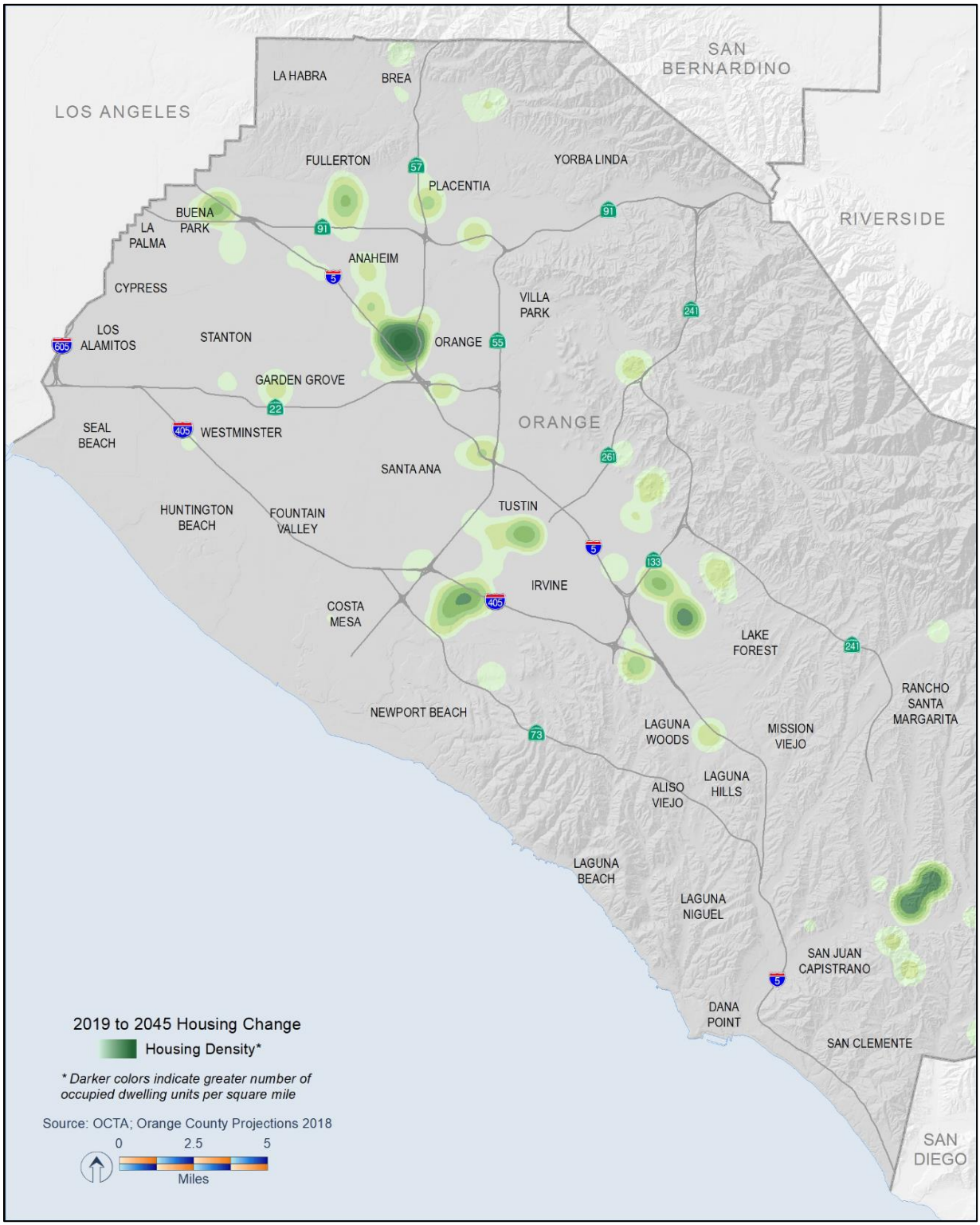


Figure 2-6: 2019 to 2045 Orange County Housing Change

While population and housing are anticipated to grow by 9%, employment is projected to increase by 12%. This is consistent with the historic trend over the past decade with employment growing faster than housing, resulting in increasing number of commuters coming into Orange County. Between 2009 and 2019, people commuting into Orange County have increased by 24%. In 2019, Orange County had 1 job for every 1.8 residents, which is higher than the SCAG region as a whole with 1 job per 2.2 residents. Many of the workers within Orange County commute from neighboring counties like Los Angeles and Riverside.

Figure 2-7 illustrates this commute trend and shows that more workers travel into Orange County than out. Between 2019 and 2045, Orange County will add 1 job for every 1.3 new residents (including non-workers). Again, this is higher than the entire SCAG region (which is expected to add 1 job for every 2.2 residents). This means that the trend seen today of more workers commuting into Orange County than out is expected to grow.

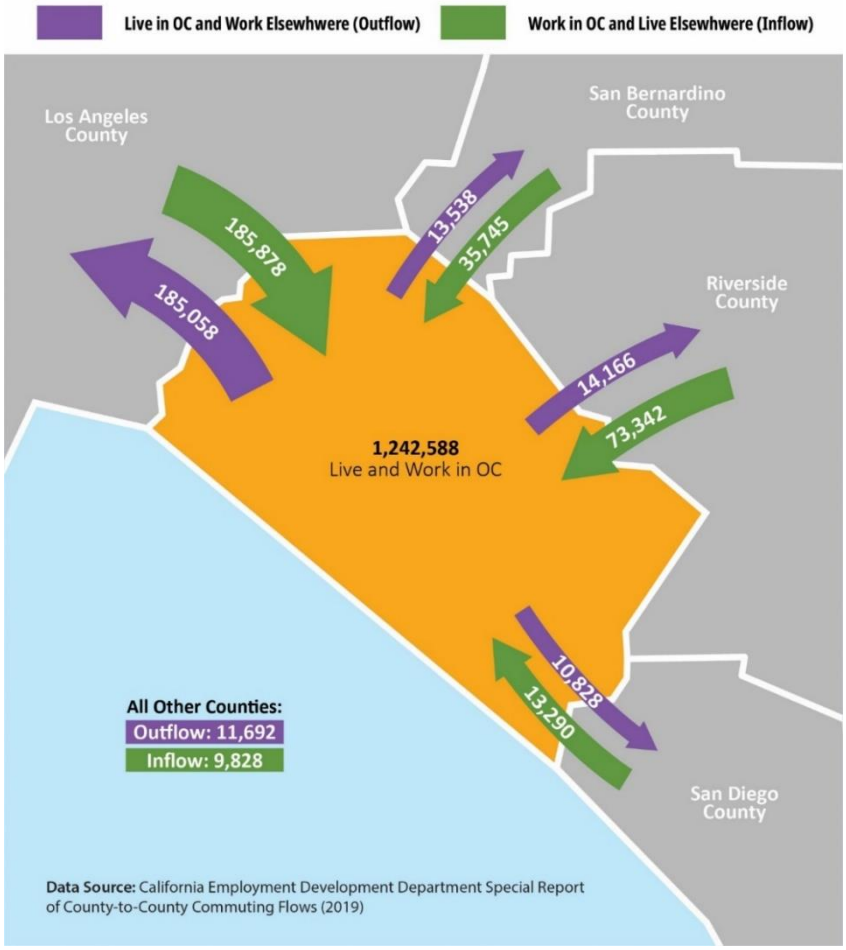


Figure 2-7: 2019 Intercounty Commuting Patterns

Figures 2-8 through 2-10 show employment density within Orange County for 2019 and 2045, and highlight areas where growth is concentrated.

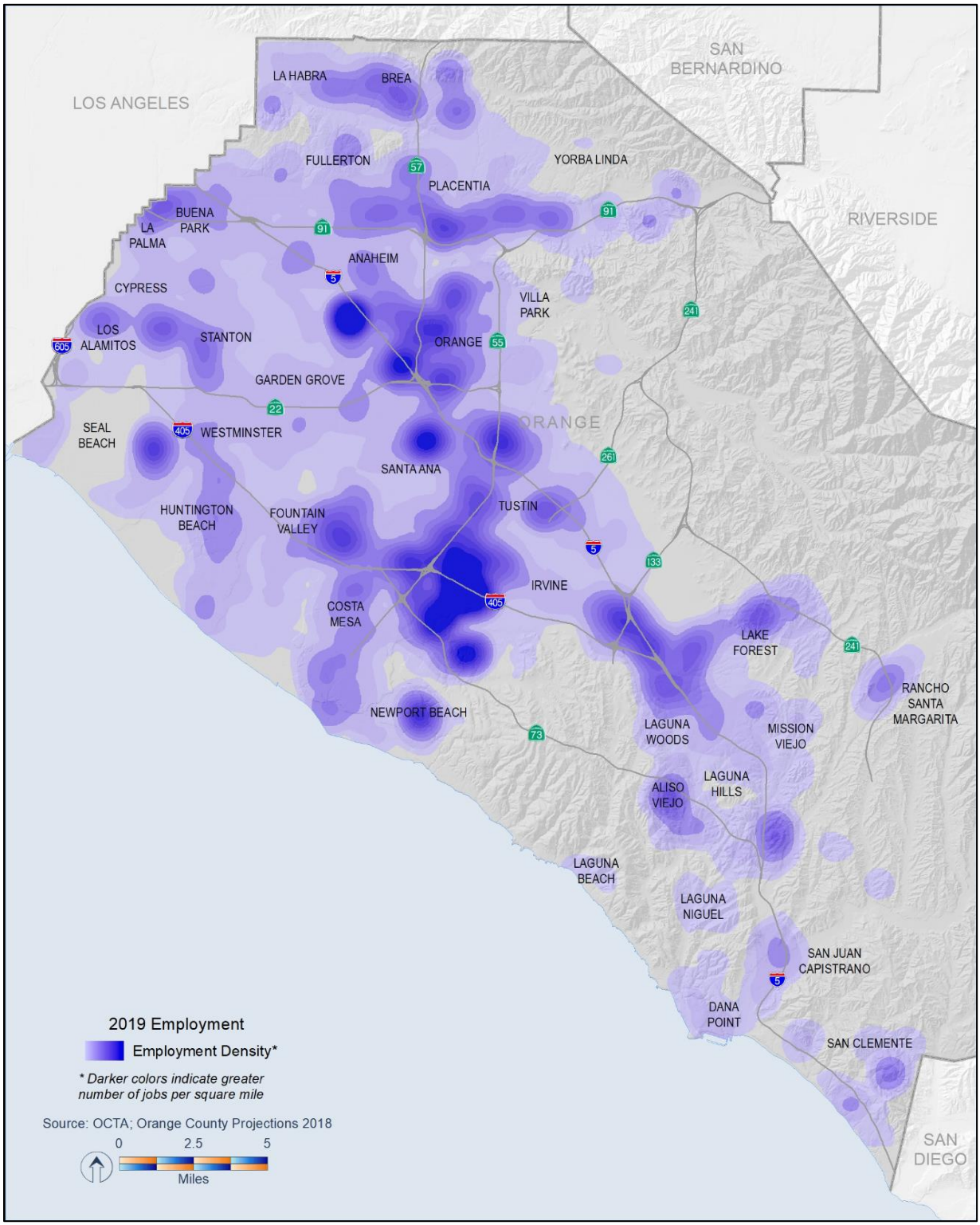


Figure 2-8: 2019 Orange County Employment Density

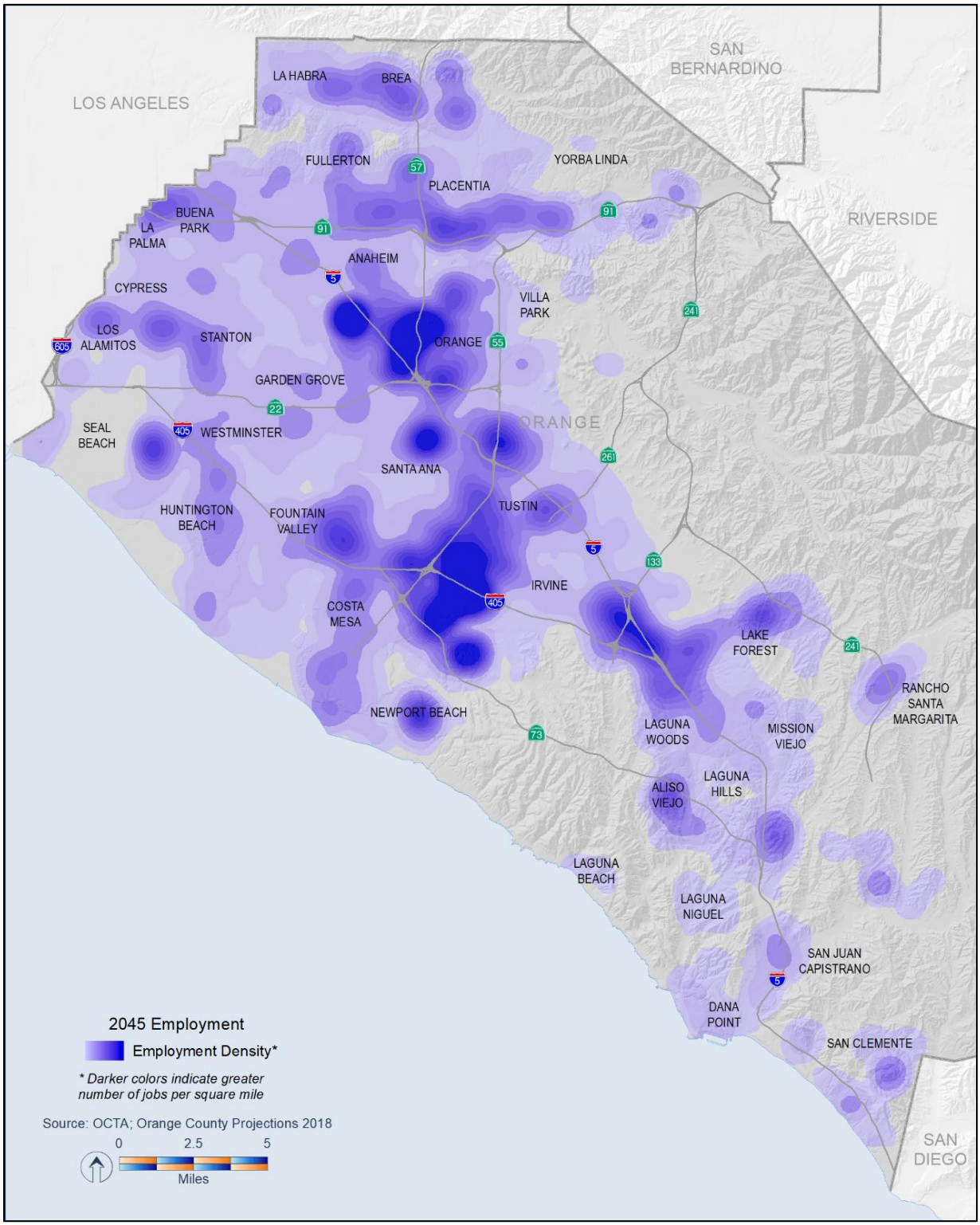


Figure 2-9: 2045 Orange County Employment Density

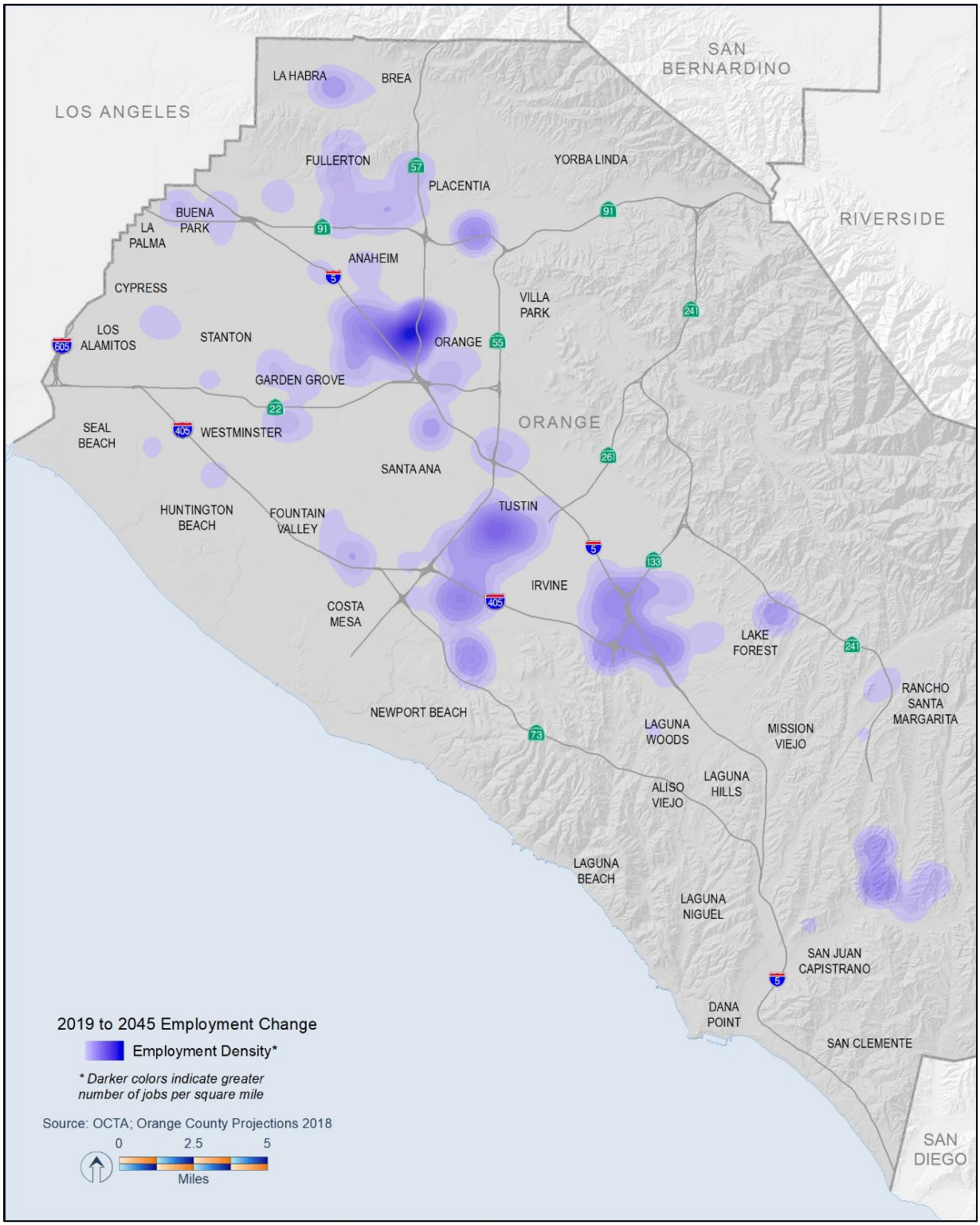


Figure 2-10: 2019 to 2045 Orange County Employment Change

2045 No-Build Scenario

The future demographic trends summarized in Table 2.1 are used as input in the Orange County Transportation Analysis Model (OCTAM) to forecast travel patterns on Orange County's transportation network. OCTAM was used to analyze and compare a series of scenarios that include the 2019 Base Year, 2045 No-Build, 2045 OC Go Sunset, and the 2045 Preferred Plan. This section focuses on the 2045 No-Build, which accounts for the socioeconomic changes noted above, but assumes no changes to the existing transportation network. This scenario is used to understand how the 2019 transportation network would be impacted by the forecasted 2045 socioeconomic changes alone.

Table 2.1: Demographic Growth

	Population	Households	Employment
2019	3,250,357	1,057,355	1,760,986
2045	3,534,620	1,154,416	1,980,433
Total Change	+284,263	+97,061	+219,447

A summary of the OCTAM travel data results for the 2045 No-Build scenario is shown in Table 2.2, and Figures 2-11 through 2-18 illustrate the characteristics of the 2019 transportation network, which is assumed to remain unchanged in the 2045 No-Build scenario. The results in Table 2.2 show that the travel impacts from the 9% population growth and 12% employment growth on the 2019 transportation network would result in a 7% increase in vehicle miles traveled (VMT) in 2045. This increase in VMT increases the time people spend in traffic congestion, which translates into an increase in the total vehicle hours of delay (VHD) and delay as a percentage of travel time. With more congestion, average travel speeds on freeways and arterials are reduced. Meanwhile, there is a 6% increase in transit ridership that is a result of both the simple increase in population and employment as well as more people choosing to use transit to avoid congestion on the roadways and freeways.

Table 2.2: Summary of OCTAM Results for the 2045 No-Build Scenario

	2019 Base Year	2045 No-Build
Daily Vehicle Miles Traveled (VMT)	76,400,000	81,900,000 (7% increase vs 2019)
Total Vehicle Hours of Travel (VHT)	2,211,000	2,463,000
Total Vehicle Hours of Delay (VHD)	341,000	454,000
Delay as a Percent of Travel Time	15%	18%
Freeway Average Speed – Peak Period	41	30
Daily Transit Trips	131,000	138,000 (6% increase vs 2019)

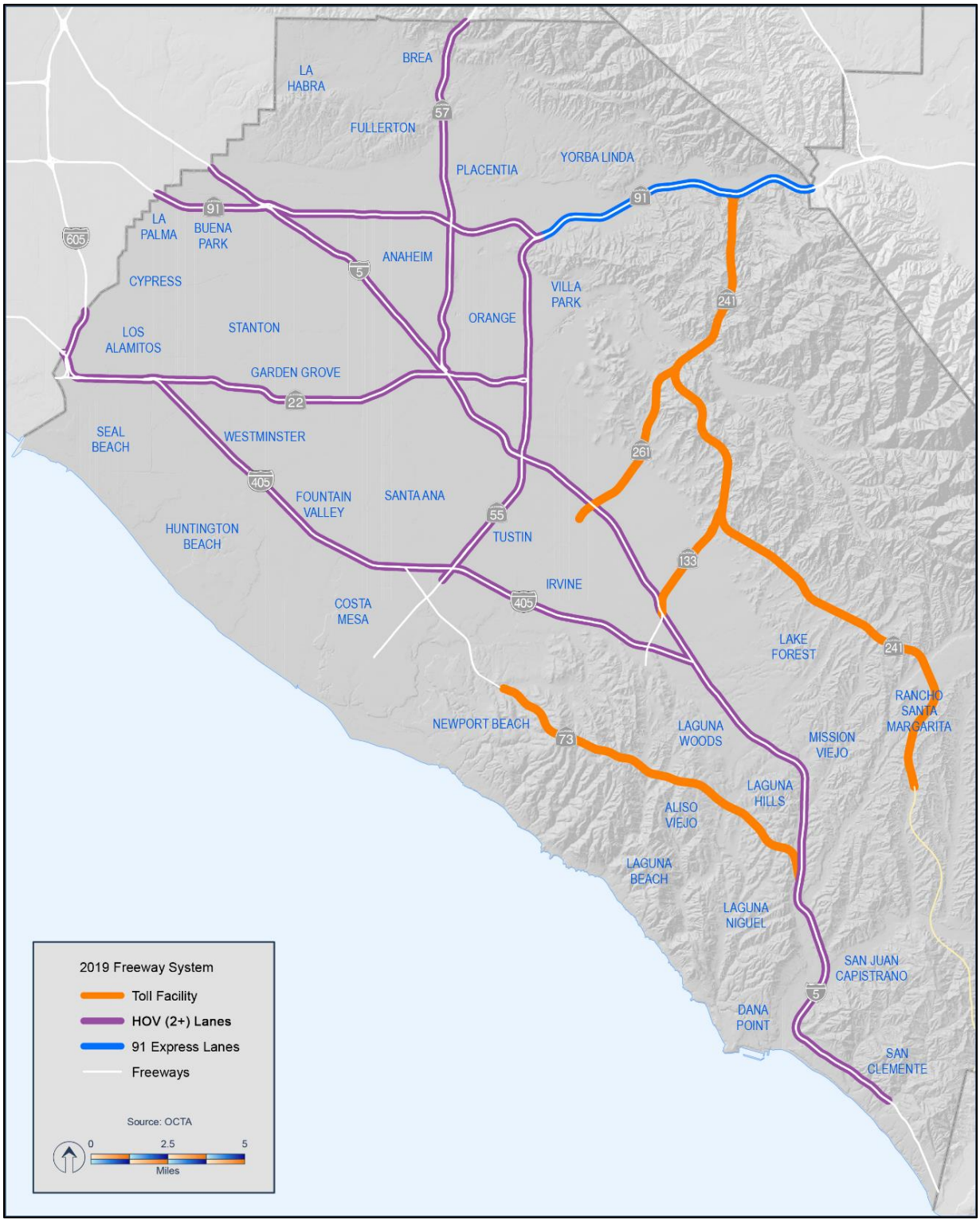


Figure 2-11: Base Year 2019 Freeway System

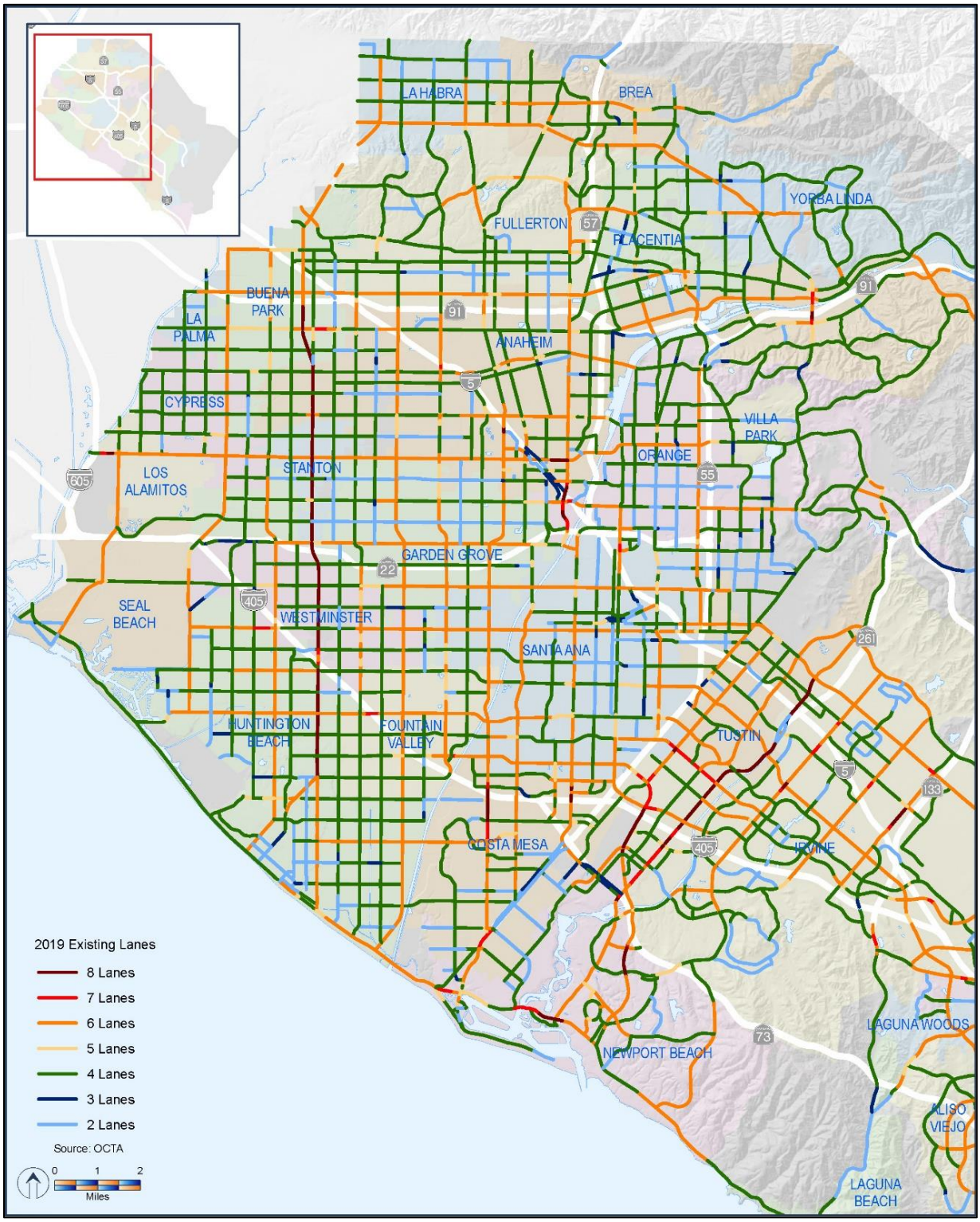


Figure 2-12: Base Year 2019 MPAH System – North County

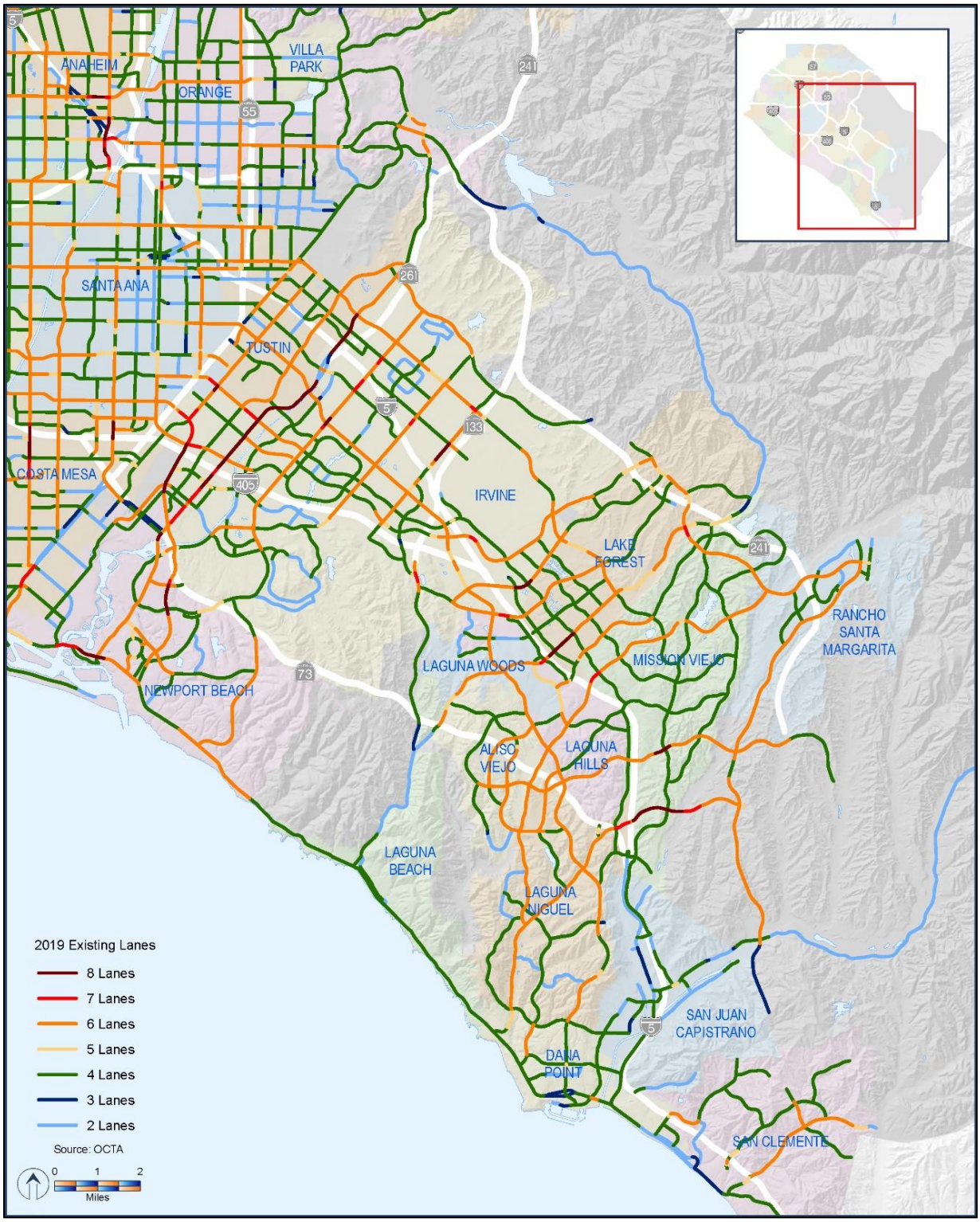


Figure 2-13: Base Year 2019 MPAH System – South County

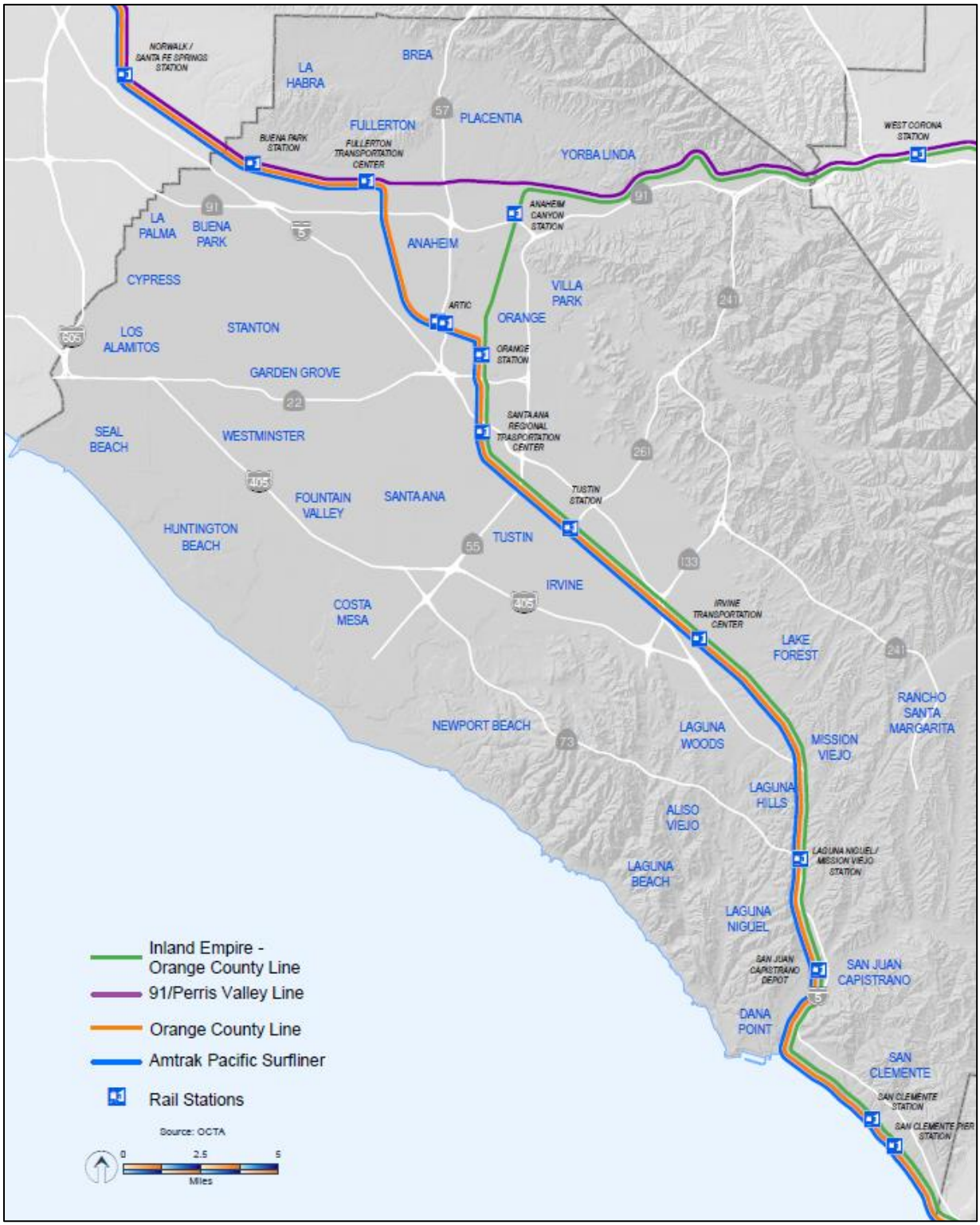


Figure 2-14: Base Year 2019 Rail Transit System

Figure 2-15: 2019 OCTA Transit Network – North County

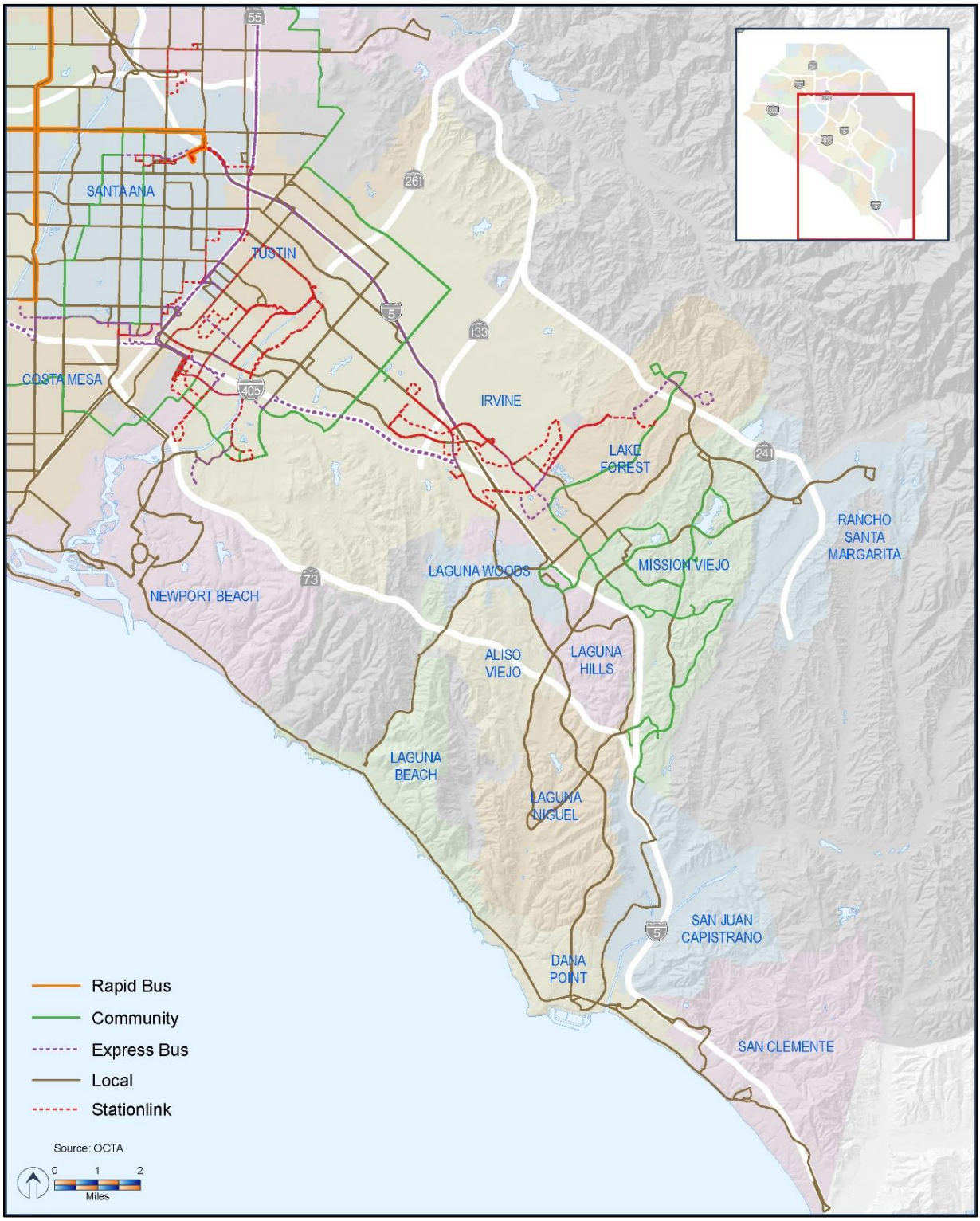


Figure 2-16: 2019 OCTA Transit Network – South County

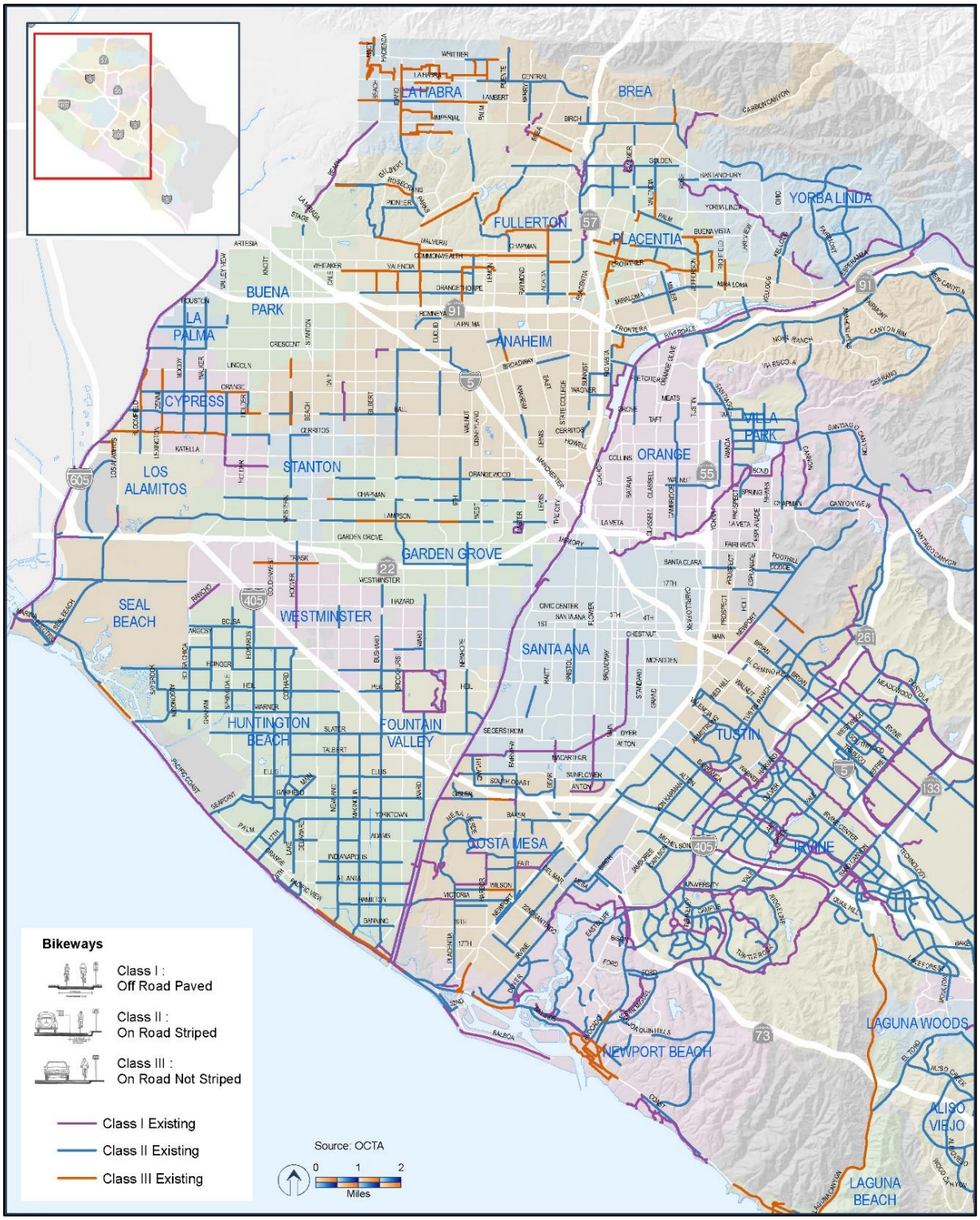


Figure 2-17: Base Year 2019 Bikeways – North County

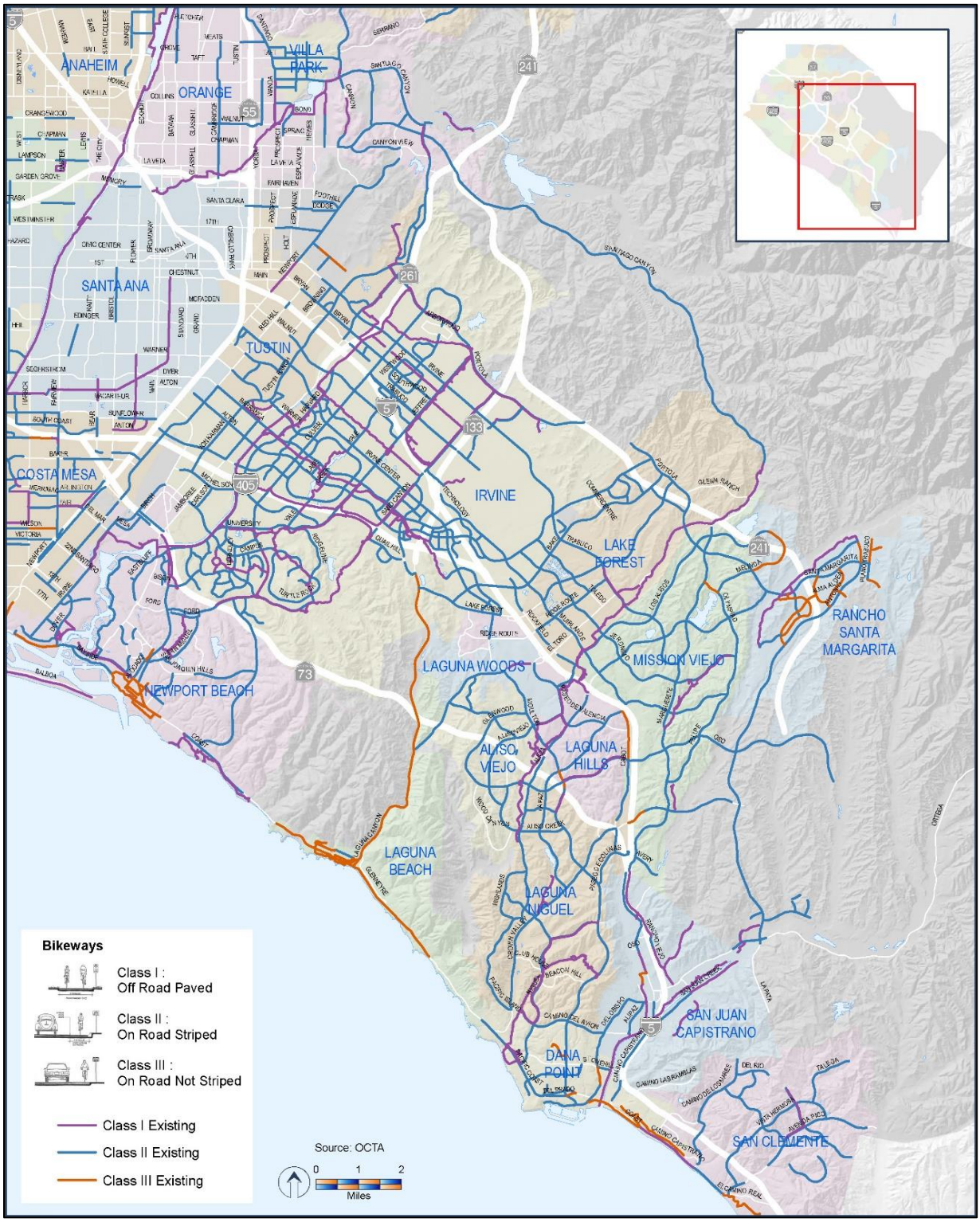


Figure 2-18: Base Year 2019 Bikeways – South County

Built Out Roadways

Keep in mind that the 2045 No-Build scenario is a hypothetical scenario that assumes no change to the transportation system between 2019 and 2045. This is used to set a bar for future travel conditions that can be used to understand the benefits of the projects and programs that are included in this LRTP. In reality, there is a series of improvements that are already either under construction or are in development that will help to address the projected increase in travel demand. Most of these are supported through OC Go, Orange County's local sales tax measure. However, once these improvements are implemented, there will be very few, if any, opportunities to significantly expand roadways or freeways.

Additional expansion would, in most cases, require the acquisition of land to accommodate new lanes on roads and freeways. This would likely result in displacement of households and businesses, which would be undesirable and costly. Additionally, policies are being implemented at the State level that generally discourage adding new lanes. These policies will be discussed in further detail later in this chapter (see **Key Factor 3: Increasing Climate-Related Risks** and **Key Factor 4: Changing Funding Outlook** sections).

The limited opportunities to add freeway and roadway capacity presents a paradigm shift in how transportation planning should be approached. The age of addressing congestion through lane additions is coming to an end, and the focus is turning to strategies that help manage travel demand, broaden travel options, and improve overall transportation system efficiency.

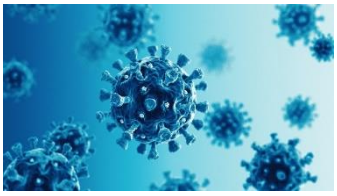
Key Factor 2: Evolving Travel Trends

Recent changes in travel demand and travel behavior have been influenced by trends that can be identified in retrospect but would have been difficult to predict. Think back to 2002 and consider whether it could have been predicted that nearly everybody would carry a smart device everywhere from which they could hail a ride, rent a bicycle or scooter, or find the fastest driving route, including how to avoid congestion from accidents. Some of these influential technologies and other recent trends are discussed below, including the nationwide downturn in transit ridership, the more recent impact of the COVID-19 pandemic, as well as the rise of smartphones and transportation network companies. Later in this section, discussion focuses on future technologies, services, and trends that will almost certainly have unpredictable influences on transportation behavior.

Transit Ridership

Beginning in 2008, public transit providers across the nation experienced a steady decline in transit ridership over several years, corresponding with an increase in automobile ownership. Furthermore, between 2009 and 2015, the number of registered vehicles in Orange County grew more than three times faster than the population. A combination of rising employment during the great recession and plummeting gas prices during this period, along with introduction of a new state law that allows undocumented immigrants to obtain driver's licenses, made driving more affordable and accessible. During this time, OC Bus ridership fell approximately 37%, prompting the implementation of a restructured bus system referred to as the OC Bus 360 program. This program focused bus service on the highest demand corridors in Orange County and was able to improve overall system operation efficiency. While ridership was on the rise after the OC Bus 360 program was implemented, another unpredictable hurdle was approaching with the start of the COVID-19 pandemic.

COVID-19 Lasting Impacts



Previously predictable travel patterns suddenly changed during the COVID-19 crisis. In a September 2020 report, OCTA found that the pandemic lockdown resulted in significant declines in travel demand (e.g., 42% less at workplaces, 42% less at transit stations, and 27% less at retail/recreation). Rail ridership declined 88% while bus ridership declined 72%. At the same time, online grocery purchases more than doubled, and delivery or pick-up of food from restaurants both increased by 40%. VMT on Orange County freeways was down 10% between January 2020 and July 2020, and the remaining travel demand was more spread out throughout the day, which reduced traffic congestion delays by 62%.

In the short time since the travel disruptions of the lockdown, freeway congestion during the morning and afternoon peak hour commute hours has

returned. On freeways and arterials, off-peak traffic volume is often higher than pre-pandemic conditions. Use of the SR-91 Express Lanes has almost returned to pre-COVID levels and, as of September 2022, daily bus ridership is less than 15% below pre-COVID average. Metrolink ridership, however, is still far below pre-COVID levels and bus ridership is still lower than before nation-wide declines began in 2009. Additional discussion of the effects of technological changes facilitating work at home is presented later in this section. A promising development during the pandemic has been the rapid uptake in electric bicycles (e-bikes). E-bikes have the ability to reduce terrain and distance constraints, thereby encouraging further growth in bicycle ridership and potentially reducing single-occupant vehicle (SOV) trips. Additionally, delivery services for food and household goods that rapidly expanded during the pandemic remain in demand and may also contribute to reductions in SOV trips.

The long-term impacts to travel behavior from the pandemic will take years to fully understand. Adaptations due to the pandemic caused major travel changes for years and some of those adaptations will linger, but the trend has been moving toward pre-pandemic conditions. While this LRTP acknowledges that COVID-19 has had a profound impact over the past few years, the analysis of 2045 conditions is primarily based on pre-pandemic travel trends. As more data becomes available, future iterations of the LRTP and other mobility studies will continue to consider and account for the long-term influence of the pandemic on travel behavior.

Technology Adaptation

Some of the biggest changes to transportation have occurred due to the rise of smartphones and the technology and policy reactions to them. Wayfinding applications (e.g., Waze, Google Maps, Apple Maps) help to divert traffic volume away from areas where accidents have reduced capacity, but they can also exacerbate problems with increasing bypass traffic on local roads and residential streets causing additional congestion. Transportation Network Companies (e.g., Uber and Lyft) can supplement public transit service by providing first-mile/last-mile solutions, but the trips added between drop-offs and pick-ups can potentially increase vehicle miles traveled. Micromobility options such as short-term bicycle and scooter rentals can fill a service gap for short-distance trips, but some providers have placed a burden on limited pedestrian rights-of-way. Public policy has often struggled to keep up with the rapid pace of changing technology.

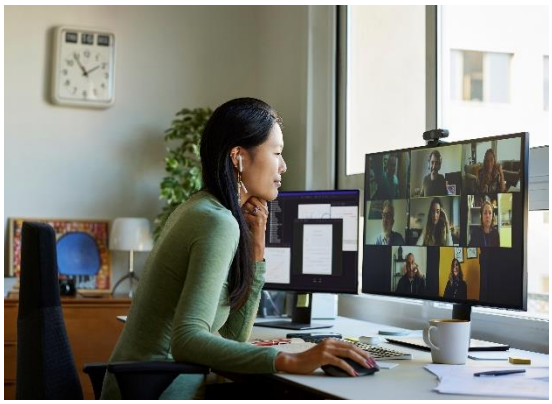
Emerging Technology

The examples above highlight how technology and services have influenced transportation in the past, and they present some opportunities that can benefit this LRTP. However, the ability to predict future technologies and how they could affect transportation choices is very limited. This LRTP forecasts future transportation conditions, but those forecasts are largely based on historical trends. As noted in the pandemic discussion above, it takes time for new trends to be established that can then be included in the analysis of future scenarios. This approach ensures that long-term planning decisions are not overly influenced by speculation. That said, it is recognized that constant monitoring of emerging technologies and services is necessary to make timely and informed decisions that can benefit mobility in Orange County.

Monitoring technological advancements is necessary for making informed decisions related to whether it is appropriate to continue monitoring, influence development, test the technology, or pursue full-scale implementation. This approach allows for a state of readiness that can help to maximize the public benefit from new technologies. The discussions below identify two stages of emerging technologies. First are the Anticipated Technologies that have recently begun to influence travel behaviors or are expected to begin influencing travel behaviors soon. Second are the Conceptual Technologies that may be showing potential to influence travel behavior but are still relatively early in development.

Anticipated Technologies

Looking forward, there are certain technologies that are taking root or may even develop into potential game changers. These include remote work and teleservices, charging infrastructure for electric vehicles, e-bikes and electric scooters (e-scooters), neighborhood electric vehicles, and connected vehicles. While there is some certainty that these will influence travel behavior, more study and analysis is needed to understand the extent of the impact each may have on mobility.



Remote Work. Part-time and full-time remote work policies have become broadly accepted by employers, potentially altering long-distance commute demand. In July 2020, during the pandemic, OCTA conducted an employment and travel survey that included over 2,500 interviews of Orange County households. The survey found that while 11.5% of residents worked from home in February 2020, 46.5% worked from home at the height of the pandemic. Similarly, the number of commuters driving alone to work dropped from 77% to 48%. When workers were asked their preference post-pandemic, only 35% responded that they wanted to decrease working from home. This may not continue to reflect workers' preference after an extended period of time working from home, but it gives an indication that remote work is likely to persist for some time.

Teleservices. The convenience of teleservices, such as video or phone doctor visits, has been widely embraced. Teleservices have the potential to eliminate some trips altogether by allowing people to use a phone or computer to interact with professionals from a variety of fields. As more service providers begin to offer teleservice options, more trips can be reduced. Delivery services also have the potential to affect travel demand. At a large enough scale, these could replace many individual trips from households to stores with more efficient delivery routes that can reduce overall travel demand.

Micromobility. Short-term bicycle rental, or bikeshare, is an example of micromobility that has been in development for several years. Micromobility services often help to address the first-mile/last-mile gap to and from regional transit services. More recently, micromobility services have been shifting to focus more on electric mobility options (e.g., e-scooters and e-bikes) and will likely be augmented to include other devices in the future. As micromobility matures, partnerships between local jurisdictions and

private service providers are being formed to develop policies and regulations that address concerns with rental devices being left in undesirable locations, like blocking sidewalks or bike lanes. As such concerns are resolved, and standards are defined, micromobility will likely become a more common and accessible choice for many shorter trips. This could allow micromobility service providers to become more permanent fixtures in Orange County and demonstrate that the public can comfortably rely on them as part of their regular travel routines.

Connected Vehicles. New vehicles are increasingly equipped with safety features that semi-autonomously control the vehicle. These features include automatic braking, lane-keeping assistance, and adaptive cruise control. Some vehicles are also capable of self-parking with minimal input from the driver. Some of these "self-driving" features rely on sensors identifying the location of nearby vehicles. As these features mature, it is anticipated that location, speed, and travel route data could be transferred between vehicles to enhance overall travel safety. With appropriate public investments, these vehicles could also communicate with public infrastructure. Communication between vehicles and public infrastructure has the potential to allow dynamic signal timing and traffic management to improve roadway efficiencies and provide real-time feedback on roadway maintenance issues.

Electric Vehicles. According to the California Energy Commission, approximately 43,500 new zero-emission vehicles (ZEVs) were sold in Orange County in 2022, the second highest number in the State. According to the latest data, 4.3% of vehicles registered in Orange County are battery electric, plug-in hybrid, or fuel cell vehicles. These vehicles have different needs for fueling infrastructure than is currently provided. The potential benefits of these vehicles are, however, worth the necessary investment. The California Air Resources Board Emission Factors model (EMFAC) for the 2045 No-Build scenario shows a 21% decline in carbon dioxide equivalent (CO_2e) emissions compared to existing conditions despite a 9% increase in population and 7% increase in VMT. This emission reduction is largely due to the increasing ZEV share in fleet mix. Public policy changes, such as the state rule to eliminate sales of gasoline-fueled vehicles after 2035, will have a significant impact on the future of transportation. This could increase the electric vehicle fleet rapidly, to the point that private investment in electrical charging infrastructure alone may not be enough to satisfy energy demand. Coordination will be needed between public and private entities, such as OCTA, local jurisdictions, developers, and utility companies.

Conceptual Technologies

Technologies that are early in development or are just emerging as concepts present less certain but potentially significant influences on travel behavior. Whether these technologies are ultimately implemented consistently with the current concepts is difficult to determine. By updating the LRTP regularly, OCTA can incorporate future technologies into the transportation planning process when appropriate. Examples of such emerging technologies include fully autonomous vehicles, air taxis, and hyperloop systems.

Optimistic predictions of autonomous vehicle availability in the near future and the rapid uptake of technology have been more muted recently. The ability for computers to predict or react to human (drivers, pedestrians, and bicyclists) behaviors must improve before fully autonomous vehicles can become part of everyday life. While development and testing continue by some companies, other companies have reduced or shut down development because of the challenges with improving this technology.

Another example is air taxis and vertiports, the concepts of which were announced with much fanfare but have been slow to develop. The air taxi concept is a vertical take-off and landing vehicle that is relatively quiet compared to helicopters, so they can operate more discreetly in urban settings. They are designed to transport passengers up to 200 miles, providing point-to-point service, and operate out of vertiports. Vertiports are compact terminals used by air taxis to load and unload passengers that would be located within high travel demand areas.

Hyperloop is a high-speed transport system that moves magnetic levitation pods through a vacuum tube and could be used for transport of people and/or goods. Conceptual applications for hyperloop include long-distance overland routes and subterranean routes within urban areas. The high-speed nature of hyperloop increases the cost-effectiveness with distance, so long as travel demand along the corridor is high enough. It is possible, however, that connection between an urban center and a suburban/exurban area could contribute to urban sprawl. Hyperloop transportation corridors are in development in multiple locations around the world and the commercial viability of them may be better known soon.

These types of conceptual technologies (i.e., fully autonomous vehicles, air taxis, and hyperloop) and innovations that have not yet been revealed could have profound effects on travel behavior. It is difficult to predict how widespread these types of technology will be used in 2045 without additional data. Monitoring their development and examining data as it becomes available will assist policymakers to incorporate the benefits while minimizing the negative outcomes.

Key Factor 3: Increasing Climate-Related Risks

Climate-related risks to Orange County's transportation infrastructure and travelers are expected to continue and will likely increase through 2045 and beyond. These include sea level rise, flooding during storm surges, extreme heat days, and wildfires. To protect past and future infrastructure investments and to ensure the safety of travelers, these types of risks must be monitored and managed.

Data provided by California's scientific and research community including the California Energy Commission, California Strategic Growth Council, and UC Berkeley were included in California's Fourth Climate Change Assessment in 2018. This data has been synthesized and presented graphically by Cal-Adapt. Data points were available for 2020 and 2050, which were the closest data points to the LRTP's 2019 baseline conditions and 2045 horizon.

OCTA owns approximately 40 miles of the Orange Rail Subdivision in South Orange County located between San Clemente and Fullerton, which is part of the 350-mile Los Angeles – San Diego – San Luis Obispo (LOSSAN) Railroad Corridor. As defined by the United States Department of Defense, the rail line between Los Angeles and San Diego is designated as a Strategic Rail Corridor Network, which consists of key railroad lines most important to national defense. This rail infrastructure is particularly vulnerable to climate risks due to the proximity to the coastline.

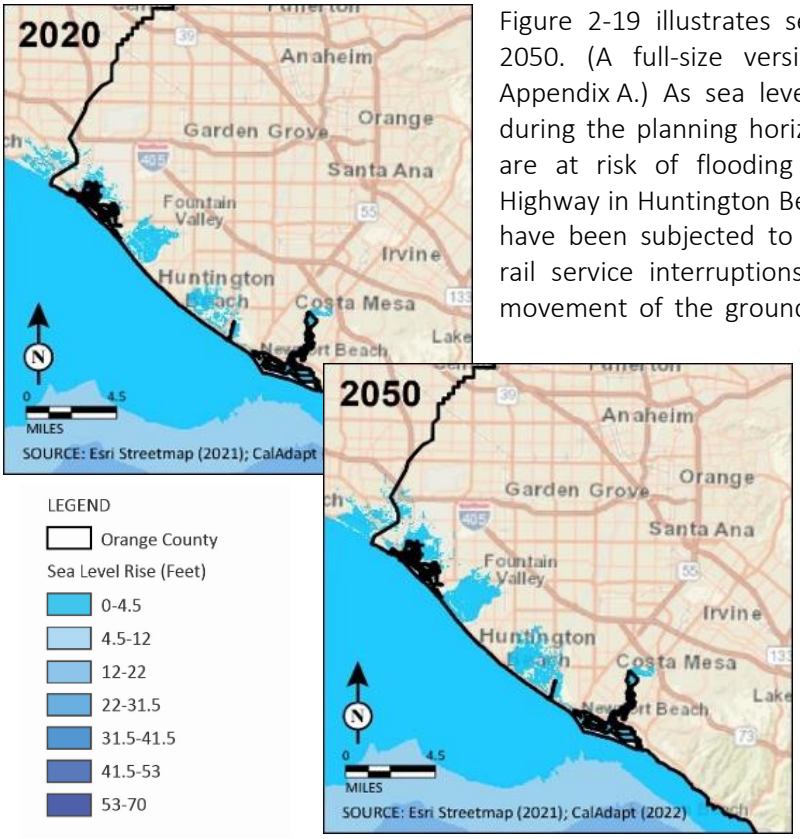


Figure 2-19: Flooding Due to Sea Level Rise, 2020 vs 2050

Figure 2-19 illustrates sea level rise and flood risk through 2050. (A full-size version of Figure 2-19 is provided in Appendix A.) As sea levels rise by an estimated 1 to 2 feet during the planning horizon, the rail line and some roadways are at risk of flooding during storm surges. Pacific Coast Highway in Huntington Beach and Coast Highway in Dana Point have been subjected to flooding during storms. Additionally, rail service interruptions occurred in 2021 and 2022 when movement of the ground under the rail line was detected in south San Clemente, thereby causing instability of the tracks. Efforts are underway to stabilize the rail line. In areas where there had been 100 feet of beach 20 years ago, storm waves now come right up to the rail line. Riprap in the form of large boulders has been placed to prevent further erosion, along with other measures to keep the rail line secure, but longer-term solutions will be studied. OCTA will be embarking on a short-/ medium-term study to identify potential solutions to protect the rail line in

the foreseeable future, which is estimated to be 30+ years. This effort will strive to gain a better understanding of climate effects on coastal rail infrastructure; develop options to protect coastal rail infrastructure in-place at various sea levels; identify potential solutions for sand replenishment/retention; and work closely with key stakeholders. Subject to external funding availability, a separate, but equally important effort will be initiated to study the potential relocation of the rail line inland.

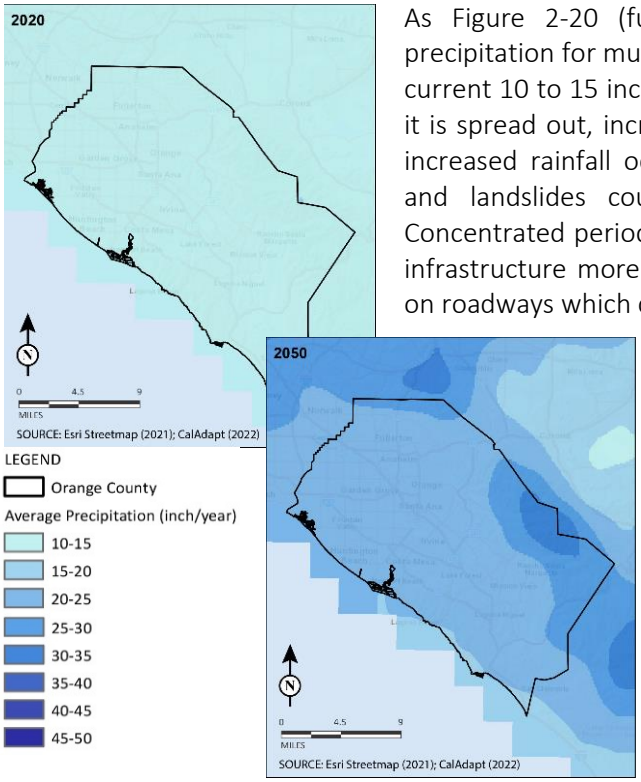


Figure 2-20: Average Precipitation, 2020 vs 2050

As Figure 2-20 (full-size version in Appendix A) shows, average precipitation for much of the County is anticipated to increase from the current 10 to 15 inches per year to 20 to 25 inches per year by 2050. If it is spread out, increased rainfall could be beneficial. If, however, the increased rainfall occurs during brief, concentrated periods, flooding and landslides could endanger the transportation infrastructure. Concentrated periods of rainfall also make use of active transportation infrastructure more challenging and increase the number of incidents on roadways which can temporarily reduce capacity.

Climate modeling predicts increases in the average maximum and minimum temperatures for much of Orange County. This increase in the averages would be caused by an increase in the number of extreme heat days, when daytime and nighttime temperatures are far higher than average. Extreme heat days have the potential to cause the buckling of rails and introduce stress at bridge joints. Transit riders waiting at bus stops and train stations are impacted, along with pedestrians and bicyclists, all of whom may not have access to alternatives that could help them avoid exposure. Heat also lowers vehicle fuel economy, reduces the range of battery-operated vehicles, makes bicycling more difficult, and can accelerate wear and tear on asphalt surfaces.

Figures 2-21 and 2-22, respectively, provide comparisons between the average year-round maximum and minimum temperatures in 2020 and those forecast for 2050. The trend of higher average temperatures could indicate higher temperatures and more high temperature days. (Full-size versions of Figures 2-21 and 2-22 are provided in Appendix A.)

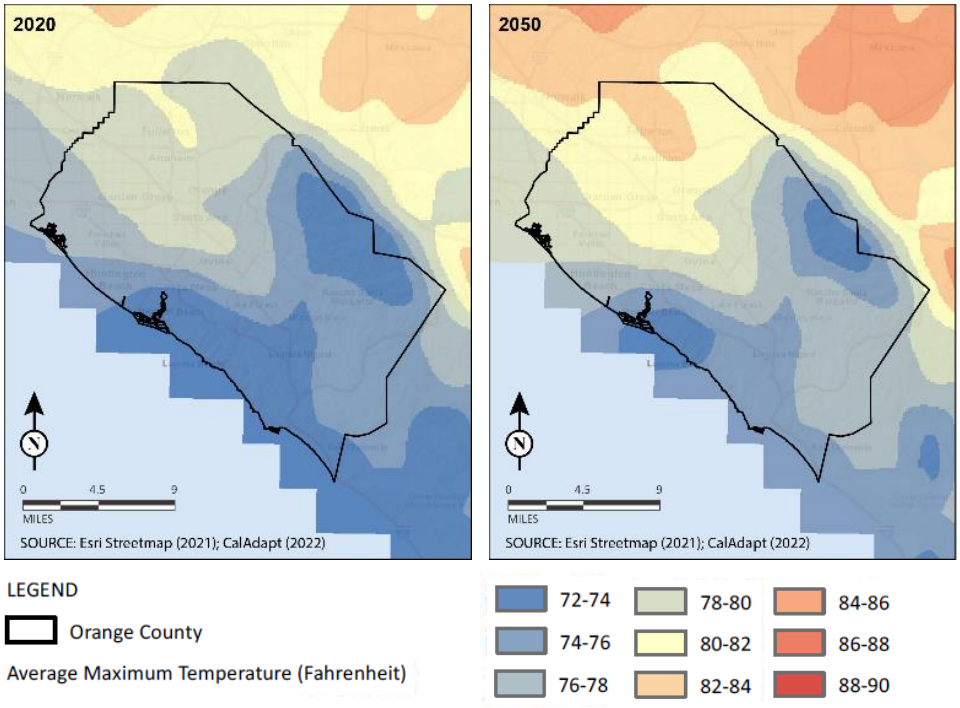


Figure 2-21: Average Maximum Temperature, 2020 vs 2050

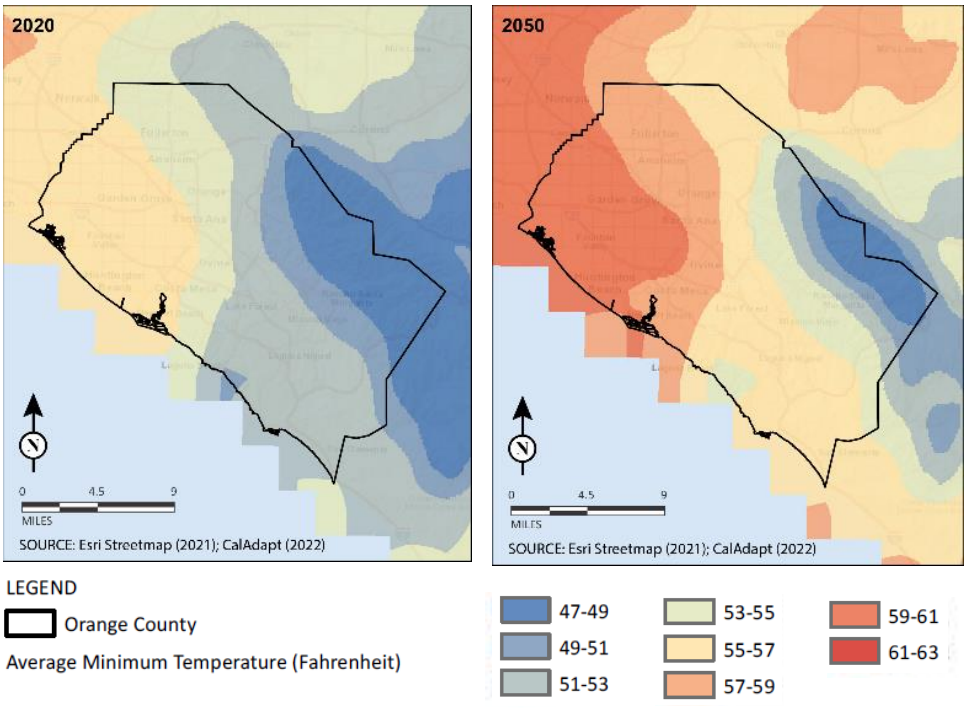


Figure 2-22: Average Minimum Temperature, 2020 vs 2050

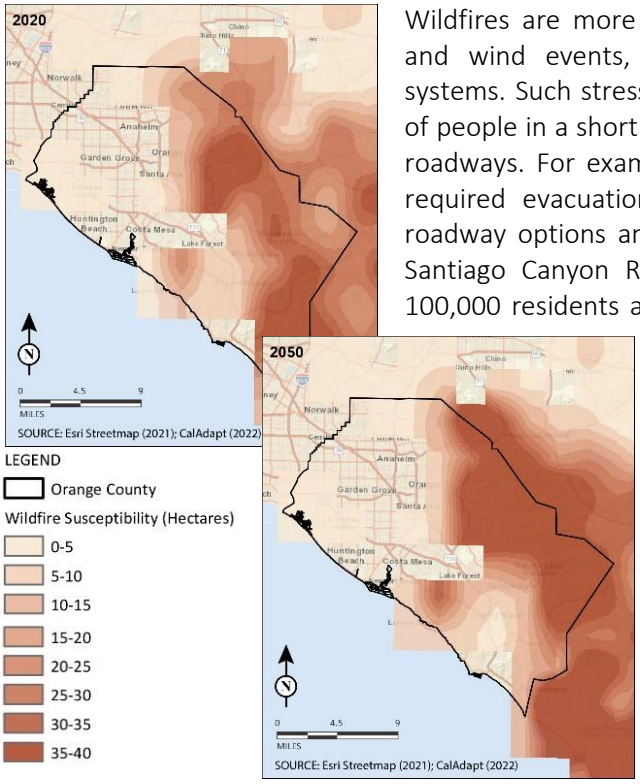


Figure 2-23: Wildfire Susceptibility, 2020 vs 2050

Wildfires are more likely to occur, particularly during extreme heat and wind events, which can impose stresses on transportation systems. Such stresses include the necessity to move large quantities of people in a short amount of time during evacuations and closure of roadways. For example, the Canyon 2 Fire in Anaheim Hills in 2017 required evacuation of a large number of residents with limited roadway options and required the closure of northbound SR-241 at Santiago Canyon Road. The Silverado Fire in 2020 displaced over 100,000 residents and again closed SR-241. The Coastal Fire in 2022 required evacuations and closed local roadways. Figure 2-23 provides a comparison between wildfire susceptibility in 2020 and the forecast for 2050. (A full-size version of Figure 2-23 is provided in Appendix A.) Wildfire susceptibility is anticipated to increase in the southern and eastern parts of the county.

Rainstorms are also becoming more intense and, at times, overwhelming the storm water management systems. Recent rainstorms have caused flooding that has resulted in unsafe travel conditions and the closure of freeways and roads in Orange County.

To combat climate change, the State has set ambitious goals for reducing greenhouse gas (GHG) emissions. In 2005, California Executive Order S-3-05 established a series of targets that ultimately lead to reducing GHG emissions to 80% below 1990 levels by 2050. Since then, additional orders have been signed to add intermediate targets. The State has achieved the 2020 GHG emissions reductions target and is now working toward the goal of further reducing GHG emissions by 40% below 1990 levels by 2030 and carbon neutrality by 2045. The transportation sector (primarily on-road travel) was the single largest contributor to GHG emissions in 2019 with 40% of total GHG emissions in the State. Therefore, many of the necessary reductions to achieve the State's 2030 and 2045 targets will come from the transportation sector.

To further align with the State's goals of combating climate change, in 2022, OCTA began developing its own Climate Adaptation and Sustainability Plan (CASP). This agency-wide plan will identify opportunities for OCTA to implement both climate adaptation and greenhouse gas emissions strategies. The CASP will support OCTA's efforts to build resilience into its infrastructure and systems as well as reduce emissions. This will help to ensure the continuity of operations, reduce costs over time, and protect the health and safety of staff and riders, thus allowing OCTA to uphold its core mission of providing essential transit solutions to keep Orange County moving.

Technology advancements, particularly in electric vehicles, can help to reduce GHG emissions. The 2022 Scoping Plan for Achieving Carbon Neutrality (CARB, November 2022), Executive Order N-79-20, and the

California Air Resources Board (CARB) Advanced Clean Cars II rule lay out a path toward 100% of in-State passenger vehicle sales being ZEVs by 2035. While this rule will increase the number of ZEVs, many internal combustion engine vehicles will remain on the road. By 2045, internal combustion engine vehicles could still make up more than 50% of the vehicle fleet and continue to emit a significant level of GHG emissions. Therefore, it will continue to be necessary to reduce single occupant vehicle travel.

One of the State's regulations aligning with climate action goals has been the implementation of Senate Bill 743 (SB 743). SB 743 resulted in revisions to the California Environmental Quality Act (CEQA) that focus analysis of transportation impacts on VMT, rather than traffic congestion. Per the screening guidelines outlined in Transportation Analysis under CEQA (Caltrans, September 2020), capacity enhancement projects, such as roadway widening and freeway lane additions, would likely lead to a measurable increase in VMT and may result in transportation impacts that must be reported and potentially mitigated. This introduces another challenge for future widening projects in addition to those discussed earlier under Key Factor 1: Growing Travel Demand and Built-Out Roadways.

Key Factor 4: Changing Funding Outlook

In alignment with SB 743, revised CEQA Guidelines, and the State's climate action priorities, the State's infrastructure funding priorities (i.e., Climate Action Plan for Transportation Infrastructure [CAPTI]) have changed. Similarly, federal programs (i.e., Infrastructure Investment and Jobs Act [IIJA]) for the interstate highway system are focusing on repair, replacement, and rehabilitation of existing infrastructure. In addition, Orange County's local transportation sales tax, OC Go, is set to expire in 2041, which will sunset the freeway program begun in 1991 with Measure M1. These realities affect the planning process because funding sources for new roadway capacity will be limited.

Climate Action Plan for Transportation Infrastructure (CAPTI)

The State's CAPTI program acknowledges that the transportation sector is the largest contributor of California's GHG emissions. It establishes an action plan that aligns approximately $5 billion in annual funding for transportation investments with the State's climate goals. CAPTI also commits to a "fix it first" approach that prioritizes maintenance of the transportation system. Other funding programs effected by CAPTI focus on improving active transportation, goods movement, multimodal options, system efficiency and deployment of zero-emission vehicles. However, this creates challenges for funding any needed roadway capacity projects. Also, GHG reduction projects are generally prioritized for funding over other local transportation needs. Another catch is that while transit capital costs are prioritized, funding for transit operations is not eligible under these state programs.

Infrastructure Investment and Jobs Act (IIJA)

The IIJA was signed in November 2021 and programmed $1.2 trillion in transportation spending, including $550 billion for upgrading aging transportation infrastructure across the country. The spending program contains a few earmarked projects for Orange County's existing aging infrastructures. The IIJA also provides large investments for passenger rail service, transit capital investments, operations support, electric vehicle infrastructure, and funding for electric buses. Transportation planning should align with these funding priorities in order to secure federal funding proportionate to Orange County's population or tax input.

Sunset of OC Go

In 2006, nearly 70 percent of Orange County voters renewed the Measure M sales tax for transportation improvements, now known as OC Go, extending the program from 2011 to 2041. OC Go is currently anticipated to generate over $15 billion in revenue for transportation improvements in Orange County and recently exceeded $1 billion in local roadway investments. These investments are part of the reason that Orange County's roadway pavement conditions are consistently ranked among the best in the State, if not the best. It is not just drivers who benefit from well-maintained roadways, a well-maintained roadway surface also benefits bicyclists, improves bus operations, and enhances safety for all users.

OC Go funding supports projects and programs that relieve congestion, improve street conditions, expand Metrolink service, reduce travel costs for seniors and persons with disabilities, synchronize traffic signals, and reduce transportation-related air and water pollution, as shown on the following page.

However, the OC Go transportation sales tax will sunset in 2041, within the horizon of this LRTP. OC Go revenue represents approximately 22% of all available transportation revenues projected for Orange County in this LRTP. If OC Go sunsets without a funding strategy that looks beyond 2041, many of the ongoing transportation programs noted above would be affected. To better understand the implications of the ending of programs funded by OC Go, the 2045 OC Go Sunset scenario was developed. This scenario assumes that the committed capital projects included in OC Go are completed. Projects completed by the Transportation Corridor Agencies (TCA) with revenue generated from their tolled facilities would continue beyond 2045. However, other ongoing programs including the Metrolink service and arterial signal synchronization would be reduced or eliminated without sustaining funding. More specifically, this scenario assumes a reduction in Metrolink service from 55 trains in 2019 to approximately 20 daily trains, as well as an approximately 10% reduction in arterial speeds on the signal synchronization network. The results of this scenario are reflected in the performance metrics shown in Table 2.3.

Table 2.3: Performance Metrics

	2019 Base Year	2045 No-Build	2045 M2 Sunset
Daily Vehicle Miles Traveled (VMT)	76,400,000	81,900,000 (7% increase vs. 2019)	85,700,000 (12% increase vs. 2019)
Total Vehicle Hours of Travel (VHT)	2,211,000	2,463,000	2,605,000
Total Vehicle Hours of Delay (VHD)	341,000	454,000	408,000
Delay as Percent of Travel Time	15%	18%	16%
Average Speed – Freeways – Peak Period	41	30	41
Average Speed – Arterials – Peak Period	26	25	24
Daily Transit Trips	131,000	138,000 (6% increase vs. 2019)	129,000 (2% decrease vs. 2019)

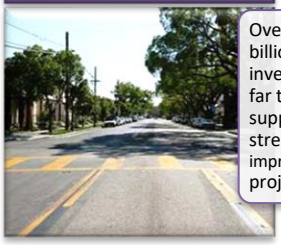
Freeway Projects

Implement 17 remaining projects to relieve congestion and improve safety

Motorist Services

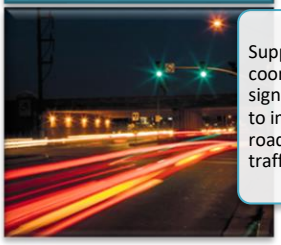
Assists motorists and removes congestion-causing debris

Street Improvements



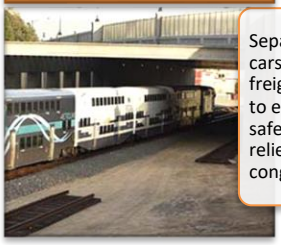
Over $1 billion invested so far to support local street improvement projects

Signal Synchronization



Supports coordinated signal timing to improve roadway traffic flow

Bridges & Underpasses



Separates cars and freight trains to enhance safety and relieve congestion

Metrolink Station Improvements

Expands service, enhances the experience, and improves safety

OC Streetcar

Construction is underway with service to begin in 2024

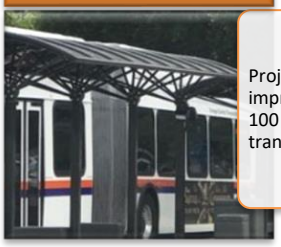
Transit Access

Reduced fares and specialized services for seniors and persons with disabilities

Local Transit

Supoorts locally operated services to enhance community level mobility

Safe Transit Stops



Projects to improve the 100 busiest transit stops

Freeway Mitigation

1300 acres aquired and preserved as open space

Environmental Cleanup

Removes pollutants from roads before they reach waterways

To summarize the data presented in Table 2.3, the completion of the OC Go freeway projects by 2041 helps to improve freeway speeds and reduce delay compared to the 2045 No-Build scenario. However, the elimination of the traffic signal synchronization program slows arterial speeds, and there is a shift from transit trips to more driving trips due to reductions in Metrolink service. This results in a 12% increase in VMT over 2019 levels, which would work against State goals to reduce VMT and greenhouse gas emissions. Alternative funding sources would be required to continue OC Go programs after 2041 and avoid these undesirable results.

The changing funding outlook across the federal, State, and local issues discussed above reveals that opportunities to fund traditional roadway widening projects are shrinking. Therefore, there is a need to develop plans and strategies that position Orange County to compete well for funding as funding programs continue to evolve. These plans and strategies should consider more efficient use of existing facilities and enhancing alternative modes of transportation to reduce drive-alone trips. Additionally, there is a need to develop and explore local funding strategies that address needs identified in the OC Go Sunset Scenario, including strategies to address Orange County's mobility, accessibility, and sustainability needs through 2045 and beyond.

Key Factor 5: Diversity, Equity, and Inclusion

Historically, many disadvantaged communities throughout the nation have been disproportionately burdened by transportation inequities that limit access to opportunities. Recently, there has been a renewed call for transparency regarding diversity, equity, and inclusion, especially in public sector activities, to ensure that the voices of those most in need are heard and meaningfully addressed. This LRTP presents an opportunity to begin tracking how well improvements planned within Orange County support an equitable transportation system and to improve engagement with diverse and disadvantaged communities.

OCTA operates all of its services, programs, and activities without regard to race, color, or national origin in accordance with Title VI federal regulations. Beyond these regulations, additional consideration of diversity, equity, and inclusion in the planning and operating of transportation for Orange County maximizes community benefits and the long-term economic viability of the County. Therefore, it is prudent to incorporate diversity, equity, and inclusion in OCTA's planning processes, beginning with public engagement that comes early and often.

Public Engagement

An outreach strategy to engage with people who live, work, and travel through Orange County was developed and implemented to inform this LRTP in Fall 2021. Due to the ongoing COVID-19 pandemic, a variety of outreach approaches were used such as e-blasts, social media messaging, and announcements on OCTA's website promoting surveys, virtual community meetings, and other outreach opportunities. Staff also attended community events, collecting feedback from cities with the greatest need for additional engagement. Feedback was also received from standing OCTA committees, including the Citizen's Advisory Committee, Diverse Community Leaders Group, and Accessible Transit Advisory Committee. In addition, two Community Leader roundtables were also held to extend the reach of project engagement.

Outreach methods were created and implemented with a diverse audience in mind to engage hard-to-reach communities and ensure all voices had the opportunity to be heard, regardless of ethnicity, language preference, or socioeconomic background. The survey and materials were available in English, Spanish, and Vietnamese. Several social media and radio advertisements were placed to connect with the Spanish and Vietnamese language communities. A

bilingual project telephone helpline was also established. Highlight of the results are presented in Figure 2-24. A full report on community engagement is included in Appendix B.

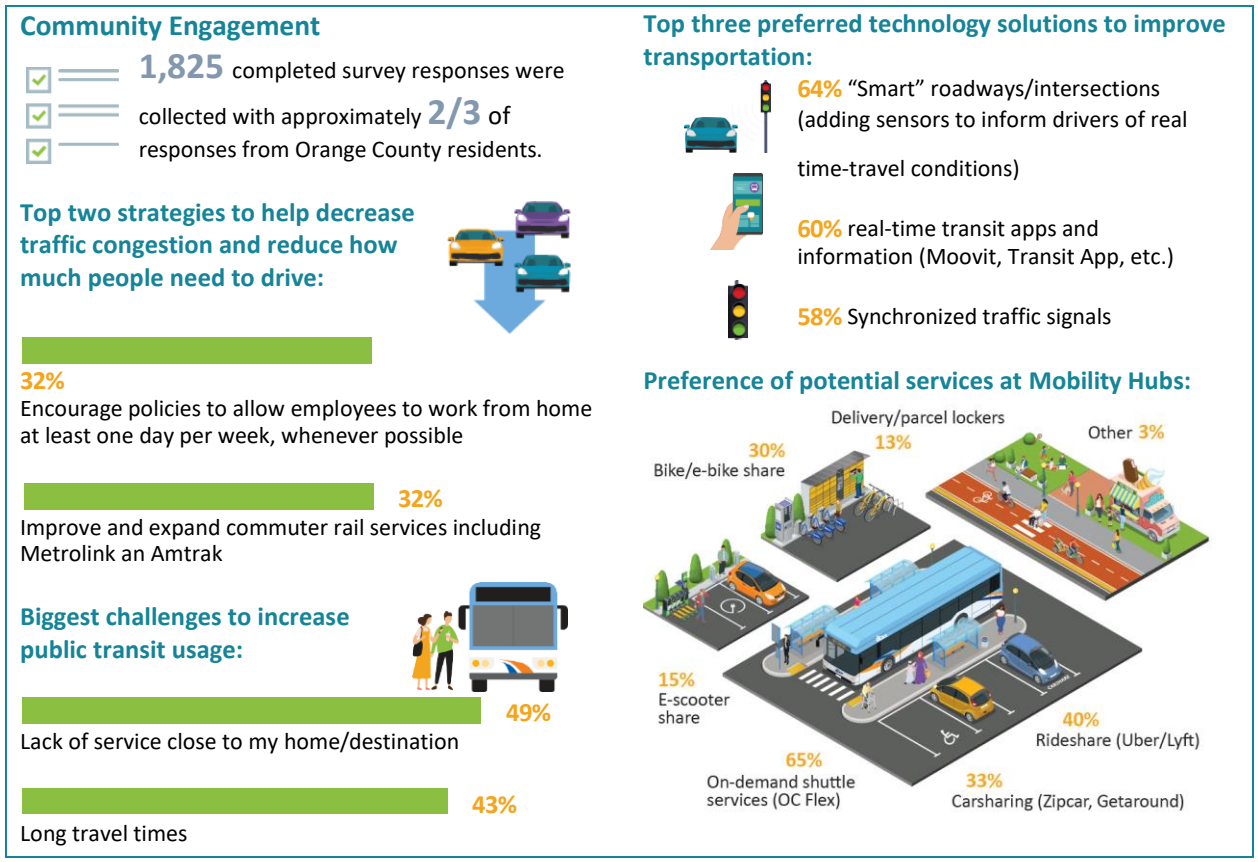


Figure 2-24: Summary of Community Concerns

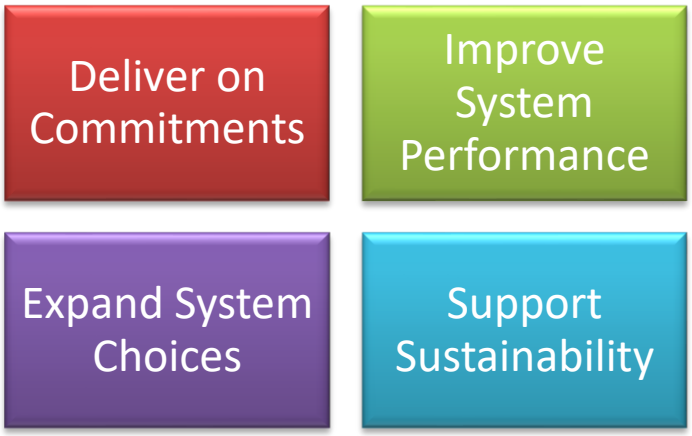
Summary

The Orange County population and employment are projected to increase by 9% and 12%, respectively, through 2045. If this growth were to occur with the existing infrastructure, VMT would increase by 7% while total vehicle hours of delay would increase by 33%. With completion of the OC Go Freeway Program in 2041 and the sunset of the other programs funded by OC Go, VMT would increase by 12% while total vehicle hours of delay would increase by 20%. The current federal and State policies and funding outlook provides limited opportunities for roadway widening projects. To overcome this, public engagement results suggest that Orange County should embrace changing travel trends and technology to make more efficient use of facilities and enhance alternatives to driving alone. These public outreach results influenced development of strategies for improving the future of mobility in Orange County and informed the performance measures used to determine progress towards the goals of the LRTP. These goals and strategies are discussed in detail in the following chapter.

Chapter 3:
Paths to Success

Chapter 3: Paths to Success

While new challenges have emerged over the years, the goals of the LRTP remain steady, thereby allowing plans, programs, and projects to stay on course. As shown below, there are four LRTP goals (which are described in further detail in the Defining Success discussion that follows). This chapter also discusses the approach used to analyze equity before describing the seven Paths to Success, which provide strategies that address the goals and respond to the five key factors influencing transportation that were covered in Chapter 2.



LRTP Goals for 2045

Defining Success

Performance measures are compared between scenarios to determine progress toward achieving the goals. Specific performance measures are aligned with each of the goals as described in the following discussions. The LRTP does not identify specific targets for the performance measures. Rather, the performance measures are compared primarily between the 2045 No-Build scenario and the 2045 Preferred Plan to determine if the proposed projects and programs are moving the needle in the right direction to support the goals. After analyzing the performance results, the Short-Term Action Plan (Chapter 5) is developed to outline efforts needed to stay on course.

Goal 1: Deliver on Commitments

The cornerstone of the LRTP is the delivery of the programs funded by the voters approved OC Go and fulfilling OCTA's responsibility for delivering safe and reliable transit service. Therefore, this goal can be measured by confirming that the OC Go funded projects and safe and reliable transit service are prioritized in the Preferred Plan.

Goal 2: Improve System Performance

This goal is related to all travel modes and often requires consideration of innovative solutions that respond to Orange County's growing travel demand. Performance metrics include total vehicle hours of delay, delay as a percentage of travel time, and average travel speed. In addition, average travel time is

included to evaluate and compare both vehicle and transit performance. Monitoring average travel time will also show whether the gap between automobiles and other modes is closing over time.

Goal 3: Expand System Choices

This goal aims to provide travelers with convenient and equitable travel options and reduce the number of SOV trips. Residents and employees in Orange County should have options available to fulfill their travel needs and provide equitable access to jobs and other essential destinations. This goal is especially significant because it correlates closely with the paradigm shift within the transportation field that is moving funding and policies away from traditional roadway and freeway improvements towards more of a multimodal emphasis that reduces the need to travel by car. Therefore, this goal has the most performance measures, as listed below:

- Total number of daily SOV trips
- Total number of daily transit trips
- Total hours of transit service (i.e., revenue service hours)
- Total hours of "frequent" transit service (i.e., routes with service every 15 minutes or better during morning and afternoon commute periods)
- Average frequency of bus service (i.e., headways)
- Number of households within 0.5 mile of "higher quality" transit service stops (i.e., Bravo!, OC Streetcar, and/or Bus Rapid Transit)
- Average number of jobs and key destinations accessible by vehicle and by transit (see Equity Analysis discussion below for details)
- Average household spending on transportation
- Total square miles of microtransit (on-demand) service areas that are existing or proposed for consideration
- Total miles of bikeways that are existing or planned
- Total number of multimodal facilities (i.e., areas where travelers can conveniently transfer between travel modes)

Goal 4: Support Sustainability

As discussed in Chapter 2, climate-related risks from sea level rise, flooding, heat, and wildfires can impact Orange County's travelers and transportation infrastructure. This goal highlights the need for adaptation and resiliency strategies that reduce these climate-related risks within a transportation plan that supports Orange County's economy, infrastructure maintenance, and overall environmental health. Therefore, performance measures are included that report on GHG emissions, other smog-forming emissions, VMT, pavement conditions, and estimated jobs created by the planned LRTP investments. The overall objective is to improve the health and quality of life in Orange County's communities.

Equity Analysis

The Equity Analysis in Regional Transportation Planning Processes report from the Transit Cooperative Research Program was used to consider the equitable distribution of transportation benefits of the Preferred Plan scenario. This process involves identifying populations for analysis, needs and concerns, impacts of proposed agency activity, and whether those impacts are disparate or have disproportionately high and adverse effects.

To identify populations for analysis, an approach was adapted from the SCAG 2020 RTP/SCS and applied using data from the 2020 U.S. Census and the 2021 American Community Survey conducted by the U.S. Census Bureau on Orange County census tracts. The first step identified the top one-third of Orange County census tracts with the highest concentration of non-white population, which is shown on Figure 3-1. This top one-third includes census tracts with non-white populations that are greater than 74.4% (and up to 98.9%).

Next, the upper one-third of census tracts with the highest concentration of households living in poverty (ranging from 8% to 35% according to the federal definition) were identified and are also displayed on Figure 3-2.

Census tracts in the top one-third for both non-white populations and households living in poverty were included as Communities of Concern within Orange County (Figure 3-3). The population of Orange County's Communities of Concern is approximately 29% of Orange County's total population. All three images are displayed side-by-side for comparison of the top one-third non-white population, highest concentration of households living in poverty, and the Orange County Communities of Concern. Full-size images are also provided individually in Appendix A.

The Communities of Concern were evaluated against other equity-related datasets to validate the findings. When looking at areas in Orange County with the lowest annual household income and highest concentration of limited English-speaking households, these areas overlap with the identified Communities of Concern. Some of the areas in Orange County with the highest concentrations of zero-vehicle households overlap with the identified Communities of Concern, but other areas with high numbers of zero-vehicle households appear to be by choice. Low-median household income, limited English-speaking, and zero-vehicle household areas are shown on Figures 3-4 through 3-6 for comparison to the Communities of Concern. These images are displayed together for comparison to the Orange County Communities of Concern. Full size images are also provided individually in Appendix A.

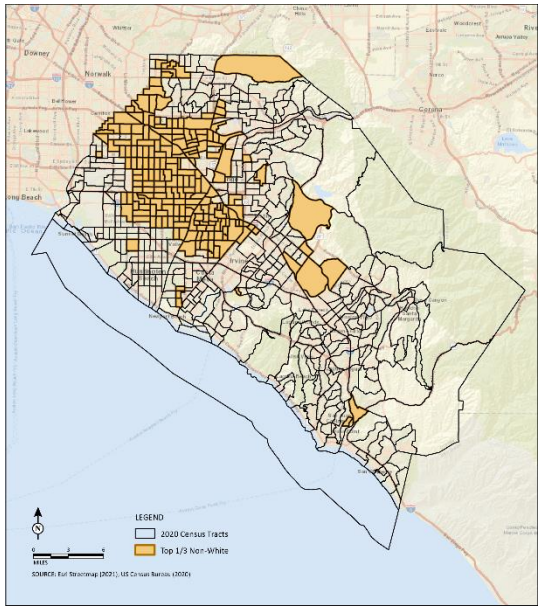


Figure 3-1: Top One-Third Non-White

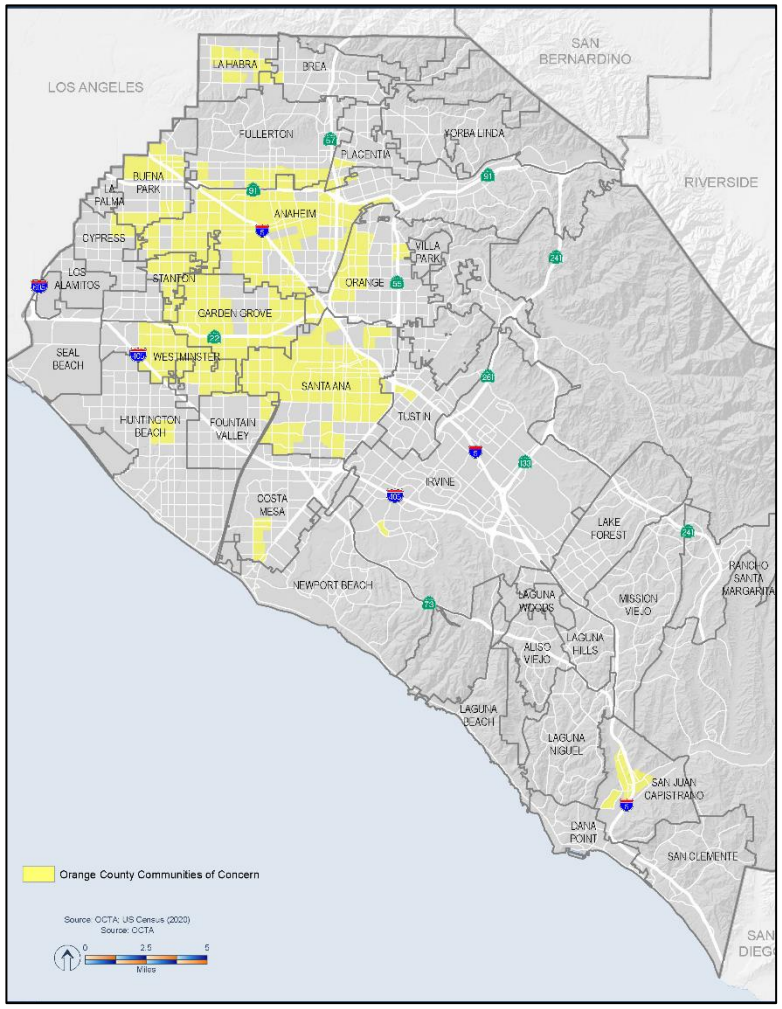


Figure 3-3: Communities of Concern Distribution

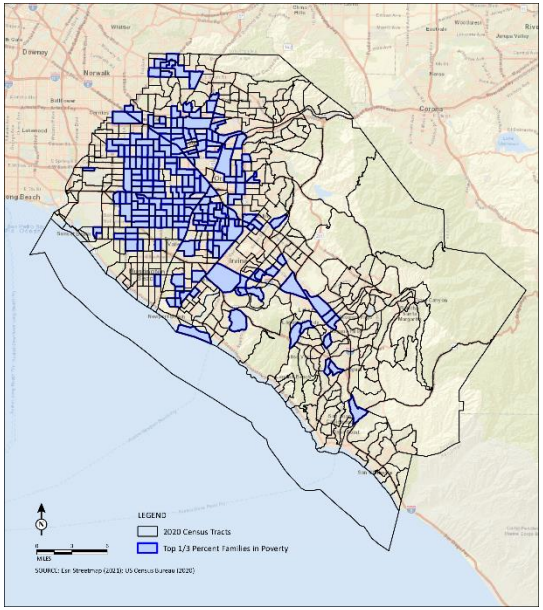


Figure 3-2: Top One-Third Families in Poverty

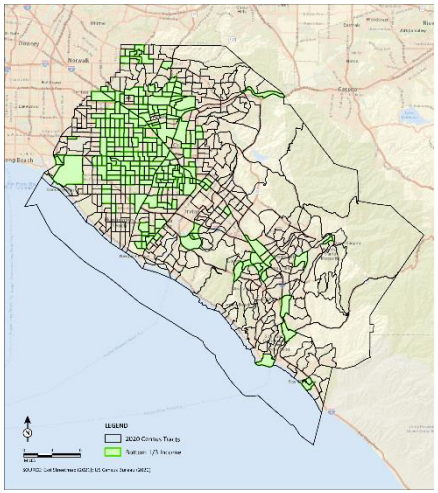


Figure 3-4: Bottom One-Third Income

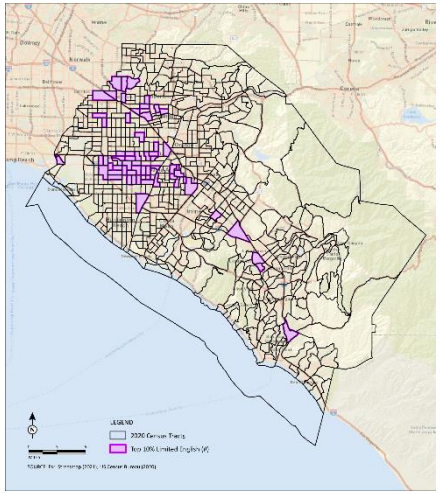


Figure 3-5: Top 10% Limited English

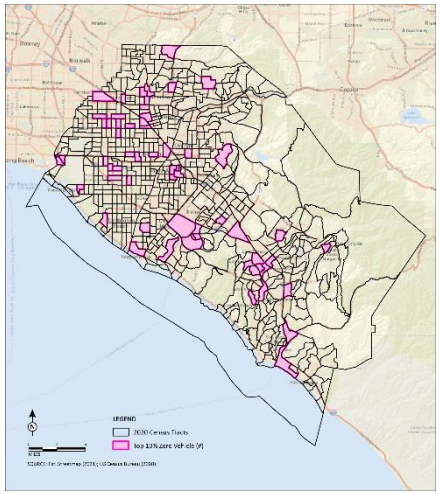
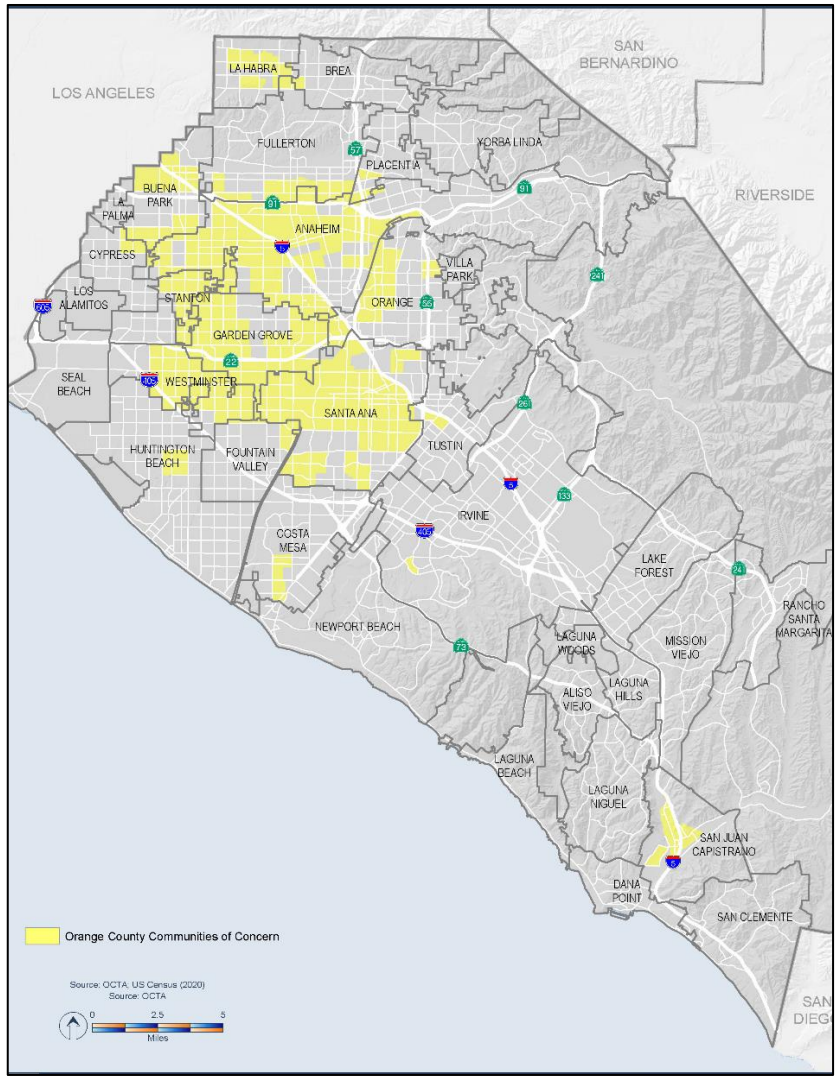


Figure 3-6: Top 10% Zero Vehicle Households



Communities of Concern Distribution

Additionally, the Communities of Concern were compared to the most impacted census tracts as ranked by the California Healthy Places Index (HPI). This comparison was made after identifying the Communities of Concern for validation of the methodology. The HPI scoring was created by the Public Health Alliance of Southern California and examines different community characteristics that affect life expectancy. Access to clean air and water, education, job opportunities, health care, etc. vary by neighborhood. When these neighborhoods are also tied to race, the health outcomes can be inequitable. Figure 3-7 shows the percentile ranking of Orange County census tracts on the HPI and overlays the Communities of Concern. This comparison indicates that all the Orange County areas ranking lowest on the HPI (dark blue) are within or immediately adjacent to the LRTP's Communities of Concern, indicating a close correlation.

To analyze mobility benefits from the transportation improvements proposed in the Preferred Plan scenario, average household access was measured to the same types of locations used in the HPI (e.g., access to education, job opportunities, health care, and open space). Key destinations providing essential services such as educational institutions, medical services, grocery stores, and open space within Orange County are illustrated (in terms of density) in Figure 3-8. Average household access was evaluated at the countywide level and for the combined Communities of Concern to highlight any disparities or improvements in mobility equity. This analysis and the findings are discussed further in Chapter 4.

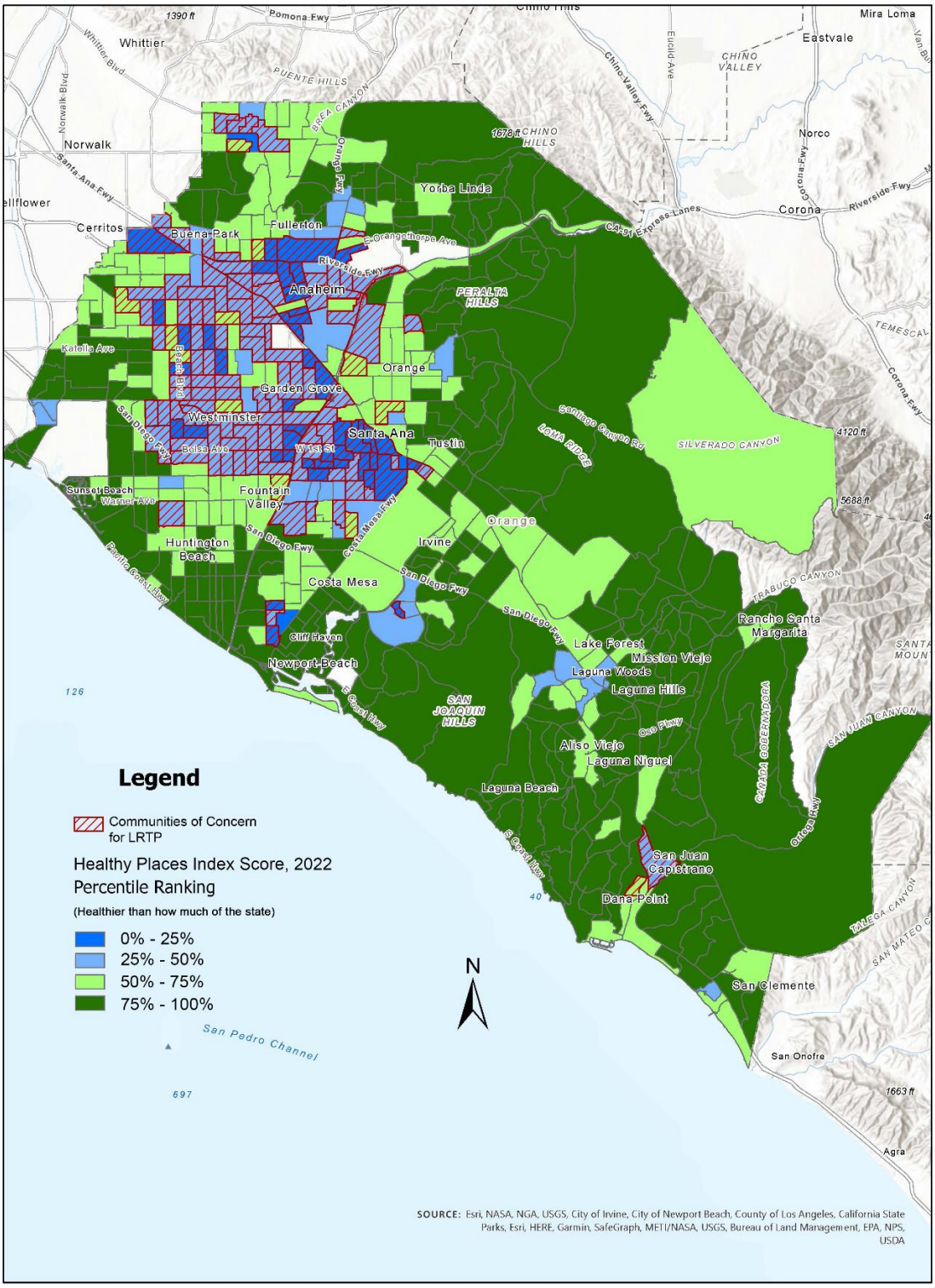


Figure 3-7: California Healthy Place Index Comparison

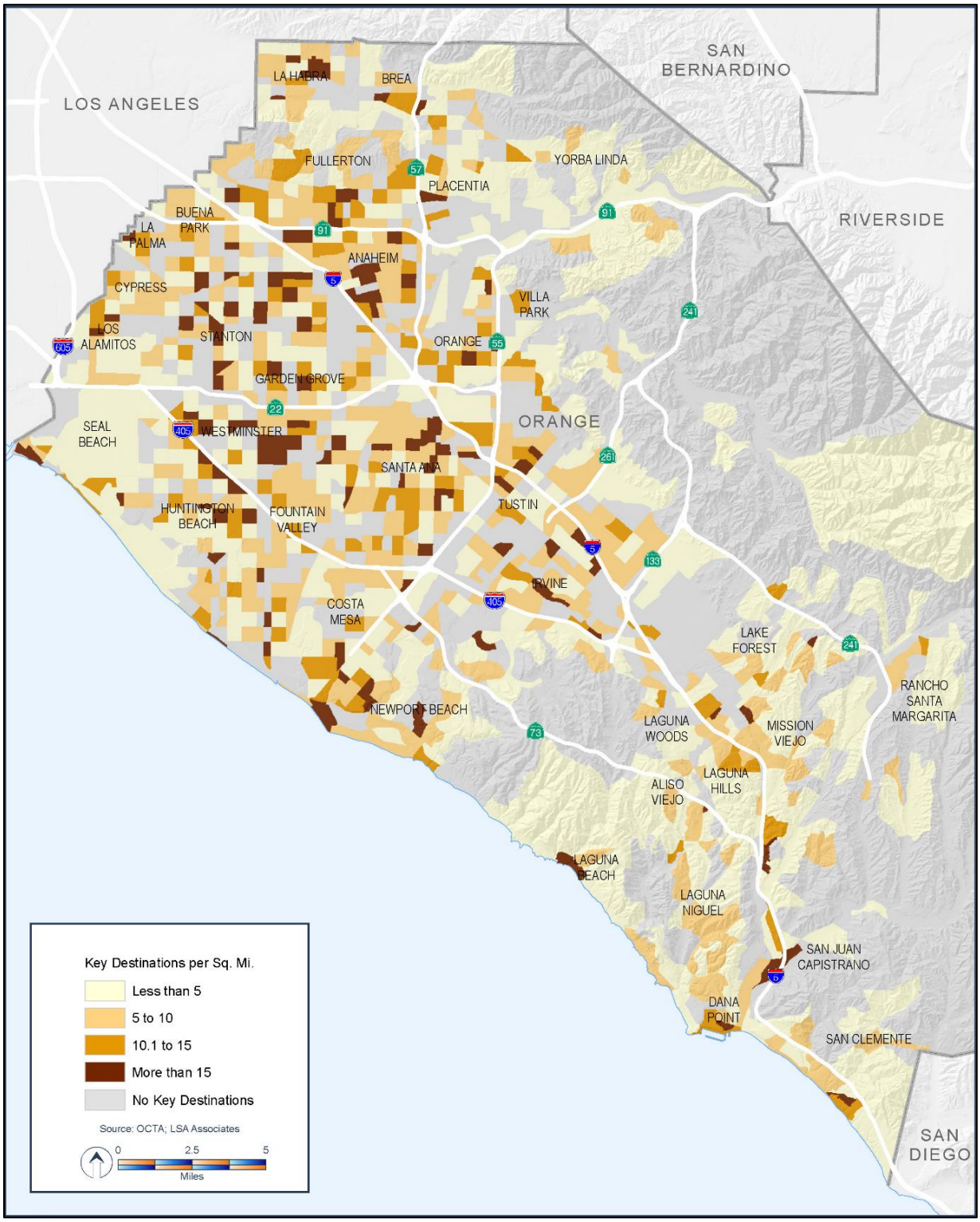
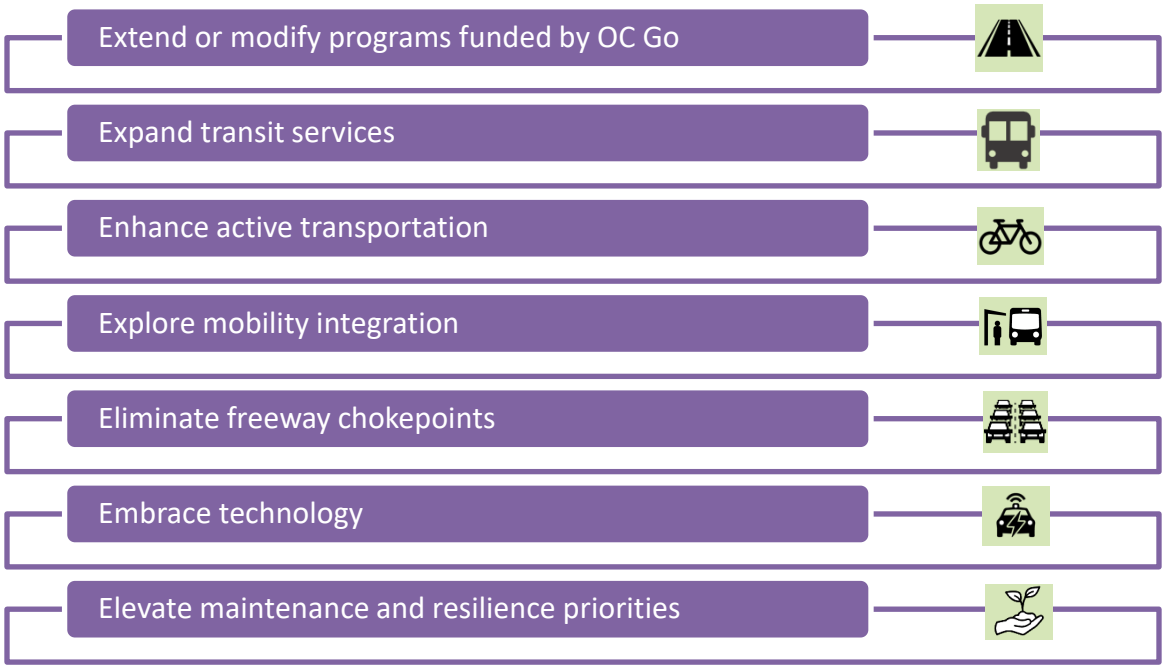


Figure 3-8: Key Destinations per Square Mile

The Paths to Success

The Paths to Success are seven strategy areas that respond to the key factors discussed in Chapter 2 and to feedback received through the initial public engagement phase. These strategies are proposed in addition to delivering on current commitments and look beyond the sunset of OC Go to achieve the goals discussed earlier. This section provides an overview of the Paths to Success, while more specific assumptions associated with each will be discussed in Chapter 4.



Path 1: Extend or Modify Programs Funded by OC Go

OC Go funded services that Orange County travelers currently rely on should either be continued or adapted to future conditions. This includes programs like signal synchronization, freeway service patrol, community circulators, and support for Metrolink service, all of which help to increase transit ridership and reduce delay. This results in more reliable travel times, improved access to employment and key destinations, and reduced emissions and VMT. Additionally, arterial roadway improvement programs help to maintain Orange County's high pavement quality, which provides for safer travel conditions and less wear on vehicles and bicycles.

As noted above, some modifications to these programs may be needed to ensure they are flexible enough to adapt to new technologies and evolving travel conditions. Examples include modifying the signal synchronization program to incorporate new technology that allows for more dynamic responses to traffic patterns and communication with connected vehicles and other devices. Also, roadway improvement programs could be modified to help implement complete street projects that improve the

mobility of all travel modes, encouraging more active transportation trips and reduce travel costs, emissions, and VMT.

The process to determine which programs funded by OC Go to retain or revamp, and to develop a long-term funding strategy, is identified in Chapter 5, as part of the Short-Term Action Plan. This is envisioned as a comprehensive effort that would require a significant level of engagement by the OCTA Board of Directors, members of the public, and stakeholders. For the purposes of this LRTP, it is assumed that most programs would continue at the current scale.

Path 2: Expand Transit Services

This Path to Success looks to enhance bus service and implement the types of service that best meet local needs. These enhancements reflect plans developed as part of the 2018 OC Transit Vision, which proposes to increase the number of corridors served by OCTA's Bravo! rapid bus service in the core of Orange County, as well as provide new freeway bus rapid transit services. The OC Transit Vision also recommends considering high-capacity transit services (e.g., bus rapid transit or streetcars) along higher density corridors with high transit demand. Expansion of high-capacity transit and rapid bus services can help improve travel times for transit riders and improve the quality of the service.

In addition, expansion of on-demand microtransit service in low-density areas of Orange County is proposed in this Path to Success. This could be in the form of additional OC Flex service or partnerships with transportation network companies to provide service charge subsidies for users within a defined area. Microtransit can be a cost-effective way to expand the service area providing additional access to transit, employment, and key destinations.

Some strategies that are gaining momentum at the state level and in other parts of the country are related to removing cost burdens for transit riders and reducing barriers to use transit. A concept is proposed in this Path to Success to evaluate significantly reducing or removing transit fares for OC Bus services. This is dependent on increased operational revenues from state and federal sources, and would require plans and procedures to preserve or enhance the quality of the transit experience. Increased service combined with affordable transit fares will help to reduce SOV trips, emissions, VMT, and household spending on travel.

Path 3: Enhance Active Transportation

OCTA looks to continue coordination with local partners to develop and implement bicycle and pedestrian routes both regionally (e.g., OC Loops) and locally (e.g., safe routes to schools) and improve overall connectivity of active transportation facilities. This includes implementation of the additional planned bikeways identified in OCTA's countywide active transportation strategy, OC Active.

These planned facilities will help make active transportation safer, better connected, and a more attractive choice for Orange County travelers. Relationships with local jurisdictions are critical for advancing the planning and implementation of these regional and local active transportation facilities.

Expanding the active transportation network gives travelers better access to safe facilities, thereby making walking and rolling more viable and attractive for trips of short- to moderate-length. This helps to reduce vehicle trips, VMT, emissions, and travel cost.

Additionally, new opportunities may be identified to expand active transportation facilities on strategic segments of the Master Plan of Arterial Highways (MPAH). An initial analysis identified approximately 60 miles of the MPAH where there appeared to be opportunities to repurpose a vehicle lane for a bikeway. To further explore this potential, the Short-term Action Plan (included in Chapter 5) recommends additional analysis with local jurisdictions to identify areas of excess capacity that may provide valuable active transportation connections.

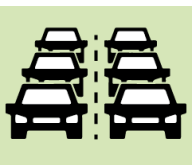
Path 4: Explore Mobility Integration

Improving integration of mobility options could increase accessibility and reduce the first- and last-mile barriers that typically discourage alternatives to SOV trips. This integration can be achieved through a combination of technological changes and capital investments.

OCTA is currently analyzing the potential benefits of a network of mobility hubs at key transit stations and destinations (such as employment and activity centers) and how to implement and operate mobility hubs. Mobility hubs provide an array of services that support the travel needs within that community or neighborhood. These services usually include connections to regional rail or bus transit, wayfinding information, rideshare services, and micromobility options. Micromobility includes first/last mile connections such as bicycle or e-scooter sharing services. By bringing these services together at key locations throughout Orange County, travelers will have increased accessibility to wider selection of alternatives to driving alone and will be able to transfer between travel modes more easily.

Mobility as a Service (MaaS) is another strategy that can be used to support mobility integration and streamline the trip planning and payment experience for travelers. MaaS is a single interface that could be accessed through a smart phone application or at a kiosk to plan trips, receive real-time travel information, and pay for any transportation services such as transit, micromobility, and rideshare.

Mobility hubs and MaaS are intended to work together to provide easier and more equitable mobility alternatives to solo driving options for Orange County travelers. Providing mobility hubs and streamlining transitions and payments between modes improves the efficiency of the system, resulting in more reliable travel times, better access to and from jobs and key destinations, fewer SOV trips, and reduced VMT, emissions, and travel costs.



Path 5: Eliminate Freeway Chokepoints

Even with the OC Go freeway program fully implemented, chokepoints on freeways may still exist. It is essential to continue identifying strategies to eliminate those chokepoints. The strategies would emphasize lower cost spot treatments that would produce measurable benefits with minimal right-of-way needs. They are intended to enhance safety and reduce operational deficiencies rather than full general-purpose lane additions.

Examples include reducing weaving and merging operations by providing new auxiliary lanes and braided ramps, eliminating lane drops, and implementing system management techniques that improve operations.

Chokepoint improvements provide benefits that go well beyond improving the performance of the freeways. By enhancing safety and efficiency on the freeway system, these treatments would help improve access to jobs and key destinations. Chokepoint improvements also include consideration of active transportation safety enhancements where freeway interchanges intersect with arterial roadways. Additionally, bus routes that operate on the freeway system would benefit from more reliable travel times. Finally, communities that experience unhealthy air quality would benefit from reductions of smog-forming emissions that tend to build where traffic is congested.

Path 6: Embrace Technology

Technology has advanced the way people travel, from trip planning applications with real-time traffic information, to transportation network companies and e-bikes, to cloud-based networks making remote work a possibility for many. Based on recent past experiences, the ability to forecast the impacts of technology is limited. However, planning for flexibility and monitoring developing technologies can allow opportunities to be leveraged when they come along.

There are several technologies being monitored or studied that may provide opportunities to enhance Orange County's transportation system. Some are being considered as part of current projects, such as upgrading traffic signal controllers in the ongoing signal synchronization program. These controllers can be utilized to support elements of connected vehicle technology as they enter the market. Additional trends and technologies that are being tracked include, but are not limited to: remote work trends, e-bikes, e-scooters, neighborhood electric vehicles, and electric vehicle charging infrastructure needs.

There are also emerging technologies being studied and developed by others, including concepts like fully autonomous vehicles, hyperloop concepts, and urban air taxi services that could develop into new travel options or could lead to other transportation breakthroughs that have not yet been imagined. Planning for, investing in, and influencing the development of new technologies and services offers potential for cleaner and more efficient transportation options or to eliminate some trips altogether. With constraints on expanding the space used by the transportation system, new technologies and services may provide some of the best opportunities to reduce congestion and provide more reliable travel times, better access to and from jobs and key destinations, fewer SOV trips, and reduced VMT and emissions.

Path 7: Elevate Maintenance and Resilience Priorities

Regular maintenance of the transportation system can be challenging and costly. Fortunately, OC Go currently provides funding to local jurisdictions to help offset the cost and makes protecting roadway investments a top priority. As a result, Orange County has the best pavement quality in the State. Additionally, the OC Go Freeway Program helps maintain freeway infrastructure when and where projects are implemented. However, a funding strategy is needed to continue these investments following the sunset of OC Go in 2041.

Additional challenges are presented with the increasing occurrences of wildfires, flooding, coastal erosion, extreme heat days, and other climate-related risks that threaten transportation infrastructure and the traveling public. Regular transportation system assessments will be conducted in response to these threats to identify proactive steps necessary for adapting to the changing environment and protecting the traveling public, infrastructure investments, and quality of life. One action that is being implemented is the conversion of the OCTA bus fleet to fully electric vehicles. Currently, 10 battery electric buses and 10 hydrogen electric buses are operating to test the different technologies and chart a path to a fully electric bus fleet by 2040. In addition, OCTA is preparing a study to develop and evaluate long-term strategies to address the rail corridor along the San Clemente coast.

By investing in clean energy technologies and adapting the transportation system to the changing environment, this path aims to reduce emissions and the risk level from climate-related events. At the same time, the path emphasizes the need to maintain past and future investments in the transportation system to provide a safe and reliable system while protecting public assets.

Summary

As discussed above, OCTA's long-term goals of delivering on commitments, improving system performance, expanding system choices, and supporting sustainability remain for this LRTP. The long-term goals and public and stakeholder feedback were key in developing the Paths to Success. These seven objectives build on the current commitments of OCTA and look beyond the sunset of OC Go to achieve OCTA's long-term goals. Performance measures used in previous LRTPs were expanded to evaluate more aspects of the goals and the Paths to Success. Techniques were also developed to measure equity consistent with OCTA's commitment to diversity, equity, and inclusion. These performance measures were used to evaluate the 2045 Preferred Plan for the LRTP, as detailed in the following chapter.

Chapter 4:
2045 Preferred Plan

Chapter 4: 2045 Preferred Plan

OCTA is committed to delivering OC Go as approved by voters while continuing to provide safe and reliable public transit for Orange County. The projects and programs funded by OC Go reflect the expectations of the Orange County public and are the bedrock of the 2045 Preferred Plan. The 2045 Preferred Plan also includes several creative strategies to deliver mobility choices in an equitable and efficient manner. The first part of the chapter discusses the 2045 Preferred Plan strategies identified for five travel modes: transit, commuter rail, local roadway, active transportation, and freeway. The second part of the chapter summarizes the performance evaluation of the 2045 Preferred Plan, which includes an equity analysis to recognize any uneven distributions of transportation resources and burden.

Transit Strategy

The Orange County transit system has been reassessed against emerging travel trends in the Making Better Connections Study Final Service Plan (Making Better Connections) approved in October 2022. Making Better Connections recommends near-term improvements to the OCTA transit network to better serve transit customers and improve system efficiency. Transit performance, ridership, countywide multimodal travel trends, and customer input were evaluated to form the basis for the recommendations. As OCTA restores service levels to pre-COVID-19 levels, the recommendations will align transit operations with the changing travel patterns. With more travel options than ever before, public transit must work harder to attract riders by delivering high-quality, reliable service, evolving to meet changing mobility needs.

Making Better Connections is the outcome of months of analysis of travel patterns and ridership trends, engagement with community stakeholders, and thoughtful redesign of routes to provide better outcomes for riders by expanding access to destinations, increasing frequency, reducing transfer wait time, and extending hours of service. The Making Better Connections Plan concentrates resources on where transit demand is highest, thereby maximizing the opportunity where transit demand is unmet by lower service levels. The recommended improvements are shown in Figure 4.1 and include:

- The following routes will operate every 10-15 minutes from 6:00 a.m. to 6:00 p.m., benefiting over 58% of all riders:
  - **29/529:** Beach Boulevard
  - **42:** Lincoln Avenue
  - **43/543:** Harbor Boulevard
  - **47:** Anaheim Boulevard/Fairview Street
  - **50:** Katella Avenue
  - **53/553:** Main Street
  - **57:** State College Boulevard/Bristol Street
  - **60/560:** Westminster Avenue/17th Street
  - **64:** Bolsa Avenue/1st Street
  - **66:** McFadden Avenue
- Underutilized routes (5 express routes, 1 Stationlink route, and 2 local routes) will be discontinued, and the resources will be reallocated to improve system productivity.
- All routes operate on a maximum headway of 60 minutes, every day of the week.
- New timed transfer hubs at Brea Mall and Laguna Hills Transportation Center.
- A new limited stop Bravo! Route 553 on Main Street (implemented as part of Oct '22 Service Change).
- An increase in the total number of bus trips offered, adding over 114,000 annual trips. The final plan adds 390 trips on weekdays and 275 trips on weekends.

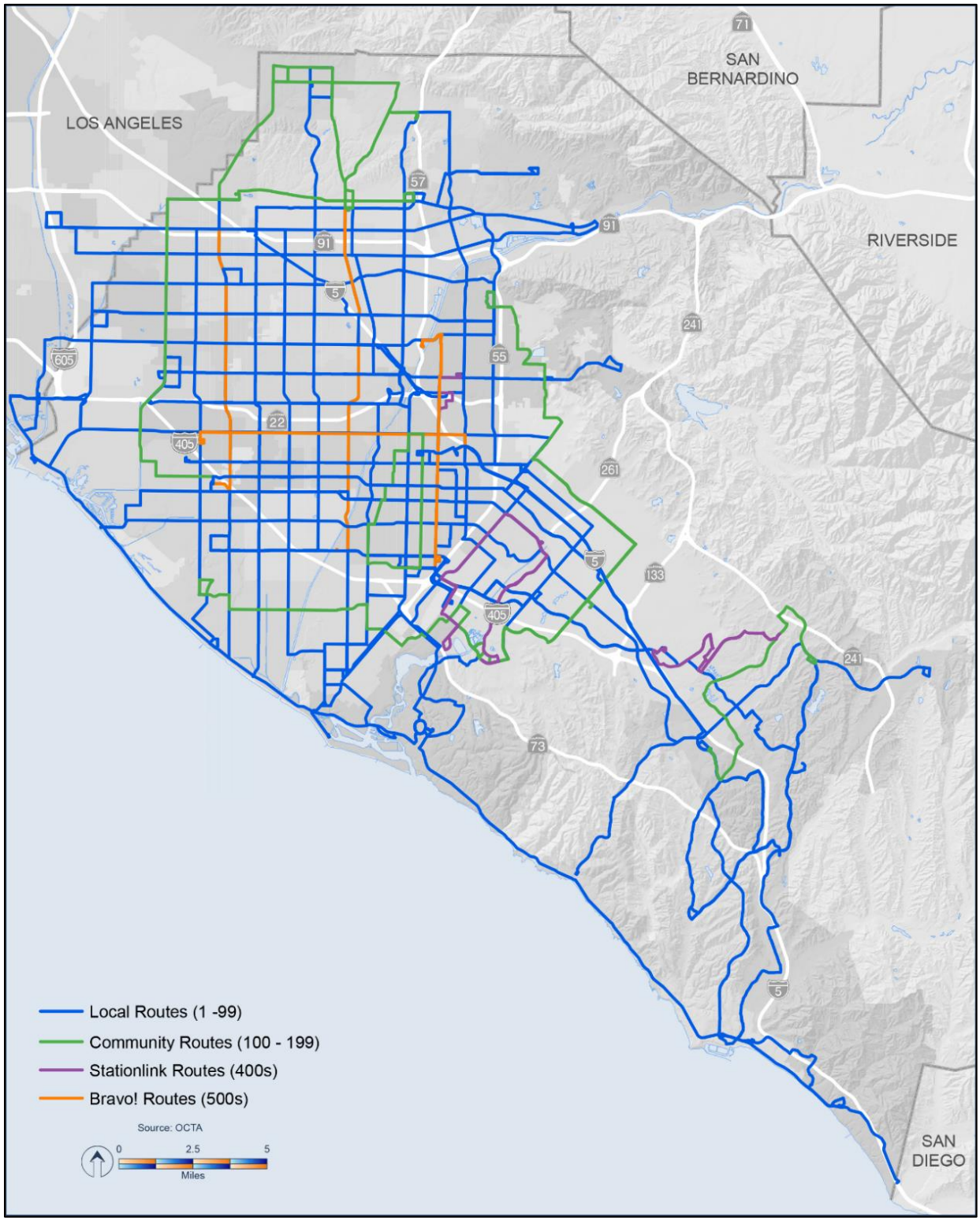


Figure 4-1: Making Better Connections Study Recommendations

- Approximately 89% of OC Bus riders will experience more frequent service, better connections, or more hours of service.
- Approximately 10% of bus riders will experience no changes.
- More than 99% of riders will be within 0.5 mile from a bus stop.

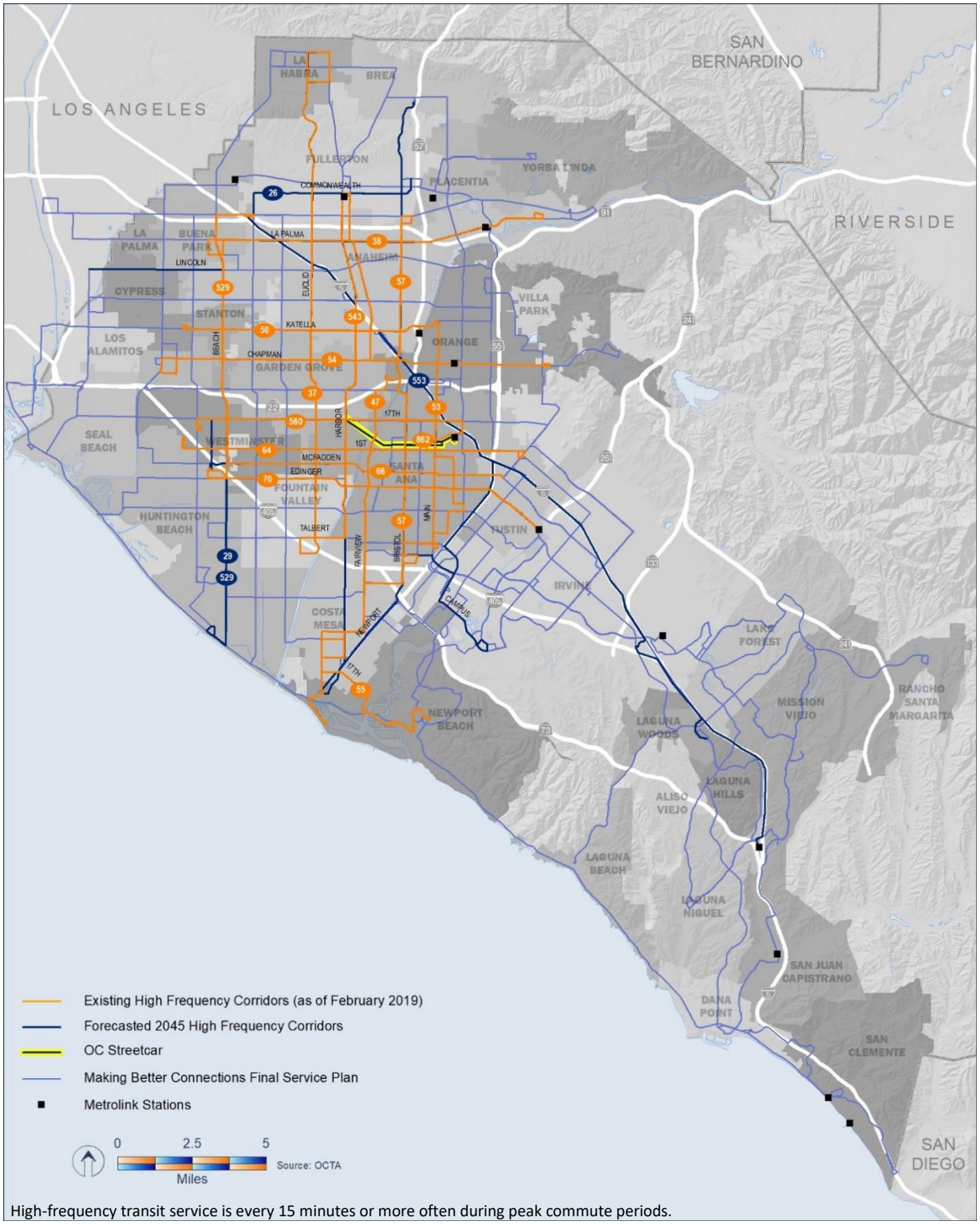
By implementing the Making Better Connections Plan), fixed route bus service will increase up to 1.625 million annual revenue hours and positions the transit system to grow to 2.1 million hours annually.

In addition to improvements planned through Making Better Connections, OCTA is working to deliver the OC Streetcar, which is funded in part through OC Go. When the 4-mile OC Streetcar makes its debut in 2024, a new mobility horizon will be realized in Orange County. This 10-stop modern streetcar will provide frequent, high-capacity transit service to destinations between Santa Ana and Garden Grove, including the Santa Ana Regional Transportation Center and the many businesses along the corridor. As estimated in OC Transit Vision 2018, the OC Streetcar is anticipated to operate for approximately 30,500 revenue service hours annually when it debuts. The 2045 Preferred Plan also accounts for potential expansion of OC Streetcar on one or more corridors identified in the OC Transit Vision and, therefore, budgets for up to 161,000 revenue service hours by 2045, increasing total revenue service hours for fixed route service to 2.1 million hours annually.

Paths to Success

Programs currently funded by OC Go are assumed to be extended through 2045 and modified, as appropriate, to provide connecting transit service at Metrolink stations, senior mobility services, support for locally operated community circulators, and other transit supportive programs. One modification assumed by 2045 is an expansion of the fare stabilization program to reduce or even eliminate transit fares. This assumption is largely dependent on modifications to federal and State rules related to fare box recovery ratios and sufficient transit operating funds.

In addition, the OC Transit Vision (January 2018) is assumed to be implemented to provide enhanced transit service on the corridors depicted in Figure 4-2. This vision includes the expansion of high-capacity service through much of the county. This would primarily be implemented as Bravo! service but could also include future Bus Rapid Transit service or possibly an extension of OC Streetcar, pending additional corridor studies.



High-frequency transit service is every 15 minutes or more often during peak commute periods.

Figure 4-2: 2045 High-Frequency Transit Corridors

As OCTA's bus fleet ages, new vehicle purchases will prioritize zero-emission vehicles. OCTA anticipates the entire bus fleet will be zero-emission by 2040. Past efforts by OCTA to modernize the bus fleet have greatly reduced criteria pollutants. This additional modernization will further reduce greenhouse gas emissions.

Microtransit services, such as OC Flex, provide on-demand transportation options within a specified service area. Microtransit can supplement OC Bus service in areas with lower demand for fixed-route services or where service on a single corridor may be inefficient. Figure 4-3 illustrates opportunity areas for expanding microtransit services in Orange County. These opportunity areas require further study to ensure there is demand for microtransit services. If they were to be fully implemented, the total area served by microtransit in Orange County would expand from 7 square miles in 2019 to up to 112 square miles.

Transit Project List

- OC Bus and OC Access: Increase to 1.926 million revenue vehicle hours
- Project S: OC Streetcar
- Project U: Expand Mobility Choices for Seniors and Persons with Disabilities
- Project V: Community Based Circulators
- Project W: Safe Transit Stops
- Reduced or Fare-Free Transit Service
- Transit Security and Operations Center
- Microtransit System Expansion

Commuter Rail Strategy

OC Go will continue to fund Metrolink service in Orange County through 2041. Metrolink provides a regional commuter rail connection and intra-county rail service between major population and employment centers in the county. Metrolink operates within Ventura, Los Angeles, San Bernardino, Riverside, and Orange counties with a further connection to Oceanside in San Diego County. Three lines operate within Orange County with 55 daily weekday trains (as of 2019) serving Orange County's 12 Metrolink stations.

Paths to Success

Figure 4-4 illustrates the train lines serving Orange County, the distribution of the 55 daily weekday trains in 2019, and the assumed increase to 86 daily weekday trains under the 2045 Preferred Plan. In addition, a new Metrolink station is assumed in Placentia by 2045. The assumed continuation and expansion of Metrolink operations is dependent on funding availability beyond the 2041 sunset of OC Go. Additionally, capital and operational improvements would need to be funded through the Southern California Optimized Rail Expansion program and implemented to accommodate the expanded service level.

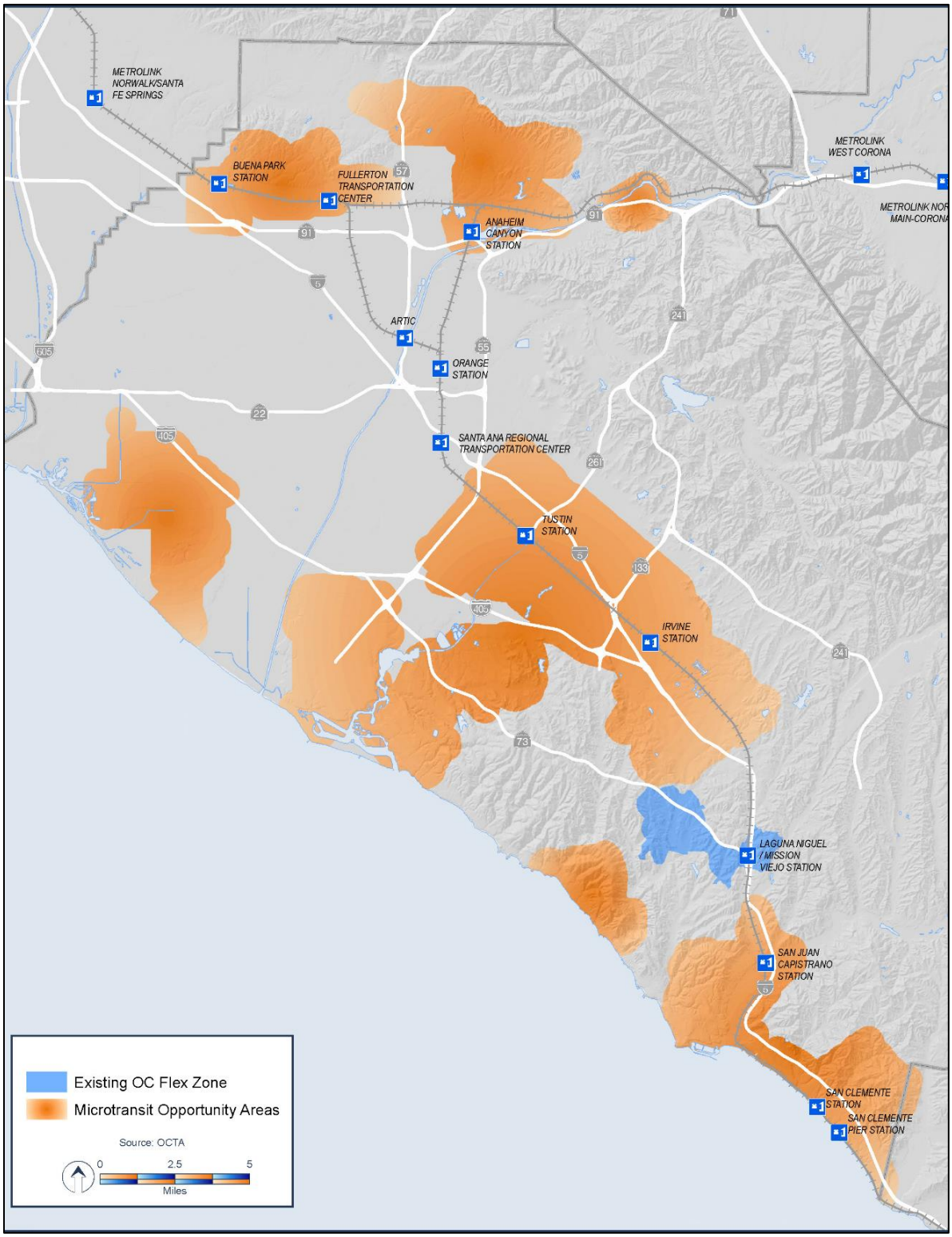


Figure 4-3: Microtransit Opportunity Areas

Figure 4-4: 2019-2045 Metrolink Service Expansion

Work is currently underway to repair the rail line along the San Clemente coast to ensure safe operations. However, a longer-term solution will likely be needed. The Short-Term Action Plan, presented in Chapter 5, recommends a study for this purpose, along with consideration for an additional Metrolink station as part of the Conceptual Project List (also in Chapter 5). It is anticipated that Metrolink will also be looking to test and implement technologies that can further reduce or potentially eliminate emissions from locomotives.

Commuter Rail Project List

- Metrolink Service: Increase to 86 weekday trains
- Project R: Anaheim Canyon Station Improvements
- Project R: Placentia Metrolink Station
- Project R: OC Maintenance Facility
- LOSSAN Corridor Grade Separations

Local Roadway Strategy

Local roads will continue to see improvements with the planned buildout of the MPAH, funded through the OC Go Regional Capacity Program. MPAH buildout would construct an additional 698 lane miles, increasing the total local roadway lane miles from 6,253 to 6,951 lane miles at buildout. Figures 4-5 and 4-6 illustrate the remaining sections for buildout of the MPAH. OC Go also continues to support the Signal Synchronization Program through 2041. Orange County's signal synchronization program provides coordination between local agencies to ensure that traffic flow along arterials does not end at city limits. The program interconnects traffic signals so that groups of vehicles traveling along the arterial at the speed limit pass through multiple green lights rather than starting and stopping at each signal. Near-term plan includes the development of a countywide signal synchronization network that enables enhanced timing strategies and will serve as the baseline for future programing needs assessment. Free flowing traffic benefits travelers but also reduces fuel consumption and subsequent emissions of greenhouse gases and smog forming pollutants. Figure 4-7 shows the corridors that have benefited from the program to date and the 2,000+ traffic signals along over 750 miles of roadway that are eligible for this program. These programs help to ensure that local roadways have adequate capacity and are able to operate efficiently, which in turn supports the movement of goods and services around the county and benefits both transit operations and drivers.

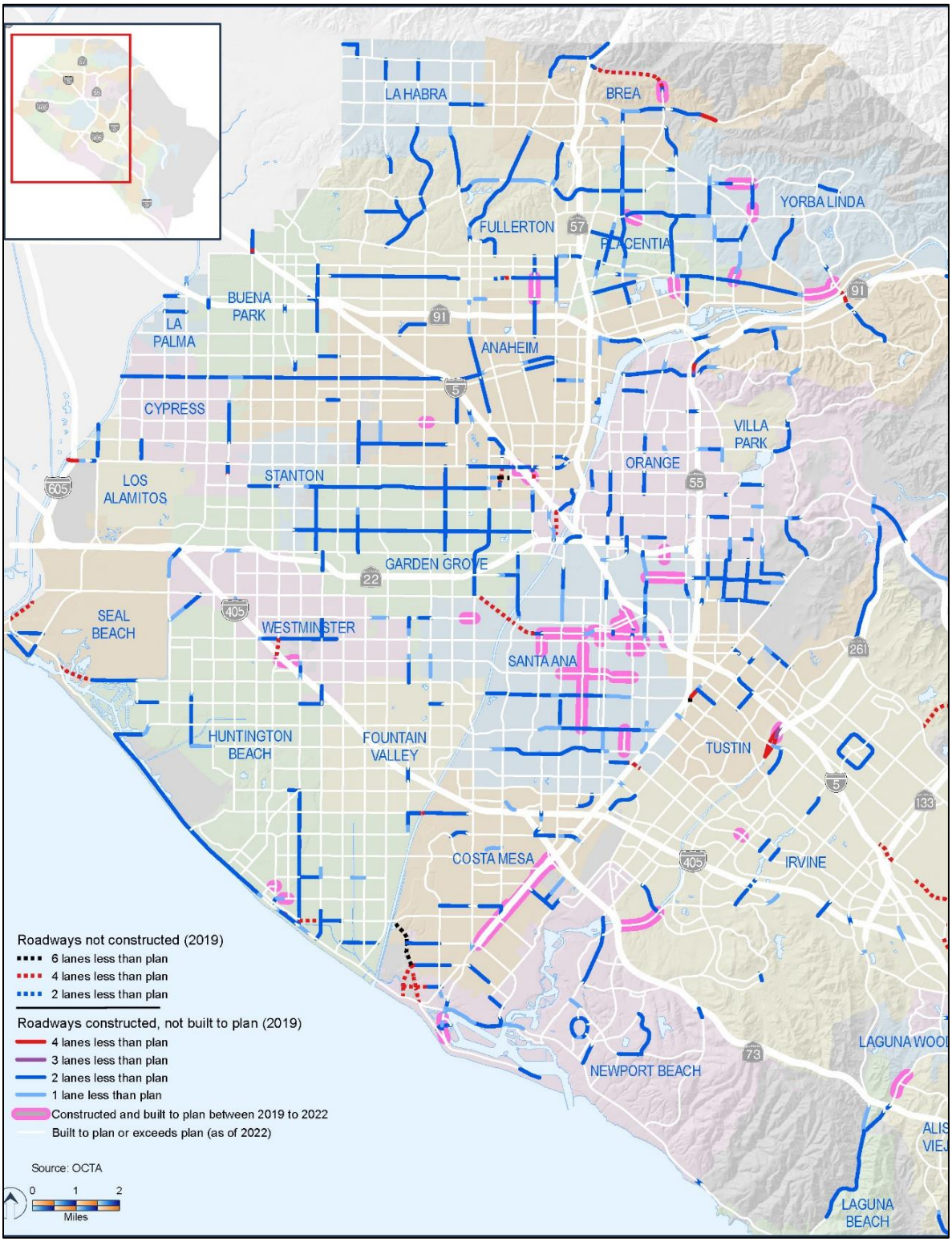


Figure 4-5: 2045 MPAH Improvements – North County

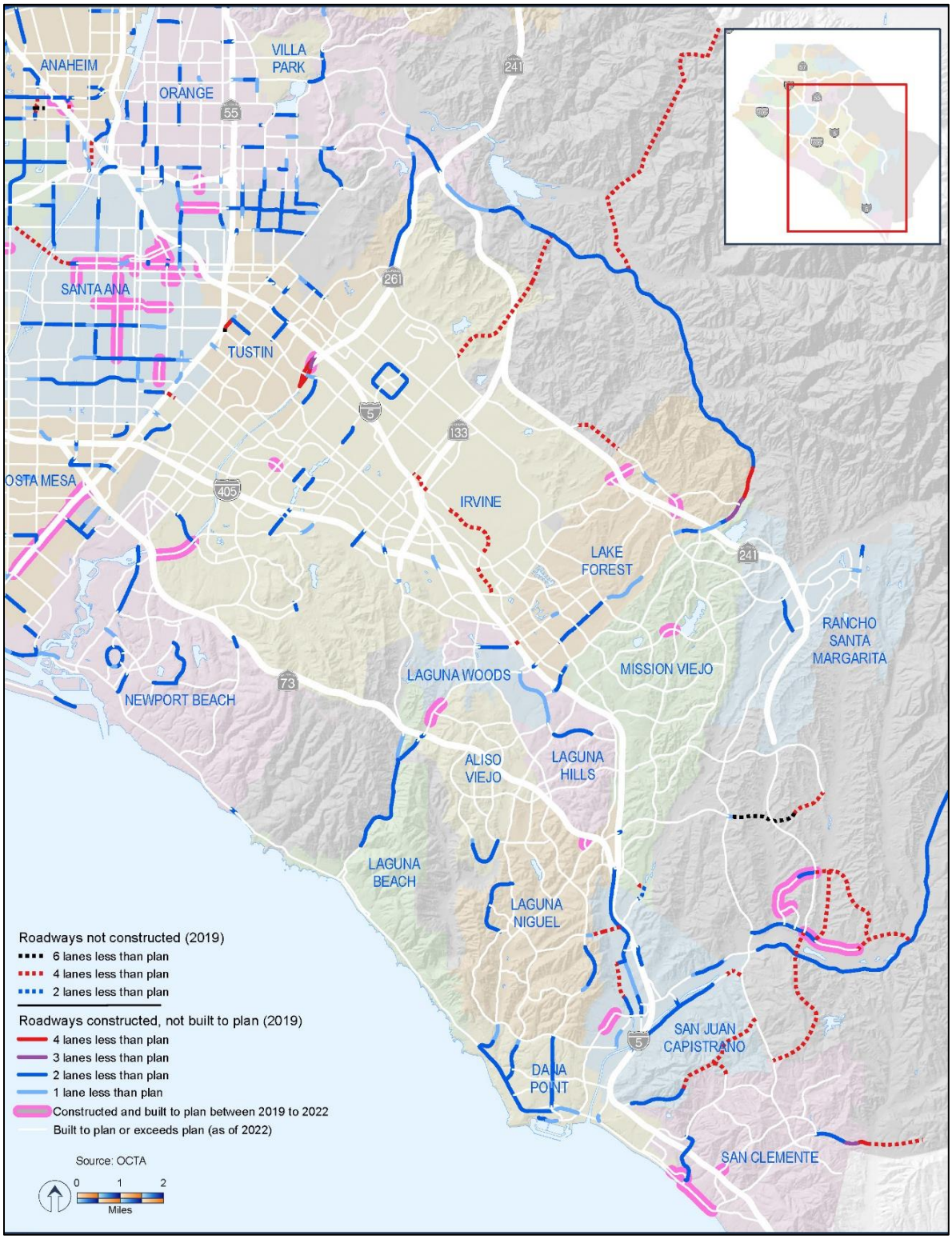


Figure 4-6: 2045 MPAH Improvements – South County

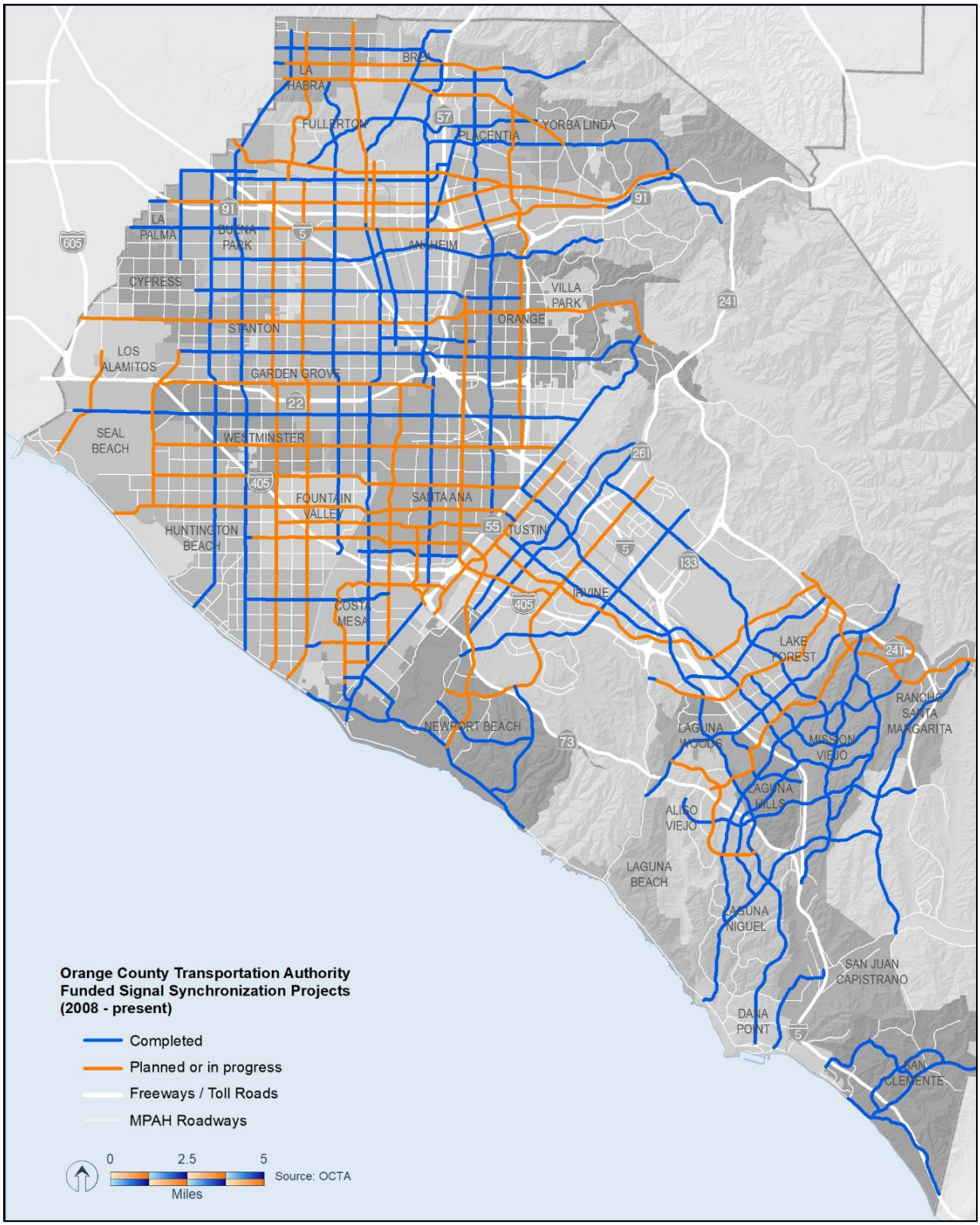


Figure 4-7: Regional Traffic Signal Synchronization Program

Transit operations, drivers, and bicycles are also benefited by Orange County's best in the State pavement quality. Smooth pavement with minimal cracking or potholes reduces bus and vehicle maintenance, reduces traffic collisions and subsequent delay, and improves bicycle safety. Continuous preventative maintenance is also less expensive and less disruptive to traffic flow than more extensive emergency repairs. OC Go includes revenue that is turned back to local jurisdictions for the purpose of roadway maintenance and incentives that encourage regular maintenance of MPAH roadways. The 2045 Preferred Plan extends these maintenance priorities that benefit multiple travel modes and protest previous infrastructure investments.

Paths to Success

Extending the local roadway programs funded by OC Go through 2045 ensures that Orange County's roadways will continue to be maintained and operate efficiently. The Regional Capacity Program would be extended and modified to support roadway improvements that benefit active transportation and transit. Additional rail/arterial grade separation projects are proposed that enhance safety and reduce delays. The Regional Traffic Signal Synchronization Program would be extended and modified to include improved timing strategies, upgrades for compatibility with connected vehicles, and the integration of local and regional traffic management centers. This enhanced signal synchronization program could provide roadway efficiency improvements that exceed the benefits of the current signal synchronization program noted above.

Local Roadway Project List

- Master Plan of Arterial Highways Buildout
- Regional Traffic Signal Synchronization Program
- Local Fair Share Program
- Pavement Maintenance

Active and Innovative Transportation Strategy

The 2045 Preferred Plan includes strategies for active transportation and allows for the implementation of new and innovative technology beyond the OC Go program, consistent with the Paths to Success. The Paths to Success support the implementation of OC Active – Orange County's Bike + Pedestrian Plan (OC Active), which has seven goals:

- Reduce pedestrian and bicyclist collisions.
- Advance strategic walking and biking network.
- Enhance walking and biking access to transit.
- Improve high-need pedestrian areas.
- Strengthen stakeholder partnerships.
- Incorporate diverse community perspectives.
- Leverage funding opportunities.

OC Active will continue to be advanced through coordination between OCTA and local jurisdictions. Implementation of Orange County's planned bikeways is expected to increase bikeway lane miles from approximately 1,200 in 2019 to over 2,000 miles by 2045 with the plan. Figures 4-8 and 4-9 illustrate the planned bikeways for North and South Orange County, respectively.

Paths to Success

As previously noted, extending and modifying the Regional Capacity Program allows it to facilitate the buildout of bicycle and active transportation routes and non-motorized connections to Metrolink. The Regional Capacity Program could also consider opportunities to reallocate roadway space for bikeways where there is excess capacity. Community circulators currently supported by OC Go (e.g., the trolley service in Dana Point, San Clemente, and Laguna Beach) could be modified to include funding support for local jurisdictions to operate bicycle, scooter, or other active transportation sharing programs if extended.

Active transportation can also become a more attractive option with expansion of supportive multimodal facilities. Metrolink stations are multimodal facilities served by fixed route bus service and providing bicycle parking. These stations provide a location for travelers to transfer from one travel mode to another. With better connections to improved active transportation networks, multimodal facilities could expand the number of travelers able to use them and the non-single occupant travel modes connecting at the multimodal facilities. The Orange County Mobility Hubs Strategy looks at potential benefits of additional multimodal facilities that can provide enhanced access to flexible travel options and connectivity with transit services. Mobility hubs are identifiable places that facilitate more seamless, sustainable, and inclusive travel experiences by co-locating regional and local travel modes and amenities at a facility designed for the local context. OCTA will look for opportunities of both local and regional agency partnerships (e.g., the California Department of Transportation (Caltrans) Park-and-Ride program) to optimize connectivity and functionality.

Mobility hubs can help to connect transit, active transportation, and on-demand services, while creating a sense of place that is attractive and helps to reduce automobile dependency. Amenities at each hub would vary based on the size and needs of the community being served but could include secure bicycle storage, wi-fi, parcel lockers, retail services, and MaaS. MaaS is the use of technology to integrate travel information and fare payment platforms. With an identifiable location to access multiple travel modes, readily available information and real time updates on available travel mode options and a fluid transition between modes, the learning curve for use of alternatives would be reduced and more travelers could make their trip without an automobile. However, mobility hub locations and MaaS require further study before implementation.

The 2045 Preferred Plan integrates personal electric transport such as electric bicycles, scooters, and neighborhood electric vehicles. MPAH standards and active transportation planning may consider the opportunities and constraints of these travel options in future planning efforts. The 2045 Preferred Plan makes room for supporting local jurisdictions as they expand electric vehicle charging infrastructure. Other innovative strategy to be considered include incentivizing remote work as a VMT reduction or mitigation strategy.

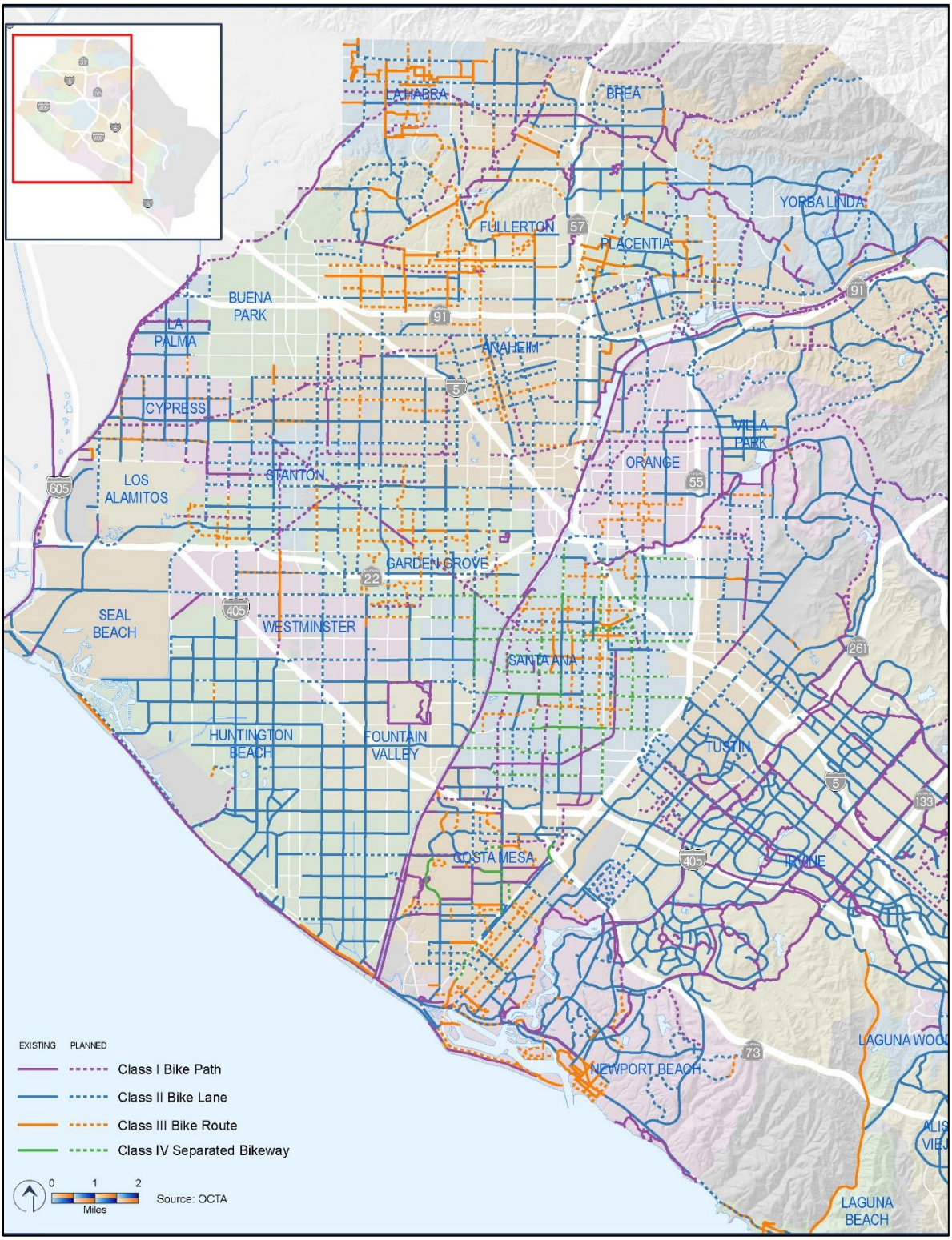


Figure 4-8: 2045 Planned Bikeways – North County

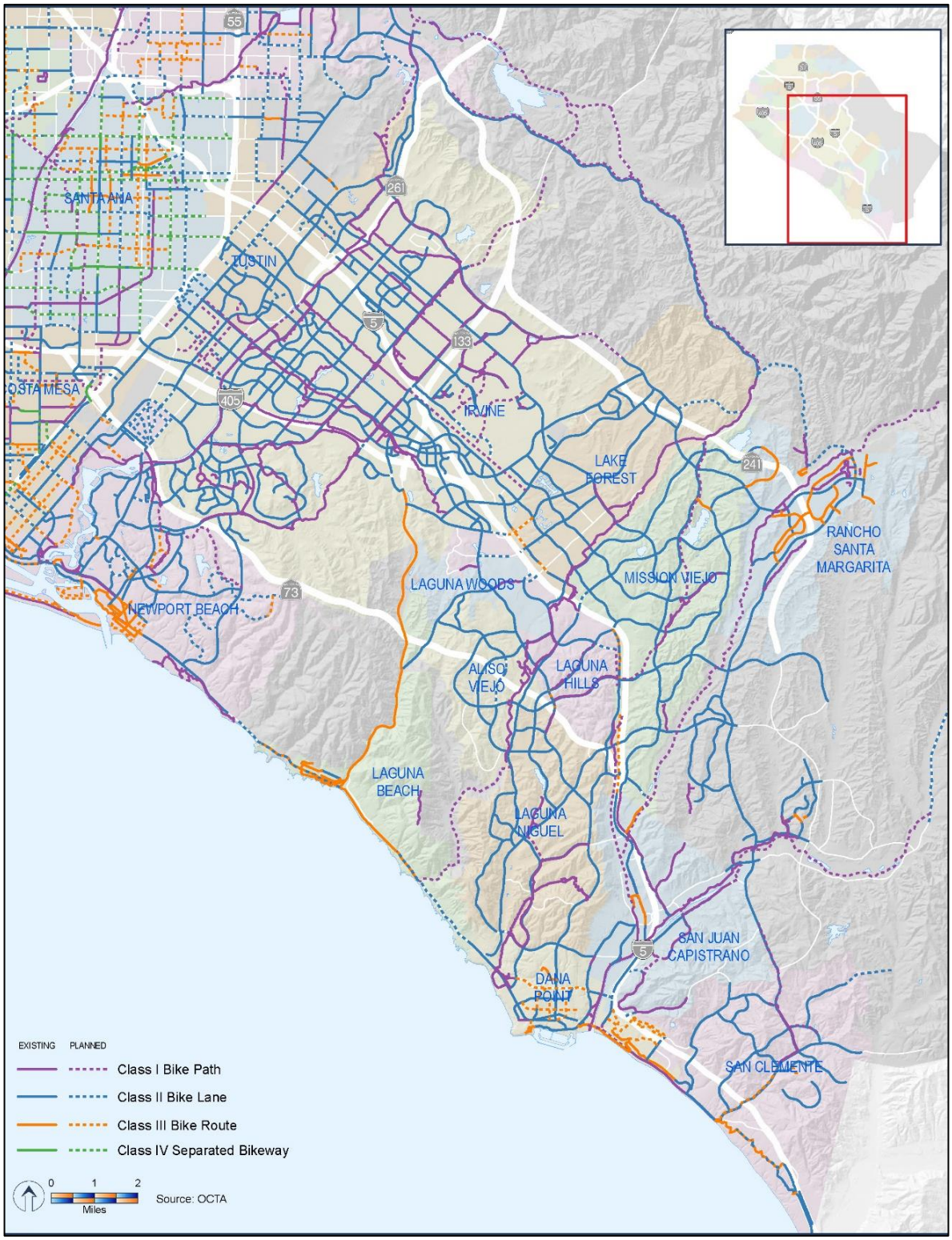


Figure 4-9: 2045 Planned Bikeways – South County

Active and Innovative Project List

- Active Transportation Network
- Enhanced Signal Synchronization
- Mobility Hubs Network
- Electric Vehicle Charging Infrastructure
- Transportation Demand Management Strategies

Freeway Strategy

The 2045 Preferred Plan will complete the OC Go Freeway Program as approved by voters, which includes improvements to general purpose lanes, managed lanes, and interchanges. Managed lanes are any lanes with controlled access, such as occupancy restrictions or pricing. The OC Go Freeway Program will add 110 general-purpose lane miles, 23 high-occupancy vehicle (HOV) lane miles, a one-mile truck climbing lane, and 32 miles of priced managed lanes (currently under construction on I-405). These projects will increase the total number of Orange County's freeway and Toll Road network lane miles from approximately 1,712 in 2019 to 1,878 lane miles. Additional capacity improvements identified through Major Investment Studies and other system-level studies are proposed beyond the OC Go Freeway Program. These include improvements to the managed lane network and two widening projects on existing Toll Road facilities. These additional capacity improvements are proposed to add another 30 managed lane miles and 27 Toll Road lane miles, increasing the total freeway and Toll Road network to approximately 1,935 lane miles. All of the OC Go Freeway Program and additional freeway capacity improvement projects are depicted on Figure 4-10.

HOV lanes are currently operated to allow use by vehicles with two or more occupants to provide an incentive for carpooling. However, traffic volumes in the HOV lanes often experience congestion and reduced speeds, degrading their purpose. Caltrans is responsible for ensuring the performance of these lanes uphold Federal standards. To do so, Caltrans may convert Orange County's HOV lanes to high-occupancy toll (HOT) lanes, which require three passengers per vehicle to access for free and other vehicles can pay a fee for access. This system of HOT lanes is anticipated to be implemented over several years, and it is assumed in this LRTP that Orange County's HOV network will be fully converted to HOT lanes by 2045. In anticipation of the expected conversion to HOT lanes by Caltrans, OCTA prepared an Express Lanes Network Study to suggest where HOT lanes should be considered for implementation in the short-, medium-, and long-term. Figure 4-11, depicts this suggested phasing, which prioritizes HOT lane implementation on SR-57, northern portions of I-5, and an extension of the 91 Express Lanes to the west ahead of other segments of Orange County's managed lane network.

Figure 4-10: 2045 Freeway System Projects

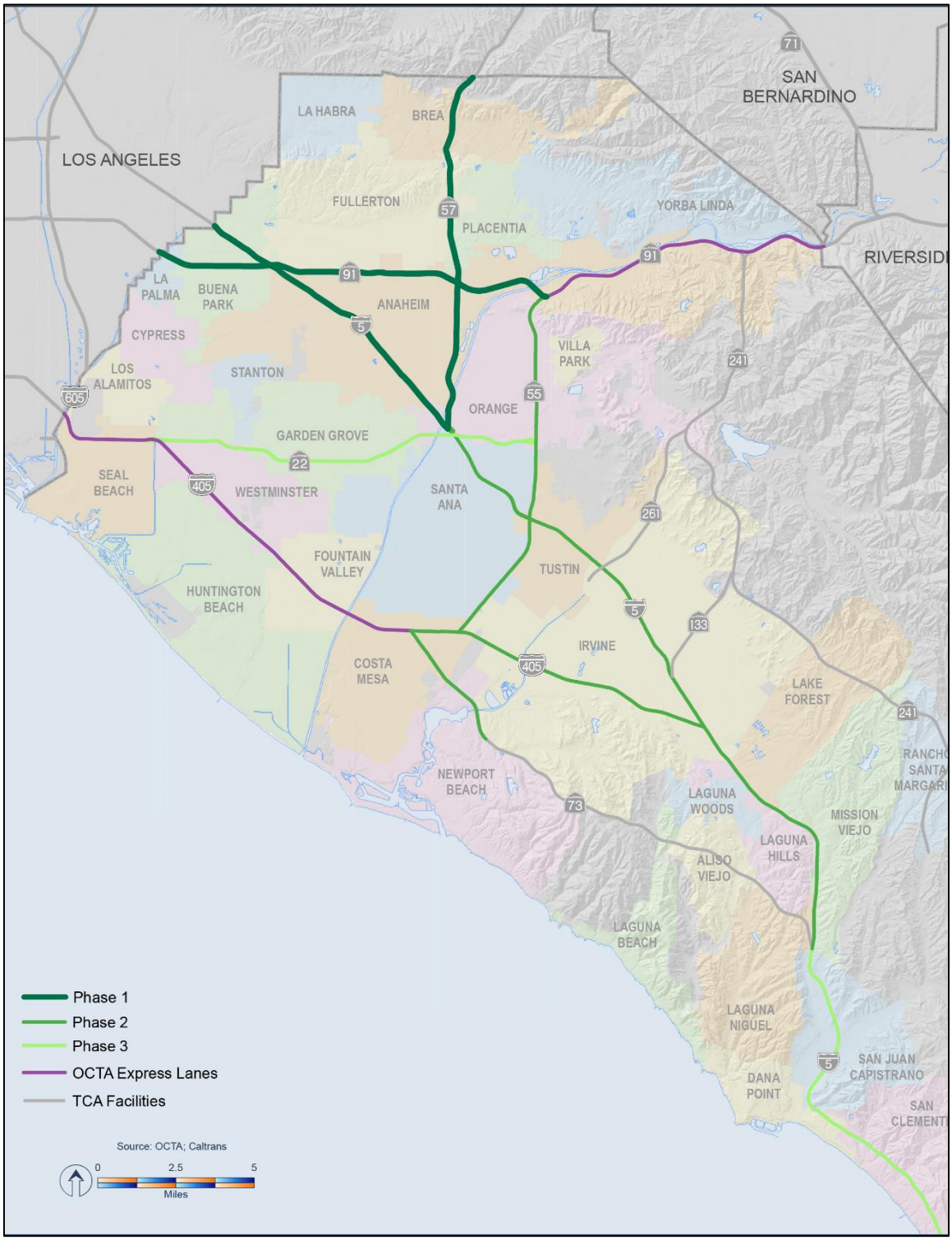


Figure 4-11: OCTA Preferred Express Lane Conversion Phasing

Paths to Success



Under the 2045 Preferred Plan, programs such as the freeway service patrol, freeway environmental mitigation program, and water quality improvement projects are recommended to be extended past the 2041 OC Go funding sunset. Other operational improvements such as eliminating congestion chokepoints are recommended to enhance safety, goods movement, and to reduce concentrations of smog-forming emissions. These operational improvements are intended to be implemented within the existing right-of-way or require additional right-of-way with minimal impact to adjacent land uses. Additionally, new transportation system management technologies are recommended to be considered in partnership with Caltrans to improve traffic flow within the existing right-of-way.

Freeway Project List

- **I-5 (Project A):** Add 1 managed lane each direction from SR-55 to SR-57 (**complete**)
- **I-5 (Project B):** Add 1 general-purpose lane each direction from I-405 to SR-55
- **I-5 (Projects C and D):** Add 1 general-purpose lane each direction from SR-73 to Oso Parkway plus auxiliary lanes as needed to improve Avery Parkway interchange
- **I-5 (Projects C and D):** Add 1 general-purpose lane each direction from Alicia Parkway to Oso Parkway plus auxiliary lanes as needed to improve La Paz Road interchange
- **I-5 (Project C):** Add 1 managed lane each direction from Alicia Parkway to El Toro Road
- **I-5 (Project D):** Improve access and merging in the vicinity of I-5/El Toro Road interchange
- **I-5:** Add 1 managed lane each direction from Avenida Pico to San Diego County line
- **I-5:** Add 1 managed lane each direction between SR-57 and SR-91
- **I-5:** Barranca Parkway managed lane interchange improvement
- **SR-22:** Improve operations and merging in the vicinity of I-5/SR-57 interchange (**complete**)
- **SR-55 (Project F):** Add 1 general-purpose lane and 1 managed lane in each direction and fix chokepoints from I-405 to I-5
- **SR-55 (Project F):** Add 1 general-purpose lane each direction and fix chokepoints from I-5 to SR-91
- **SR-57 (Project G):** Add 1 northbound general-purpose lane between Orangewood Avenue and Katella Avenue
- **SR-57:** Improve SR-57/Lambert Road interchange
- **SR-57 (Project G):** Add 1 northbound truck climbing lane from Lambert Road to Los Angeles County line
- **SR-73:** Add 1 managed lane each direction from MacArthur Boulevard to I-405
- **SR-73:** add 1 managed lane each direction from SR-133 to Newport Coast Drive
- **SR-91 (Project I):** Improve operations from SR-55 to Lakeview Avenue, add 1 eastbound general-purpose lane from La Palma Avenue to SR-55, and 1 westbound general-purpose lane from Acacia Street to La Palma Avenue
- **SR-91 (Project J):** Add 1 eastbound general-purpose lane from SR-241 to SR-71 and 1 westbound general-purpose lane from Green River Road to SR-241 (**westbound lane complete**)
- **SR-91:** Add SR-91/Fairmont Boulevard interchange and overcrossing to the north
- **SR-91:** Add express lane connector at SR-91/SR-241

- **SR-91:** Express lanes operations and maintenance
- **SR-241:** Add overcrossing and SR-241/Oso Parkway/Los Patrones Parkway interchange (**complete**)
- **SR-241:** Add 1 lane each direction from SR-133 to SR-261
- **I-405:** Add 1 express lane each direction from SR-73 to I-605
- **I-405 (Project K):** Add 1 general-purpose lane each direction from Euclid Street to I-605 and improve operations
- **I-405 (Project L):** Add 1 general-purpose lane each direction from I-5 to SR-55 and add southbound auxiliary lane from SR-133 to Irvine Center Drive
- **I-405:** Add auxiliary lanes from University Drive to Sand Canyon Avenue (**complete**)
- **I-405:** Express lanes operations and maintenance
- **I-605 (Project M):** Improve I-605/Katella Avenue interchange
- **Motorist Services (Project N):** Freeway Service Patrol
- Freeway Chokepoint Safety Projects

System Performance

A high-level summary of the 2045 Preferred Plan performance is shown in Table 4.1. These results demonstrate the travel impacts from implementing the strategies discussed in this chapter. Implementing these strategies leads to reductions in total vehicle hours of delay and delay as a percentage of travel time. Average speeds on freeways and arterials during the peak commute periods would also improve. VMT, however, only increases slightly compared to the 2045 No-Build scenario, despite the improved driving conditions. This is due to the proposed investments in alternatives to SOV travel that contribute to increases in daily transit trips. More detailed discussions of the LRTP performance measures are presented in subsequent subsections. This discussion will focus on the performance metrics as related to each of the LRTP goals: Improve System Performance, Expand System Choices, and Support Sustainability. As previously noted, the goal to Deliver on Commitments is fulfilled by ensuring the inclusion of programs funded by OC Go within the 2045 Preferred Plan.

Table 4.1: Performance Metrics Summary

Performance Measure	2019 Base Year	2045 No-Build	% Change (2019 Base – 2045 No-Build)	2045 Preferred Plan	% Change (2045 No-Build – 2045 Preferred)
Daily Vehicle Miles Traveled (VMT)	76,400,000	81,900,000	↑7%	82,100,000	< ↑1%
Total Vehicle Hours of Travel (VHT)	2,211,000	2,463,000	↑11%	2,318,000	↓6%
Total Vehicle Hours of Delay (VHD)	341,000	454,000	↑33%	316,000	↓30%
Delay as Percent of Travel Time	15%	18%	--	14%	--
Peak Period Average Speed (mph) Freeway Arterial	 41 26	 40 25	 ↓2% ↓4%	 42 27	 ↑5% ↑8%
Daily Total Trips	16,237,000	17,584,000	↑8%	17,671,000	↑0.5%
Daily Transit Trips	131,000	138,000	↑6%	185,000	↑34%

Improve System Performance

Table 4.2 reports metrics associated with system performance. The 2045 No-Build scenario demonstrates that increases in population and employment would result in increased delay and lower average speeds on Orange County roadways if the 2019 network were maintained as is. Implementation of the 2045 Preferred Plan would sustain or slightly improve on 2019 travel conditions. The 2045 Preferred Plan improvements reduce the hours of delay (which is experienced during the peak commute periods) but do not have a perceptible effect on the average travel time for automobile trips. Increases to the number of high frequency transit routes would result in a 4% reduction in the average transit travel time.

Table 4.2: Performance Metrics – Improve System Performance

Performance Measure	Unit	2019 Base Year	2045 No-Build	2045 Preferred Plan	% Change (2045 Preferred – 2045 No-Build)
Daily Vehicle Hours of Delay	Vehicle-Hours	341,000	454,000	316,000	-30%
Delay as Percent of Travel Time	Percent	15%	18%	14%	--
Freeway Average Speed	Miles/Hour				
Peak Period		41	40	42	5%
AM Peak		40	38	40	5%
PM Peak		43	41	43	5%
Arterial Average Speed	Miles/Hour				
Peak Period		26	25	27	8%
AM Peak		25	25	26	4%
PM Peak		27	26	27	4%
Managed Lane Average Speed	Miles/Hour				24%
Peak Period		51	49	61	
Average Travel Time	Minutes				
Transit		63	63	60	-5%
Automobile		14	14	14	0%

Expand System Choices

Table 4.3 reports metrics associated with the evaluation of system choices. As expected, the total number of trips projected for 2045 No-Build scenario increases with population and employment growth. Under the 2045 Preferred Plan scenario, the increase in total daily trips is slightly higher than the No-Build scenario, suggesting that congestions reduced by the proposed improvements encouraged additional travel. These trips are indicative of growth in economic activities and improved access to open space, recreation centers, medical facilities, and other key destinations that support the quality of life for Orange County residents. Most importantly, these additional daily trips are largely comprised of non-SOVs as a result of expanded system choices in the 2045 Preferred Plan. Non-SOV mode share is projected to increase from 52% in 2019 to 57% under the 2045 Preferred Plan.

Table 4.3: Performance Metrics – Expand System Choices					
Performance Measure	Units	2019 Base Year	2045 No-Build	2045 Preferred Plan	% Change (2045 Preferred - 2045 No-Build)
Total Number of Daily Trips	Person-Trips	16,200,000	17,600,000	17,700,000	0%
Daily Transit Trips	Person-Trips	131,000	138,000	185,000	34%
Non-SOV Mode Share	Percent	52%	51%	57%	--
Average Bus Headways	Minutes	36.8	36.8	35.2	--
Revenue Service Hours (All Transit)	Hours	1,651,000	1,651,000	2,061,000	25%
Revenue Service Hours (Frequent Transit Service[1])	Hours	74,000	74,000	688,000	828%
Households with Access to High-Capacity Transit Stops	Households	64,000	73,000	259,000	254%
Microtransit Service Area	Square Miles	7	7	112	1,437%
Multimodal/Rideshare Facilities	Facilities	28	28	67	--
Bikeways (Class, I, II, III, IV)	Miles	1,238	1,238	2,045	65%
Jobs Accessible:	Jobs				
By Transit within 15 minutes		7,000	8,000	9,000	11%
By Transit within 30 minutes		65,000	71,000	79,000	11%
By Transit within 45 minutes		150,000	166,000	185,000	11%
By Automobile within 15 minutes		304,000	314,000	380,000	21%
By Automobile within 30 minutes		1,307,000	1,366,000	1,640,000	20%
By Automobile within 45 minutes		2,594,000	2,743,000	2,987,000	9%
Key Destinations Accessible:	Destinations				
By Transit within 15 minutes		10	10	10	0%
By Transit within 30 minutes		70	70	80	8%
By Transit within 45 minutes		160	160	170	10%
By Automobile within 15 minutes		350	330	380	14%
By Automobile within 30 minutes		1,270	1,200	1,420	19%
By Automobile within 45 minutes		1,900	1,810	2,010	11%
Average Household Spending on Transportation as a Percent of Income	Percent	22.5%	--[2]	↓2% vs. No-Build[2]	--

Notes:

[1] Includes OC Streetcar

[2] Future household income information unavailable; assumed to be constant for 2045 No-Build and 2045 Preferred.

Transit service increases in the 2045 Preferred Plan with a significant increase in revenue service hours of frequent transit service (including the OC Streetcar) accompanied by a reduction in average bus headway. In addition, the number of households with access to high-capacity transit stops more than doubles. The revenue service hours for all transit service would increase by 25% in the 2045 Preferred Plan. This 25% increase in service is projected to grow the number of transit trips by 34%, resulting in more efficient use of transit resources.

In addition to fixed-route transit service, the 2045 Preferred Plan proposes expansion of microtransit service to fill gaps where fixed-route services may struggle to operate efficiently. Orange County currently has a microtransit service area of approximately 7 miles, which is proposed to increase to 112 square miles under the Preferred Plan. The Plan also proposes expansion of multimodal facilities from the current 28 facilities to 67 facilities in 2045. Multimodal facilities provide locations for travelers to conveniently transfer between travel modes and may include Metrolink stations, bus depots, park-and-ride lots, and mobility hubs. Both microtransit services and multimodal facilities allow people to make connections to their final destinations, providing alternatives to SOV trips. Finally, the 2045 Preferred Plan proposes to add over 800 miles of bikeways in Orange County, amounting to 65% increase from existing bikeways. The facility expansion will improve connectivity and make active transportation a more attractive alternative to automobile travel.

The available mode choices and efficiency of the transportation networks under the 2045 Preferred Plan results in improved accessibility. The number of jobs accessible by transit increases by 11% compared to the 2045 No-Build scenario. The number of key destinations accessible within 30 minutes by transit increases by 8% and within 45 minutes increases by 10%. However, cars are still expected to provide access to the greatest number of jobs and key destinations with locations accessible within 30 minutes increasing approximately 20% over the 2045 No-Build network.

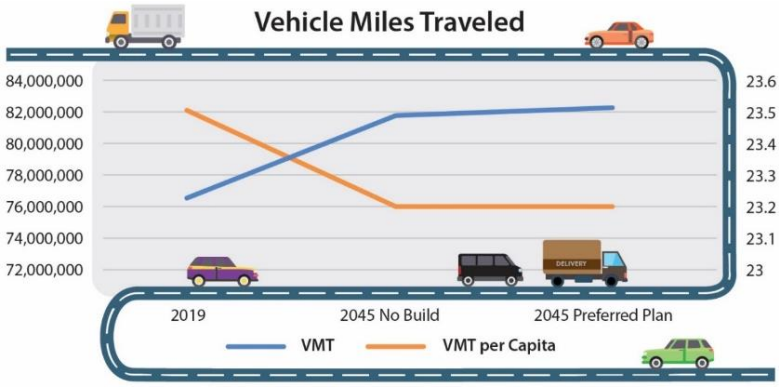
Transportation costs typically are a large part of a household budget second only to housing. In 2019, the average household spending on transportation accounted for 22.5% of household income. While estimates of future household income (and therefore future transportation costs as a percentage of income) were not analyzed, an estimate was developed based on 2019 incomes that found that the expanded choices in the 2045 Preferred Plan transportation system would reduce the average household spending on transportation by 2%.

Support Sustainability

Table 4.4 reports metrics associated with sustainability.

Table 4.4: Performance Metrics – Support Sustainability

Performance Measure	2019 Base Year	2045 No-Build	2045 Preferred Plan	% Change (2045 Preferred – 2045 No-Build)
Vehicle Miles Traveled per Capita	23.5	23.2	23.2	--
Greenhouse Gas Emissions (CO_2e lbs/day) from vehicles	52,600,000	41,500,000	40,400,000	-3%
Criteria Pollutant Emissions (lbs/day) from vehicles				
Reactive Organic Gases (ROG)	4,200	1,200	1,100	-8%
Nitrogen Oxides (NO_X)	19,300	4,200	4,000	-3%
Carbon Monoxide (CO)	215,500	98,100	94,900	-3%
Sulfur Oxides (SO_X)	500	400	400	0%
Particulate Matter – 10 micrometers (PM_{10})	3,900	3,810	3,870	2%
Particulate Matter – 2.5 micrometers ($PM_{2.5}$)	1,400	1,240	1,260	1%
Average Arterial Pavement Condition (PCI)	79.9	77.9	86.0	--
Jobs Created or Supported by Transportation Investment	--	--	745,000	--



As previously reported in Table 4.1, total daily VMT is expected to increase by approximately 7% by 2045 under the Preferred Plan. However, VMT per capita is anticipated to decline in future scenarios, since the projected VMT growth is less than the projected 9% population growth in Orange County. Nevertheless, absolute VMT will likely continue to be the recommended governing metrics for evaluating transportation projects under CEQA and a VMT mitigation program to reduce VMT may be necessary.

As the State moves forward with eliminating sales of new gasoline powered vehicles by 2035, the share of zero emission vehicles in operation is expected to grow. Therefore, 2045 Preferred Plan traffic data were analyzed in the California Air Resources Board EMFAC model, which accounts for the anticipated increase in ZEVs. The EMFAC results showed a decline in GHG emissions and smog-forming pollutants by 2045, as shown in Table 4.4. While the increased number of ZEVs was a significant factor in these results, the 2045 Preferred Plan strategies also help to increase the non-SOV mode share and provide for a more efficient transportation system. Note that the 2045 Preferred Plan is anticipated to slightly increase particulate matter emissions compared to the 2045 No-Build scenario, but the future levels would be below 2019 levels.

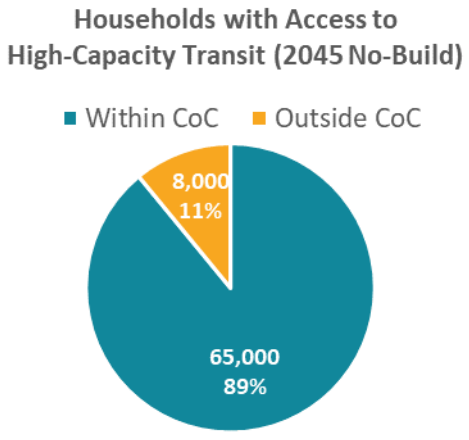
Pavement condition can serve as an indicator of the sustainability of the transportation system. Routine preventative maintenance is more economical and less disruptive than deferring maintenance until major repairs or reconstruction is necessary. Poor pavement conditions result in vehicle wear and tear, and present increased safety hazard to roadway users, including bicyclists, and a liability risk for local jurisdictions. Orange County maintains high pavement quality on roadways, in part, through OC Go funding used for roadway maintenance and improvements. Measurements of the Pavement Condition Index (PCI) have found current Orange County roadways to be good on average (PCI range of 75-85 indicates "good" condition and PCI of 86 or higher indicates "very good" condition). Investments proposed in the 2045 Preferred Plan are expected to achieve OCTA's target threshold for "very good" pavement conditions.

Finally, the proposed investments in capital, operations, and maintenance projects in the 2045 Preferred Plan are expected to generate 745,000 jobs which contributes to the economic sustainability of Orange County.

Mobility Equity

Table 4.5 reports metrics associated with mobility equity. Each of these metrics was calculated for both the entire County and within the Communities of Concern to evaluate if implementation of the 2045 Preferred Plan would provide equitable results.

For daily automobile trips and transit trips, the percentage within Communities of Concern are consistent with the countywide trend. Households with access to high-capacity transit stops increase 158% within the Communities of Concern and increase by 254% countywide. The 2045 Preferred Plan improves the percentage of Communities of Concern households with access to high-capacity transit from 6% in No-Build to 16% in 2045 Preferred Plan. A closer look at this metric reveals that 89% of households with access to high-capacity transit stops are within Communities of Concern under No-Build. The 2045 Preferred Plan expands high-capacity transit countywide. As a result, households outside of the Communities of Concern with access to high-capacity transit stops increase from 11% to 36%. This means that households within the Communities of Concern would have improved access to areas outside of the Communities of Concern under the Preferred Plan.



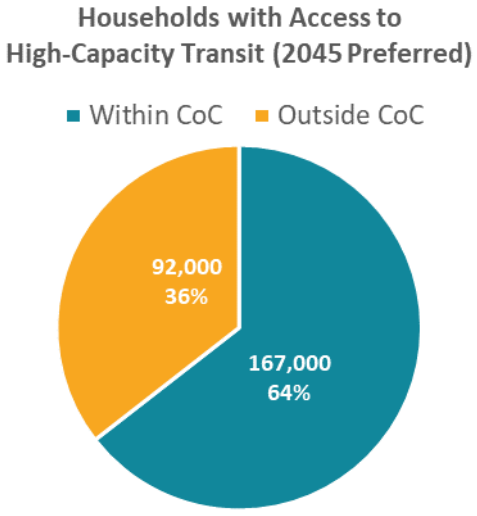


Table 4.5: Performance Metrics – Diversity, Equity, and Inclusion				
Performance Measure	2019 Base Year	2045 No-Build	2045 Preferred Plan	2045 Preferred – 2045 No-Build % Change
Daily Auto Trips				
Countywide	14,300,000	15,500,000	13,900,000	-11%
Communities of Concern	4,700,000	5,000,000	4,500,000	-11%
Daily Transit Trips				
Countywide	131,000	138,000	185,000	40%
Communities of Concern	72,000	75,000	105,000	39%
Households with Access to High-Capacity Transit Stops				
Countywide	64,000	73,000	259,000	254%
Communities of Concern	57,000	65,000	167,000	158%
% Households with Access to High-Capacity Transit Stops				
Countywide	2%	2%	7%	--
Communities of Concern	6%	6%	16%	--
Jobs Accessible within 30 minutes by Transit				
County Average	65,000	71,000	79,000	11%
Communities of Concern Average	102,000	113,000	131,000	16%
Jobs Accessible within 30 minutes by Auto				
County Average	1, 310,000	1,366,000	1,640,000	20%
Communities of Concern Average	1,659,000	1,773,000	2,078,000	17%
Key Destinations Accessible within 30 minutes by Transit				
County Average	72	71	77	8%
Communities of Concern Average	132	129	143	11%
Key Destinations Accessible within 30 minutes by Auto				
County Average	1,273	1,199	1,421	19%
Communities of Concern Average	1,492	1,442	1,673	16%
Transit Travel Time (Minutes)				
County Average	63	63	60	-2%
Communities of Concern Average	58	58	55	-3%
Average Household Spending on Transportation as a Percent of Income[1]				
County Average	22.5%	--	↓2% vs. No-Build	--
Communities of Concern	32.6%	--	↓3% vs. No-Build	--

Note:

[1] Future household income information unavailable; assumed to be constant for 2045 No-Build and 2045 Preferred.

That ability to travel outside of the Communities of Concern is reflected in the average jobs accessible within 30 minutes by transit. Average jobs accessible by transit increase more for the Communities of Concern than the County average (8,000 more jobs for an 11% increase countywide and 18,000 more jobs for a 16% increase for Communities of Concern). Key destinations accessible by transit increase more

for the Communities of Concern than the County average (8% countywide and 11% for Communities of Concern). Average jobs accessible by automobile increase for the Communities of Concern under the 2045 Preferred Plan, but less than the County average on a percent basis (20% countywide and 17% for Communities of Concern). Key destinations accessible by automobile also increase more for the Communities of Concern under the 2045 Preferred Plan, but less than the County average on a percent basis (19% countywide and 16% for Communities of Concern). In absolute terms, jobs accessible by automobile increase by 305,000 on average for Communities of Concern compared to 274,000 countywide. Similarly, in absolute terms, key destinations accessible by automobile increase slightly more on average within the Communities of Concern compared to countywide (231 on average for Communities of Concern and 222 on average countywide).

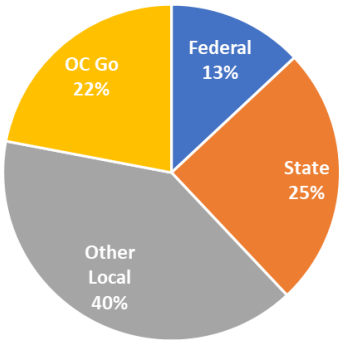
In the current condition, Orange County transit service (and especially high-capacity transit service) benefits residents in the Communities of Concern. The analysis shows that the transit investments of the 2045 Preferred Plan also benefit the Communities of Concern at a rate greater than the County average. However, analysis of roadway investments proposed in the 2045 Preferred Plan shows that while they do benefit the Communities of Concern and increase the number of jobs and key destinations accessible to the Communities of Concern, the rate of benefit is lower than average for the County.

Private automobile ownership can make job opportunities and key destinations accessible, but private automobile ownership is expensive. A transportation system dependent on private automobile ownership costs more for its users and can exclude more people from the benefits of mobility than a transportation system with wider travel options. As OCTA expands system choices, the dependency on private automobile ownership and the cost of using the transportation system will likely decline. In 2019, transportation costs account for an average of 22.5% of income countywide and 32.6% of income for residents within the Communities of Concern. Since this LRTP does not estimate future household income, transportation costs as a percentage of income are unavailable for future scenarios. Alternatively, by holding future income constant, it was calculated that 2045 Preferred Plan would reduce the countywide average transportation cost as a percentage of income by 2% compared to the 2045 No-Build scenario. The Communities of Concern would have a higher reduction at 3%.

System Performance Summary

The 2045 Preferred Plan delivers on OCTA's commitments while continuing to support many of the annual programs funded by OC Go benefiting Orange County residents and employees. If not for the proposed 2045 Preferred Plan investments, the system performance would be degraded due to the anticipated population and employment growth through 2045. The 2045 Preferred Plan would expand system choices resulting in decreased average household spending on transportation (as a percentage of income). Consistent with the State's climate action objectives and OCTA's sustainability goals, the 2045 Preferred Plan would not result in an increase in VMT per capita and would decrease greenhouse gas and smog forming emissions by 3% to 8%. In relation to OCTA's diversity, equity, and inclusion policies, the 2045 Preferred Plan is shown to be effective at distributing the benefits

LRTP Funding by Source
Total (in millions) = $52,425



of transportation investments. The 2045 Preferred Plan also helps to decrease average household spending on transportation for the county as a whole and even more so for Communities of Concern.

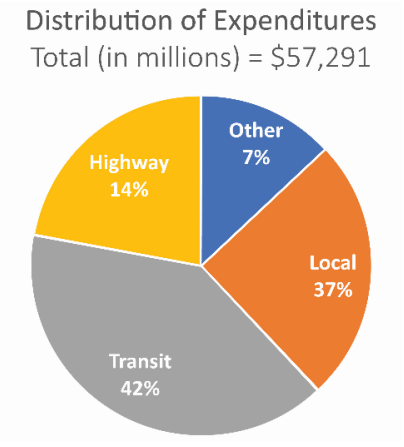
Financial Forecast

A forecast for transportation revenues between 2023 and 2045 was developed, which totals approximately $52.4 billion. Federal programs (including roadway and transit capital investment and transit operations assistance) make up 13% of the anticipated funding through 2045. This is higher than previous estimates of 9-10% due to the passage of the Infrastructure Investment and Jobs Act in 2021 that increased federal transportation funding.

State funding is anticipated to account for 25% of future revenue. This includes local turnback funding from SB 1 gasoline taxes. Estimates for SB 1 revenue are based on recent levels of funding and account for anticipated declining revenue as the State transitions away from new sales of gasoline powered vehicles.

The OC Go half-cent transportation sales tax is anticipated to generate $11.5 billion in revenue between 2023 through 2041. Other local funds include Transportation Development Act funds, local general fund expenditures for maintenance, developer fees, express lane revenues, and local transit fare revenues. These local funds account for 40 percent of total future funding.

These transportation funds are not always interchangeable. For example, the Federal New Starts transit funding cannot be used for roadway projects or transit operations. Most federal and State funding is allocated through programs for specific types of uses. The Measure M and OC Go sales taxes were approved by Orange County voters to provide investments in transportation projects consistent with Orange County priorities. However, the sunset of OC Go in 2041 will result in the loss of this local funding source.



Total expenditures for the 2045 Preferred Plan are projected to be $57.3 billion between 2023 and 2045, the majority of which is used to fund transit services and improvements to local facilities, as shown in the chart to the left. As mentioned earlier, revenues are projected at $52.4 billion which results in a shortfall of approximately $4.9 billion. There are potential opportunities to address this shortfall through the development of a long-term funding strategy. This funding strategy would consider all potential new funding sources including, but not limited to, revenues generated from the conversion of HOV lanes to express lanes, state-implemented mileage-based user fee, future local transportation sales tax, or a combination of prospective new sources. Some transportation programs could be funded through a VMT mitigation program that agencies, developers, and others could fund to implement VMT reduction strategies that offset transportation impacts identified in CEQA for transportation and/or development projects.

2045 Preferred Plan Project List

The beginning of Chapter 4 identified and described the projects included in the 2045 Preferred Plan by transportation mode. Table 4.6 compiles the 2045 Preferred Plan project list for inclusion in the SCAG RTP/SCS.

Table 4.6: 2045 Preferred Plan

Project	Description
Local Facilities	
Master Plan of Arterial Highways (MPAH)	Coordinate with local jurisdictions to implement the MPAH
Regional Traffic Signal Synchronization Program	Coordinate with local jurisdictions to maintain and expand the Orange County signal synchronization network
Enhanced signal synchronization and integration with connected vehicles	Incorporate technologies in the signal synchronization network that further improve the efficiency and safety of roadways
Pavement Maintenance	Coordinate with local jurisdictions to maintain or improve pavement quality on Orange County roads
Local Fair Share Program	Continue to provide funding to qualifying local jurisdictions to support transportation improvements that address local needs
Active Transportation Network	Coordinate with local jurisdictions to implement and enhance regional and local bicycle and pedestrian networks
State Facilities	
I-5: SR-55 to SR-57 (Project A, Complete)	Add one managed lane in each direction
I-5: I-405 to SR-55 (Project B)	Add one general purpose lane in each direction from I-405 to Yale Avenue; add one general purpose lane in each direction from Yale Avenue to SR-55; improve merging
I-5: SR-73 to Oso Parkway (Projects C and D)	Add one general purpose lane in each direction, plus auxiliary lanes as needed and improve Avery Parkway interchange
I-5: Oso Parkway to Alicia Parkway (Projects C and D)	Add one general purpose lane in each direction, plus auxiliary lanes as needed and improve La Paz Road interchange
I-5: Alicia Parkway to El Toro Road (Project C)	Add one managed lane in each direction; add auxiliary lanes as needed
I-5: El Toro Road (Project D)	Improve access and merging in the vicinity of I-5/El Toro Road interchange
I-5: Avenida Pico to San Diego County Line	Add one managed lane in each direction
I-5: Barranca Parkway	Add southbound managed lane on-ramp and northbound managed lane off-ramp
I-5: SR-57 to SR-91	Add one managed lane in each direction
SR-22: at I-5/SR-57 (Complete)	Improve operations and merging in vicinity of I-5/SR-57 interchange
SR-55: I-405 to I-5 (Project F)	Add one general purpose lane and one managed lane in each direction and fix chokepoints; add auxiliary lanes between select on/off ramps and other operational improvements through project limits
SR-55: I-5 to SR-91 (Project F)	Add one general purpose lane in each direction and fix chokepoints from I-5 to SR-22; and other operational improvements throughout project limits

Table 4.6: 2045 Preferred Plan	
Project	**Description**
SR-57: Orangewood Avenue to Katella Avenue (Project G)	Add one northbound general-purpose lane
SR-57: Lambert Road	Improve SR-57/Lambert Road interchange
SR-57: Lambert Road to Los Angeles County Line (Project G)	Add one northbound truck climbing lane
SR-73: I-405 to MacArthur Boulevard	Add one managed lane in each direction
SR-73: SR-133 to Newport Coast Drive	Add one toll lane in each direction
SR-91: SR-57 to SR-55 (Project I)	Improve westbound operations from Lakeview Avenue to SR-55; add one eastbound general-purpose lane from La Palma Avenue to SR-55; add one westbound general-purpose lane from La Palma Avenue to Acacia Street.
SR-91: SR-241 to SR-71 (Project J)	Add one eastbound general-purpose lane; add one westbound general-purpose lane from Green River Road to SR-241 (Westbound Lane Complete)
SR-91: Fairmont Boulevard	Add SR-91/Fairmont Boulevard interchange and overcrossing to the north
SR-91: at SR-241	Add Express Lane Connector at SR-91/SR-241
SR-91 Express Lanes operations & maintenance	Operations & maintenance expenses for the 91 Express Lanes
SR-241: Oso Parkway to Los Patrones Parkway (Complete)	Add overcrossing and SR-241/Oso Parkway/Los Patrones Parkway interchange
SR-241: SR-133 to north of SR-261	Add one toll lane in each direction
I-405: SR-73 to I-605 (Project K)	Add one express lane in each direction and convert the existing managed lane to an express lane from SR-73 to I-605; add one general purpose lane in each direction from Euclid Street to I-605; improve operations
I-405 Express Lanes operations & maintenance	Operations & maintenance expenses for the 405 Express Lanes
I-405: I-5 to SR-55 (Project L)	Add one general-purpose lane in each direction and add one southbound auxiliary lane from SR-133 to Irvine Center Drive
I-405: University Drive to SR-133 (Complete)	Add auxiliary lanes – University Drive to Sand Canyon Avenue and Sand Canyon Avenue to SR-133
I-605: Katella Avenue (Project M)	Improve I-605/Katella Avenue interchange
Freeway Chokepoint Safety Projects	Improve safety and supply chain efficiency on Orange County freeways
Conversion of carpool lanes to tolled Express Lanes by 2045 (Caltrans initiative)	Modify operations of carpool lanes to allow tolled access for vehicles with fewer than three passengers (vehicles with three or more persons have toll-free access)
Freeway Program Economic Uncertainties	Funding reserve to cover unforeseeable cost or revenue fluctuations
Motorist Services (Project N)	Freeway Service Patrol: assist motorists and remove congestion-causing debris
Transit	
OC Streetcar (Project S)	Implement streetcar service from Santa Ana Regional Transportation Center to Harbor Boulevard/Westminster Avenue

Table 4.6: 2045 Preferred Plan	
Project	**Description**
OC Bus and OC ACCESS	Zero-emission bus fleet by 2040; Increase to 1.926 million revenue vehicle hours of service – includes: • Making Better Connections recommendations • Main Street BRAVO! • Expanded Main Street BRAVO! • Expanded Beach Boulevard BRAVO! • Lincoln Avenue/La Palma Avenue BRAVO! • Chapman Avenue BRAVO! • McFadden Boulevard/Bolsa Avenue BRAVO! • Westminster Avenue/17th Street/Bristol Street high-capacity transit • Bristol Street/State College Boulevard high-capacity transit • South Harbor Boulevard high-capacity transit • North Harbor Boulevard high-capacity transit • I-5 BRT • SR-55 BRT
Mobility Accessibility Programs (Project U)	Expand mobility choices for seniors and persons with disabilities • Senior Mobility Program • Senior Non-Emergency Medical Transportation Program • Fare Stabilization Program
Community-Based Circulators (Project V)	Work with local jurisdictions to maintain successful community circulator projects and potentially provide grant opportunities for expanded or new services
Safe Transit Stops (Project W)	Continue to improve the top 100 busiest transit stops to enhance customer experience
Reduced or fare-free transit service	Continue and potentially expand programs to reduce transit fares
Transit Security & Operations Center	New operations center for transit and emergency security functions
Microtransit service	Expand service (e.g., OC Flex) in suitable areas
Metrolink Service	Increase service to 86 weekday trains through coordinated improvements with the Southern California Regional Rail Authority
Anaheim Canyon Station improvements (Project R, Complete)	Add a second passenger platform, new amenities, new second track, and improvements to at-grade crossings at La Palma Avenue and Tustin Avenue
Placentia Metrolink Station (Project R)	New rail station in the City of Placentia
OC Rail Maintenance Facility (Project R)	A new rail maintenance facility that allows for expanded transit services to meet the needs of a growing population and to support employment growth and sustainability objectives
Grade Separations	LOSSAN rail corridor bridge and underpass projects at: • 17th Street • State College Boulevard • Santa Ana Boulevard • Ball Road • Grand Avenue • Main Street • Orangethorpe Avenue

Table 4.6: 2045 Preferred Plan	
Project	**Description**
Transportation Demand Management (TDM) Strategies	
Vanpool & Rideshare Programs	Continue and potentially expand vanpool and rideshare programs
Mobility Hubs Network	Coordinate with partners to implement and operate a network of mobility hubs
Remote Work Incentive Program	Reduce trips and vehicle miles traveled through an incentive-based program
Additional TDM Initiatives	Continue to explore and develop additional TDM strategies
Other	
Environmental Cleanup Program	Transportation-related water quality program (Project X)
Environmental Mitigation Program	Environmental mitigation for the OC Go freeway program (Projects A - M)
Adaptation & Resiliency Initiatives	Continue to explore and develop adaptation and resiliency initiatives including, but not limited to, addressing concerns with coastal rail infrastructure
Electric Vehicle Charging Infrastructure	Coordinate implementation of publicly accessible electric vehicle charging stations that accounts for equity and infrastructure needs
Debt Service	Payments against bonding

Notes:

BRT = Bus Rapid Transit
I-405 = Interstate 405
I-5 = Interstate 5
I-605 = Interstate 605
SR-22 = State Route 22
SR-55 = State Route 55
SR-57 = State Route 57
SR-71 = State Route 71
SR-73 = State Route 73
SR-91 = State Route 91
SR-133 = State Route 133
SR-241 = State Route 241
SR-261 = State Route 261
LOSSAN = Los Angeles – San Diego – San Luis Obispo

Chapter 5:
A Living Document

Chapter 5: A Living Document

Orange County's LRTP is updated every 4 years to adapt to the needs of Orange County travelers, new technologies, and other changing conditions that influence travel and transportation infrastructure. OCTA responds to these changing factors that influence transportation by updating the LRTP on a regular basis and including a Short-Term Action Plan that advances the LRTP Preferred Plan strategies. Additionally, OCTA maintains a Conceptual Projects listing that identifies projects that are not yet ready for inclusion in the Preferred Plan, but that may be further developed to support the goals of future LRTPs.

Short-Term Action Plan

OCTA has identified several short-term activities that build on the foundation of the LRTP (see Table 5.1). These activities are grouped into the categories of local and regional planning, emerging issues, and transportation outreach and education, and include all modes of transportation. They further the goals outlined in the LRTP, keeping OCTA moving forward by continuing to plan and dream, working with partners, considering all segments of Orange County's community, and making room for new technologies, regulations, and partnerships.

Table 5.1: Short-Term Action Plan

Activity	Description
Orange County Planning Activities	
Coordination with Local Partner Agencies	Continue dialogue with local jurisdictions – the California Department of Transportation (Caltrans) District 12, TCA, local transit operators, and other local agencies as needed to further intra-county connectivity.
Diversity, Equity, and Inclusion	Explore opportunities to improve equity-related analyses in OCTA planning processes.
Long-Term Transportation Funding Strategy	Develop and recommend strategies for securing funds for addressing transportation needs beyond the 2041 sunset of OC Go sales tax.
Corridor Studies and Improvements	Conduct studies evaluating the feasibility of multimodal corridor enhancements.
OC Transit Vision Update	Update the long-term transit vision for Orange County.
Transit Chokepoints Study	Evaluate locations and sources of transit service delays and recommend improvements to routing and scheduling as well as capital improvements such as transit signal priority.
Transit Support Services	Establish a long-term plan for Orange County transit supportive services, such as OC Flex, vanpools, and park-and-rides.
OC Metrolink Vision	Develop a long-term Metrolink operations vision for Orange County.
Coastal Infrastructure Study	Study sustainable solutions for infrastructure along Orange County's southern coast.

Table 5.1: Short-Term Action Plan	
Activity	Description
Managed Lane Studies	Coordinate with Caltrans District 12 on the I-5 Managed Lanes Project from Red Hill Avenue to the Los Angeles County Line. Explore additional operational enhancements to the high-occupancy vehicle (HOV) network and potential expansion of priced managed lanes on SR-91 and SR-57.
Future of the Toll Roads	Coordinate with Caltrans District 12 and TCA to plan for toll road improvements and operational approaches on the Toll Road corridors related to the State assuming full control of the facilities beyond 2045 including identifying traffic modeling approach for future transportation planning analyses.
Freeway Chokepoints	Study and develop projects to improve freeway safety and system efficiency.
Signal Synchronization	Support local initiatives to maintain signal synchronization corridors countywide and support study opportunities for advanced technologies.
Transportation Demand Management (TDM)	Study opportunities for new or expanded TDM projects.
Mobility Hubs	Develop a concept of operations for a future demonstration project to be pursued with public and private partners.
Active Transportation Investments	Continue evaluating Orange County's Active Transportation needs, develop long-term plans, and implement programs that address data collection, data management, and safety education.
Complete Streets	Analyze the Master Plan of Arterial Highways (MPAH) for opportunities to reallocate excess capacity in support of active transportation and transit.
Sustainable Transportation Strategies	Study potential for a mitigation program designed to offset vehicle miles traveled (VMT) induced by transportation and land use projects within Orange County.
Electric Vehicle Charging Infrastructure	Develop a strategy for Orange County's electric vehicle charging infrastructure to ensure equitable and affordable access as the electric vehicle fleet rapidly grows.
Joint Development Studies	Evaluate opportunities for joint developments at OCTA transit terminals to improve transit facilities and connectivity with employment/housing.
Asset Management	Monitor maintenance needs for existing and new facilities and equipment. Update fleet plans to address zero-emission bus requirements.
Adaptation Planning	Study infrastructure needs and develop recommendations.
Traffic Model Update	Update the Orange County Traffic Analysis Model (OCTAM) to incorporate the latest socioeconomic data.

Table 5.1: Short-Term Action Plan	
Activity	Description
Regional Planning Activities	
Coordination with Regional Partner Agencies	Continue dialogue with Southern California Association of Governments (SCAG), San Diego Association of Governments (SANDAG), County Transportation Commissions, South Coast Air Quality Management District (SCAQMD), Caltrans, and other regional agencies as needed to further inter-county connectivity.
Trade Corridors/Goods Movement	Coordinate with partner agencies to plan for projected growth in regional goods movement.
2024 Regional Transportation Plan/ Sustainable Communities Strategy (RTP/SCS)	Participate in the development of the 2024 RTP/SCS and initiate dialogue with SCAG and local jurisdictions.
2028 Olympics	Coordinate with Los Angeles County Metropolitan Transportation Authority (Metro) and jurisdictions hosting venues in Orange County on preparations for the 2028 Olympics.
Metro Countywide Express Lanes Strategic Plan	Continue dialogue with Metro and appropriate agencies to identify impacts to, and opportunities for, connectivity with Orange County's transportation network.
San Diego's I-5 High Occupancy Toll Lane Project	Continue dialogue with SANDAG and appropriate agencies to identify impacts to, and opportunities for, connectivity with Orange County's transportation network.
West Santa Ana Branch/ Pacific Electric Right-of-Way	Continue dialogue with Metro and appropriate agencies to identify impacts to, and opportunities for, connectivity between the Los Angeles and Orange County transportation networks.
Gold Line Eastern Extension – Phase 2	Continue dialogue with Metro and appropriate agencies to identify impacts to, and opportunities for, connectivity with Orange County's transportation network.
Emerging Issues	
Monitor Technology	Monitor developing technologies and their potential impacts on transportation (e.g., autonomous and connected vehicles, remote work trends, vertiports and air taxis).
Connected Infrastructure Needs Assessment	Study infrastructure needs and identify opportunities to implement and/or complement emerging transportation technologies.
State and Federal Regulation	Monitor State and federal legislation/regulations/policies.
State and Federal Funding	Identify strategies and opportunities to access and leverage State and federal funding.
Transportation Outreach and Education	
Diversity, Equity, and Inclusion	Provide all members of the public equal opportunities to provide input into OCTA planning efforts.
Active Transportation Safety	Seek opportunities to enhance public outreach and education related to active transportation safety.
Transit Use and Trip Planning	Explore new approaches to increase the use of modes other than single-occupant vehicles, including enhanced transit and active transportation facilities, public education, and incentives.

Conceptual Transportation Projects

Several transportation concepts and projects have been identified that go beyond the Preferred Plan but also support the LRTP goals. They have typically been vetted through high-level planning efforts, such as major investment studies, but require more research, development, funding, and/or public input. As these concepts become defined and refined through stakeholder input and further analysis, they may be considered for inclusion within the preferred project list in future LRTPs (see Table 5.2).

Table 5.2: Conceptual Project List
Local Facility
Crown Valley Parkway – I-5 to Greenfield Drive Lane Additions beyond MPAH
Cabot Road – Paseo De Colinas to Camino Capistrano Lane Additions beyond MPAH
Pedestrian Bridge Improvements in the Anaheim Resort Area
Harbor Boulevard – Warner Avenue to 17th Street Lane Additions beyond MPAH
Laguna Canyon Road – El Toro Road to Canyon Acres Drive
MPAH Complete Streets Assessment – Reuse of Excess Capacity
State Facility
Ortega Highway – Operational Improvements
I-5 – Avenida Pico to Avenida Vaquero Truck Lane
Additional Freeway Chokepoint Relief & System Management Projects (TBD)
Direct access ramps (TBD) – Managed Lane and High-Capacity Transit Support
SR-73, SR-261, SR-241 North – Buildout to Planned Capacity – TCA Project
SR-73/Glenwood Drive Intersection Improvement – TCA Project
SR-133/Great Park Boulevard Interchange – City of Irvine Project
SR-55/Meats Avenue Interchange
SR-55 – Extend Managed Lanes to Southern Terminus
Transit
Enhanced East/West OCTA transit service connecting ARTIC mobility hub to areas of high employee and visitor travel demand
California High-Speed Rail
New Southern OC Metrolink Station
Metrolink Expansion (SCRRA vision to increase above 86-weekday trains)
Other
Goods Movement – Supply Chain Resiliency

TBD – To be determined