

Appendix U18

2015 Regional Plan Sustainable Communities Strategy

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California Assembly Bill 1730

In February 2019, California Assemblymember Lorena Gonzalez introduced Assembly Bill 1730 (AB 1730), which provides for a two-year extension to update the Regional Transportation Plan and Sustainable Communities Strategy for the San Diego region and ensure that San Diego Forward: The 2015 Regional Plan, its Sustainable Communities Strategy, and related environmental analysis remain valid for state compliance, funding eligibility, and other purposes through 2021. AB 1730 also contains an exemption from the California Environmental Quality Act (CEQA) for the 2019 Federal Regional Transportation Plan.

AB 1730 passed out of the California Legislature on September 12, 2019, and was signed into law by the Governor on October 8, 2019.

The full text of AB 1730 may be found at the following link:

http://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200AB1730

Below is the language in AB 1730 related to the Sustainable Communities Strategy that will be added to Government Code Section 65080(d)(2).

(A) Notwithstanding subdivisions (b) and (c), and paragraph (1), inclusive, the regional transportation plan, sustainable communities strategy, and environmental impact report adopted by the San Diego Association of Governments on October 9, 2015, shall remain in effect for all purposes, including for purposes of consistency determinations and funding eligibility for the San Diego Association of Governments and all other agencies relying on those documents, until the San Diego Association of Governments adopts its next update to its regional transportation plan.

(B) The San Diego Association of Governments shall adopt and submit its update to the 2015 regional transportation plan on or before December 31, 2021.

The language in AB 1730 pertaining to the CEQA exemption for the 2019 Federal RTP, which will appear in Government Code Section 65080(d)(2)(E) states:

The update to the regional transportation plan adopted by the San Diego Association of Governments on October 9, 2015, which will be prepared and submitted to federal agencies for purposes of compliance with federal laws applicable to regional transportation plans and air quality conformity and which is due in October 2019, shall not be considered a regional transportation plan pursuant to this section and shall not constitute a project for purposes of the California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code).

Consistent with the passage of AB 1730, San Diego Forward: The 2015 Regional Plan and its Sustainable Communities Strategy will remain valid for state compliance, funding eligibility, and other purposes through 2021. Chapter 2 and Appendix C of San Diego Forward: The 2015 Regional Plan and its Sustainable Communities Strategy are included to demonstrate compliance with this state requirement.



Chapter 2 A Strategy for Sustainability

2

A Strategy for Sustainability

Smart growth and environmental protection through transportation choices



The Sustainable Communities Strategy

At the heart of San Diego Forward: The Regional Plan (Regional Plan) is a Sustainable Communities Strategy (SCS) that charts a course toward lower greenhouse gas emissions related to cars and light trucks, and proposes other measures to make the San Diego region more environmentally sustainable. Why the focus on transportation? Because about a third of greenhouse gas emissions generated in this nation come from that sector alone.¹

Reducing greenhouse gas emissions is a major goal for the state of California, and the nation. Rising emissions, chiefly carbon dioxide from the burning of fossil fuels, are increasing average temperatures around the globe. And those emissions are leading to numerous changes, including rising sea levels and shifting weather patterns. In the southwestern United States, climate scientists project that the effects of climate change include increasingly higher temperatures and more intense and frequent droughts, among other consequences.

At the heart of San Diego Forward: The Regional Plan is a Sustainable Communities Strategy that charts a course toward lower greenhouse gas emissions.



The SANDAG SCS must integrate plans for how we use our land with our plans for transportation, and show how future investments will reduce greenhouse gas emissions to meet the targets.

**Government Code
§ 65080(b)(2)(B)**

Each metropolitan planning organization shall prepare a sustainable communities strategy, subject to the requirements of Part 450 of Title 23 of, and Part 93 of Title 40 of, the Code of Federal Regulations, including the requirement to utilize the most recent planning assumptions considering local general plans, and other factors.

Confronting this challenge, California has moved aggressively to reduce statewide greenhouse gas emissions. In 2006, it became a national leader in taking action when the state Legislature passed Assembly Bill 32 (Nunez, 2006) (AB 32). AB 32 requires the state to reduce its greenhouse gas emissions to 1990 levels by 2020. Passage of this landmark bill was a recognition that states, especially one as large and economically powerful as California, have significant roles to play in our collective effort to reduce greenhouse gas emissions.

Following the passage of AB 32, California’s Legislature passed the Sustainable Communities and Climate Protection Act of 2008 – one of several steps the state has taken to achieve the goals set by AB 32. Also known as Senate Bill 375 (Steinberg, 2008) (SB 375), the Sustainable Communities Act required the California Air Resources Board (ARB) to set regional targets for reducing greenhouse gas emissions from passenger vehicle use.² In 2010, ARB established targets for 2020 and 2035 for each region in California governed by a Metropolitan Planning Organization (MPO). SANDAG is the MPO for the San Diego region. The SANDAG target, as set by ARB, is to reduce the region’s per capita emissions of greenhouse gases from cars and light trucks by 7 percent by 2020, compared with a 2005 baseline. By 2035, the target is a 13 percent per capita reduction. SB 375 does not require ARB to set targets beyond 2035. Nevertheless, the Regional Plan also includes a 2050 time horizon to integrate the *TransNet* Program, which has a 2048 time horizon (very close to 2050).

To achieve these targets, SANDAG and other MPOs are required to develop an SCS, as an element of its Regional Transportation Plan (RTP). The SANDAG SCS must integrate plans for how we use our land with our plans for transportation, and show how future investments will reduce greenhouse gas emissions to meet the targets. The law added specific sections to the California Government Code, and throughout this chapter we’ve included references to those sections to show how we’re meeting the law. In addition, Appendix C: Sustainable Communities Strategy Documentation and Related Information includes a more detailed matrix that further documents how the Regional Plan meets the SB 375 requirements for an SCS.

Through implementation of the Regional Comprehensive Plan (RCP) and other planning efforts, our region has for years moved toward better integrating land use and transportation plans. This is illustrated in Figure 2.1, which shows the region’s population and employment densities in 2012 overlaid with the existing transportation network, which serves our most populated areas. But SB 375 prompted us to focus more directly on reducing greenhouse gas emissions. In 2011, the SANDAG Board of Directors adopted the region’s first SCS, included in the 2050 Regional Transportation Plan and its Sustainable Communities Strategy (2050 RTP/SCS) – which was also the first SCS produced in the state of California. This chapter lays out the updated SCS for the San Diego region.³

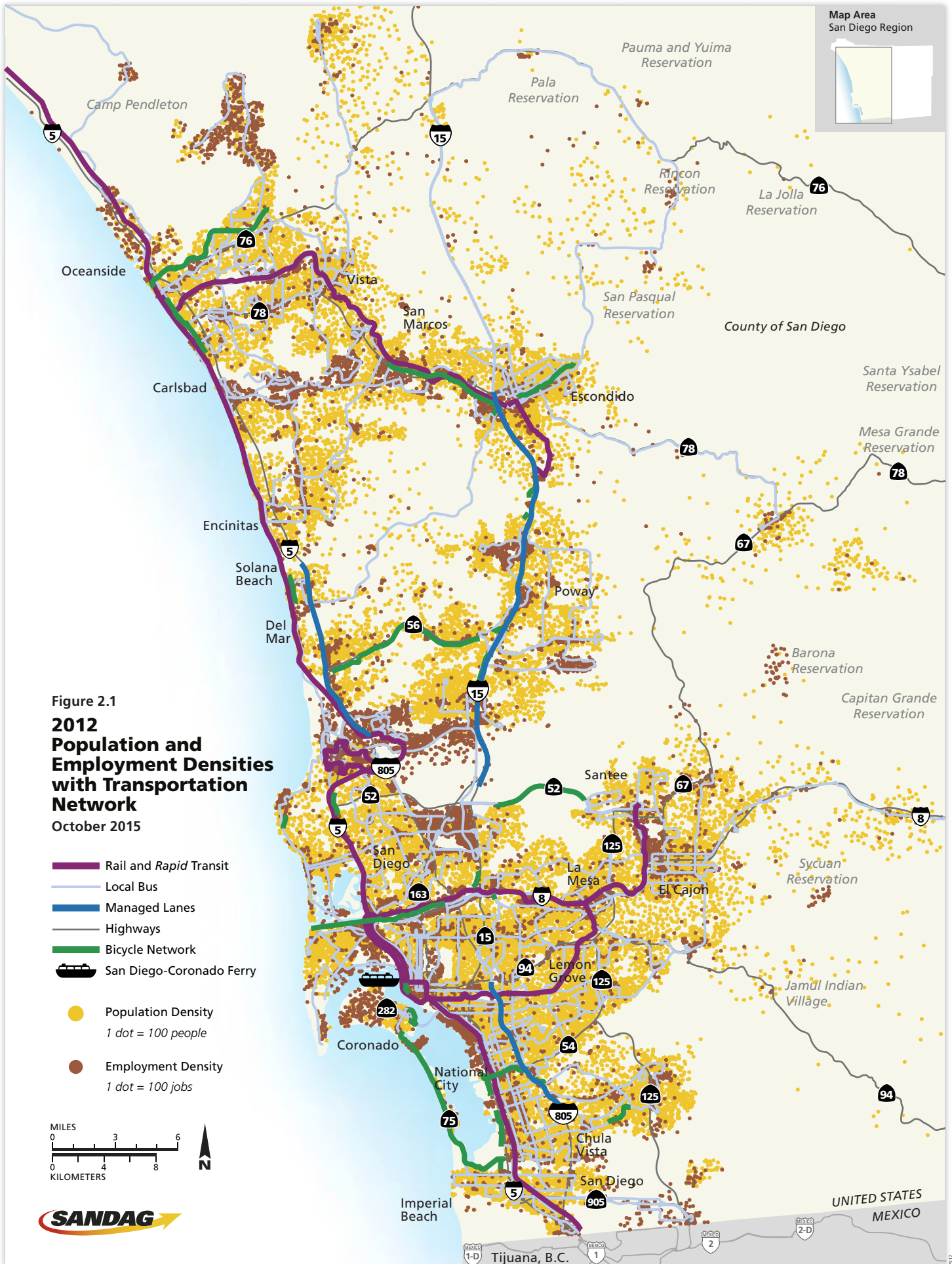
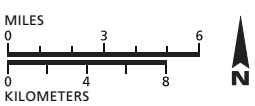


Figure 2.1
2012 Population and Employment Densities with Transportation Network
 October 2015

- Rail and Rapid Transit
- Local Bus
- Managed Lanes
- Highways
- Bicycle Network
- San Diego-Coronado Ferry
- Population Density
1 dot = 100 people
- Employment Density
1 dot = 100 jobs



The Five Building Blocks of Our SCS

Consistent with our previous SCS, this updated version includes five building blocks, in accordance with SB 375, which are accompanied by strategies. They include:

- A **land use pattern** that accommodates our region’s future employment and housing needs, and protects sensitive habitats, cultural resources, and resource areas.
- A **transportation network** of public transit, Managed Lanes and highways, local streets, bikeways, and walkways built and maintained with reasonably expected funding.
- **Managing demands** on our transportation system (also known as Transportation Demand Management, or TDM) in ways that reduce or eliminate traffic congestion during peak periods of demand.
- **Managing our transportation system** (also known as Transportation System Management, or TSM) through measures that maximize the overall efficiency of the transportation network.
- **Innovative pricing policies** and other measures designed to reduce the number of miles people travel in their vehicles, as well as traffic congestion during peak periods of demand.

The five strategies to move us toward sustainability

Reducing greenhouse gas emissions, given the potential consequences of climate change, will help build a more sustainable future globally. In the San Diego region, the path toward sustainability requires lowering these emissions locally, and also other strategies. The following section describes our path toward sustainability in five concrete strategies we can understand and build upon. Our SCS is organized around these five strategies.



Focus housing and job growth in urbanized areas where there is existing and planned transportation infrastructure, including transit.



Protect the environment and help ensure the success of smart growth land use policies by preserving sensitive habitat, open space, cultural resources, and farmland.



Invest in a transportation network that gives people transportation choices and reduces greenhouse gas emissions.



Address the housing needs of all economic segments of the population.



Implement the Regional Plan through incentives and collaboration.



Heading Toward 2050 – A Quick Note About Transportation

In this chapter, we cover a wide range of topics. In the middle of the chapter, we lay out plans for the region’s future transportation network in quite a bit of detail, followed by a discussion on coordinated regional efforts to address climate change. But first, as a prelude, here is a set of principles that has guided the development of our future transportation network:

- The transportation network included in the Regional Plan must be based on financial constraints. Every family knows that it should live within its means, and it’s no different for the San Diego region. The SANDAG investment plan, which we also refer to as the “Revenue Constrained Transportation Network,” will be built with financial resources we reasonably expect to be available between now and 2050.
- A more efficient transportation network will be achieved through two key strategies: effectively managing the overall system (TSM), and effectively managing demands on the system (TDM). Innovative technologies will be integrated into both TSM and TDM. The result will be maximized efficiency in the transportation network, which ultimately can lower greenhouse gas emissions.⁴

- Managing parts of the network, such as adding Managed Lanes and transit-only lanes on our freeways, can encourage people to carpool and use public transit to bypass bottlenecks.
- The road toward a more sustainable San Diego region should include vehicles that use cleaner, alternative sources of energy. SANDAG can play an important role in promoting this transition.

Where We've Been and How We Got Here

To understand where we are today and effectively plan for our future, we need to know where we've been. Our region has continually grown, and the reasons are easy to understand. Our beautiful coastline, unique neighborhoods, strong economy, and big open spaces make our region an attractive place to live. In past decades, these and other attributes drew people to our region, and neighborhoods steadily expanded – mostly toward the east. But more recently, we've placed a greater value on protecting open space. Collectively, the long-term plans for our local cities and the County of San Diego now call for focusing new growth in the urbanized areas of the western portion of our region where more people already live. This will allow us to preserve more open space and make more efficient use of resources such as water, energy, and transportation facilities.

A history of sprawl

Efforts to create a more sustainable future began in the late 1960s and early 1970s, when Congress and the State of California passed sweeping federal and state environmental protection laws. Concerns here in San Diego had been rising over the environmental impacts of rapid growth and development. Our cities and suburbs had quickly expanded north and east as developers built tracts of single-family homes to meet the rising demand. Our city governments and the County, meanwhile, developed long-range plans that allowed the continued spread of suburban development into open land east of existing communities.

By the late 1980s, rapid suburban development was threatening remaining open space, with long commutes resulting in growing traffic congestion and air quality impacts. Voters responded by calling for the creation of a regional growth management review board, and approving the first local *TransNet* half-cent sales tax to fund regional transit, highway, and road improvements. These are responsibilities that SANDAG carries to this day.

An awakening to smart growth

During the 1990s, California expanded its commitment to environmental protection when the state Legislature enacted the Natural Community Conservation Planning (NCCP) Act. Local jurisdictions, collaborating with one another and with federal and state wildlife agencies, created plans to conserve natural habitats, better manage watersheds, and improve air quality. In the San Diego region, we adopted the Multiple Species Conservation Program (MSCP)⁵ in 1998 and Multiple Habitat Conservation Program (MHCP) in 2002. These landmark programs identify an interconnected open space system from the U.S.-Mexico border to Riverside and

Efforts to create a more sustainable future began in the late 1960s and early 1970s, when Congress and the State of California passed sweeping federal and state environmental protection laws.



Orange counties. The land designated by these planning efforts, along with land in federal and state parks and forests, has preserved more than 1.2 million acres for open space and habitat preservation. That’s about half our region’s total land area.⁶

By the year 2000, new challenges emerged as familiar ones persisted. Affordable housing grew harder to come by. Traffic, a consequence of growth and a strong economy, continued to worsen. We needed a refined vision for planning that recognized these new realities.

To address the need to accommodate growth in ways that protect our quality of life, the RCP, as we discussed in Chapter 1: Our Region, Our Future, was adopted in 2004. The RCP called for new growth and development to occur in urbanized areas, near existing public facilities and transportation infrastructure, and for following principles of smart growth and sustainable development. Its goals were to provide people with more housing and transportation choices in existing communities, while reducing pressure to develop new suburbs in rural parts of the region that didn’t have urban water and sewer service, or frequent transit service. The individual cities and the County – whose representatives make up the SANDAG Board of Directors that adopted the RCP – began to change their local long-range plans to reflect the land uses called for in the big picture outlined by the RCP.

During the last 15 years, our jurisdictions have changed their land use plans significantly, resulting in development patterns that concentrate future growth in urbanized areas, reduce sprawl, and preserve more land for open space and natural habitats.

This evolution, illustrated in Figure 2.2, compares the region’s projected housing and job growth based upon local general plans in 1999 against plans in effect in 2012, as well as the growth forecasted in 2012 with an overlay of the transit projects planned in 2050. During the last 15 years, our jurisdictions have changed their land use plans significantly, resulting in development patterns that concentrate future growth in urbanized areas, reduce sprawl, preserve more land for open space and natural habitats, and use the region’s water and energy supplies more efficiently.⁷

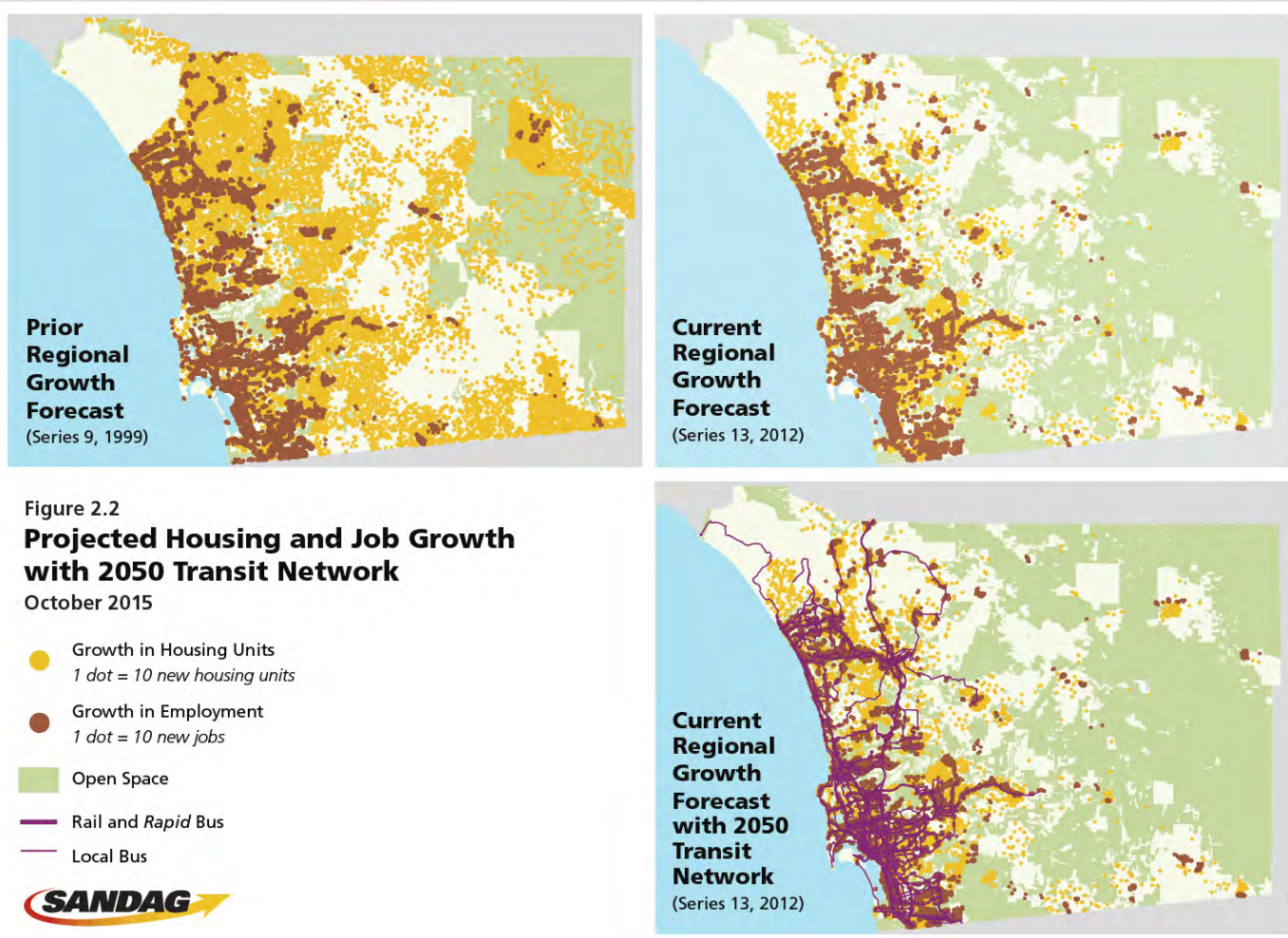
New thinking on transportation and sustainability

These were seismic shifts in thinking about how to grow, and with them came new perspectives about how our region should invest in public transit, roads and highways, and other transportation infrastructure. It was becoming clear that people needed more options for getting around than just the car. This is now the basis of the transportation network described later in this chapter.

In 2004, our region’s voters took another major step forward by approving an extension of the *TransNet* half-cent sales tax measure. This regional measure identified specific transportation projects that would give us more travel options. And as described in this chapter, the *TransNet* sales tax measure also provided various incentives. Significantly, it earmarked \$850 million to preserve natural habitats, and it set aside nearly \$600 million for smart growth and active transportation.

Defining Active Transportation:

Active Transportation includes any method of travel that is human-powered, but most commonly refers to walking and bicycling.





For example, it identified \$280 million in grants to local jurisdictions to promote new mixed-use developments in smart growth areas that combine affordable housing with stores and other commercial buildings – all near existing and planned public transit. It also set aside an additional \$280 million in grants for local jurisdictions to plan and build infrastructure for walking and biking in our urbanized communities.

As new kinds of development patterns have emerged, we've adjusted our region's long-range transportation plans. We've shifted our investment from single purpose highway lanes to Managed Lanes to support carpools, vanpools, and *Rapid* transit service – changes that serve all kinds of communities new and old, including long-established suburbs. We've added miles of new light rail lines to our transportation plans, including the Mid-Coast Trolley, which will connect the U.S.-Mexico border and Downtown San Diego with the University of California San Diego (UC San Diego) and University City, the region's largest job center. We've also made investments in regional bikeways and other infrastructure for biking to connect neighborhoods to job centers, schools, and public transit – including the new \$200 million Regional Bike Plan Early Action Program to build out the backbone of the system in 10 years. These new investments, along with our existing transportation infrastructure, will use new and emerging technologies to become more accessible and more efficient.

Defining Mixed-Use: The combining of commercial, office, and residential land uses to provide easy pedestrian access and reduce the public's dependence on driving. It is often implemented in multi-story buildings containing businesses and retail stores on the lower floors, and homes on the upper floors.

A closer look at the five strategies toward sustainability in the SCS

Now let's take a look at each of the five strategies of the SCS that will move us toward sustainability:



Focus housing and job growth in urbanized areas where there is existing and planned transportation infrastructure, including transit.

San Diego County and cities across the region have updated their land use plans, changing patterns of future development to provide more housing and jobs in cities, along existing transit corridors, and where projected job growth will be situated.⁹ The highest density housing and employment density is planned within the most urbanized areas of the region.

As part of preparing this Regional Plan, we asked whether additional land use changes – beyond those already reflected in the general plans of our 18 cities and the County of San Diego – could further reduce greenhouse gas emissions.¹⁰ Working with our stakeholders, the public, and our elected officials, we developed three hypothetical land use scenarios. With an eye toward reducing greenhouse gas emissions, each scenario had a different emphasis; the first, Scenario A, focused on second units and infill (such as “granny flats” on single-family parcels), the second, Scenario B, on transit-oriented development, and the third, Scenario C, on dense urban cores (See Figure 2.3). Then we paired up each hypothetical scenario with the transportation network from the 2050 RTP/SCS, and studied whether they could lower greenhouse gas emissions beyond those projected with the land uses in the Regional Growth Forecast.

The results showed that changes already made to the general plans of the local jurisdictions throughout San Diego County – and already included in this Regional Plan – are projected to have a major impact on greenhouse gas emissions in the future. In other words, the growth projected in the Growth Forecast developed in 2013 will result in 30 percent less greenhouse gas emissions than the growth projected in the Growth Forecast prepared in 1999. The key difference between the two was the smart growth patterns that were adopted between these two growth forecasts.

So, given the fact that previous changes to land use plans lowered the projected greenhouse gas emissions so significantly, the study went on to look at whether the more drastic changes than those considered in the hypothetical scenarios would provide even more benefits. The answer was that the three scenarios had the potential to continue lowering emissions compared with the forecast, but at a much slower pace – only up to 3 percent more over the next 35 years. This slower pace is largely due to the fact that the significant land use changes have already been made to local plans.

Government Code § 65080(b)(2)(B)

Requires that the SCS be based on “the most recent planning assumptions considering local general plans and other factors.”

The growth projected in the Growth Forecast will result in 30 percent less greenhouse gas emissions than the growth projected in the Growth Forecast prepared in 1999.

Figure 2.3
Hypothetical Land Use Scenarios

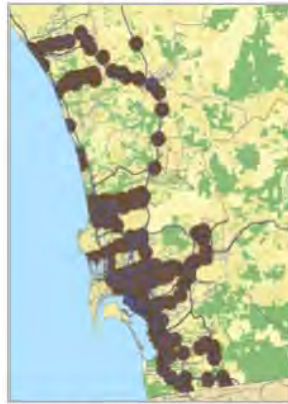


Scenario A: Second Units and Infill



Scenario A constrains future residential and employment growth to the west of the incorporated cities boundaries, and tests the impact of second units.

Scenario B: Transit Oriented Development



Scenario B concentrates new housing and jobs around existing and future transit stations included in the 2050 RTP/SCS. New development consists primarily of urban/compact development.

Scenario C: Multiple Dense Cores



Scenario C focuses future growth into four dense cores. New housing and jobs consist of urban/compact development concentrated in North County; Mid-County; the greater Downtown area; and South County/International Border.

Source: SANDAG, December 2013

This exercise showed us that we are moving in the right direction. As our local jurisdictions continue to update their plans, they should be encouraged to continue to embrace smart growth and sustainable development, moving forward in the new direction that started with the RCP more than a decade ago.

Complementing this effort, our areas of higher density housing, job centers, and transportation access are shown on the Smart Growth Concept Map (see Chapter 1, page 7), which we developed as a tool to better coordinate our investments in transportation with the development of land. Transportation and planning professionals from all 18 cities and the County contributed to the development of this map, which identifies places with the potential to focus future high-density, mixed use, and compact development close to jobs, public services, and existing and planned transit. Because smart growth isn't a one-size fits all approach, the map includes seven distinct types of smart growth areas, from rural villages to town centers to Downtown San Diego. The map also shows major employment areas that support our economy.

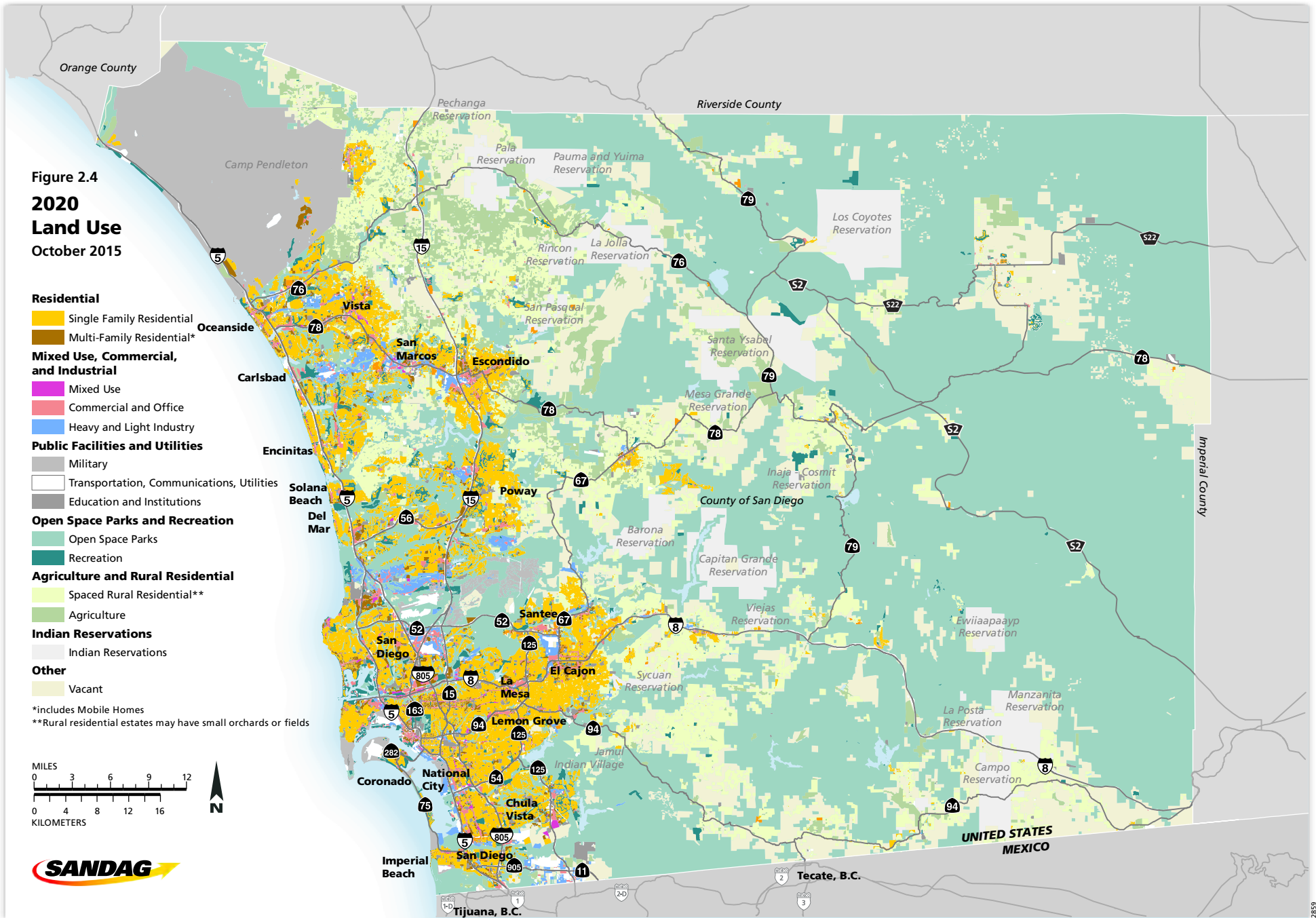
As we discussed in Chapter 1, focusing new growth and development in the most urbanized areas of the region is a key strategy toward sustainability. At the same time, we recognize that much of the region has already been developed, both in an urban and suburban pattern. Part of the smart growth strategy is to provide a more efficient transportation system in established areas. New investments in our regional transportation network, discussed later in this chapter, are designed to give people everywhere, including urban areas, established suburban areas, employment centers, and rural areas, more choices for getting around.

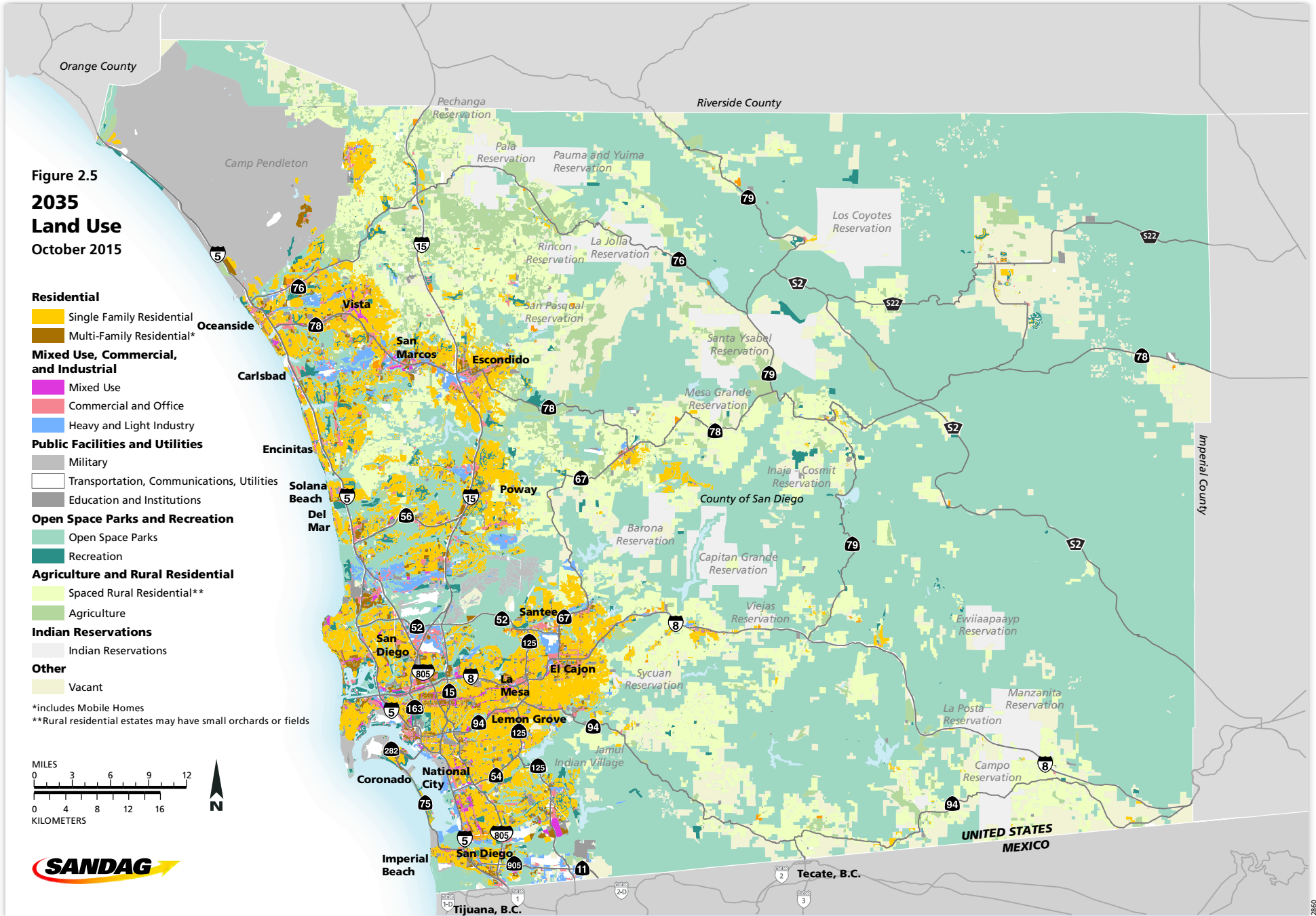
As our local jurisdictions continue to update their plans, they should be encouraged to continue to embrace smart growth and sustainable development.

Now for some numbers. In 2012, the San Diego region included about 3.1 million people, 1.1 million homes, and over 1.3 million jobs. Most of the homes and jobs today are located within the western third of the region, and in areas served by public transit. The Regional Growth Forecast (which is also known as the Series 13 Forecast), projects that the region will grow by nearly 1 million people by 2050 (see Figures 2.6 and J.12 in Appendix J: Regional Growth Forecast). Over 325,000 new homes and 460,000 new jobs will be added during this time frame. (The base year for the Regional Plan is 2012, the year the data collection effort began to prepare the Regional Growth Forecast. It projects changes expected to occur from 2012 to 2050.)

As pointed out above, our region has made great strides in planning for more compact, higher density, greater employment intensity, and walkable developments situated near transit and in the incorporated areas of the region already served by water, sewer, and other public facilities. Evidence of the region's success can be found in the Regional Growth Forecast, which is the foundation of the SCS land use pattern, as shown in Figure 2.4 (2020 Land Use) and Figure 2.5 (2035 Land Use). The land use pattern accommodates 79 percent of all housing and 86 percent of all jobs within the portion of the region covered by the Urban Area Transit Strategy (UATS, described later in this Chapter), where the greatest investments in public transit are focused (see Figure 2.6). More than 80 percent of new housing in the region will be attached multifamily. The greatest employment density and building intensities will be with existing employment centers. The land use pattern also preserves about 1.3 million acres of land, more than half the region's land area. These open space lands include habitat conservation areas, parks, steep slopes, farmland, floodplains, and wetlands.¹¹







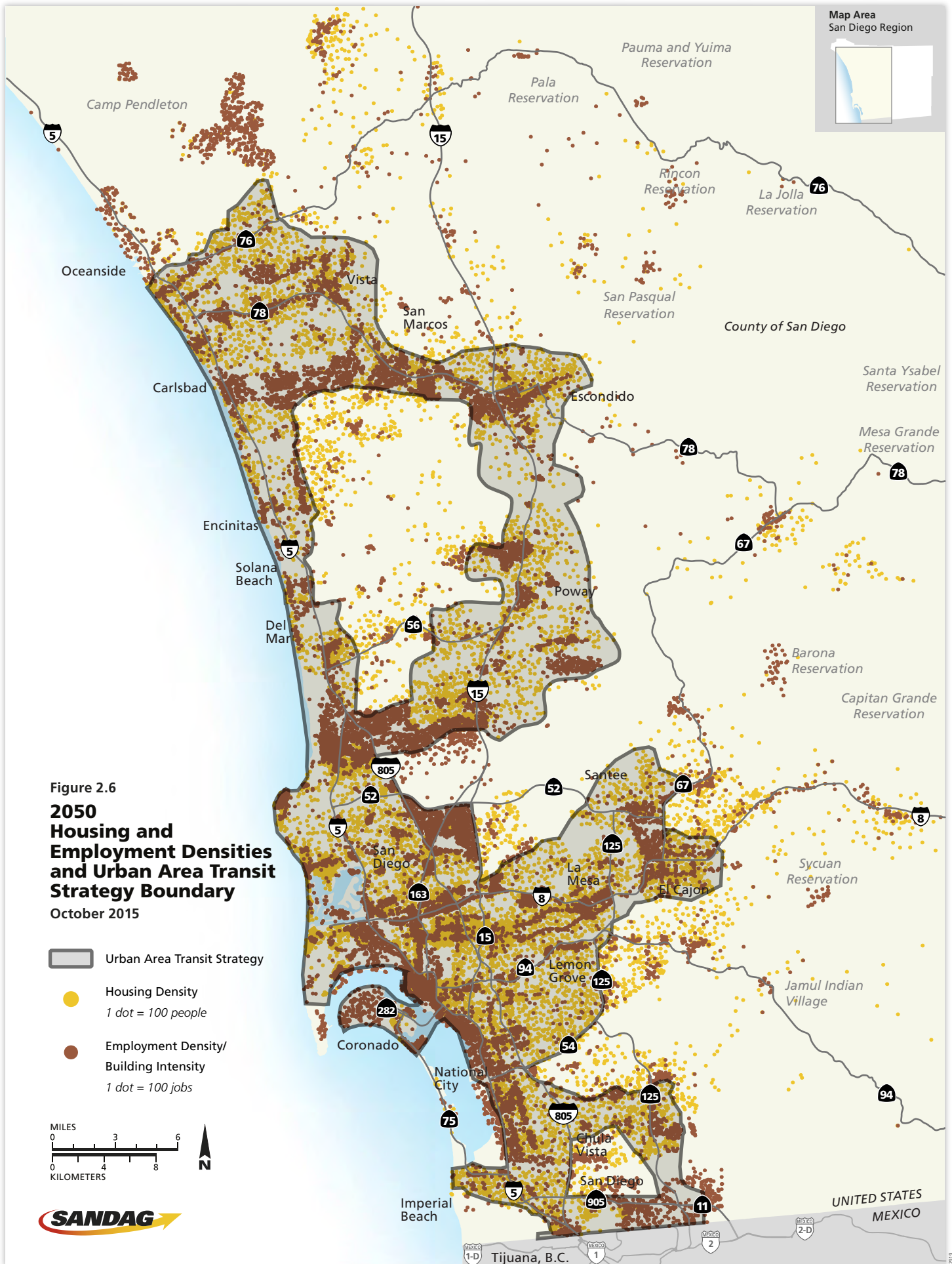
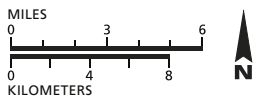


Figure 2.6
**2050
 Housing and
 Employment Densities
 and Urban Area Transit
 Strategy Boundary**
 October 2015

- Urban Area Transit Strategy
- Housing Density
1 dot = 100 people
- Employment Density/
Building Intensity
1 dot = 100 jobs



**Government Code
§ 65080(b)(2)(B)(v)**

Gather and consider the best practically available scientific information regarding resource areas and farmland in the region.

**Government Code
§ 65080(b)(4)(C)**

The metropolitan planning organization shall consider financial incentives for cities and counties that have resource areas or farmland.

Protect the environment by preserving sensitive habitat, open space, and farmland

Complementing plans for how our urbanized areas will develop are plans for protecting parklands, open space, natural resource areas, and farmland. About half of our region's 2.7 million acres have been preserved,¹² and by 2050, 55 percent will be preserved, according to our forecast, which is based on local land use plans (see Appendix C Introduction, Appendix C Figure C.6, and Appendix J Figure J.6).¹³

Our region is fortunate to have a local funding source for preserving natural habitats. When the region's voters approved the extension of the *TransNet* half-cent sales tax back in 2004, their vote included a provision to fund the \$850 million Environmental Mitigation Program (EMP). The primary purpose of the EMP is to purchase habitat as mitigation for future transportation projects. The program buys land early and in large parcels, saving money, and in the process restores and maintains preserved land.

In addition, the EMP provides funding, through a competitive incentive program, to acquire, manage, and monitor sensitive lands in habitat preservation planning areas (such as the MSCP and the MHCP discussed earlier in this chapter). This is done to help mitigate the environmental impacts of transportation projects.



Over the years, we've established criteria for the incentive program to ensure that the region's conservation priorities are being met. The program also includes funding for working landscapes, such as agricultural lands, if they also support wildlife.

One of the unique aspects of the EMP is that it provides an "economic benefit" incentive, which enables *TransNet* funding to be used to buy land that contributes to wildlife and habitat conservation. This funding is earmarked as milestones are achieved during certain transportation projects. Recognized nationally as a major success, the *TransNet* EMP program is unique to our region, and it provides a critical source of funding to protect open space and preserve natural habitats.

Invest in a transportation network that gives people transportation options and reduces greenhouse gas emissions

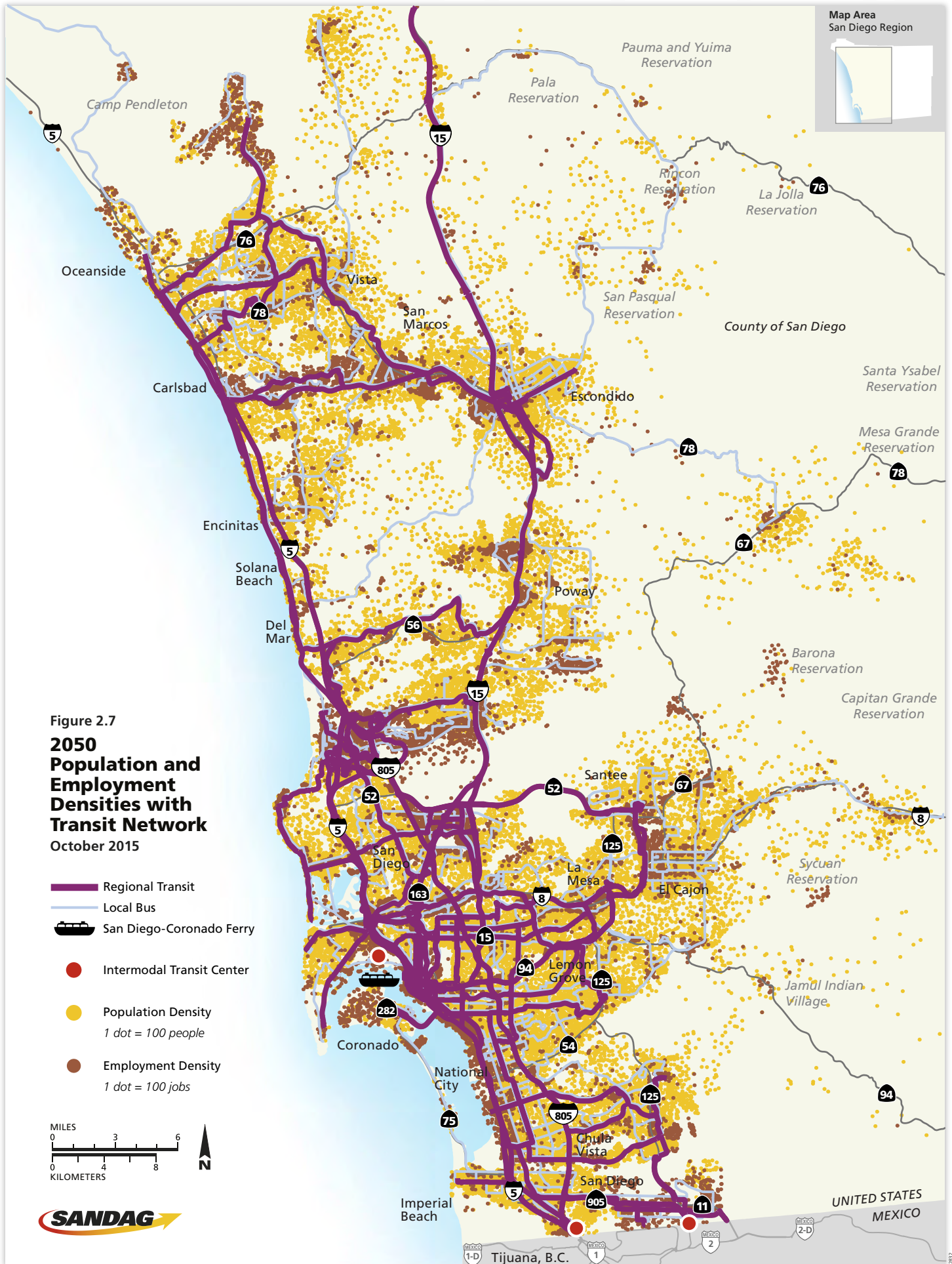
Our goal for a more sustainable future in San Diego is one in which fewer people have to drive alone, and more people have increased travel choices available to them. Those choices will include an ever-expanding, more accessible, and more convenient public transit system: carpooling; ridesharing; and more interconnected networks of biking and walking paths. These are just a few of many investments we'll discuss later in this chapter. To see a visual overview of these investments, check out the following series of maps (Figures 2.7, 2.8, and 2.9), which are overlaid with data on projected population and employment.

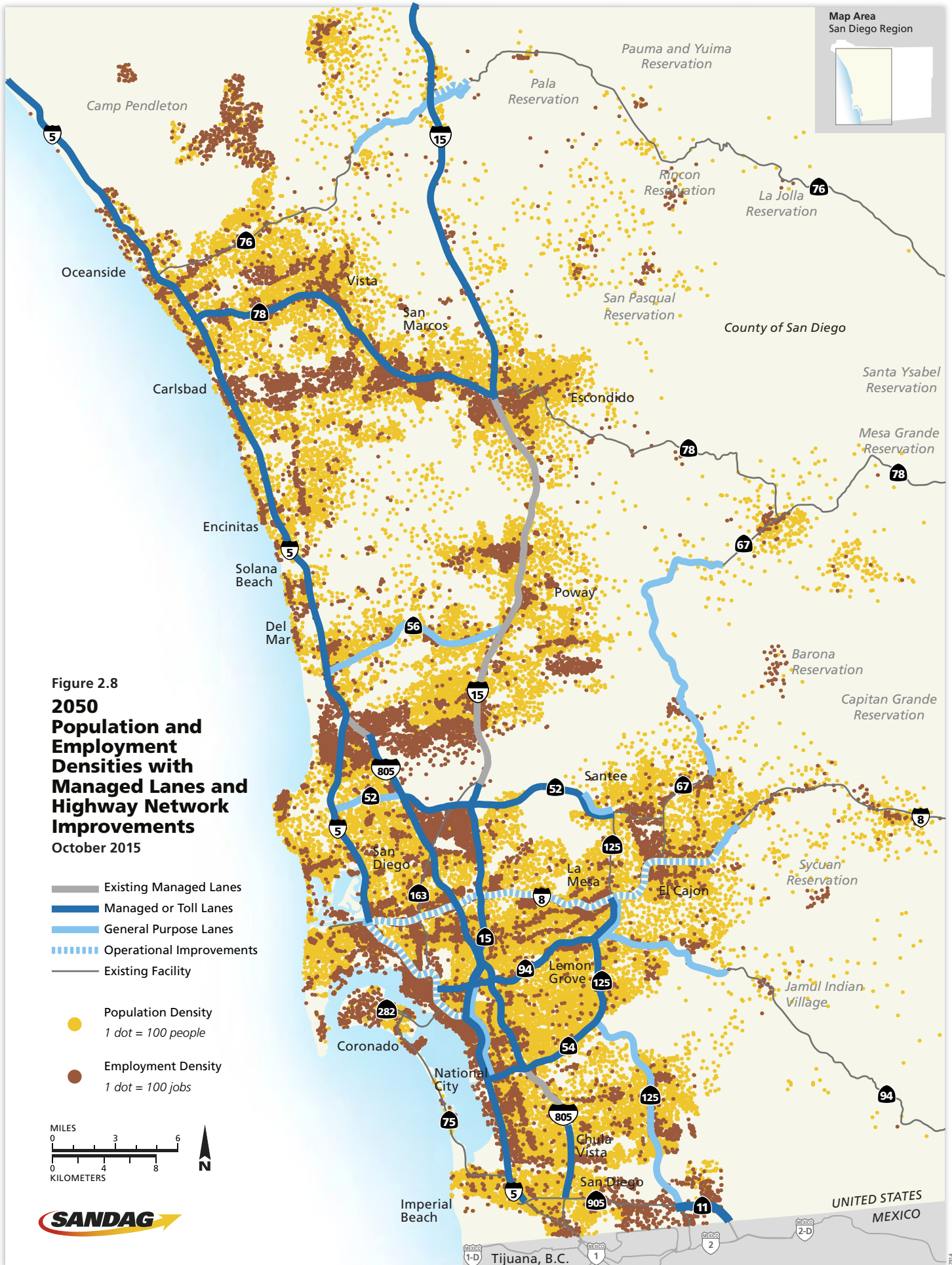
New transportation investments will help us improve existing infrastructure with technology designed to help cut congestion and travel times. Strengthening our public transit system and other transportation choices where most of us live and work, meanwhile, will give us more options for getting around. Today, about a third of our region lives within a half mile of high-frequency public transit. By 2050, that number will jump to more than 60 percent, which is attributable to our local jurisdictions planning for more housing near transit stations and to our investments in more high frequency transit routes closer to existing and future housing and jobs. These changes will help reduce per capita greenhouse gases emitted in the region.

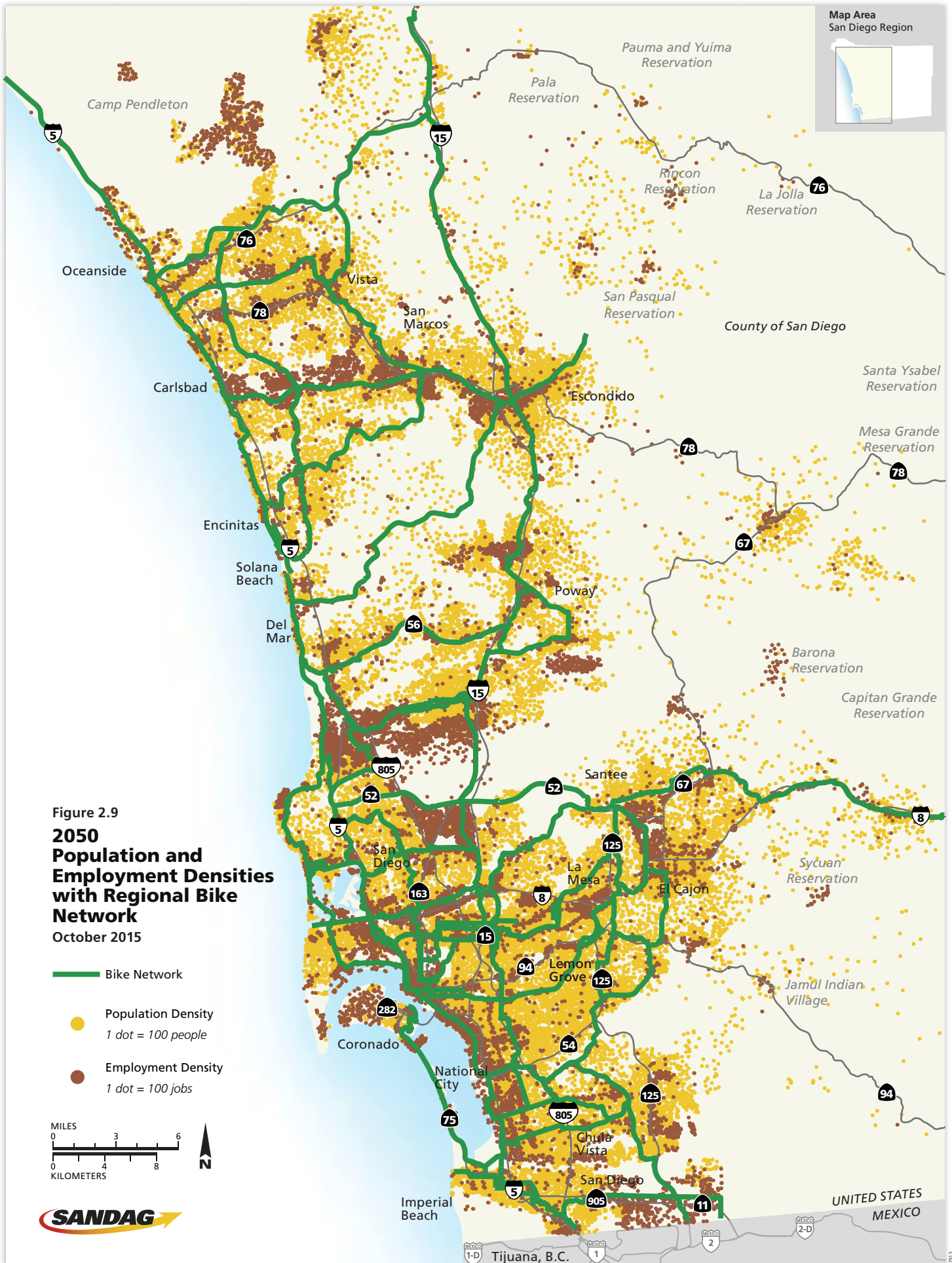
To maximize our transportation investments, particularly those in transit, we recognize that we need to pay close attention to the mix of land uses and the urban design in the immediate vicinity of existing and planned transit stations. To focus more sharply on implementing land uses that support our transit investments – such as existing transit stops and future transit stations – SANDAG worked with a wide variety of stakeholders to develop a Regional Transit Oriented Development (TOD) Strategy, entitled *Regional Transit Oriented Districts: A Strategy for the San Diego Region*.¹⁴ The strategy focuses on identifying tools, techniques, and actions for implementing and prioritizing transit oriented development in the areas identified on the Smart Growth Concept Map. Implementing the Regional TOD Strategy will be an important step toward carrying out our Regional Plan.

Government Code § 65080(b)(2)(B)(vii)

Set forth a forecasted development pattern for the region, which, when integrated with the transportation network, and other transportation measures and policies, will reduce greenhouse gas emissions from automobiles and light trucks to achieve, if there is a feasible way to do so, the greenhouse gas emission reduction targets approved by the state board.









Equally important is placing a greater emphasis on the quality of our streets. For a number of years, a growing movement has been underway to convert our streets, over time, to roads that serve the needs of a broader range of users than primarily those who drive cars. This effort to create “complete streets” involves rethinking roadway design to better accommodate people walking and riding bike. The good news is that many of our local jurisdictions have adopted or are in the process of developing local complete streets policies consistent with Assembly Bill 1358 (Leno, 2008) (AB 1358) – The Complete Streets Act. In 2014, SANDAG adopted a Regional Complete Streets Policy¹⁵ for future improvements on SANDAG transportation infrastructure projects, a policy that is integrated into the Regional Plan.

In short, our transportation investments are not just about the transportation projects themselves. They’re also about the surrounding land uses that make our communities livable and vibrant, and the improvements to our streets to make them friendlier and safer for all users, including people who walk and bike.

Our transportation investments are not just about the transportation projects themselves. They’re also about the surrounding land uses that make our communities livable and vibrant.



 **Address the housing needs of all economic segments of the population**

As we discussed in Chapter 1, providing adequate housing for a growing number of people, from all income levels and at all stages of their lives, continues to be one of the major goals for our region. The land use pattern of the Regional Plan is based on the Regional Growth Forecast, which in turn draws its information from the general plans of the region’s local jurisdictions. The Regional Growth Forecast serves as the basis of our SCS.

There are two specific laws pertaining to housing with which the Regional Plan must comply. First, SB 375 requires that areas be identified within the region sufficient to house the entire population of the region, including all economic segments of the population, over the course of the planning period. Second, we must complete a Regional Housing Needs Assessment (RHNA), in accordance with California Housing Element law. The assessment determines the region’s housing needs in four income categories – very low, low, moderate, and above moderate. The RHNA process occurs before each housing element cycle, which is required to occur every eight years by SB 375. In the past, the RHNA was completed every five years, and that process occurred separately from the RTP update. SB 375 now links the RHNA and RTP processes to better integrate housing, land use, and transportation planning, helping to ensure that the state’s housing goals are met.

Accommodating the Eight-Year Regional Housing Needs Assessment

In terms of housing, the SCS land use pattern addresses the needs of all economic segments of the population. Our projected land use pattern identifies areas within the region sufficient to meet the needs detailed in the RHNA for the fifth housing element cycle (2010 – 2020), and it accommodates the projected growth between now and 2050 (see Figures J.3, J.4, and J.5 in Appendix J). The SANDAG Regional Growth Forecast projects the need for 325,000 additional homes to serve the expected population growth of nearly one million people. The capacity for future housing in the region, which is based entirely on the capacity in the general plans of the 18 cities and the County of San Diego, currently contains enough capacity for nearly 395,000 new homes. Of these, about 169,000 units are projected to have a housing density of 30 or greater dwelling units per acre, and almost 62,000 units are projected to fall into a density range of 20 to 29 dwelling units per acre.¹⁶ This capacity for planned housing development, particularly for multifamily development, will help the region accommodate the projected housing needs for San Diegans of all income levels.¹⁷

The SCS land use pattern and RHNA allocation meet the state’s four housing goals – increasing the supply and mix of housing types, promoting infill development and efficient development patterns, promoting an improved relationship between jobs and housing, and creating economically balanced communities. In fact, about 82 percent of the projected new homes to be built by 2050 will be attached multifamily units – condominiums, townhomes, and apartments, and 80 percent of the new homes will be located within the UATS boundary where the greatest investments in public transit are being made (see Figure 2.6). This future, spelled out in local plans for growth, will increase the supply, mix, and affordability of housing regionwide.¹⁸

The transition toward more multifamily homes throughout the region will benefit everyone. In particular, it will help young adults, single parents, and seniors whose incomes often aren’t enough to afford a single-family home in our high-priced market. Metropolitan areas around the nation are moving toward this kind of development. Surveys show that an increasing number of people prefer to live in denser, more walkable neighborhoods with access to a wide variety of stores and services, and, importantly, public transit.¹⁹ A larger number of multifamily homes situated near public transit options will offer people of all ages – and from all backgrounds, economic circumstances, and physical capabilities – lives enriched by more opportunities to work, shop, study, exercise, and play.

Government Code § 65080(b)(2)(B)(iii)

Identify areas within the region sufficient to house an 8-year projection of the regional housing need for the region.

Government Code § 65080(b)(2)(B)(ii)

Identify areas within the region sufficient to house all the population of the region, including all economic segments of the population, over the course of the planning period of the regional transportation plan taking into account net migration into the region, population growth, household formation and employment growth.

Government Code § 65080(b)(2)(B)(vi)

Consider the state housing goals.

Surveys show that an increasing number of people prefer to live in denser, more walkable neighborhoods with access to a wide variety of stores and services, and, importantly, public transit.



**Government Code
§ 65080(b)(2)(K)**

Neither a sustainable communities strategy nor an alternative planning strategy regulates the use of land, nor, except as provided by subparagraph (J), shall either one be subject to any state approval. Nothing in a sustainable communities strategy shall be interpreted as superseding the exercise of land use authority of cities and counties within the region.



Implement the Regional Plan through Incentives and Collaboration

The course charted by the Regional Plan won't be implemented by SANDAG alone. Achieving the Regional Plan's vision and goals requires collaboration among local jurisdictions, Caltrans, transit operators, developers, water agencies, energy providers, other infrastructure providers, and a wide range of interest groups, stakeholders, and organizations.

While some of the projects in the Regional Plan will be implemented through funding that SANDAG will receive from the state and federal governments, we also need to rely on incentives and collaboration. The Smart Growth Toolbox contains a set of powerful tools to help us realize our regional vision for a sustainable future. They include the Smart Growth Concept Map; smart growth design guidelines; smart growth visual simulations; guidelines for integrating TDM into the planning process; parking management tools; guidelines for planning and designing for pedestrians; a smart growth photo library; and competitive grant programs that provide incentive funds for planning and capital projects in smart growth areas and for active transportation projects. These tools were developed with contributions from people throughout the region and are included in Chapter 5: Ensuring Performance.

The Transportation Network – A System that Offers More Ways to Get Around

As we've discussed, a transportation system that offers more choices to get around empowers people to choose more sustainable ways to travel. And that improves air quality and the environment. And a transportation system that offers more choices improves the connections between businesses and their workers, customers, and partners – fueling the economy. This ultimately makes the system itself more functional, because more choices allow people and businesses to choose the best options for them – for the kinds of trips they're making and the time of day they're making them.

The SCS will help guide investments in our transportation system over the next 35 years. The Regional Plan outlines the investment of nearly \$204 billion in year-of-expenditure dollars in local, state, and federal dollars to build a comprehensive, interconnected transportation system that provides choices.

All this investment will improve mobility for everyone, and give us more freedom by creating more travel choices. Doing so, while also taking steps to protect the environment – isn't just a goal for our everyday trips. It's vital for shipping the goods that help fuel our regional economy, and for keeping our region healthy. How we all get from point A to point B is important, and it impacts the quality of our lives. Commuting to work, getting to school, shopping, running errands, and saving time for some fun away from home – it all requires mobility. Whether it's driving a car on the highway, taking the local bus or one of the regional *Rapid* services, catching the COASTER, SPRINTER, or Trolley, jumping on a bike, or just taking a walk – we all want the freedom to choose how and when we get around.

In the upcoming review of our planned transportation network, you'll read about various "modes" of transportation – or ways that people travel to their destinations. Together, these modes offer a diverse mix of public transit service; a variety of Managed Lane projects on our highways (which include toll lanes, carpool, and transit-only lanes); pedestrian and bike investments (known as active transportation); and other programs. They're all designed to work together as a package, making the entire system more efficient while also giving travelers a variety of options.

As we look to the future, we can learn about new modes of transportation and mobility that are being studied and in some cases implemented around the world. Some of these ideas may work for our region. Skyways, often referred to as "aerial trams" or "aerial gondolas," offer one example. Our region is beginning to research the feasibility of adding Skyways for short-distance trips – those first-mile, last-mile connections that could improve access to our regional transit system. Existing Skyways work well in dense urban environments, and they're well-suited to traversing freeways, canyons, hills, and other obstacles. They also may be more cost-effective than other transit infrastructure investments. Future studies will assess the feasibility of Skyways as alternatives to ground-based transportation routes in several corridors.

Government Code § 65080(b)(2)(B)(iv)

Identify a transportation network to service the transportation needs of the region.

The Regional Plan outlines the investment of nearly \$204 billion (in year-of-expenditure dollars) from local, state, and federal sources to build a comprehensive, interconnected transportation system that provides choices.





Building a System That Meets the Needs of a Growing Region

Our region's transportation network, shown in Figure 2.1, includes 390 miles of regional public transit service and 1,236 miles of local public transit service. The existing network also includes more than 30 miles of Managed Lanes (high occupancy vehicle (HOV) and Express Lanes) on sections of Interstates I-5, I-15, and I-805. In addition, the network consists of 1,340 miles of bike routes and amenities, and about 9,400 miles of sidewalks.²⁰ Rounding out the network and supporting connectivity of all transportation types are thousands of miles of local streets and roads maintained and managed by the individual cities and the County of San Diego.

Between now and 2050, we will steadily add more high-quality public transit and expand our regional network of interconnected bike routes and walking paths. Also planned is a connected and free-flowing system of Managed Lanes on our highways.²¹

As our region grows, a quality transportation system will go a long way toward preserving our quality of life, even making it better than it is today. We may not think about it much – or maybe we do! – but the way we get around impacts our environment, our wallets, and our physical and mental health. It impacts how much we exercise, the quality of the air we breathe, and the amount of money we have available to spend on other things. Our investment plan reflects our Regional Plan's commitment to a healthier and higher-quality daily life for the people in our region.²²

Selecting the Transportation Network

A specific process was followed to select the transportation network for the Regional Plan. The first step was to identify the Unconstrained Transportation Network, which contains a number of public transit, highway, goods movement, bikeway, pedestrian, and supportive program projects to serve the mobility needs of the region through 2050. These needs require funding above and beyond reasonable assumptions of the revenues that will be available during the period covered by the Regional Plan. The purpose was to create a project list to start with that was based on projected need versus projected revenues. The Unconstrained Transportation Network included not only the projects that have been committed to through the *TransNet* Ordinance (approved by voters in 2004), but also projects from corridor and mobility studies, and needs identified through travel demand modeling.

Project evaluation criteria were then developed to support the vision and three goals of the Regional Plan, and to rank the transportation projects. Meanwhile, revenue projections were developed for the likely amount of funding that would be available for transportation purposes, and in what time periods the funds would be available between now and 2050. The highest ranking projects were then brought together in a series of transportation network scenarios that could be implemented within projected funding availability. Not all of the projects in the Unconstrained Transportation Network could be included in the network scenarios with the highest ranked projects, but this does not mean SANDAG gives up on the projects that do not make the cut. SANDAG will continue to pursue additional funding while focusing available funding on priority corridors and projects. Funding availability, project readiness, and project rankings were all taken into consideration in crafting the transportation network scenarios selected for additional evaluation.

A second set of metrics, or performance measures, were then applied to the transportation scenarios to assess how these groups of projects work together to help people in the region access jobs, schools and services, ensure an equitable distribution of investments, and improve air quality, reduce greenhouse gas emissions, and improve safety. These performance measures were developed following a public process with public input, as described in Appendix N: Evaluating the Performance of the Transportation Network. Then, through another extensive public engagement process with the SANDAG working groups, policy committees, and Board of Directors, as well as the general public via workshops and online comments, a final or preferred network was assembled. This preferred network was accepted by the SANDAG Board to develop San Diego Forward: The Regional Plan. For more information on the evaluation criteria and performance measures, please see Appendix H: Social Equity: Engagement and Analysis, Appendix M: Transportation Project Evaluation Criteria and Rankings, and Appendix N: Evaluating the Performance of the Transportation Networks.



Elements of 21st Century Mobility

An expanded and more efficient public transit system

The transit plan envisioned 30 years ago has been largely realized. Now there's a new vision for the next generation of public transit.

Where We've Been – San Diego Trolley Launched a New Era in the '80s

Back in 1981, the new San Diego Trolley marked a big leap forward for public transit. But a lot has changed since then – for the better. What was a limited collection of local bus routes in the 1970s has evolved into a system of modern local bus services and regional high-speed bus service (*Rapid*), paired up with efficient rail services including the San Diego Trolley, *SPRINTER*, and *COASTER* lines. The result? Annual transit boarding on public transit has more than doubled, from 42 million riders in 1981 to just over 100 million riders in 2013.

Where We're Headed – A Transit Strategy Focused on the Most Urbanized Areas

Over time, plans change to reflect the progress we've made and to incorporate new and changing ideas. The transit plan envisioned 30 years ago has been largely realized. Now there's a new vision for the next generation of public transit. The UATS,²³ developed for the 2050 RTP/SCS in 2011 and used in this Regional Plan as a foundation of the SCS transit network, aims to create a world-class public transit system similar to what many people have experienced in other major cities worldwide. The UATS studied the transit strategies that work best in other cities,

and built upon local market research to help identify what San Diegans want from their transit system. These include:

- Making a strong link between how we design local development projects and how we design the regional transit systems that serve them.
- Focusing improvements to the transit system where the most people and jobs are concentrated, so riders can easily walk and bike to transit stations.
- Making transit more convenient. Market research shows that if trains and buses come by at least every 10 minutes, people don't have to plan their day around transit. Instead, transit is planned around them.
- Offering a range of transit services that fits the needs of riders. Some people use transit for short trips, where local transit services fit their needs. Others use transit for longer trips and where express services with fewer stops are a better option.
- Making the transit trip fast and reliable. Transit-only lanes, traffic lights that give priority to public transit vehicles, and freeway Managed Lanes all can help transit vehicles bypass congested areas.
- Offering lots of ways to get to and from transit stations, including carsharing, bikesharing, and employer shuttles. Infrastructure and safety improvements for people who bike or walk to transit also can help.
- Making transit easy to use. Maximizing investments in current technology can make paying fares easier, transit information more readily available, and enhance choices for getting to and from transit stations.

The UATS used market research, along with local land use plans, to identify the most effective places to concentrate transit improvements. The Smart Growth Concept Map included in Chapter 1 shows the UATS Boundary layer, geographically illustrating the areas where our Regional Plan focuses regional transit investments that serve major activity centers, residential areas, and places of employment. In addition, as discussed earlier in this chapter, transit oriented development (TOD) and complete streets policies help complement the performance of our transit network, the friendliness of our streets, and the overall livability of our communities.

Looking ahead: The transit investments planned for 2050

So, what new transit services and improvements are we planning? In our growing region, public transit will play an increasing role in lightening the load on our roads and highways, and getting people where they want to go quickly and safely. The following is a summary of the major transit projects included in the Regional Plan.



Los Angeles-San Diego-San Luis Obispo (LOSSAN) Rail Corridor: The COASTER, AMTRAK, and Metrolink rail corridor is the nation’s second busiest. Premier passenger rail services connect the San Diego region to Los Angeles and other points north and east. The Regional Plan builds on this corridor by adding more track capacity and improved stations. These enhancements also will benefit shipping, because the LOSSAN corridor serves as the region’s main freight rail line. Figure 2.10 illustrates the Southern California intercity and commuter rail services.

Trolley/SPRINTER/Rapid service: These routes serve as the trunk lines of the regional transit system. Together, they offer fast and reliable rail and bus travel with limited stops in key travel corridors. The Trolley and SPRINTER operate on their own dedicated rail lines, while *Rapid* service operates on freeway Managed Lanes and on local streets. Planned improvements include:

- The Mid-Coast Trolley extending service from Santa Fe Depot in Downtown San Diego to the University City community, serving Old Town, UC San Diego, and Westfield University Towne Centre.
- SPRINTER double-tracking, which will enable higher frequency service, and the extension of service from Escondido south to Westfield North County.
- A new Trolley line from San Ysidro to Carmel Valley along the I-805/I-15 corridors via Chula Vista, National City, Southeastern San Diego, Mid-City, Mission Valley, Kearny Mesa, University City, and Sorrento Valley.
- A new Trolley line from Pacific Beach to the El Cajon Transit Center, via Clairemont, Kearny Mesa, Mission Valley, and San Diego State University (SDSU).

- A new Trolley line from Downtown San Diego to SDSU, along the Park Boulevard and El Cajon Boulevard corridors via Balboa Park, North Park, and City Heights.
- A new Trolley line from University City to Sorrento Valley, which will include a connection to the COASTER.
- New *Rapid* service from Otay Mesa to Downtown San Diego, along State Route 125 (SR 125)/ East Palomar/I-805 corridors via Otay Ranch, eastern Chula Vista, and National City.
- New *Rapid* service from San Ysidro to Downtown San Diego, along the I-5 corridor.
- New *Rapid* service for commuters. This will offer peak period service to key regional job centers along the Managed Lanes of key freeway corridors, including South Bay to Kearny Mesa/University City/Sorrento Mesa via the I-805 corridor; East County to Kearny Mesa/University City/Sorrento Mesa via the SR 52 and I-805 corridors; East County to Downtown San Diego via the SR 94 corridor; South County/Mid-City to Palomar Airport Road corridor via the I-805/I-5 corridors; and Downtown San Diego to Kearny Mesa along the SR 163 corridor.
- New *Rapid* service on arterials. This will operate on arterial roadways and provide limited-stop, high-speed service along several key corridors throughout the region, supplementing existing local bus services. This new arterial service would benefit from a variety of measures designed to give public transit priority along busy roadways (e.g., signal priority for buses and transit-only lanes). The frequency of service will be every 10 minutes (at least) on most routes throughout the day.





- New Airport Services. This will include premium bus transit from select stations along the I-5 and I-15 corridors directly to San Diego International Airport, as well as to the crossborder airport facility with access to Tijuana International Airport. All funding for these airport services is assumed to come from other sources, such as the San Diego Regional Airport Authority and other agencies.

Figure 2.11 shows the network of rail services by 2050, and Figure 2.12 shows the network of *Rapid* services.

Local Bus Services: Local bus services remain the backbone of the regional transit system. Most routes within the Urban Area Transit Strategy boundary will see service frequencies increased to every 10 minutes all day, creating a network of convenient local bus service for short-distance trips and access to rail and *Rapid* services.

Ferry: Another available transportation option is the San Diego-Coronado Ferry. This ferry service offers people more travel choices and vital connections to key job and activity centers. The San Diego-Coronado Ferry, owned and operated by Flagship Cruises & Events, offers two routes that serve Coronado from San Diego, with departures from Broadway Pier every hour and from the San Diego Convention Center every thirty minutes.²⁴ A 15-minute ride delivers passengers to Coronado Ferry Landing, a waterfront marketplace just north of the bridge. Passengers are allowed to bring their bicycles for no extra charge. Meanwhile, people who take the ferry during weekday morning commute hours ride free and are given a return ticket to use in the afternoon. The ferry has an average of 73,000 boardings per year during commute hours, based on data from 2004 to 2015, and it supplements an existing bus service (Route 901), which serves about half a million passengers annually during commute hours.

Streetcars/Shuttles: Streetcars and shuttles are great for short distance trips, and in many ways they can help strengthen community character and generate economic activity. Streetcars are rail vehicles that operate in auto travel lanes and offer short-distance rides within neighborhoods. They also offer connections to regional transit lines. The Regional Plan includes streetcars that would operate in several neighborhoods in and around Downtown San Diego, connect North Park with Downtown San Diego, and link La Jolla with Mission Beach via Pacific Beach. A shuttle in Downtown San Marcos also is included. Most funding for streetcars and shuttles is assumed to come from non-transit sources, such as local agencies and business improvement districts.

Seniors and People with Disabilities: The Regional Plan reserves 10 percent of transit operations funding for seniors and persons with disabilities. Five percent of the funds are reserved for Americans with Disabilities Act (ADA) services. Additionally, the Regional Plan includes 5 percent of transit operations funds to support a coordinated system of services provided by social services agencies for “door-through-door” assistance for seniors and persons with disabilities.

High-Speed Train Service: In coming years, our state will be home to a high-speed rail line connecting Northern and Southern California. The first legs of this exciting rail system are being built now in the Central Valley. When completed, high-speed trains will connect San Diego, Los Angeles, San Francisco, and Sacramento. In San Diego, high-speed trains will arrive at the future Intermodal Transportation Center to be located adjacent to the San Diego International Airport. This is a project funded by the State of California.²⁵



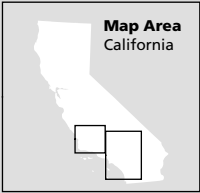
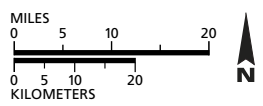


Figure 2.10
Southern California
Intercity/Commuter Rail
and San Diego Region
Airport Locations
October 2015

- █ Amtrak Pacific Surfliner
- █ Metrolink Ventura County Line
- █ Metrolink Antelope Valley Line
- █ Metrolink San Bernadino Line
- █ Metrolink Riverside Line
- █ Metrolink 91 Line
- █ Metrolink Orange County Line
- █ Metrolink Inland Empire-Orange County Line
- █ COASTER
- Rail Station

- Airport Operator**
- City of Oceanside
 - City of San Diego
 - County of San Diego
 - Grupo Aeroportuario del Pacifico
 - Military
 - San Diego County Regional Airport Authority



UNITED STATES
 MEXICO

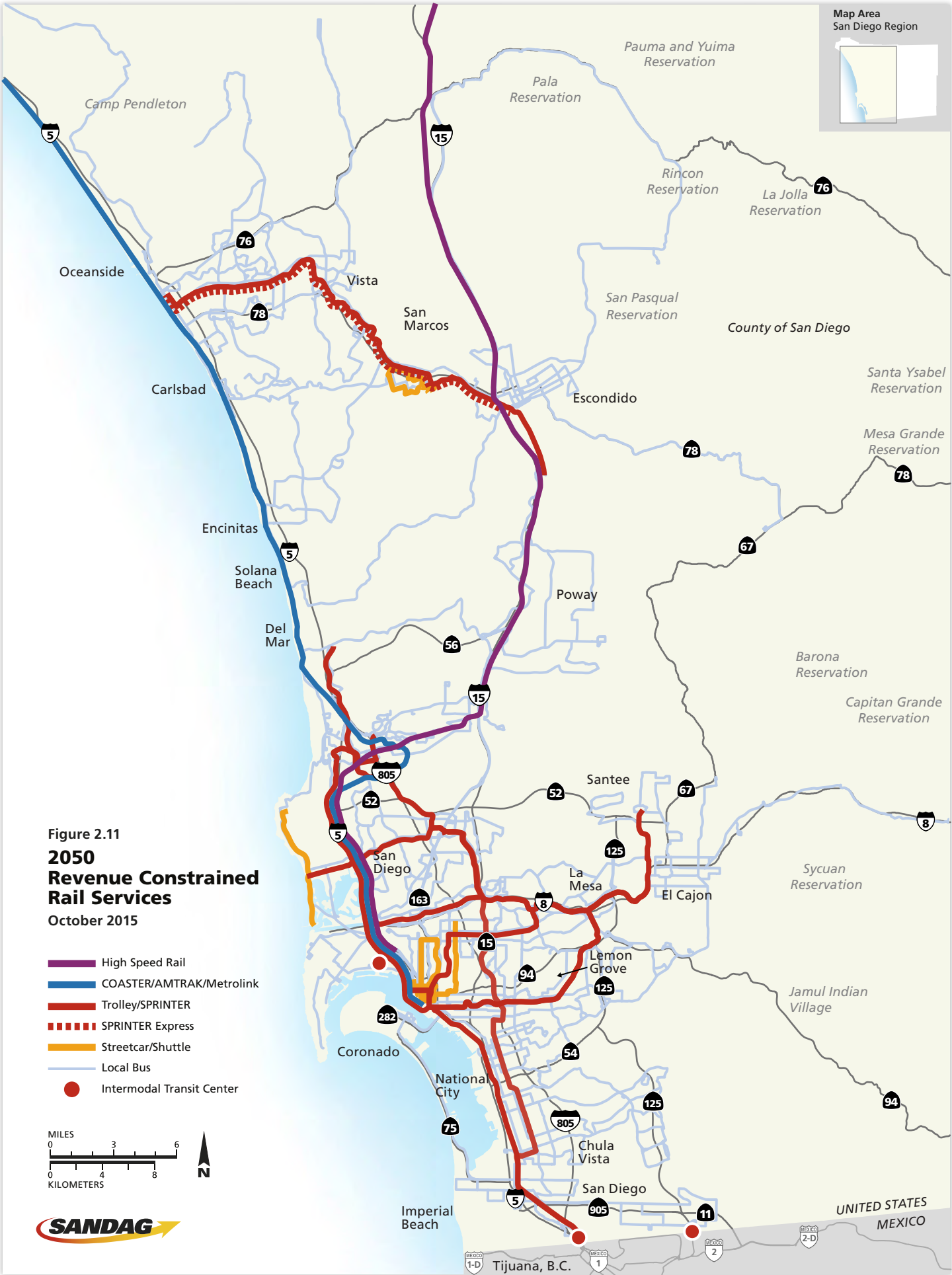


Figure 2.11
**2050
Revenue Constrained
Rail Services**
October 2015

- High Speed Rail
- COASTER/AMTRAK/Metrolink
- Trolley/SPRINTER
- SPRINTER Express
- Streetcar/Shuttle
- Local Bus
- Intermodal Transit Center

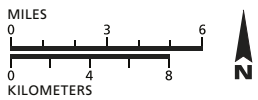




Figure 2.12
2050
Revenue Constrained
Rapid Services
 October 2015

- Rapid Transit
- Local Bus
- Intermodal Transit Center

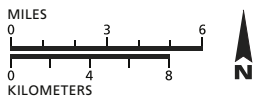


Figure 2.13 shows all of the transit investments included in our Regional Plan by 2050. The Regional Plan offers a robust and interconnected network of services that promote quick and convenient travel to the places we live, work, and play in our region’s most urbanized areas. We’ve come a long way since the initial transit network from the 1970s. With nearly 50 percent of the Regional Plan’s revenues going toward transit infrastructure and operations, we’re moving ambitiously toward the world-class transit system envisioned in the UATS – a natural progression that builds on our success over the last 30 years. A new local funding source starting in 2020 will be needed to implement many of the new services.

The active transportation network: Healthy alternatives to driving

More of us than ever before are choosing to walk or ride our bikes to more places. Biking and walking, while not for everybody all the time, are important choices for many people. They’re good for the environment and for our health.

Over time, choosing to walk and bike has become known as active transportation, because these two forms of getting around provide opportunities for exercise (i.e., being active), rather than letting a car do the work.

At some point in the day, walking is a part of most every person’s life. That’s particularly true in mixed-use, smart growth neighborhoods, where people often walk and sometimes bike between their homes, stores, parks, schools, and jobs.

With nearly 50 percent of the Regional Plan’s revenues going toward transit infrastructure and operations, we’re moving ambitiously toward the world-class transit system envisioned in the Urban Area Transit Strategy – a natural progression that builds on our success over the last 30 years.



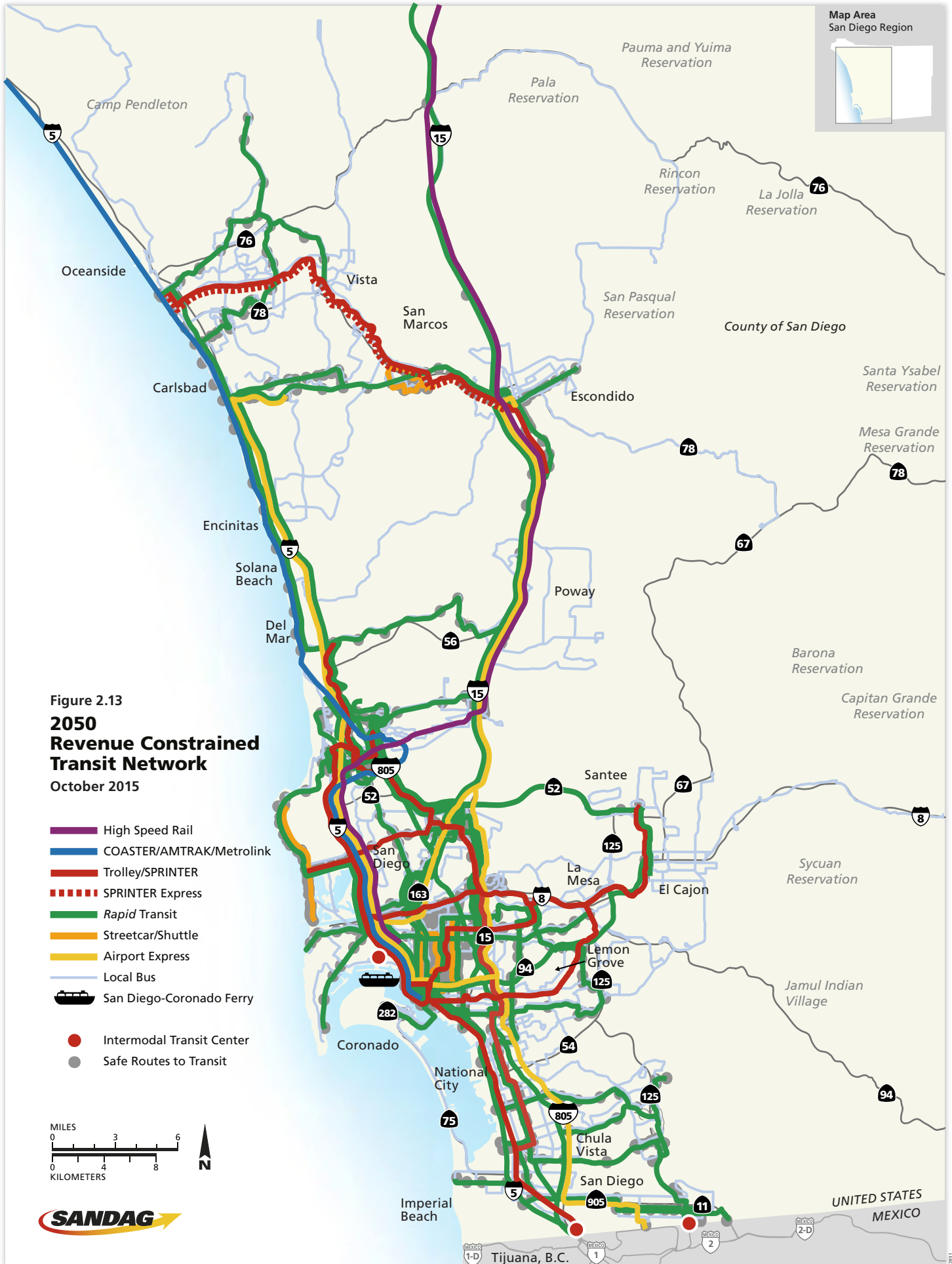
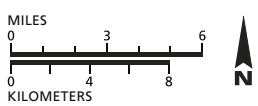


Figure 2.13
2050 Revenue Constrained Transit Network
 October 2015

- High Speed Rail
- COASTER/AMTRAK/Metrolink
- Trolley/SPRINTER
- - - SPRINTER Express
- Rapid Transit
- Streetcar/Shuttle
- Airport Express
- Local Bus
- San Diego-Coronado Ferry
- Intermodal Transit Center
- Safe Routes to Transit



Our active transportation projects are intended to make walking and biking safer, particularly for students, seniors, and people with disabilities. Walking and biking will only be viable choices for people if they're safe. The Regional Plan recognizes this, and so it incorporates safe bike and pedestrian access into investments in other modes of travel, including public transit and highway improvements.

The Regional Plan's Active Transportation Implementation Strategy²⁶ includes the projects and programs described below. It includes projects that comprise the Active Transportation Network, which are found in the Regional Bike Plan, as well as Safe Routes to Transit projects and bike and pedestrian improvements in and around highway and freeway interchanges. The Strategy also includes various educational programs and data collection efforts. The Strategy will provide safer access for pedestrians, particularly the most vulnerable roadway users such as school children, seniors, and people with disabilities.

Regional Bike Plan: The regional bike network is a valuable resource for people who choose to bike. This network was identified in *Riding to 2050: The San Diego Regional Bicycle Plan*, which SANDAG adopted in 2010.²⁷ It is incorporated into the Regional Plan. As shown in Figures 2.14 and 2.15, the bike plan details 40 interconnected bike corridors throughout the region, which total more than 500 miles of bike routes.²⁸ The goal of the Regional Bicycle Plan is to make it more practical and desirable for people to choose biking for everyday trips. By 2050, the Regional Plan includes full build-out of the entire regional bike network. Most bike projects will have safety improvements not only for people on bikes but also for pedestrians, including shortened crossing distances at intersections.

Safe Routes to School: The San Diego Regional Safe Routes to School Strategic Plan, which SANDAG adopted in 2010, was designed to help local communities establish Safe Routes to School programs.²⁹

Safe Routes to Transit: Safe Routes to Transit projects will make walking or riding a bike between transit stops or stations and a variety of destinations – including residential areas, commercial centers, and places of employment – safer and more comfortable.³⁰ (See Figure 2.13 for Safe Routes to Transit Improvements.) Retrofit Safe Routes to Transit projects also would be considered as part of the Mobility Hub Implementation Strategy given the nexus between mobility hubs at transit centers and access to those centers by pedestrians and people on bikes.

Education and Data Collection Efforts: The Regional Plan includes investments in education on bike and pedestrian safety, outreach and encouragement programs such as GOBYBIKE, and data collection and modeling.

Active Transportation Improvements Related to Highway and Freeway

Interchanges: When walking or riding a bike, crossing highway on-ramps and off-ramps is often the most dangerous and difficult part of a person's trip. Our Regional Plan includes the incorporation of safer crossings as part of future projects at freeway

Our Active Transportation projects are intended to make walking and biking safer, particularly for students, seniors, and people with disabilities.



Figure 2.14
2050 Revenue Constrained Regional Bike Network
 October 2015

- Class I - Bike Path
- Cycle Track
- Bike Boulevard
- Enhanced Class II - Bike Lane
- Enhanced Class III - Bike Route
- Freeways and Highways
- Regional Arterials

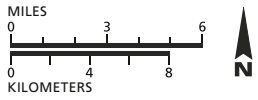


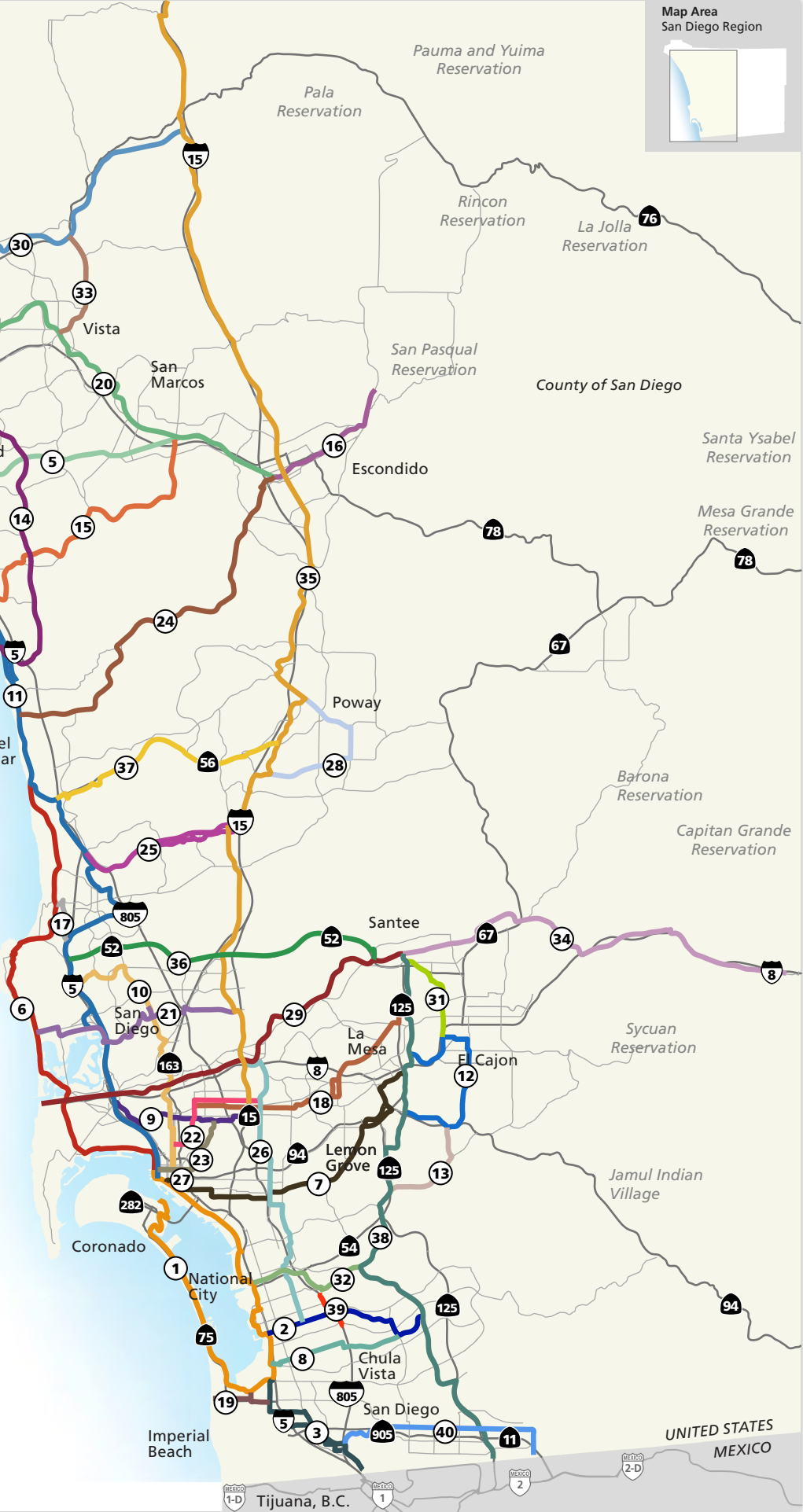
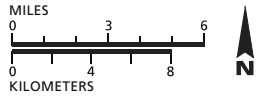


Figure 2.15
2050
Regional Bike
Network Corridor
Alignments

October 2015

- 1 Bayshore Bikeway
- 2 Bay to Ranch Bikeway
- 3 Border Access Corridor
- 4 Camp Pendleton Trail
- 5 Carlsbad - San Marcos Corridor
- 6 Central Coast Corridor
- 7 Centre City - La Mesa Corridor
- 8 Chula Vista Greenbelt
- 9 City Heights - Old Town Corridor
- 10 Clairemont - Centre City Corridor
- 11 Coastal Rail Trail
- 12 East County Northern Loop
- 13 East County Southern Loop
- 14 El Camino Real
- 15 Encinitas - San Marcos Corridor
- 16 Escondido Creek Bikeway
- 17 Gilman Connector
- 18 Hillcrest - El Cajon Corridor
- 19 Imperial Beach Connector
- 20 Inland Rail Trail
- 21 Kearny Mesa - Beaches Corridor
- 22 Kensington - Balboa Park Corridor
- 23 North Park - Centre City Corridor
- 24 Mid-County Bikeway
- 25 Mira Mesa Corridor
- 26 Mission Valley - Chula Vista Corridor
- 27 Park Boulevard Connector
- 28 Poway Loop
- 29 San Diego River Bikeway
- 30 San Luis Rey River Trail
- 31 Santee - El Cajon Corridor
- 32 Sweetwater River Bikeway
- 33 Vista Way Connector
- 34 I-8 Corridor
- 35 I-15 Bikeway
- 36 SR 52 Bikeway
- 37 SR 56 Bikeway
- 38 SR 125 Corridor
- 39 I-805 Connector
- 40 SR 905 Corridor

— Freeways and Highways
— Regional Arterials



and highway interchanges. (See Figure 2.16 for Active Transportation Improvements related to Highway and Freeway Interchanges.) Retrofit active transportation improvement projects surrounding existing highway on- or off-ramps will be considered for implementation as part of future operations and maintenance projects using State Highway Operations and Preservation Program (SHOPP) dollars.

California Coastal Trail: The California Coastal Trail (CCT) is made up of a series of trails stretching 1,300 miles up and down the California coastline.³¹

The CCT is intended as a continuous public right-of-way that extends from the northern border of California to the southern border, all within sight, sound, or at least smell of the ocean. It is the CCT's proximity to the ocean that makes it distinctive among other trails.

SANDAG has developed a technical memoranda entitled "Feasibility Study for the San Diego Portion of the California Coastal Trail" to inform the scoping of a comprehensive feasibility study for the region. The documents lay the groundwork and gather preliminary material to help identify existing and potential network segments, linkages, gaps, and coastal access routes. These technical memoranda are located in Technical Appendix U.5: California Coastal Trail Technical Memoranda. A map of the California Coastal Trail is included in Appendix A: Transportation Projects, Costs, and Phasing, as requested by Government Code Section 65080.1. Trails identified in the San Diego County Community Trails Master Plan (CTMP) are included on this map as well.

Offering people more route choices

Local Streets and Roads

Local streets and roads can get busy, especially on weekdays when kids are getting dropped off at school and people are heading to work in the morning, and when people are heading home in the afternoon. On many weekends, it seems as though everyone is out – in cars, on bikes, riding scooters and skateboards, walking, and running. So it's vital to keep local streets and roads in good shape and safe. Our region has thousands of miles of local streets and roads, and they demand a lot of care to make sure they're serving people well. Our investment plan dedicates a great deal of resources to help local jurisdictions improve, rehabilitate, and maintain these local roadways.

An important function of local streets and roads is to accommodate the various buses, Trolleys, and streetcars that connect our local neighborhoods and surrounding communities. So, our investment plan includes funding to ensure that these vehicles can flow smoothly. Among the planned projects, improvements include: coordinating traffic signals, managing systems that detect traffic, implementing technology that gives public transit priority on roads and at intersections (such as queue jumpers), and deploying management systems that optimize the flow of arterials.

Our investment plan dedicates a great deal of resources to help local jurisdictions improve, rehabilitate, and maintain the local roadways.



While local roads and streets are the responsibility of our cities and the County government, completing the Regional Arterial System (RAS) is nevertheless a continued priority in our Regional Plan.³² For vanpools, carpools, and solo drivers, regional arterials offer critical links to highways. The RAS is the network of regional roadways and local streets that, along with the system of highways and transit services, allows for a significant amount of mobility throughout the region.

The region’s 18 cities and the County have planned improvements to arterials within their jurisdictions, and these improvements are detailed in Appendix A.

Managed Lanes: Adapting the Highway System for Optimal Mobility

The Regional Plan also supports a flexible highway system. By “flexible” we mean that some highway lanes can be dedicated to certain users to create a wide range of time-competitive travel choices on our highway system. Within this plan, these lanes are referred to as “Managed Lanes.” They generally fall into three categories:

- *Express Lanes:* These are lanes in the middle of the highway that give priority access to transit, carpools, vanpools, motorcycles, and certain clean-air vehicles at no cost. Excess capacity on these Express Lanes is available for people driving alone to travel for a fee through the FasTrak® program. These “freeways within a freeway” also can be constructed with moveable barriers, allowing different

The Regional Plan supports a flexible highway system that can be accessed by many types of users.



lane configurations such as three lanes in one direction and one lane in another, instead of two lanes in each direction. Express Lanes are managed to ensure that the people who use them can bypass congestion. Access to Express Lanes is typically provided along the route, and electronic signs post the cost for solo drivers. On-ramps to Express Lanes – such as direct access ramps – allow vehicles to safely drive onto them.

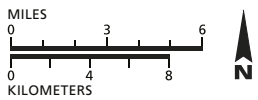
- *Carpool Lanes:* These lanes, also known as HOV or high occupancy vehicle lanes, have a limited number of access points along the highway. They are similar to Express Lanes, but solo drivers are precluded from using them. Each vehicle that travels onto an HOV lane must carry the minimum number of people posted at the entrance sign. Currently in San Diego County, that number is two, but some areas of the state require three. Some HOV lanes in California are active only during peak commute times, but the HOV lanes in San Diego County operate all day.
- *Transit-Only Lanes:* These lanes are open only to transit vehicles. They accommodate both regional and local bus services.

One of the important features of the Express Lane system is that the fee that solo drivers pay to use Express Lanes (through the FasTrak system) supports transit service along the same corridor. This is now the case along the I-15 corridor and is planned as a feature for other corridors in the future. As shown in Figure 2.16, the Regional Plan includes a robust system of Managed Lanes that can be designated as Express Lanes, carpool lanes, or transit-only lanes.



Figure 2.16
2050
Revenue Constrained
Managed Lanes and
Highway Network
October 2015

- Existing Managed Lanes
 - Managed Lanes
 - General Purpose Lanes
 - Toll Lanes
 - Operational Improvements
 - Existing Facility
 - Freeway Connectors
 - ML Connectors
 - Freeway & ML Connectors
 - Bicycle/Pedestrian Improvements at Freeway Interchanges
- C = Conventional Highway
F = Freeway
ML = Managed Lanes
T = Toll Road
R = Reversible Lanes
OPS = Operational Improvements





The San Diego region is building its Managed Lanes system incrementally. In 2012, the region had about 30 miles of HOV lanes and Express Lanes on sections of I-5, I-15, and I-805. An important strategy of the Regional Plan is to continue to guide the development of the freeway system into a fully interconnected network of Managed Lanes that supports not only carpools, vanpools, and fee-paying solo drivers, but also the extensive network of *Rapid* transit services that is planned for full build-out with the Regional Plan.³³ The Regional Plan includes funding for four new Managed Lanes on segments of I-5, I-15, and I-805, and funding for two new Managed Lanes on portions of SR 52, SR 54, SR 78, SR 94, and SR 125. By 2050, the region’s Managed Lane system will include about 160 miles. In addition to Managed Lane improvements, the Regional Plan includes direct Managed-Lane-to-Managed-Lane connectors where major facilities intersect.

The I-15 corridor is one of the region’s best examples for how to integrate transit and roadways into a flexible transportation system for an entire corridor. The 20-mile segment between SR 163 and SR 78 includes four Express lanes that feature a movable barrier (similar to the movable barriers on the San Diego–Coronado Bridge); dynamic pricing; multiple access points to regular highway lanes; and direct access ramps for buses, high occupancy vehicles, and toll-paying customers. Revenues from toll-paying customers are used to help fund public transit in the corridor. High-frequency *Rapid* transit vehicles operate in these lanes, enhancing connectivity to regional job centers for residents throughout the region.

In the future, *Rapid* transit service connecting Otay Mesa to Downtown San Diego will run on the I-805 and SR 94 Express Lanes. *Rapid* transit express service with limited stops, between San Ysidro and Downtown San Diego, will operate on the I-5 Managed Lanes.

During peak periods, *Rapid* transit vehicles using the I-805, I-5, SR 52, and SR 94 Express Lanes will carry commuters from their neighborhoods to where they work. Routes include South County to Kearny Mesa/University City/Sorrento Mesa on the I-805 corridor; East County to Kearny Mesa/University City/Sorrento Mesa on the SR 52 and I-805 corridors; East County to Downtown San Diego via the SR 94 corridor; and South County/Mid-City to Palomar Airport Road via the I-805 /I-5 corridors. South County *Rapid* routes also provide services to individuals who live in Baja California.

Highway Improvements

Highway improvements (including highway lanes, freeway connectors, and operational improvements) complement and complete the existing highway network. Planned improvements will increase the efficiency of the regional transportation system. The vast majority of the investments are focused on Managed Lanes that also support transit and carpooling instead of traditional general purpose lanes.

Toll Roads

State Route 11, a proposed two-mile toll highway, will connect the future Otay Mesa East Port of Entry (POE) with the rest of the region’s freeway system via SR 905 and the South Bay Expressway. The new POE will offer an alternative to the highly congested ports of entry at Otay Mesa and San Ysidro, benefitting the regional economy and the environment by reducing border-crossing wait times. Separately, new toll lanes are envisioned on the I-5 corridor north of SR 76 and on I-15 north of SR 78, if demand builds over time and the improvements can be financed with toll revenues.





Applying the latest technologies to maximize mobility

To make our transportation system as efficient and user-friendly as possible, the Regional Plan envisions a network of high-tech tools to help transportation managers keep the system running smoothly, and to help travelers make their trips faster, more efficient, and trouble-free.

Intelligent Transportation Systems (ITS) is the term that describes a whole variety of technology applications to different modes of travel. We've all seen those electronic alerts on the freeway that give us a heads up on road construction, or warn us of an accident up ahead. And many of us have used FasTrak transponders to zip onto Express Lanes, toll roads, and bridges. Those are basic examples of how technology can be used to keep us moving efficiently and safely. Technology also can be leveraged inside cars, on local roads, at intersections, with public transit, and throughout bike and pedestrian networks. Technology, applied intelligently, is most powerful when it gives each of us the ability to choose the best mode of travel for a given circumstance.³⁴

Technology embedded into the transportation system will grow even more useful when it's linked to our smart phones, tablets, and other hand-held computing devices. There's no reason why our regional transportation system can't leverage the power that mobile applications, or apps, and other smart phone features give us – and they will.



The benefits of these technologies go beyond speeding up the commute. Better informed travelers and more efficiently run roadways and transit systems can lead to lower demands on the overall transportation system. People have the information to make smarter choices about when and where to hit the road, and to drive alone less often. Better access to real-time information also can encourage people to use public transit more, or choose to bike or walk instead of driving.

Our region already uses, is developing, or plans to develop several emerging technologies to make the transportation system more efficient.³⁵ Here are several examples:

- **Vehicle Technologies:** It's the kind of stuff you see now in movies and sci-fi television shows – cars and other vehicles that drive themselves and are connected to one another and the larger environment through which they're traveling. But those kinds of technologies aren't fiction. They're coming. Autonomous or automated vehicles are evolving from today's driver-assist vehicles to vehicles that will be able to operate independently, and use sensors to survey their surroundings and respond to changing conditions. Vehicles that communicate wirelessly with one another will work cooperatively to increase the capacity of highway lanes, use fuel more efficiently, and increase safety. By 2025, driverless cars are expected to begin replacing conventional cars. Autonomous vehicle technologies will transform public transit as well, increasing efficiency and accessibility while reducing congestion.

By 2025, driverless cars are expected to begin replacing conventional cars. Autonomous vehicle technologies will transform public transit as well, increasing efficiency and accessibility while reducing congestion.



- **MultiModal Management:** Our region’s network of freeways, arterials, roads, transit systems, bike paths, and sidewalks must be managed as a unified transportation system so that all modes of travel work together most efficiently. Doing this requires implementing Integrated Corridor Management (ICM). An important step toward making this happen is expanding the Regional Communications Network, a high-speed, inter-governmental data network that supports the San Diego region by defining, designing, and deploying specific projects that make the entire system work more effectively. The Regional Communications Network also improves mobility by allowing system managers to assess real-time travel conditions and then provide travelers with options. Expanding the Regional Communications Network would result in:
 - The deployment of a Dedicated Short-Range Communications (DSRC) system to support future Vehicle Infrastructure Integration (VII);
 - Enhanced data collection for regional arterials, bikeways, and pedestrian facilities in order to better monitor how the transportation system is performing; and
 - An enhanced California Freeway Performance Measurement System, which collects data that can be used to improve both transit and road performance.

An emerging technology within Multimodal System Management is real-time computer modeling and simulations of multiple modes of travel.

These applications are designed to simulate and evaluate traffic patterns, and then develop strategies for making the transportation system more efficient across jurisdictional boundaries – all within minutes. Equipped with this technology, system managers can better forecast traffic patterns and pursue operational changes to minimize delays and congestion.

- **Smart Parking:** Smart parking combines management strategies and technology to deliver advanced parking solutions for communities. Smart parking systems can inform people where, when, and how much parking is available in the vicinity of their destination – even before they take their trip. Smart parking systems collect, analyze, and report data to help determine, for example, how public parking lots are being used, and to provide people the facts they need to use available parking more efficiently. Information like this can help people decide when to leave, whether to travel by car or by transit, what public transit service to take, or what route to choose.

The practical application of management strategies and smart parking technology has many benefits. It can reduce unnecessary driving to find a parking space, saving time and gas while also reducing greenhouse gas emissions and traffic congestion; provide travelers with improved information, as real-time parking information will supplement transit alerts like departure and arrival times; and improve the management and financial health of parking lots and garages.

- **Universal Transportation Account:** A unified or universal transportation account combines all forms of public transportation payments, including transit fares, municipal parking, and toll collection into a single user-friendly system. By offering rewards based on frequent use, toll discounts and other incentives, the system can lead to a shift from driving alone to using public transit. A universal transportation account can be at the heart of a well-connected city, where people constantly receive information from the transportation network and are provided with the best options for their trips – based on their priorities, including cost, convenience, speed, and environmental impact.

A universal transportation account can be at the heart of a well-connected city.

Other emerging technology trends and programs

Other emerging technologies and programs that could have an impact on transportation demand, systems management, travel choices, and system accessibility include:

- Traveler Information Program
- Arterial Management
- Freeway Management
- Transit Management System
- Advanced Transportation Technology Program
- Transit Infrastructure Electrification/Regional Charger Program
- Active Traffic and Demand Management

These technologies and programs are described in Appendix E: Transportation System and Demand Management Programs, and Emerging Technologies.

Transportation Demand Management

Managing demands on the existing transportation system is an important strategy for making the overall system more efficient.

The Regional Plan makes investments in emerging TDM innovations that are gaining traction across the globe. They are envisioned as key components of the Regional Plan. These TDM innovations have the potential to help transform the way that we travel within and between our communities. One of the new investment areas is “mobility hubs,” or transportation centers focused around particular geographic locations and designed to give people more options for getting around. The other is “shared mobility services,” which give people alternatives to owning a car, such as shared, temporary, and convenient transportation options when they need them. These two innovations, mobility hubs and shared mobility services, can transform our transportation behaviors and patterns. Let’s take a closer look at them:

- **Mobility Hubs:** What exactly are mobility hubs? They’re places of connectivity, where different modes of transportation — walking, biking, ridesharing, and transit — come together seamlessly to connect people to their jobs, school, shopping, errands, recreation, and back home. Smart growth areas are excellent places to build mobility hubs, because of their mixture of land uses and transit amenities.

Access to transit is a key ingredient of a mobility hub. We all recognize that getting to and from transit stations can sometimes be challenging, and those first and last steps often end up being deterrents to using public transit. Mobility hubs can solve that problem. They promote options like carsharing, bikesharing, and neighborhood electric vehicles – for short trips within the neighborhood or to connect to the transit station for longer trips outside the area.



Meanwhile, mobility hubs include several features onsite that make using public transit easier. These include bike and pedestrian improvements, signs or apps that help people find their way (akin to “You Are Here” maps at shopping malls), urban design enhancements, real-time traveler information, parking spots for shared mobility services, and a universal payment system. Figure 2.17 provides an example of what elements could be included in a mobility hub.

A near-term action of the Regional Plan is to develop a “Regional Mobility Hub Implementation Strategy” to further define the mobility hub concept for the San Diego region and to identify opportunities for pilot projects (See Chapter 5).

Mobility hubs will play a big role in the lives of many people. By 2050, 87 percent of the region’s new housing and 79 percent of new jobs will be situated within a half-mile of public transit – making mobility hubs increasingly useful and accessible to all travelers including persons with disabilities and seniors.

- Shared Mobility Services:** The Regional Plan promotes shared mobility, which reduces the need to own and drive a private automobile by offering people on-demand access to convenient and affordable transportation options for any type of trip, whether or not these are in mobility hub areas. These options include carsharing, bikesharing, real-time ridesharing, Transportation Network

Companies (e.g., Uber, Lyft, Sidecar), neighborhood electric vehicles, scootershare, and shuttle or jitney services. Shared mobility services give people convenient alternatives to driving alone, in addition to the more traditional options such as public transit, carpooling, vanpooling, biking, or walking to work. Shared mobility can even provide people with options for running an errand or going to an off-site meeting in the middle of the workday.

The idea of shared mobility is becoming more popular in our region. Carsharing and bikesharing have experienced unprecedented growth. As of 2014, more than 33,000 people had access to more than 400 carshare vehicles regionwide. Early research shows that people who carshare drive less and use public transit more because shared mobility options complement public transit. As a result, opportunities to pair up shared mobility and mobility hubs provide great potential to influence our transportation choices and patterns.

While the section above focuses on innovative strategies to manage the demands on our transportation system, it's important to remember that many of our existing TDM programs have been very effective for years. They are expected to continue to make valuable contributions to the efficiency of the transportation system. These more traditional TDM strategies include the Regional Vanpool Program, employer services and outreach, and commuter services and bike programs.



Source: Mike Di Edoardo



Addressing Parking Needs

When it comes to planning for a more efficient transportation system, parking is a big focus. Many of us are often concerned about the location, price, supply, and convenience of parking, as well as the impact it has on travel choices and even the affordability of housing, among other issues. There are growing concerns about how parking impacts the transportation system, land use, and the design of our communities.

Over the years, SANDAG studies have shown that managing parking effectively can help communities achieve their goals for smart growth, mobility, and a healthier environment. We've also learned that proactive parking programs can support thriving commercial districts, affordable housing development, and increased choices for travelers. While many parking studies have been prepared, the need for a practical set of parking management strategies – a parking toolbox to help city governments cope with parking issues – was identified in the 2050 RTP/SCS.

SANDAG, in collaboration with local jurisdictions, businesses, and other community organizations, developed the Regional Parking Management Toolbox as part of the Regional Plan. The toolbox is one of many planning and financing tools that support smart growth and sustainable development. In short, it is an interactive, [web-based resource](#)³⁶ for local jurisdictions to identify parking-related challenges, such as long-term parkers using on-street spaces, spillover into neighborhoods, or parking issues faced by small businesses, and apply solutions that fit local communities, such as comprehensive curb lane management policies, valet zones, or the use of transitional parking spaces.³⁷ As we move toward smarter growth and implementing mobility hubs and shared mobility services, the parking toolbox can help communities apply approaches that meet their specific needs.

Defining Proactive Parking

Programs: A proactive parking program relies on local data collection and analysis to identify current parking issues and evaluate parking management solutions. Proactive parking management seeks to continuously balance parking supply and demand to create a parking system that serves the needs of businesses, residents, and visitors alike.



Promoting Sustainable Mobility: Building Infrastructure for More Environmentally-Friendly Vehicles

Reducing the number of miles that people travel in their cars is an important goal for our Regional Plan. Transitioning to more fuel efficient vehicles and alternative, low-carbon fuels are key steps toward a more sustainable San Diego region. Fuel efficiency improvements and alternatives also comprise a major part of the state of California's plan for reducing greenhouse gas emissions from the transportation sector.

1.5 million zero-emission vehicles will be operating in California by 2025.

This transition will be implemented primarily through the state's Low Carbon Fuel Standard (LCFS) and Advanced Clean Cars Program. The LCFS calls for a reduction of at least 10 percent in the carbon intensity of California's transportation fuels by 2020. The Advanced Clean Cars Program is designed to boost vehicle efficiency by combining greenhouse gas emission standards and other air pollution requirements into a single package of standards. Under the program, 1.5 million zero-emission vehicles (ZEVs) will be operating in California by 2025, and 15 percent of new car sales will be ZEVs by then. For the state to meet its clean vehicle goals, new fueling infrastructure is needed statewide to power ZEVs and alternative fuel vehicles.

California also is working to reduce greenhouse gas emissions from transportation statewide by promoting the use of alternative fuels (including propane, natural gas, biodiesel, and ethanol). In our region, efforts are underway to promote the use of zero-emission vehicles and alternative fuels, and to ensure that we have the infrastructure to support them.

Since 2012, SANDAG has provided a forum for local governments and other regional stakeholders to discuss how to lower barriers to increasing the number of alternative fuel vehicles, and how to take steps toward building the needed fueling stations. In 2014, SANDAG completed a [regional readiness plan for plug-in electric vehicles \(PEVs\)](#)³⁸ and charging stations, as shown in Appendix U.12: San Diego Regional Plug-In-Electric Vehicle Readiness Plan. By 2016, an expanded plan that also addresses readiness for all alternative fuels will be completed.

As of 2015, our region is home to more than 16,000 plug-in electric vehicles and more than 500 public charging stations, including more than 20 DC Fast Chargers, a type of electric vehicle charging station, along key corridors. Moving forward, the readiness plan for plug-in electric vehicles identified barriers that the region still needs to address. These include the need for a better installation process for chargers at multi-unit dwellings, at the workplace, and at other commercial sites. Also needed is a more streamlined permitting process, as well as the integration of plug-in electric vehicle infrastructure into building codes. The Regional Plan provides us with an opportunity to continue to be leaders in this area, and to address these barriers to progress toward wider use of zero-emission vehicles.

Our region is home to more than 16,000 plug-in electric vehicles and more than 500 public charging stations.





Separating Key Rail Crossings and Busy Streets from One Another

The transportation system is not just a collection of disconnected modes of travel. At its best, a transportation system integrates all modes of travel into a unified whole, so that people and goods can travel efficiently and safely. Rail-grade separations offer a good example of how our transportation system can work together. When tracks are separated from streets, cars, trucks, bicyclists, pedestrians, and the goods shipped by rail can get to where they're headed without coping with conflicts built in to the system. Rail-grade separations are expensive, and their construction must be prioritized. However, over the years we've added them in key locations throughout the region. The Regional Plan identifies several additional places where rail-grade separations will help the transportation system function more smoothly and safely. By 2050, nine rail-grade separations are proposed along the LOSSAN and SPRINTER corridors. On the Orange and Blue Line Trolley lines, 11 rail-grade improvements are planned by 2050.

Connecting the Region and Crossing Borders

The San Diego region, with the greater Los Angeles area to the north, the international border region of Baja California to the south, and agricultural industries to the east, sits between major centers of production, trade, and population. We depend on an integrated transportation network to effectively move people and goods within our region, in and out of our region, and through our region to the rest of the nation and around the world. In our region, I-5, I-15, and SR 125 are major north-south corridors, while I-8 is the key east-west corridor for domestic cargo and international trade.

Our regional transportation system also is impacted by interregional commuting patterns between San Diego County and Imperial, Orange, and Riverside counties.

Three international land ports of entry operate between San Diego County and Baja California, while a fourth is planned at Otay Mesa East. Additionally, a crossborder airport terminal connecting San Diego to the Tijuana International Airport is under construction. Another three land ports of entry connect Imperial County to Baja California. All of these accommodate millions of crossings every year, including pedestrians, people on bikes, personal vehicles, and buses as well as trucks and trains carrying cargo.

The San Ysidro POE is one of the busiest border crossings in the world, with an estimated 59 million bidirectional crossings in 2014.³⁹ The port primarily processes pedestrians and passenger vehicles, but it also handles trade on a small-scale through its intermodal rail cargo facility.

The San Ysidro port of entry is one of the busiest border crossings in the world and the Otay Mesa port of entry is the busiest commercial crossing in California.



The Otay Mesa POE is the busiest commercial crossing in California, and it processes the third highest dollar-amount value of U.S.-Mexico trade on the entire border. In 2014, an estimated 1.6 million trucks carrying nearly \$38.8 billion in trade crossed through the port.⁴⁰ Congestion at this POE causes major delays in crossborder goods movement. The future port at Otay Mesa East is expected to ease congestion in Otay Mesa.

The smallest POE in San Diego County is Tecate. Tecate is a multimodal facility for freight rail, commercial vehicles, personal vehicles, buses, and pedestrians. Projects to modernize the crossborder rail line are being planned. These projects would increase the market potential of this route for the international and interstate shipment of goods.

The Managed Lanes along the I-5, I-805, and I-15 corridors increase the capacity of these highways so they can meet the demands of interregional travel. The improvements at the San Ysidro POE and the additional Cross Border Facility (Cross Border Xpress) connecting with the Tijuana International Airport aim to consistently reduce wait times in the near future. The future land port at Otay Mesa East is intended to cut delays for both individual international crossings and trade. Reductions in wait times reduce the amount of time vehicles spend idling and therefore greenhouse gas emissions.

Transporting goods more efficiently

The shipping of goods fuels the regional economy. It's made possible by an extremely complex network of public and private assets and operations, and as a result it's often the least understood part of the regional transportation system. The flow of goods by truck, rail, air, and sea – throughout our region and across borders – generates a constant stream of raw materials, parts, and finished goods. They all keep us supplied with food, clothing, shelter, vital consumer goods, and discretionary items.

The region's transportation network for shipping goods, also referred to as the "goods movement" network, encompasses the transport of air cargo at airports, the shipping of goods in trucks and rail cars at border crossings, maritime operations, and the flow of energy along pipelines and at terminals, as well as rail yards and mainlines. All of these elements of the goods movement network are served by trucks that use local and regional roadways.

Vital infrastructure serving the movement of goods includes: roadways (local, state, and Interstate routes); Class I and short line track and yards (nearly all rail tracks are shared with public passenger trains); the maritime Port of San Diego (two terminals at Tenth Avenue and in National City); San Diego International Airport's Cargo terminal, as well as smaller air cargo operations; several privately held pipeline networks and associated energy terminals; and finally border crossings by rail at San Ysidro, and by trucks at Otay Mesa and Tecate.

The flow of goods by truck, rail, air, and sea – throughout our region and across borders – generates a constant stream of raw materials, parts, and finished goods.



The SANDAG Draft 2015 Freight Gateway Study Update reviews our goods movement system in detail.⁴¹ But the Regional Plan focuses on a few key points. Among them: goods movement contributes to the regional economy; the planning of goods movement is driven by sophisticated logistical practices that involve lean delivery approaches; there are both inherent conflicts and synergies between personal travel and the movement of goods (e.g., they often share the same assets at the same time, and operations have to be planned carefully); and finally, the movement of goods has to be planned and managed so operations are sustainable. Whenever and wherever possible, our Regional Plan strives to balance the need for mobility and speed, the capacity for growth, economic competitiveness goals, and the importance of clean air and healthy communities.

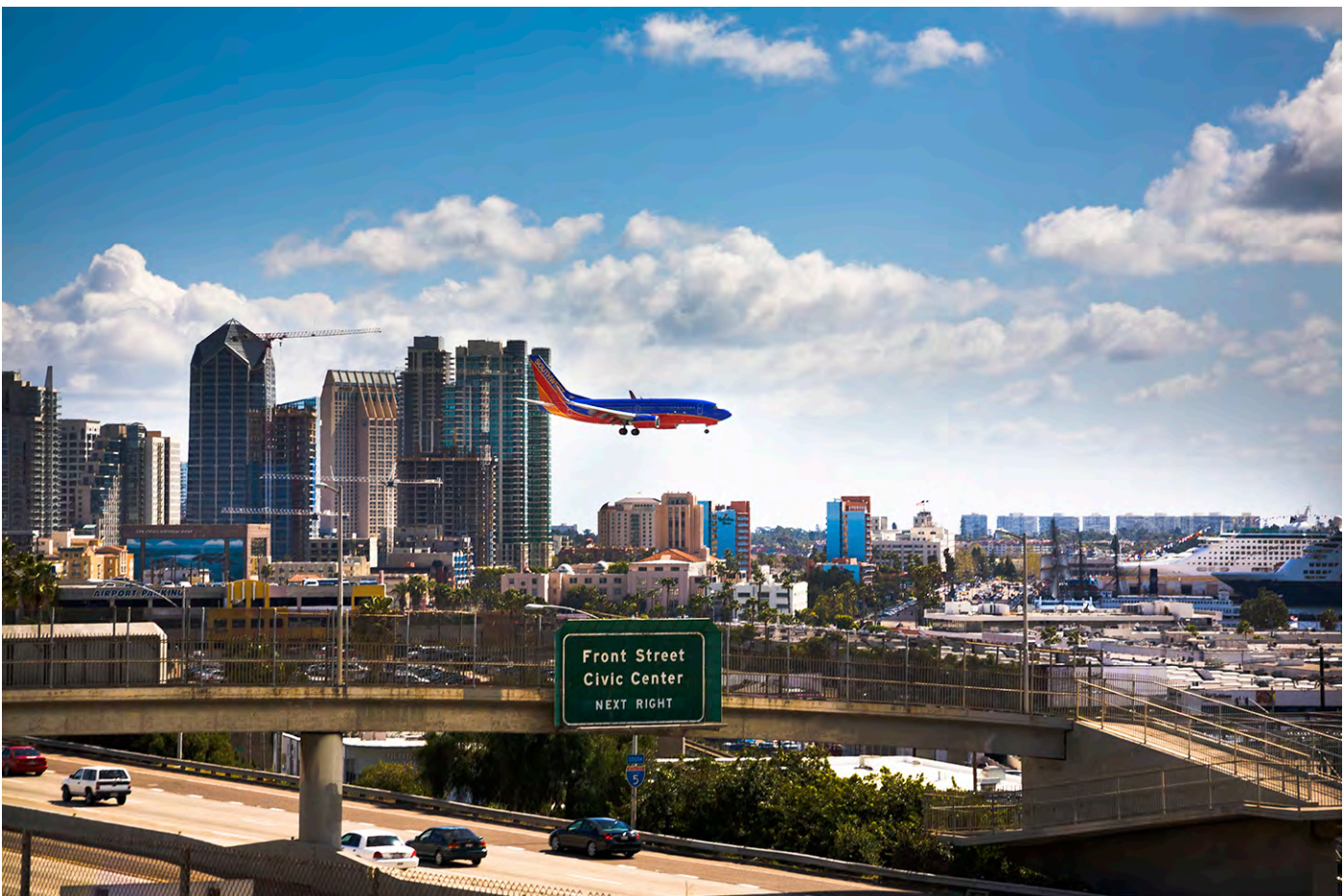
The majority of potential goods movement-related infrastructure projects outlined in our Regional Plan appears in the list of “unconstrained” goods movement projects.⁴² There are far more projects in the unconstrained list than in the “preferred” or “revenue-constrained” list. This is because only *self-financed projects* and/or roadway and railway projects with dual passenger and freight benefits will be found in the preferred scenario. Investments in goods movement infrastructure are only beginning to be thought of as appropriate for public financing. As a result, there is no long-term funding category in our overall transportation investment plan that is solely focused on goods movement projects.

Even so, SANDAG works extensively with state and federal policy makers to help shape a publicly funded freight investment program. To date, SANDAG has financed all of the region’s freight projects through grants, dedicated border funds, one-time bond bills, and other innovative financing strategies. A long list of unfunded projects to enhance the movement of goods regionally can be found in Appendix A. This list is a testament to a great unmet need. The Unconstrained Goods Movement Network Map is shown in Figure 2.18.

Quick and easy access to regional airports

Headache-free air travel is elusive for millions of Americans around the country. One of the goals of our Regional Plan is to make access to air travel as easy as possible. First, a few stats on how much we rely on air travel in our region:

- In 2014, more than 18 million air passengers used the San Diego International Airport (SDIA). McClellan-Palomar Airport also serves commercial travel. There are 12 public use airports in the San Diego region, as well as four military airports/airfields. Tijuana International Airport is located directly south of the U.S. border. The system accommodates commercial, general aviation, and corporate services (Figure 2.10). Airports that serve only general aviation and corporate operations are Brown Field Municipal, Gillespie Field, Montgomery Field, and Ramona. The remaining airports accommodate general aviation only. Many people choose to use other airports in the region, including in Mexico because of the varied air services they offer.





- Of all the San Diego County passengers who connect at Los Angeles International Airport (LAX) annually, 41 percent originate their travel at San Diego International Airport, and about 54 percent connect at LAX using ground transportation (e.g., train, car, and bus). About 5 percent of the passengers connecting at LAX begin their trips at McClellan-Palomar, which currently offers only commercial service to LAX.
- Previous studies have documented demand for air travel across our international border. A large share of San Diego County individuals who traveled to Mexico destinations flew from the Tijuana International Airport after crossing the international border.
- In 2014, nearly 178,000 tons of air cargo were shipped from or to the San Diego region. About 90 percent of the cargo handled at San Diego International Airport was accommodated on integrated/express carriers that originated from or were destined for Downtown San Diego.
- Senate Bill 10 (Kehoe, 2007), enacted in 2007, required SANDAG and the San Diego County Regional Airport Authority (Airport Authority) to coordinate planning for the multiple modes of transportation that serve the airport. The legislation required the development of two plans: a Regional Aviation Strategic Plan (RASP) and an Airport Multimodal Accessibility Plan (AMAP). The Airport Authority was the lead agency for the RASP, which analyzes scenarios to improve the performance of the regional airport system. SANDAG was the lead agency for the AMAP, which details a multimodal strategy to improve airport access for cars, transit, shuttles, trucks, and other surface transportation. The overarching goal of both these plans is to maximize the efficiency and effectiveness of existing and planned aviation facilities.⁴³

San Diego International Airport

In 2009, SANDAG, the Airport Authority, and the City of San Diego completed *Destination Lindbergh*, which detailed a planning strategy for the ultimate build-out of San Diego International Airport at its present location. The document evaluated improved intermodal access to the airport, and determined actions that could reduce traffic on surrounding arterial streets. Also envisioned was a consolidated rental car center on the north side of the airport (currently in construction), and the development of an Airport Intermodal Transit Center (ITC) along the existing rail corridor to provide direct connections to Amtrak, COASTER, Trolley, bus services, and the southern terminus for the proposed high-speed train service. Also planned were direct connector ramps from I-5 to Pacific Highway that would improve access to and from the airport.

The Airport Authority has completed its expansion of Terminal 2, known as The Green Build, which opened in August 2013. These improvements will accommodate growth to 21 million passengers annually. The Airport Authority has begun a planning update called the Airport Development Plan, which will identify the next phase of improvements so San Diego International can meet demand through 2035. The Airport Development Plan will look at the entire airport, and generate a

The Regional Plan includes the development of an Airport Intermodal Transit Center along the existing rail corridor to provide direct connections to Amtrak, COASTER, Trolley, bus services, and proposed high-speed train service.

plan that considers the redevelopment of Terminal 1, as well as coordination with SANDAG on the Intermodal Transit Center and ground access plans.

Beyond 2035, San Diego International Airport likely will not have enough capacity to meet growing demand. This may result in the inability of the region as a whole to accommodate the demand for air travel, leading to potential service disruptions and higher air-fares. Several options, including high-speed trains, could help alleviate problems caused by exhausted capacity at San Diego International from 2035 through 2050.

Cross Border Airport Facility

A new, elevated pedestrian bridge for Tijuana International Airport passengers crossing the U.S.-Mexico border is scheduled to be completed in 2015. The “Cross Border Xpress” is the first such facility in the United States to directly connect to a foreign airport terminal. The Cross Border Xpress will be an option for about 2.4 million passengers who already cross the border as part of their travels, enabling them to avoid often unpredictable and long delays at the San Ysidro and Otay Mesa land ports of entry. Bridge users, who will pay a toll to cross, will be able to fly to China and more than 30 destinations within Mexico that Tijuana International Airport offers. Many of these Mexican destinations are not served by other Southern California airports. Direct express bus service that provides a one-seat ride from North County Inland to the cross border airport facility is proposed.



Our international border: Easier travel across and back

Since the U.S. Congress enacted the North American Free Trade Agreement (NAFTA), the international ports of entry in our region have experienced significant increases in the number of crossings, increased global trade, and security issues. All this has led to longer wait times for pedestrians and vehicles crossing the border into the United States, with substantial negative impacts on the economies and health of our border communities. In recent years, the federal governments of the United States and Mexico have taken steps to improve this situation. They include expanding the hours of operation, improving and modernizing border infrastructure, and using innovative technology to implement programs that reduce security threats and increase operational efficiencies at the region's ports of entry.

Currently, a variety of "trusted traveler" programs are used by people crossing at our region's ports of entry, including the Secure Electronic Network for Traveler's Rapid Inspection (SENTRI) and Global Entry, which provide expedited inspection processing for pre-approved, low-risk travelers. The Fast and Secure Trade (FAST) program facilitates trade and the movement of goods across the border via dedicated inspection lanes.

In 2014, agencies and stakeholders from both sides of the border prepared an update to the California – Baja California Border Master Plan. The intent of this plan is to coordinate the planning and delivery of projects at land ports of entry and the transportation infrastructure serving the border crossings. The Border Master Plan was prepared for the U.S.-Mexico Joint Working Committee and led by Caltrans and the Secretariat of Infrastructure and Urban Development of Baja California. The Master Plan created a list of prioritized projects to guide implementation.

As traditional resources for transportation and land ports of entry are diminishing, SANDAG and Caltrans, along with a number of local, state, and federal agencies in the United States and Mexico, are developing innovative tools to self-finance a proposed new border crossing at Otay Mesa East in the San Diego-Baja California region.⁴⁴

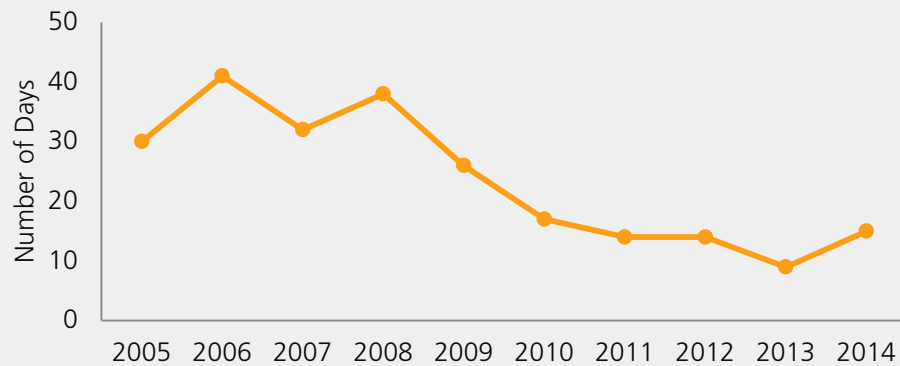
Improving Air Quality & Doing Our Part to Combat Climate Change

Air quality in the San Diego region has improved significantly over the past four decades. One measure of air quality is the Air Quality Index (AQI), which reports daily air quality. It tells us how clean or polluted the air is and if there are associated health effects that might be of concern. For the San Diego region, the AQI is calculated for two major pollutants regulated by the Clean Air Act: ground-level ozone and particle pollution (also known as particulate matter). For both of these pollutants, the U.S. Environmental Protection Agency has established national air quality standards to protect public health.

Air quality in the San Diego region has improved significantly over the past four decades.

An AQI value of 100 generally corresponds to the national air quality standard for the pollutant and is generally thought of as satisfactory. When AQI values are above 100, air quality is considered unhealthy – first for sensitive groups such as children, seniors, and those with heart or lung disease, and then for everyone as AQI values rise. As seen in Figure 2.19, the number of days with AQI values of more than 100 has dropped significantly, with the lowest levels seen in 2013.⁴⁵

Figure 2.19
Air Quality Index Values Over 100

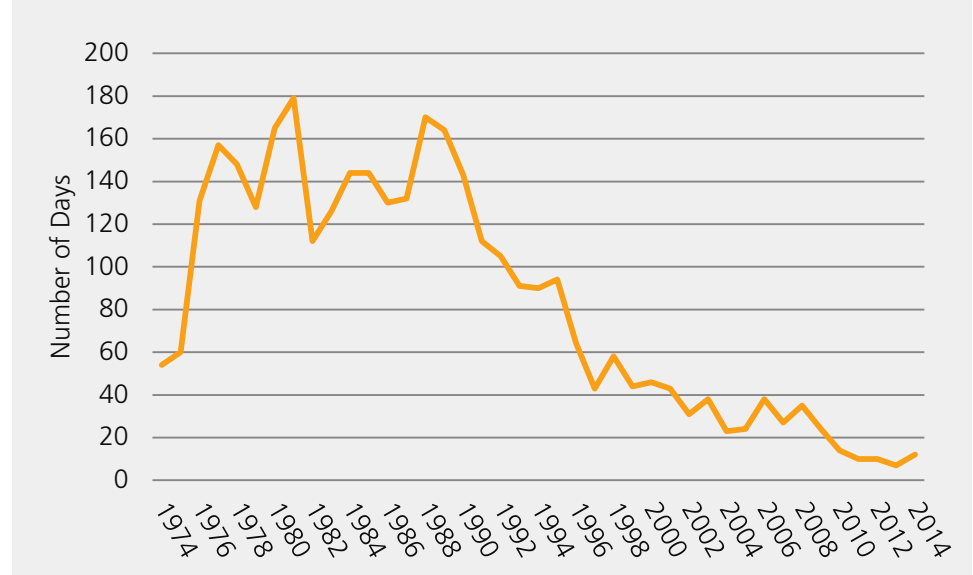


**Government Code
65080(b)(2)(B)(viii)**

Allow the regional transportation plan to comply with Section 176 of the federal Clean Air Act.

Ground-level ozone, which most people refer to as smog, also has decreased across our region. The number of days exceeding the federal 2008 standard for ozone levels over an eight-hour period has fallen dramatically, from a high of 179 days in 1981 to 12 days in 2014 as shown in Figure 2.20.⁴⁶ Transportation investments detailed in this Regional Plan, coupled with improvements in fuel and vehicle technologies, will continue to help reduce ozone levels throughout our region. Appendix B: Air Quality Planning and Transportation Conformity includes the air quality analysis for the Regional Plan, including how the Regional Plan conforms to applicable Clean Air Act requirements.

**Figure 2.20
Days Exceeding the 2008 Eight-Hour Ozone Standard**



Using our land and building a transportation system in ways that lead to reduced greenhouse gas emissions

As we've discussed, the Legislature has mandated reductions across the state in greenhouse gas emissions. It's also calling upon regional planning agencies to coordinate efforts that make the state more adaptable and resilient to the effects of climate change. Here in the San Diego region, that means supporting a strong economy, improving public health, providing more sustainable transportation and energy choices, protecting infrastructure, conserving open space and natural habitats, and striving for equal opportunities for everyone.

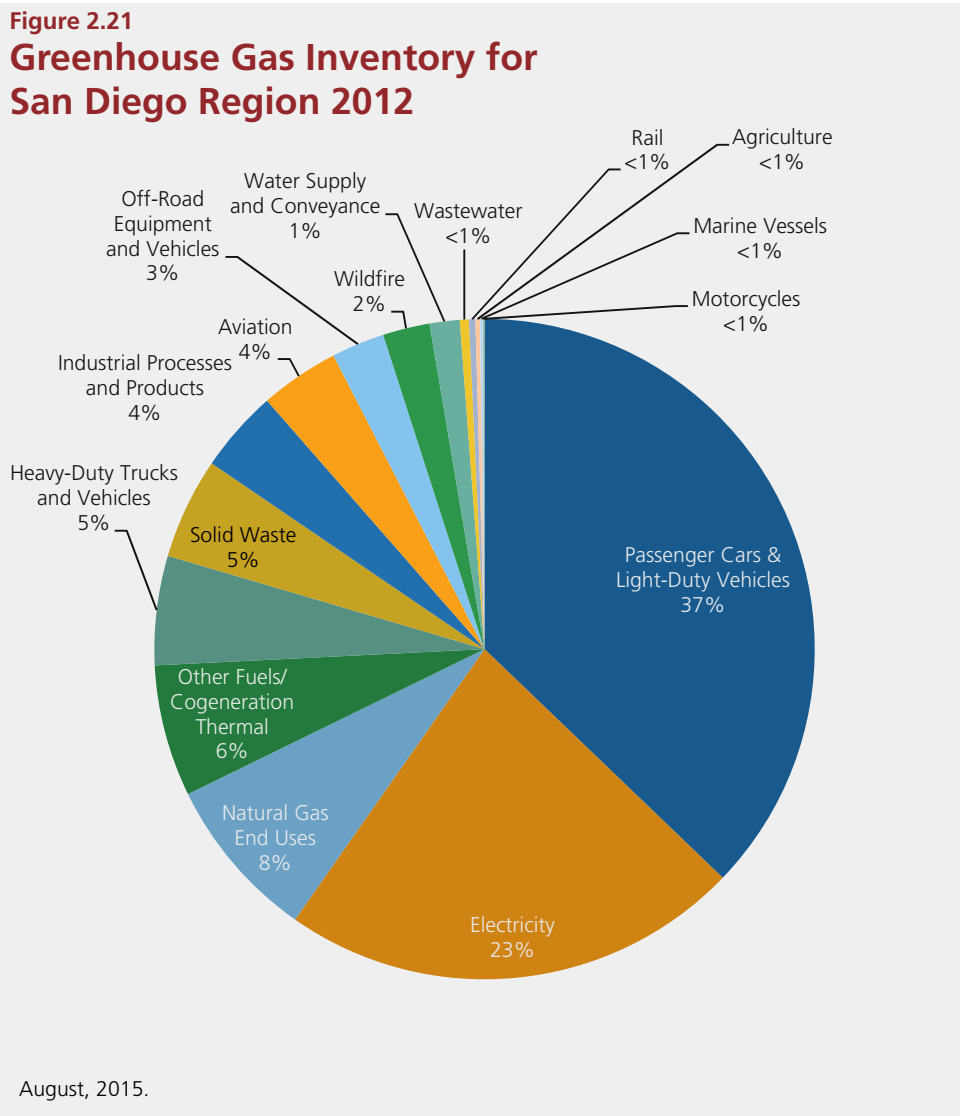
Across the San Diego region, SANDAG is working collaboratively with regional public agencies and local governments to reduce the production of greenhouse gases that contribute to climate change, as well as to prepare for the potential impacts of a changing climate in the region.

Land use decisions made at the local level can impact nearly all sources of emissions, – for better and for worse. Development guided by smart growth principles – remember: more compact communities, less suburban sprawl – brings people closer to more destinations. It also encourages alternative travel choices, such as public transit, carpooling, walking and biking, which cut greenhouse gas emissions and

Across the San Diego region, SANDAG is working collaboratively with regional public agencies and local governments to reduce the production of greenhouse gases

other forms of pollution. Mixed use, compact developments also use less water, electricity, heating, and cooling per capita. Beyond this, smart growth promotes the preservation of agricultural land, open space, and natural habitats; improved water quality regionally because more compact developments cover less land than suburban housing tracts; less air pollution; and healthier lifestyles.

To better track the sources of greenhouse gas emissions in the region, SANDAG periodically completes an inventory of sources. This inventory identifies and then quantifies our region’s sources of emissions, which allows planners to monitor those sources over time. In 2012, regionwide emissions totaled 35 million metric tons of carbon dioxide equivalents (MMT CO_2e), which is a measure of all greenhouse gases – including CO_2 and others such as methane and nitrous oxide.⁴⁷ The total amount in 2012 – 35 million metric tons – was an 18.7 percent increase over 1990 emissions levels, which measured 29 million metric tons (see Appendix D: 2012 Greenhouse Gas Inventory and Projections for the San Diego Region). As you can see from Figure 2.21, transportation is the largest source of greenhouse gas emissions in the region, followed by electricity and natural gas.



Our region's 18 cities and the County of San Diego all have inventoried greenhouse gas emissions from government operations and from their communities as a whole. More than half of these jurisdictions, representing more than 75 percent of the region's population, also have adopted or are in the process of developing a climate action plan (CAP). This type of plan includes an inventory and forecast of greenhouse gas emissions. It also identifies measures to lower emissions toward a specific target.

In addition to designing this Regional Plan to achieve SB 375's greenhouse gas reduction targets for light duty vehicles, SANDAG also supports local efforts to reduce the greenhouse gas emissions that contribute to climate change. In 2010, SANDAG prepared a Climate Action Strategy, which provides tools for local agencies as well as SANDAG itself to consider as plans and projects are prepared. SANDAG also offers local agencies resources and incentives for smart growth, and it supports efforts to save energy. Through our Energy Roadmap Program, SANDAG has developed energy management plans, or "Roadmaps," for local governments that identify opportunities to save energy in their own operations and in their larger communities. All 18 cities and the County have completed their own Roadmaps, and SANDAG is now focused on supporting them as they implement recommendations within their Roadmaps. The Energy Roadmap Program is made possible through a Local Government Partnership with San Diego Gas & Electric.⁴⁸

Through the Energy Roadmap Program, we've also partnered with the San Diego Regional Clean Cities Coalition to assess the fleets of the region's local governments. We've reviewed options available to them for converting to alternative fuel vehicles, and detailed the costs, savings, and environmental impacts of making the switch. These fleet assessments complement our broader efforts to reduce emissions through the use of ZEV and alternative fuels.

Despite local efforts to reduce greenhouse gas emissions, the San Diego region will experience the consequences of ongoing global climate change.⁴⁹ As we've mentioned, sea levels along our coastline are already rising. The potential impacts for our region, identified in the SANDAG Climate Action Strategy (2010), are summarized in Figure 2.22. These impacts include higher surf and storm surges as a consequence of rising seas that will be seen statewide – and these will erode beaches, degrade bluffs, and damage coastal infrastructure. Other projected impacts, some of which we mentioned at the beginning of this chapter, include less fresh water, an increase in the frequency and intensity of wildfires, the loss of native plant and animal species, and severe weather events. All these are expected to threaten public health and the regional economy. Further, the region's cultural resources could also be threatened by climate impacts. Native Americans and others associate the natural habitat with the natural heritage of the region and that natural heritage is important to preserve.

Figure 2.22

Climate Impacts in the San Diego Region



Preparing the region for the inevitable consequences of our changing climate requires steps to adapt to these consequences and create more resilient communities. These words, “adaptation” and “resiliency” aren’t chosen randomly. They represent important ways in which we can cope with coming changes – despite our best efforts regionally, nationally, and globally to reduce greenhouse gas emissions. *Adapting* to climate change means adjusting how we build, where we build, how we store and distribute water, and myriad other things in the face of ongoing change. Making our region more *resilient* to the consequences of climate change means increasing the capacity of our communities, economy, and environment to cope with hazardous events such as storms, heat waves, wildfires, and ongoing drought. State officials in Sacramento have developed policy guidance for local and regional decision makers, planning resources for local and regional governments, and technical tools to assist governments at every level to help their constituents adapt to climate change and become more resilient.

SANDAG considers the potential impacts of climate change on transportation projects by designing infrastructure to withstand impacts such as sea level rise, extreme heat, and intense rain events. Also, through our *TransNet* EMP, SANDAG studies how to help natural habitats become more resilient to climate changes. In addition, SANDAG also promotes collaboration to build and maintain beaches, which are threatened by rising sea levels.

Preparing the region for the inevitable consequences of our changing climate requires steps to adapt to these consequences and create more resilient communities.

Selecting the transportation network in our regional plan and measuring its effects

Constructing and managing a transportation network that will work best for our region into the future – and that we can afford – is no small challenge. But our Regional Plan has been guided by the three Board-adopted goals of Innovative Mobility and Planning, a Vibrant Economy, and a Healthy Environment and Communities. To predict the success of the network included in the Regional Plan, we subjected it to ten key questions that were designed to gauge the performance of the chosen network (Figure 2.23). Appendix N: Evaluating the Performance of the Transportation Network includes detailed performance results at the regional, subregional, and corridor level, and the methodology SANDAG used for estimating the performance measures.⁵⁰ The SANDAG travel demand model used for this analysis is documented in Appendix T: SANDAG Travel Demand Model and Forecasting Documentation.

Figure 2.23
Performance Measures

Goal		Key Question
Vibrant Economy	1	Do the transportation system investments help to improve the regional economy?
	2	Are the relative costs of transportation changing similarly for all communities?
	3	Are connections to neighboring counties, Mexico, tribal lands and military facilities improved?
Innovative Mobility and Planning	4	Are travel times reduced?
	5	Are more people walking, biking, using transit, and sharing rides?
	6	Is the transportation system safer?
Healthy Environment and Communities	7	Does the transportation network support smart growth?
	8	Is access to jobs and key destinations improving for all communities?
	9	Is the region's air quality improving?
	10	Are greenhouse gas emissions reduced?

The transportation investments in the Regional Plan provide benefits that outweigh their costs by a ratio of nearly two-to-one. With implementation of our Regional Plan, the percentage regionwide of people and jobs near high-frequency transit will increase substantially. In 2012, 35 percent of the region's population lived near high-frequency transit stops. With the significant transit investments and the implementation of the land uses outlined in the Regional Plan, that figure will increase to 61 percent by 2050. Similarly, the percentage of jobs located within half a mile of high-frequency transit will increase from 42 percent in 2012 to 71 percent in 2050.

Meanwhile, investments in infrastructure for biking and walking, combined with implementing smart growth principles, will result in an increase in the percentage of people and workplaces near bike routes. These transportation options will result in more people exercising and fewer people choosing to drive alone.

The Regional Plan's transportation investments, coupled with expected improvements in fuel and vehicle technologies, will help to reduce on-road, smog-forming pollutants and greenhouse gas emissions below 2012 levels. Over the life of the Regional Plan, more than 3.9 million fewer tons of greenhouse gases will be emitted, compared to a scenario in which no improvements are made (also known as the "no-build" scenario).

The transportation choices provided in the Regional Plan yield region-wide benefits, but these benefits are often more pronounced in the corridors where the transportation investments occur. Significant investments are being made in public transit, helping to improve transit access to a number of the region's major job centers. With an increase in efficient transit options, more people will be using transit to access jobs in Kearny Mesa, with nearly 9 percent of peak-period work trips being made via transit in 2050 – more than three times 2012 levels of 2.3 percent. Similar increases are expected to be seen in the University City and Sorrento Mesa job centers. More people will also be taking transit to jobs in Downtown San Diego – with nearly one in five people taking transit to work in 2050.



In terms of the use of the future transit system, daily regional transit boardings will double from 356,000 in 2012 to 775,000 in 2035, with a further increase to 947,000 in 2050. In terms of annual transit boardings, this translates to:

- 100.5 million annual boardings in 2012
- 247.9 million projected annual boardings in 2035
- 303.0 million projected annual boardings in 2050

The transportation investments made in our Regional Plan will provide residents, workers, and visitors with more transportation choices, while helping to preserve the environment and support regional economic growth.

Measuring greenhouse gas emissions reductions

So, how does the transportation network we've described in this chapter measure up? Will it help achieve the state-mandated targets for reducing greenhouse gas emissions in our region?⁵¹

A Climate Change Scoping Plan (Scoping Plan) was prepared pursuant to AB 32 (The Global Warming Solutions Act of 2006) by ARB in 2008 and updated in 2014.⁵² The Scoping Plan identifies reduction targets for all sources of greenhouse gas emissions in the state. While the transportation sector is responsible for the greatest greenhouse gas reductions, nearly 30 percent of the total, most of those reductions will come from higher fuel efficiency vehicles (Pavley fuel efficiency

standards) (18 percent), and a more diverse fuel mix (low carbon fuel standards) (9 percent). Statewide, Regional Transportation Plans prepared by metropolitan planning organizations, such as SANDAG, are responsible for less than 3 percent of the greenhouse gas reductions. SB 375 is the mechanism that establishes greenhouse gas emission reduction targets for each regional agency.

SANDAG’s SB 375 target is to reduce regional greenhouse gas emissions from cars and light trucks by 7 percent, per capita, by 2020, and by 13 percent by 2035, compared with a 2005 baseline.

The Regional Plan, encompassing both our RTP and our SCS, shows that our region will exceed these targets. How? By pursuing the strategies we’ve discussed here already: using land in ways that make developments more compact, conserving open space, and investing in a transportation system that provides people with alternatives to driving alone.

In short, as shown in Table 2.1, our SCS will result in a 15 percent reduction in emissions by 2020, and a 21 percent reduction by 2035 – far more than what the state mandates require.⁵³ Appendix C includes the technical methodology to estimate greenhouse gas emissions submitted to ARB and the detailed greenhouse gas emission reductions calculations.

SANDAG’s SB 375 target is to reduce regional greenhouse gas emissions from cars and light trucks by 7 percent, per capita, by 2020, and by 13 percent by 2035, compared with a 2005 baseline.

Table 2.1
SB 375 Greenhouse Gas Reduction Targets and Regional Plan Greenhouse Gas Emissions Reductions Results

	2020	2035
ARB Targets	7 percent	13 percent
Greenhouse Gas Emissions Reductions	15 percent	21 percent

Note: Average weekday per capita carbon dioxide reductions for cars and light trucks from 2005.

Source: ARB and SANDAG

Government Code
§ 65080(b)(2)(H)

Prior to adopting a sustainable communities strategy, the metropolitan planning organization shall quantify the reduction in greenhouse gas emissions projected to be achieved by the sustainable communities strategy.

Potential State Funding to Meet our Greenhouse Gas Reduction Goals

Transportation projects that result in lower greenhouse gas emissions go hand-in-hand with the drive toward smarter growth and a healthier environment. Recognizing this, the California Legislature has set aside funding to support projects that reduce emissions. The Legislature’s [cap-and-trade initiative](#),⁵⁴ which created a market to encourage businesses to lower their emissions of greenhouse gases that contribute to climate change, provides financial incentives for lowering emissions. As a result, the state could provide financial help for many of the transportation projects planned in our region and well as local land use plans and projects.⁵⁵ These include, but are not limited to, increasing transit to low-income communities, expanding transit systems, purchasing low-emission vehicles, encouraging transit-oriented development and affordable housing, and building high-speed rail. Cap-and-trade revenues are included in the financial plan (See Appendix O: Transportation Financial Background).

California's Active Transportation Program, funded in part by federal tax dollars, supports projects that encourage walking and biking as an alternative to driving. In our region, the *TransNet* Ordinance and the state's Transportation Development Act also set aside funds for bike and pedestrian projects. *TransNet* provides further funding for building and operating new transit projects.

Looking Past 2035 – Possible Pathways for Additional Greenhouse Gas Emissions Reductions from Transportation

Continuing the effort to reduce greenhouse gas emissions beyond the SB 375 time horizon (year 2035) will require carefully crafted and aggressive policies and strategies. The effort, obviously, must be a global one – far beyond the scope and control of just regional government bodies such as SANDAG.

As our region looks ahead, it will be important to consider how we can reduce greenhouse gas emissions beyond the current SB 375 targets as they apply to cars and light-duty trucks. Progress could be made on several fronts, including:

- Expanding programs that enhance Transportation Demand Management (TDM) and Transportation System Management (TSM) – making the existing transportation system increasingly efficient.
- Implementing transportation projects that provide people with alternatives to driving alone and reduce vehicle miles traveled.
- Extending the Low Carbon Fuel Standard (LCFS) beyond the current reduction horizon year of 2020.⁵⁶
- Getting more zero emission vehicles on the road, beyond near-term statewide goals.⁵⁷
- Increasing the availability of vehicle charging stations, in order to extend the electric range of plug-in hybrid electric vehicles.
- Providing supportive infrastructure for the operations of automated vehicles and other emerging technologies.

As described in Appendix D, both ARB and Caltrans are evaluating potential strategies to meet statewide climate goals with a focus on the transportation sector. In 2012, ARB released a [Draft Vision for Clean Air: A Framework for Air Quality and Climate Planning](#), which examines strategies to meet California's air quality and climate goals.⁵⁸ ARB currently is developing an update to the Vision Scenario Planning modeling tool. A public workshop on Vision 2.0 was held in March 2015.⁵⁹ As part of the development of the California Transportation Plan 2040 (CTP 2040), Caltrans also is using the ARB Vision framework to evaluate greenhouse gas emissions reductions from the transportation sector toward achieving California climate goals.⁶⁰

The SANDAG Regional Plan focuses on reducing greenhouse gas emissions from cars and light-duty trucks, as required by SB 375. SANDAG reviewed the assumptions included in the ARB Vision scenarios and the draft CTP 2040 to help develop a post 2035 scenario illustrated in Figure 2.24, a scenario focused on carbon dioxide emissions reductions from cars and light-duty trucks for the San Diego region. This scenario uses state greenhouse gas 2050 emission reduction goals under Executive Orders S-03-05 and B-16-12 as long-term reference points for the San Diego region.⁶¹ (SANDAG recognizes that the Governor in Executive Order B-30-15 has also set an interim 2030 state greenhouse gas reduction goal of 40 percent below 1990 levels prior to 2035, by the year 2030.)

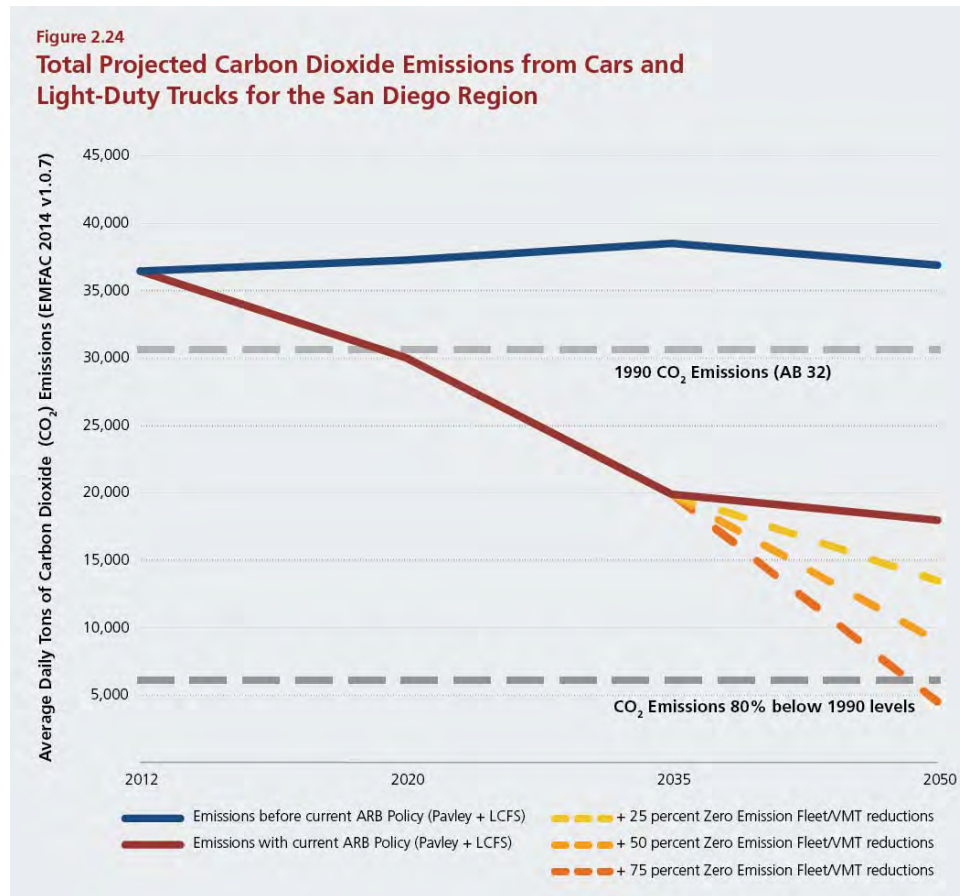


Figure 2.24 illustrates the projected regional carbon dioxide (CO₂) emissions from cars and light-duty trucks before current ARB policy and with current ARB policy. Current ARB Policy includes the Advanced Clean Car Program (Pavley) and low carbon fuel standard (LCFS). In addition, as shown in Figure 2.24 in dashed lines, a combination of varying levels of zero emission vehicle penetration and VMT

reductions could further decrease emissions by 2050. For example, the 25 percent emissions reduction shown in the dashed yellow line could be achieved solely with VMT reductions or zero emission vehicles or a combination of both strategies that yields the 25 percent reduction. Per capita, the examples of VMT reductions would mean driving nearly six fewer miles daily (25 percent reduction from 2050), or 12 fewer miles per day (50 percent reduction from 2050), or nearly 18 fewer miles on a daily basis (75 percent reduction from 2050). Achieving the additional emission reductions would require substantial changes in state and federal policies or regulations, which are beyond SANDAG’s ability to implement.

It’s worth noting that 2050 greenhouse gas emission projections are highly uncertain, and depend on assumptions regarding the growth of our regional population and economy, increasing the utilization of clean technologies, and major changes in markets for energy and transportation systems. To achieve the 2050 greenhouse gas emission reduction goals will require a concerted effort among federal, state, regional, and local agencies. California lawmakers, along with many local and regional governments within the state and beyond, are working to create innovative policies, plans, and programs to strive for a lower-carbon future. In the San Diego region, local governments, SANDAG, and other regional public agencies are working collaboratively with local non-profits, universities, and businesses to coordinate efforts with state, federal, and international initiatives.

SCS Public Involvement Activities

The public was deeply involved in the development of this Regional Plan’s SCS. Through an extensive public outreach program, thousands of residents, community leaders, academics, business leaders, elected officials, and representatives from underrepresented groups have participated in the development of the Regional Plan and its SCS. The Regional Plan Public Involvement Plan (PIP) established a process and outlined specific activities for communicating with the public and obtaining input from the public – throughout the Regional Plan’s development. The PIP, adopted on February 22, 2013, is based on the SANDAG Public Participation Plan, which was approved by the Board of Directors on December 21, 2012. In addition, SANDAG and the Southern California Tribal Chairmen’s Association (SCTCA) developed and implemented the Tribal Consultation Plan for San Diego Forward (The consultation process is documented in Appendix G).

**Government Code
§ 65080(b)(2)(F)**

Each metropolitan planning organization shall adopt a public participation plan, for development of the sustainable communities strategy.



On March 27, 2015, SANDAG conducted an informational meeting on the SCS at its Board of Directors meeting. Pursuant to Government Code Section 65080(b)(2)(E), one informational meeting is required, if it is attended by the County Board of Supervisors and city councilmembers who represent a majority of the cities with a majority of the population in the incorporated areas of the County. SANDAG has exceeded the statutory requirement by holding discussions concerning the SCS at several other public meetings of the Board of Directors since October 2010. The documentation of these meetings also is included in Appendix F: Public Involvement Program.

The Draft Regional Plan was released on April 24, 2015 for public review and comment. During the public comment period, SANDAG hosted a series of seven public meetings throughout the San Diego region to obtain public input. Spanish translation was available at all of the workshops, and one workshop was conducted entirely in Spanish. Three workshops also were streamed live over the internet, allowing for remote access. Meanwhile, community based organizations contracted by SANDAG, conducted dozens of outreach meetings to seek input on the Draft Regional Plan from the region’s disadvantaged communities.

**Government Code
§ 65080(b)(2)(E)**

The metropolitan planning organization shall conduct at least two informational meetings in each county within the region for members of the board of supervisors and city councils on the sustainable communities strategy.

In June 2015, SANDAG offered two additional chances for the public to provide oral and written comment on the Draft Regional Plan, in addition to its Sustainable Communities Strategy, the Draft Environmental Impact Report, and the Draft Air Quality Conformity Analysis. The first hearing occurred during a SANDAG Board meeting and the second hearing occurred in front of a SANDAG hearing officer at the North County Transit District's offices. These public hearings were conducted pursuant to Government Code Section 65080(b)(2)(F)(v), which calls for at least two public hearings to be held. SANDAG's efforts to involve the public in the development of the SCS have been tracked and recorded to chronicle the large number and wide range of activities organized and held by the agency. This record shows that SANDAG exceeded the public involvement requirements, including informational meetings mandated by SB 375 and federal regulations. The details of these activities, as well as the PIP and the Public Participation Plan, are included in Appendix F.

**Government Code
§ 65080(b)(2)(G)**

In preparing a sustainable communities strategy, the metropolitan planning organization shall consider spheres of influence that have been adopted by the local agency formation commissions within its region.

Consultation with the Local Agency Formation Commission

SANDAG considered spheres of influence that have been adopted by the Local Agency Formation Commission (LAFCO) within our region during the development of the SCS. A sphere of influence is defined as a plan for the probable physical boundaries and service area of a local government agency, as determined by LAFCO. All territory proposed for annexation to an incorporated city is required to be included in the city's sphere of influence and be located within the city's general plan.

LAFCO is responsible in our region for assisting the state legislature with promoting orderly development and growth, while also fulfilling many regional priorities. These include: accommodating growth within or through the expansion of local agency boundaries, extending necessary government services, preserving open space and prime agricultural lands, and promoting the provision of housing for residents of all incomes.

LAFCO also is a member of the Regional Planning Technical Working Group, which provides coordination on regional planning issues among member agencies. Members of the working group include the planning or community development director from each of the 18 cities and the County of San Diego, as well as representatives from other single-purpose regional agencies.

In the development of the Regional Growth Forecast, LAFCO and SANDAG consulted regarding sphere of influence determinations – as well as on factors that would be considered in the review of proposals. The 18 incorporated cities and the County of San Diego were asked about sphere of influence issues during the Regional Growth Forecast land use input process. No requests for adjustments to spheres of influence were made.⁶²



Up Next: Paying for the Regional Plan

Next, in Chapter 3: Financing Our Future, we'll review how the transportation network described in this chapter will be paid for over the next 35 years. This is the "Financial Element" of the Regional Plan, as required by state law. Among the sections in Chapter 3 are:

- A discussion of where our transportation funds come from, and how we can invest them to build the network we can afford. We'll also offer a brief analysis of our investment plan – that is, a general review of how much money will be invested on different aspects of the transportation network.
- A reference to detailed information on the risks associated with relying on sources of funding for the new Regional Plan, and what SANDAG can do if anticipated revenues fall short.



Endnotes

- ¹ EPA: <http://www.epa.gov/climatechange/ghgemissions/sources/transportation.html>
ARB: First Update to Scoping Plan 2014, p 46.
- ² <http://www.arb.ca.gov/cc/sb375/sb375.htm>
- ³ Additional detailed information on the SCS is included in Appendices C: Sustainable Communities Strategy Documentation and Related Information, I: Consultation with the Local Agency Formation Commission (LAFCO), J: Regional Growth Forecast, L: Regional Housing Needs Assessment Plan, and U.13: Housing – Providing Homes for all Residents. Appendix C, Table C.4 documents specific locations in San Diego Forward where each of SB 375’s SCS requirements is met.
- ⁴ See Appendix E: Transportation System and Demand Management Programs, and Emerging Technologies for a discussion of TDM and TSM strategies.
- ⁵ In this region, the Multiple Species Conservation Program and Multiple Habitat Conservation Program implement the Natural Communities Conservation Plan from the state and federal government, which implements the California State Wildlife Action Plan.
- ⁶ Appendix U.10: Management Strategic Plan for Conserved Lands in Western San Diego County.
- ⁷ As of mid-2014, over half of the jurisdictions had adopted or were currently performing General Plan updates, and almost 85 percent of the jurisdictions had adopted or updated community plans, master plans, or specific plans. These include, but are not limited to, the Cities of San Diego, Chula Vista, Escondido, Vista, San Marcos, La Mesa, and National City, and the County of San Diego. See the following document for more information:
http://www.sandag.org/uploads/projectid/projectid_360_17804.pdf
- ⁸ This provision does not vest SANDAG with any authority to mandate changes to existing city and county general plans. But it does allow the SCS to take into account reasonably expected changes in existing general plans and other city and county land use regulations. In addition, because the SCS planning process is collaborative in nature, the process may be used to help local jurisdictions identify potential further changes that would promote the goals of sustainability and reducing greenhouse gas emissions.
- ⁹ Appendix J: Regional Growth Forecast includes the Series 13 Regional Growth Forecast and Appendix L: Regional Housing Needs Assessment Plan includes the Regional Housing Needs Assessment (RHNA) for the San Diego Region.
- ¹⁰ Appendix U.3: SANDAG Board of Directors Report San Diego Forward: The Regional Plan Alternative Land Use Scenarios
- ¹¹ Appendix J: Regional Growth Forecast
- ¹² Open Space and Parks include Beach-Passive (other sandy areas along the coastline with limited parking and access), Open Space Park or Preserve, and Undevelopable Natural Area. Farmland includes Williamson Act Lands. Habitat includes SANDAG Conserved Lands.
- ¹³ Based on the best practically available scientific information regarding resource areas and farmland in the region as additionally shown in Appendix C and used to prepare the Regional Growth Forecast described in Appendix J.
- ¹⁴ Appendix U.4: SANDAG Transit Oriented Development Strategy
<http://www.sandag.org/index.asp?classid=12&projectid=500&fuseaction=projects.detail>
- ¹⁵ Appendix U.2: Regional Complete Streets Policy

-
- ¹⁶ The Regional Growth Forecast reflects land use changes made by local jurisdictions since the adoption of the 2050 RTP/SCS, RHNA, and Series 12 Regional Growth Forecast. These changes include updates made as a result of housing elements prepared by the local jurisdictions for the fifth housing element cycle.
- ¹⁷ Further information about how SANDAG considered and meets the state housing goals and the Series 13 Regional Growth Forecast is included in Appendix L and Appendix U.13: Housing - Providing Homes for all Residents
- ¹⁸ Updated housing information is included in Appendix U.13: Housing – Providing Homes for all Residents.
- ¹⁹ Journal of the American Planning Association, Is Support for Traditionally Designed Communities Growing? Evidence From Two National Surveys Susan Handy, James F. Sallis, Deanne Weber, Ed Maibach & Marla Hollander April 2008, Vol. 74, Issue 2 pages 209-221
National Association of REALTORS® 2013 Community Preference Survey, Realtors® Report Americans Prefer to Live in Mixed-Use, Walkable Communities, October 2013
America in 2013: A ULI Survey of Views on Housing, Transportation, and Community
- ²⁰ With the exception of regional arterials, data represents lane miles (Lane miles are calculated by multiplying the centerline mileage of a road by the number of lanes). For regional arterials, centerline mileage is reported.
Generating a Sidewalk Network for San Diego County: Project Documentation. Prepared for Urban Design for Health, Inc., and the San Diego Association of Governments. June 17, 2011. Submitted by Resource Systems Group
- ²¹ Appendix R: Transportation Security and Safety
- ²² The Healthy Communities Atlas can be found in Appendix U.11: Healthy Communities Atlas, San Diego Region.
- ²³ Appendix U.17: Urban Area Transit Strategy
- ²⁴ For more information on the San Diego – Coronado ferry, visit FlagshipSD.com/cruises/Coronado-ferry.
- ²⁵ Although High-speed Rail (HSR) is not a proposed Regional Plan project, since its funding and implementation will be determined by the State of California rather than by entities within this region, its revenues and expenditures are included in the Regional Plan because the HSR segment between Los Angeles and San Diego, via the Inland Empire, is expected to provide connectivity for the San Diego region with the rest of the state and the project. Therefore, it is an integral part of the planned transportation infrastructure for the region.
- ²⁶ Appendix U:16: Active Transportation Implementation Strategy
- ²⁷ Included in Appendix U.16: Active Transportation Implementation Strategy
- ²⁸ See Appendix A: Transportation Projects, Costs, and Phasing for an updated California Coastal Trail map, and Appendix U.5: California Coastal Trail Technical Memoranda for maps and discussion of the California Coastal Trail, as required by Government Code Section 65080.1.
- ²⁹ Included in Appendix U.16: Active Transportation Implementation Strategy
- ³⁰ Safe Routes to Transit will be informed by recommendations from subregional studies such as the I-8 Corridor Study and the California-Baja California Port of Entry Bicycle and Pedestrian Study.

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- ³¹ The development of the California Coastal Trail a collaborative effort among the Coastal Conservancy, State Parks, the Coastal Commission, and the nonprofit agency Coastwalk. Designated in 1999 as California’s Millennium Legacy Trail, it is defined as “a continuous public right-of-way along the California coastline; a trail designed to foster appreciation and stewardship of the scenic and natural resources of the coast through hiking and other complementary modes of non-motorized transportation.”
- ³² A description of the Regional Arterial System is included in Appendix M: Transportation Project Evaluation Criteria and Rankings and Appendix U.7: SANDAG Federal Congestion Management Process provides an overview of the SANDAG Federal Congestion Management Process.
- ³³ A definition of *Rapid* bus is included in Appendix K: Glossary of Transportation Terms, Abbreviations, and Acronyms.
- ³⁴ Additional information on emerging technologies, transportation demand management (TDM), transportation system management (TSM), and investment levels is included in Appendix E and the Emerging Technologies White Paper (Appendix Q).
- ³⁵ Appendix U.8: San Diego Region Intelligent Transportation Systems Strategic Plan
- ³⁶ www.sandag.org/TDM and <http://www.sdforward.com/mobility-planning/regional-parking-management-toolbox>
- ³⁷ Additional information and a link to the toolbox can be found in Appendix E.
- ³⁸ http://www.sandag.org/uploads/publicationid/publicationid_1817_17061.pdf Appendix U.12: San Diego Regional Plug-In Electric Vehicle Readiness Plan.
- ³⁹ U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, Border Crossing/Entry Data, based on the U.S. Department of Homeland Security, Customs and Border Protection data
- ⁴⁰ Ibid.
- ⁴¹ Appendix U.15: Draft 2015 Freight Gateway Study Update.
- ⁴² This list can be found in Appendix A.
- ⁴³ The RASP Technical Report and AMAP are included in Appendix U.6: Regional Aviation Strategic Plan and Airport Multimodal Accessibility Plan.
- ⁴⁴ More information on crossborder transportation issues is included in Appendix U.14: Borders.
- ⁴⁵ San Diego County Air Pollution Control District and California Air Resources Board, Air Quality and Metrological Information System (AQMIS).
- ⁴⁶ California Air Resources Board, AQMIS
- ⁴⁷ Carbon dioxide equivalent (MMTCO₂e) is a measure of all greenhouse gases – including CO₂, as well as others such as methane and nitrous oxide converted to what their quantity would be if converted to just CO₂.
- ⁴⁸ Appendix U.9: Regional Energy Strategy for the San Diego Region.
- ⁴⁹ Appendix Q: White Papers
- ⁵⁰ Details on the project evaluation criteria which informed the transportation network development are included in Appendix M.
- ⁵¹ SB 375 is the only mandated greenhouse gas reduction requirement for MPOs and focuses only on the reductions that could come from transportation planning for passenger vehicles, not those reductions that can come from vehicle technology improvements or from the carbon intensity of fuels.

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- ⁵² Initial AB 32 Climate Change Scoping Plan Document
<http://www.arb.ca.gov/cc/scopingplan/document/scopingplandocument.htm>
First Update to the AB 32 Scoping Plan
<http://www.arb.ca.gov/cc/scopingplan/document/updatedscopingplan2013.htm>
- ⁵³ The greenhouse gas reductions for the final Regional Plan were calculated using the ARB model EMFAC 2014 v1.0.7 and adjustment factors provided by ARB to account for differences in emission rates between EMFAC 2007 (used to set the targets) and this latest version of the emissions model (EMFAC 2014 v1.0.7). The per capita greenhouse gas reductions for 2020 and 2035 have changed from the draft Regional Plan to the final Regional Plan by three percentage points. The ARB adjustment factor for SANDAG reduces the per capita results for both 2020 and 2035 by two percentage points. For example, before the ARB adjustment, per capita reductions for 2020 were 17 percent, and after applying the adjustment, the reductions become 15 percent. The additional one percentage point difference for 2020 and 2035 is due to final travel demand model runs, which also use EMFAC 2014 v1.0.7 to estimate greenhouse gas emissions.
- ⁵⁴ <http://www.ebudget.ca.gov/2014-15/pdf/Enacted/BudgetSummary/CapandTradeExpenditurePlan.pdf>
- ⁵⁵ Cap-and-Trade Expenditure Plan. <http://www.ebudget.ca.gov/2014-15/pdf/Enacted/BudgetSummary/CapandTradeExpenditurePlan.pdf>
- ⁵⁶ The LCFS directive calls for a reduction of at least 10 percent in the carbon intensity of California's transportation fuels by 2020. LCFS targets are back loaded in terms of mandated carbon reductions in the California fuel supply, starting slowly and ramping up quickly starting in 2015.
- ⁵⁷ The current Pavley Clean Car Standards (AB 1493) and Advanced Clean Cars Program are limited to a 2025 horizon year, yielding an opportunity to seek additional greenhouse gas reduction benefits if these or similar programs were supported by the state legislature in the future.
- ⁵⁸ ARB Vision for Clean Air: A framework for Air Quality and Climate Planning, June 27, 2012
http://www.arb.ca.gov/planning/vision/docs/vision_for_clean_air_public_review_draft.pdf;
Vision for Clean Air: A Framework for Air Quality and Climate Planning Sacramento Vision Workshop August 22, 2012
http://www.arb.ca.gov/planning/vision/docs/staff_presentation_on_August_22_2012.pdf;
Scenario Assumptions and Results, August 20, 2012
http://www.arb.ca.gov/planning/vision/docs/draft_scenario_assumptions_and_results_appendix.pdf
- ⁵⁹ ARB, Vision 2.0, <http://www.arb.ca.gov/planning/vision/workshops.htm#mar2015>
- ⁶⁰ Caltrans, Draft California Transportation Plan 2040, March 2015.
- ⁶¹ Executive Order (EO) S-03-05 establishes the following greenhouse gas emission reduction targets for California: reduce greenhouse gas emissions to 2000 levels by 2010, to 1990 levels by 2020, and to 80 percent below 1990 levels by 2050. E.O. B-30-15 establishes an interim statewide greenhouse gas emission reduction target of 40 percent below 1990 levels by 2030. EO B-16-12 orders that California target for 2050 a reduction of greenhouse gas emissions from the transportation sector equaling 80 percent less than 1990 levels.
- ⁶² Reference Appendix I for more information on Local Agency Formation Commission.

Appendix C

Sustainable Communities Strategy Documentation and Related Information

Appendix Contents

SB 375 Greenhouse Gas Reduction Targets set by the California Air Resources Board and Results of Greenhouse Gas Emissions Reductions

Housing Goals, Capacity, and Proximity to Transit

SANDAG Sustainable Communities Strategy Documentation

Figures Supporting the Sustainable Communities Strategy

Attachments:

1. Correspondence on Technical Methodology to Estimate Greenhouse Gas Emissions
2. SANDAG Off-Model Greenhouse Gas Reduction Methodology

Sustainable Communities Strategy

Documentation and Related Information

This appendix includes documentation in support of the Sustainable Communities Strategy (SCS) pursuant to Senate Bill 375 (Steinberg, 2008) (SB 375). This appendix includes a matrix that outlines the requirements in SB 375 and where the Regional Plan addresses the requirements, either in specific chapters of the Regional Plan or in specified appendices (Table C.4). The resource mapping prepared by SANDAG is based on the best practically available scientific information regarding resource areas and farmland. The source data includes: (1) 1995 data for the eastern two-thirds of the County, which cover the entire region and use the Holland classification system (Holland 1996; Oberbauer et al., 2008); (2) 2012 data which cover much of the western one-third of the region and use a classification system of groups, alliances, and associations based on the National Vegetation Classification Standard and the California Manual of Vegetation (Sproul et al., 2011; Sawyer et al., 2009); and (3) Department of Conservation Farmland Mapping and Monitoring Program data, 2010.

This appendix includes the following figures to support the SCS:

- Figure C.1: Housing Near High Frequency Transit
- Figure C.2: 2020 Land Use¹
- Figure C.3: 2035 Land Use²
- Figure C.4: San Diego Region Wetlands
- Figure C.5: San Diego Region Important Agricultural Lands
- Figure C.6: San Diego Regional Habitat Preserved Lands
- Figure C.7: San Diego Region Generalized Vegetation
- Figure C.8: Potential Aggregate Supply Sites
- Figure C.9: 2020 Employment and Housing Density
- Figure C.10: 2035 Employment and Housing Density
- Figure C.11: 2035 Potential Transit Priority Project Areas

Appendix C also contains links to two SANDAG Board of Directors reports that support the development of the transportation network selected for San Diego Forward: The Regional Plan:

- [August 15, 2014 – Draft Revenue Constrained Transportation Scenarios³](#)
- [September 12, 2014 – Preferred Revenue Constrained Transportation Scenario⁴](#)

The Technical Methodology to estimate greenhouse gas emissions submitted to the California Air Resources Board (ARB) on June 7, 2013, as well as ARB’s acknowledgment of receiving this methodology also are included in Appendix C, Attachment 1.

- June 7, 2013 – Correspondence from SANDAG to ARB regarding Technical Methodology to estimate greenhouse gas emissions from the San Diego Association of Governments Sustainable Communities Strategy.
- August 12, 2013 – Correspondence from ARB to SANDAG regarding Technical Methodology to estimate greenhouse gas emissions.

SB 375 Greenhouse Gas Reduction Targets set by the California Air Resources Board and Results of Greenhouse Gas Emissions Reductions

The path toward living more sustainably is clear: focus housing and job growth in urbanized areas where there is existing and planned transportation infrastructure, protect sensitive habitat and open space, invest in a transportation network that provides people with transportation options that reduce greenhouse gas emissions, and implement the plan through incentives and collaboration.

As part of its mandate under SB 375, in 2010 the California Air Resources Board (ARB) set specific targets for reducing greenhouse gas emissions for cars and light trucks for each of the state’s regions from a 2005 base year. The greenhouse gas targets set for the San Diego region call for a 7 percent per capita reduction by 2020, and a 13 percent per capita reduction by 2035. The SCS will result in a 15 percent reduction in emissions by 2020, and a 21 percent reduction by 2035 – far more than what the state mandates require – as shown in Table C.1. The greenhouse gas reductions for the final Regional Plan were calculated using the ARB model EMFAC 2014 v. 1.0.7 and adjustment factors provided by ARB to account for differences in emission rates between EMFAC 2007 (used to set the targets) and this latest version of the emissions model (EMFAC 2014 v.1.0.7). The per capita greenhouse gas reductions for 2020 and 2035 have changed from the draft Regional Plan to the final Regional Plan by 3 percentage points. The ARB adjustment factor for SANDAG reduces the per capita results for both 2020 and 2035 by 2 percentage points. For example, before the ARB adjustment, per capita reductions for 2020 were 17 percent, and after applying the adjustment, the reductions become 15 percent. The additional 1 percentage point difference for 2020 and 2035 is due to final travel demand model runs, which also use EMFAC 2014 v.1.0.7 to estimate greenhouse gas emissions. Attachment 2 describes the off-model greenhouse gas reduction methodology that supplements the SANDAG Activity Based Model calculations as well as the ARB adjustment referenced above.

Table C.1
SB 375 Greenhouse Gas Reduction Targets and Regional Plan Greenhouse Gas Emissions Reductions Results

	2020	2035
ARB Targets	7 percent	13 percent
Greenhouse Gas Emissions Reductions	15 percent	21 percent

Note: Average weekday per capita carbon dioxide reductions for cars and light trucks from 2005.

Source: ARB and SANDAG

Breakdown of the Regional Plan’s SCS Components that Contribute to SB 375 Per Capita Greenhouse Gas Reductions

Several components and strategies contribute toward SB 375 per capita greenhouse gas reductions from passenger vehicles. Approximately half of the reductions would result from the Regional Plan’s investments in transit projects and their operations, managed lanes, active transportation projects, and TDM measures that support teleworking (i.e., working from home or telecommuting). About one-quarter of the reductions are estimated from changing land use and population characteristics, while another quarter are projected from increases in the cost of driving (auto operating costs).

Housing Goals

Figure C.1 and Table C.2 show that the number of homes located within one half-mile of high frequency public transit services will increase from 35 percent in 2012 to 63 percent in 2050 (for population this increase is 35 percent to 61 percent). This increase is due to new transit services, detailed in Appendix A: Transportation Projects, Costs, and Phasing, and to growth being primarily concentrated in the urbanized areas.

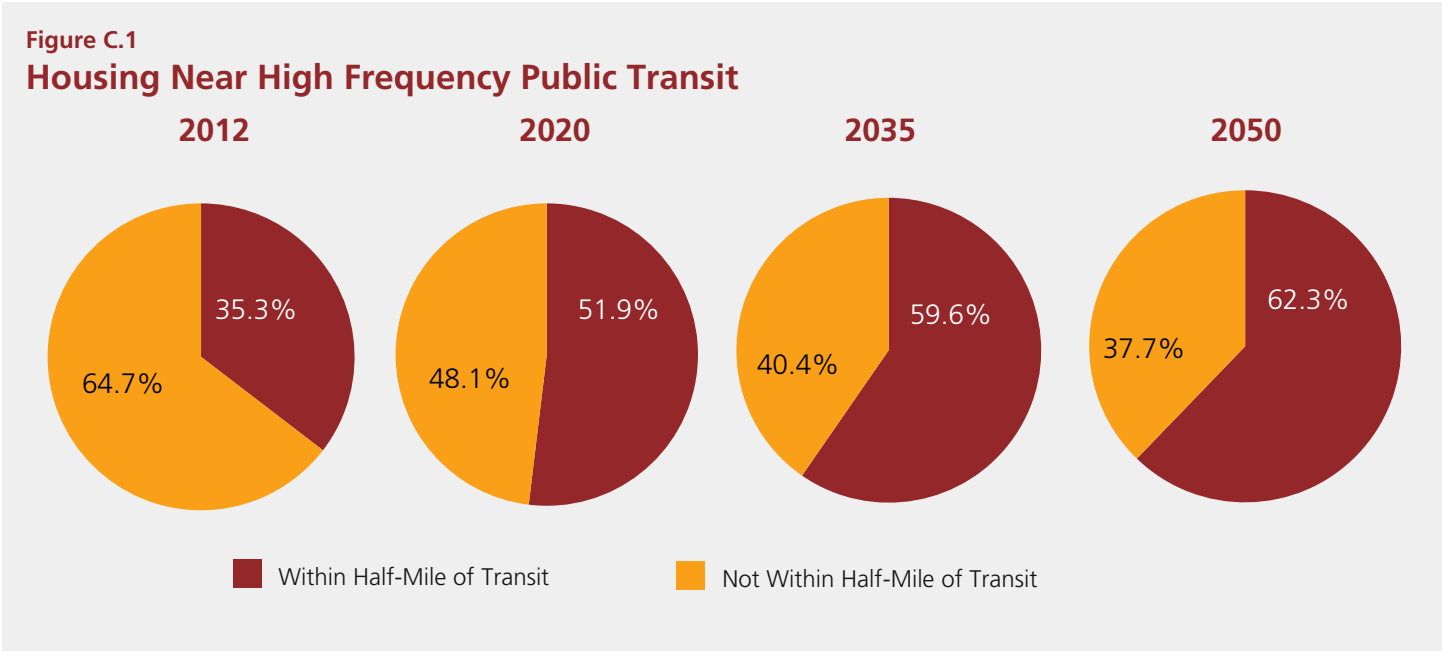


Table C.2
Housing Near High Frequency Public Transit

	2012		2020		2035		2050	
	Numeric	Percent	Numeric	Percent	Numeric	Percent	Numeric	Percent
Within Half Mile of Transit	412,050	35.3%	648,622	51.9%	831,837	59.6%	929,785	62.3%
Not Within Half Mile of Transit	753,768	64.7%	601,062	48.1%	562,946	40.4%	562,150	37.7%
Total	1,165,818	100.0%	1,249,684	100.0%	394,783	100.0%	1,491,935	100.0%

Table C.3 shows that the projected increase in new housing capacity is generally higher for areas with densities above 20 dwelling units per acre. The increases reflect extensive work by local jurisdictions to update general and specific plans to accommodate future growth and development in the urbanized areas of the region where existing and planned public transit is located.

Table C.3

Series 13 Regional Growth Forecast Estimated Housing Capacity by Jurisdiction and Subregion

	Dwelling Units Per Acre				Total
	0 to 10	10 to 20	20 to 30	30+	
City of San Diego	46,446	11,328	49,508	84,747	192,029
Unincorporated	40,625	11,330	4,621	5,794	62,370
North County	7,526	2,734	1,654	3,140	15,054
Coastal					
Carlsbad	4,106	1,507	-	-	5,613
Del Mar	(28)*	44	-	-	16
Encinitas	1,204	764	741	-	2,709
Oceanside	2,170	398	403	3,140	6,111
Solana Beach	74	21	510	-	605
North County Inland	16,484	1,635	1,077	12,622	31,818
Escondido	6,194	745	133	3,923	10,995
Poway	900	17	35	452	1,404
San Marcos	8,468	(112)*	187	395	8,938
Vista	922	985	722	7,852	10,481
East County	3,014	1,555	1,457	19,702	25,728
El Cajon	(283)*	763	566	10,633	11,679
La Mesa	759	188	215	7,055	8,217
Lemon Grove	201	168	180	1,372	1,921
Santee	2,337	436	496	642	3,911
South Bay	21,166	597	2,856	43,424	68,043
Chula Vista	20,356	441	1,561	10,070	32,428
Coronado	61	2	94	24	181
Imperial Beach	6	62	341	1,431	1,840
National City	743	92	860	31,899	33,594
Total	135,261	29,179	61,173	169,429	395,042

* Negative capacity is a result of redevelopment to either a different density range or to commercial land.

Table C.4

SANDAG Sustainable Communities Strategy Documentation

Subject Area		Addressed
SCS Requirement	CGC Section 65080(b)(2)(B) Each metropolitan planning organization shall prepare a sustainable communities strategy subject to the requirements of Part 450 of Title 23 of and Part 93 of Title 40 of the Code of Federal Regulations, including the requirement to utilize the most recent planning assumptions considering local general plans and other factors. The sustainable communities strategy shall:	See Regional Plan Chapters 2 and 5. Also see Appendices C (SCS Documentation and Related Information), J (Regional Growth Forecast), L (Regional Housing Needs Assessment Plan), and S (Monitoring Performance)
Land Use	CGC Section 65080(b)(2)(B)(i) identify the general location of uses, residential densities, and building intensities within the region;	See Regional Plan Chapter 2 and Appendices C (SCS Documentation and Related Information Figures C-2 and C-3), and J (Regional Growth Forecast)
Housing Goals	CGC Section 65080(b)(2)(B)(vi) consider the state housing goals specified in Sections 65580 and 65581;	See Regional Plan Chapter 2 and Appendices C (SCS Documentation and Related Information), L (Regional Housing Needs Assessment Plan), and U.13 (Housing: Providing Homes for all Residents)

Table C.4 (continued)

SANDAG Sustainable Communities Strategy Documentation

Subject Area	Addressed
<p>CGC Section 65080(b)(2)(B)(ii) identify areas within the region sufficient to house all the population of the region, including all economic segments of the population, over the course of the planning period of the regional transportation plan taking into account net migration into the region, population growth, household formation and employment growth;</p>	<p>See Regional Plan Chapter 2 and Appendices J (Regional Growth Forecast), L (Regional Housing Needs Assessment Plan), and U.13 (Housing: Providing Homes for all Residents)</p>
<p>CGC Section 65080(b)(2)(B)(iii) identify areas within the region sufficient to house an eight-year projection of the regional housing need for the region pursuant to Section 65584;</p>	<p>See Regional Plan Chapter 2 and Appendices L (Regional Housing Needs Assessment Plan), and U.13 (Housing: Providing Homes for all Residents)</p>
<p>Natural Resources</p> <p>CGC Section 65080(b)(2)(B)(v) gather and consider the best practically available scientific information regarding resource areas and farmland in the region as defined in subdivisions (a) and (b) of Section 65080.01;</p>	<p>See Regional Plan Chapter 2 and Appendix C figures titled:</p> <ul style="list-style-type: none"> • Figure C.4 San Diego Region Wetlands • Figure C.5 San Diego Region Important Agricultural Lands • Figure C.6 San Diego Region Habitat Conservation Lands • Figure C.7 San Diego Region Generalized Vegetation

Table C.4 (continued)

SANDAG Sustainable Communities Strategy Documentation

Subject Area		Addressed
Transportation Network	CGC Section 65080(b)(2)(B)(iv) identify a transportation network to service the transportation needs of the region;	See Regional Plan Chapter 2 and Appendix A (Transportation Projects, Costs, and Phasing)
Meeting Greenhouse Gas Reduction Targets	CGC Section 65080(b)(2)(B)(vii) set forth a forecasted development pattern for the region, which, when integrated with the transportation network and other transportation measures and policies, will reduce the greenhouse gas emissions from automobiles and light trucks to achieve, if there is a feasible way to do so, the greenhouse gas emission reduction targets approved by the state board;	See Regional Plan Chapter 2 and Appendices C (SCS Documentation and Related Information), J (Regional Growth Forecast), and T (SANDAG Travel Demand Model and Forecasting Documentation)
Meeting Federal Air Quality Requirements	CGC Section 65080(b)(2)(B)(viii) allow the regional transportation plan to comply with Section 176 of the federal Clean Air Act (42 U.S.C. §7506).	See Appendix B (Air Quality Planning and Transportation Conformity), Appendix J (Regional Growth Forecast), Appendix T (SANDAG Travel Demand Model and Forecasting Documentation)
Informational Meetings	CGC Section 65080(b)(2)(E) The metropolitan planning organization shall conduct at least two informational meetings in each county within the region for members of the board of supervisors and city councils on the sustainable communities strategy and alternative planning strategy, if any. Only one informational meeting is needed in each county if it is attended by representatives of the county board of supervisors and city councils that represent a majority of the cities representing a majority of the population in the incorporated areas of that county.	See Regional Plan Chapter 2 and Appendix F (Public Involvement Program)

Table C.4 (continued)

SANDAG Sustainable Communities Strategy Documentation

Subject Area		Addressed
Public Participation Plan	CGC Section 65080(b)(2)(F) Each metropolitan planning organization shall adopt a public participation plan, for development of the sustainable communities strategy and an alternative planning strategy, if any, that includes all of the following:	See Regional Plan Chapter 2 and Appendix F (Public Involvement Program)
Public Participation Plan – outreach	CGC Section 65080(b)(2)(F)(i) Outreach efforts to encourage the active participation of a broad range of stakeholder groups in the planning process, consistent with the agency’s adopted Federal Public Participation Plan, including, but not limited to, affordable housing advocates, transportation advocates, neighborhood and community groups, environmental advocates, home builder representatives, broad-based business organizations, landowners, commercial property interests, and homeowner associations.	See Appendix F (Public Involvement Program)
Public Participation Plan – consultation	CGC Section 65080(b)(2)(F)(ii) Consultation with congestion management agencies, transportation agencies, and transportation commissions.	See Appendix F (Public Involvement Program)
Public Participation Plan - workshops	CGC Section 65080(b)(2)(F)(iii) Three workshops throughout the region to provide the public with the information and tools necessary to provide a clear understanding of the issues and policy choices. Each workshop, to the extent practicable, shall include urban simulation computer modeling to create visual representations of the SCS and the alternative planning strategy.	See Appendix F (Public Involvement Program)
Public Participation Plan – SCS public review	CGC Section 65080(b)(2)(F)(iv) Preparation and circulation of a draft SCS and an alternative planning strategy, if one is prepared, not less than 55 days before adoption of a final regional transportation plan.	See Appendix F (Public Involvement Program)

Table C.4 (continued)

SANDAG Sustainable Communities Strategy Documentation

Subject Area		Addressed
Public Participation Plan – public hearings	CGC Section 65080(b)(2)(F)(v) At least three public hearings on the draft sustainable communities strategy in the regional transportation plan and alternative planning strategy, if one is prepared. If the metropolitan transportation organization consists of a single county, at least two public hearings shall be held. To the maximum extent feasible, the hearings shall be in different parts of the region to maximize the opportunity for participation by members of the public throughout the region.	See Appendix F (Public Involvement Program)
Public Participation Plan – public notice	CGC Section 65080(b)(2)(F)(vi) A process for enabling members of the public to provide a single request to receive notices, information, and updates.	See Appendix F (Public Involvement Program)
Consultation with Local Agency Formation Commission	CGC Section 65080(b)(2)(G) In preparing a sustainable communities strategy, the metropolitan planning organization shall consider spheres of influence that have been adopted by the local agency formation commissions within its region.	See Regional Plan Chapter 2 and Appendix I (Consultation with the Local Agency Formation Commission)
ARB Greenhouse Gas Reduction Targets for San Diego Region	CGC Section 65080(b)(2)(H) Prior to adopting a sustainable communities strategy, the metropolitan planning organization shall quantify the reduction in greenhouse gas emissions projected to be achieved by the sustainable communities strategy and set forth the difference, if any, between the amount of that reduction and the target for the region established by the state board.	See Regional Plan Chapter 2 and Appendix C (SCS Documentation and Related Information, Table C.1)

Table C.4 (continued)

SANDAG Sustainable Communities Strategy Documentation

Subject Area		Addressed
<p>Consideration of Financial Incentives for Cities and Counties with Resource Areas or Farmlands</p>	<p>CGC Section 65080(b)(4)(C) The metropolitan planning organization or county transportation agency, whichever entity is appropriate, shall consider financial incentives for cities and counties that have resource areas or farmland, as defined in Section 65080.01, for the purposes of, for example, transportation investments for the preservation and safety of the city street or county road system and farm-to-market and interconnectivity transportation needs. The metropolitan planning organization or county transportation agency, whichever entity is appropriate, shall also consider financial assistance for counties to address countywide service responsibilities in counties that contribute towards the greenhouse gas emission reduction targets by implementing policies for growth to occur within their cities.</p>	<p>See Regional Plan Chapter 2 and Chapter 5</p>

Figure C.2
2020
Land Use
October 2015

Residential

- Single Family Residential
- Multi-Family Residential*

Mixed Use, Commercial, and Industrial

- Mixed Use
- Commercial and Office
- Heavy and Light Industry

Public Facilities and Utilities

- Military
- Transportation, Communications, Utilities
- Education and Institutions

Open Space Parks and Recreation

- Open Space Parks
- Recreation

Agriculture and Rural Residential

- Spaced Rural Residential**
- Agriculture

Indian Reservations

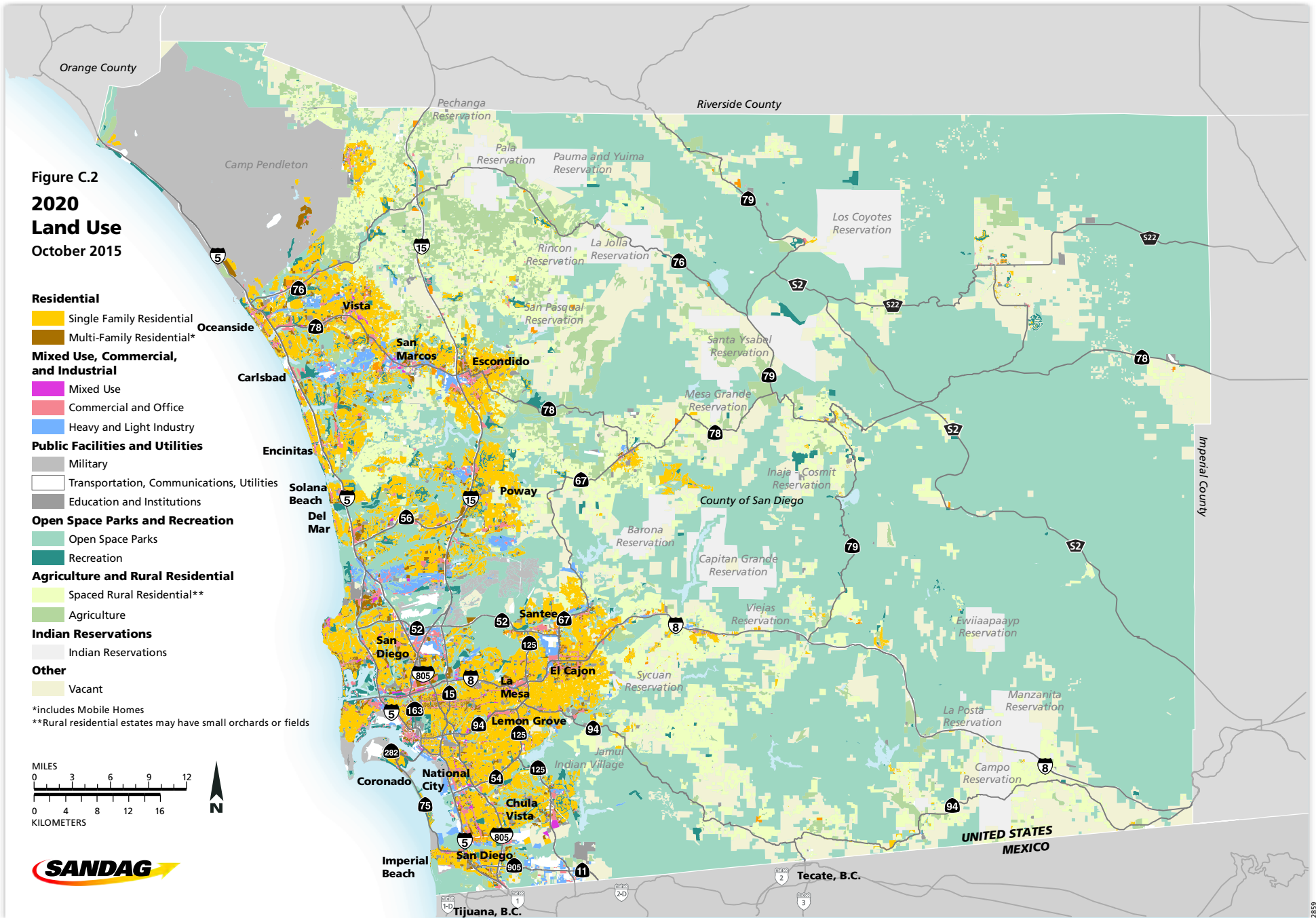
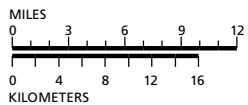
- Indian Reservations

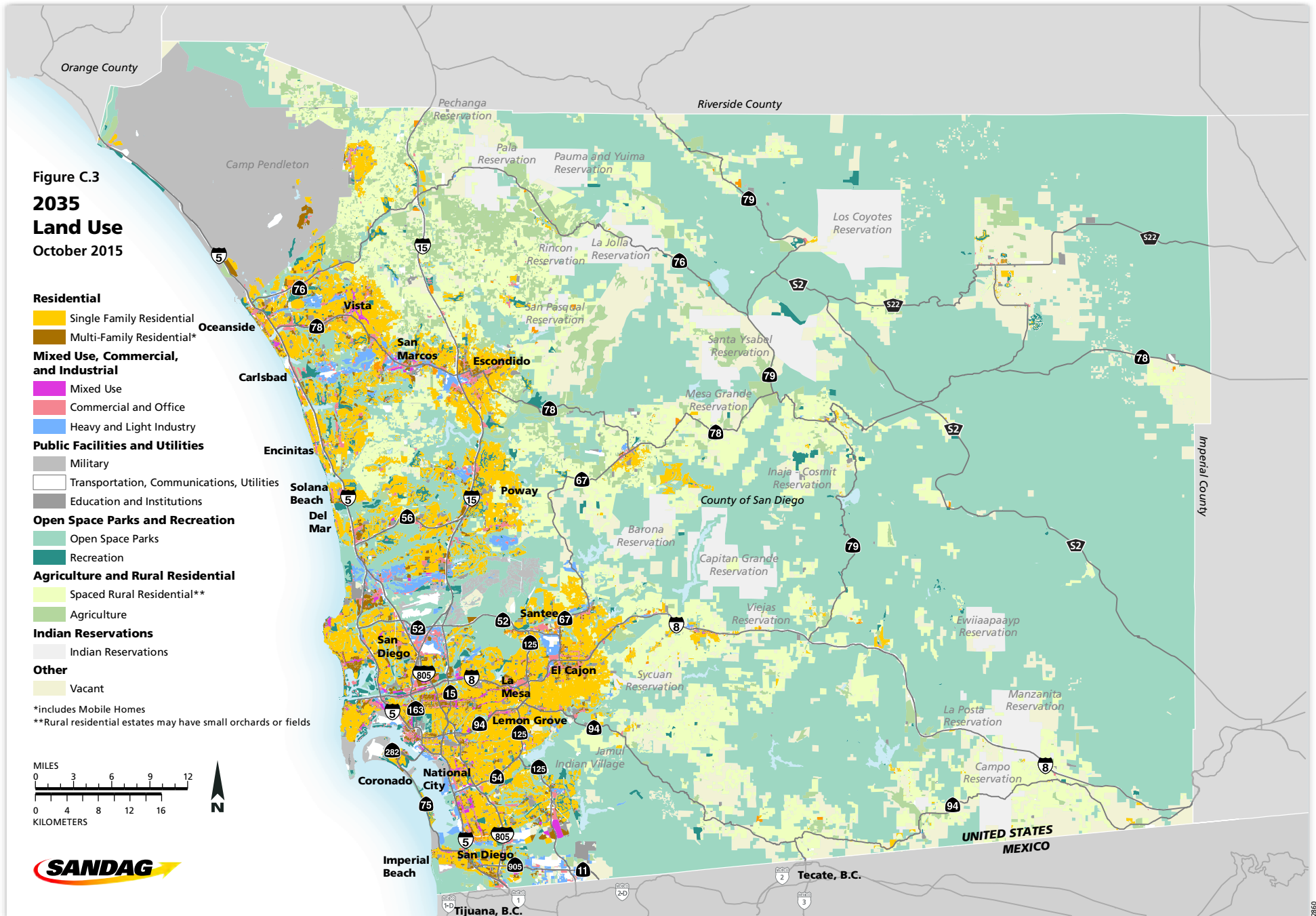
Other

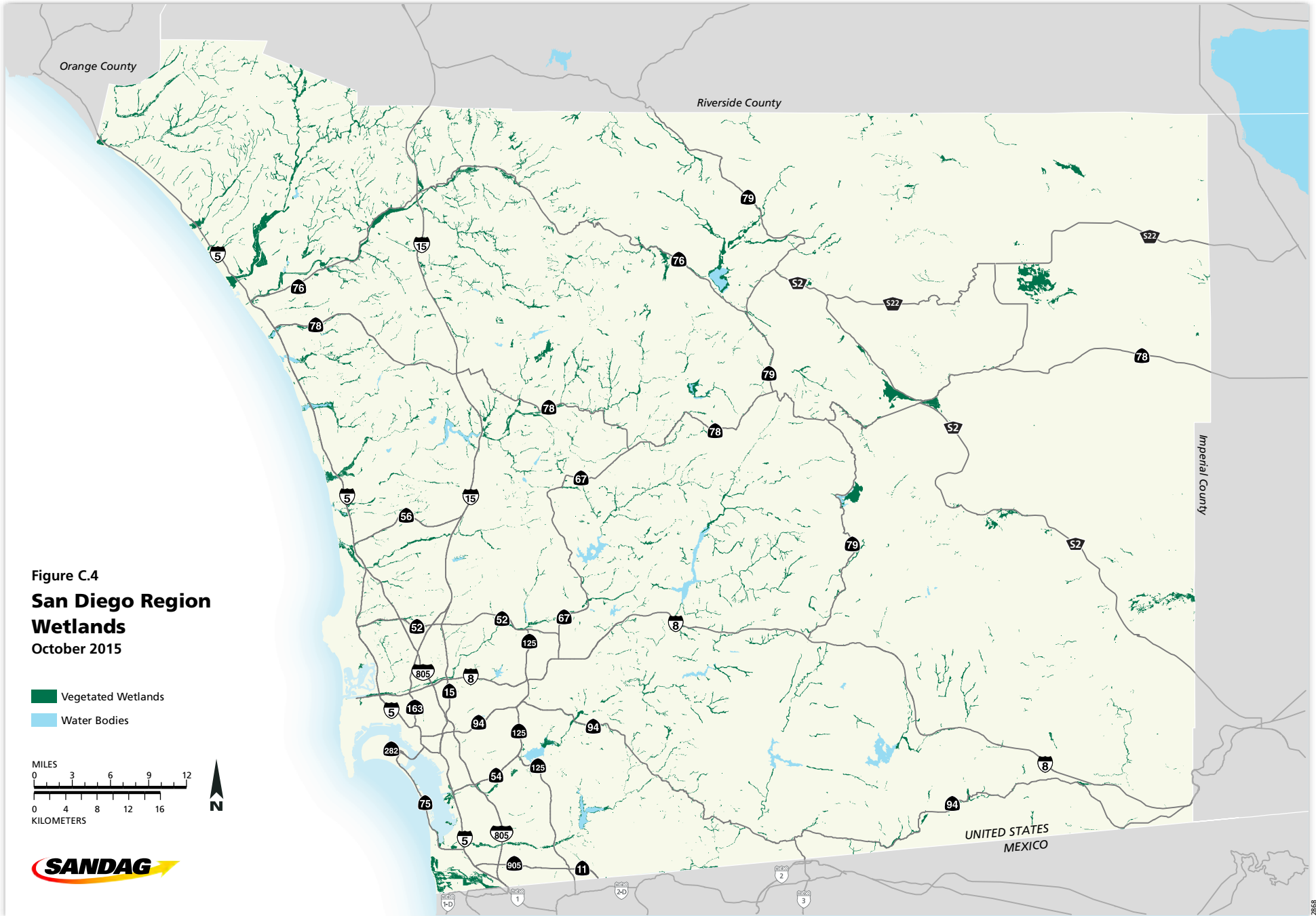
- Vacant

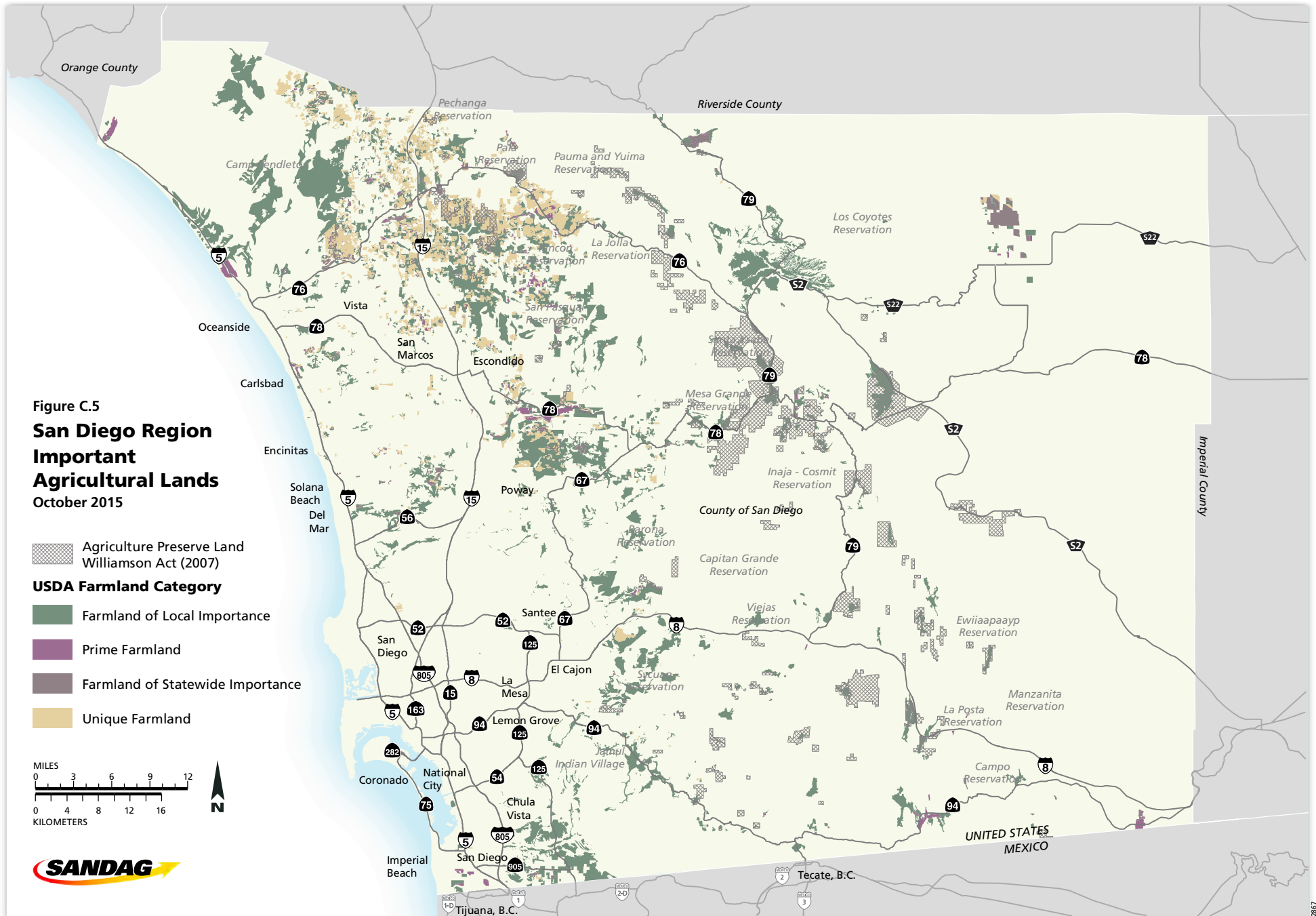
*includes Mobile Homes

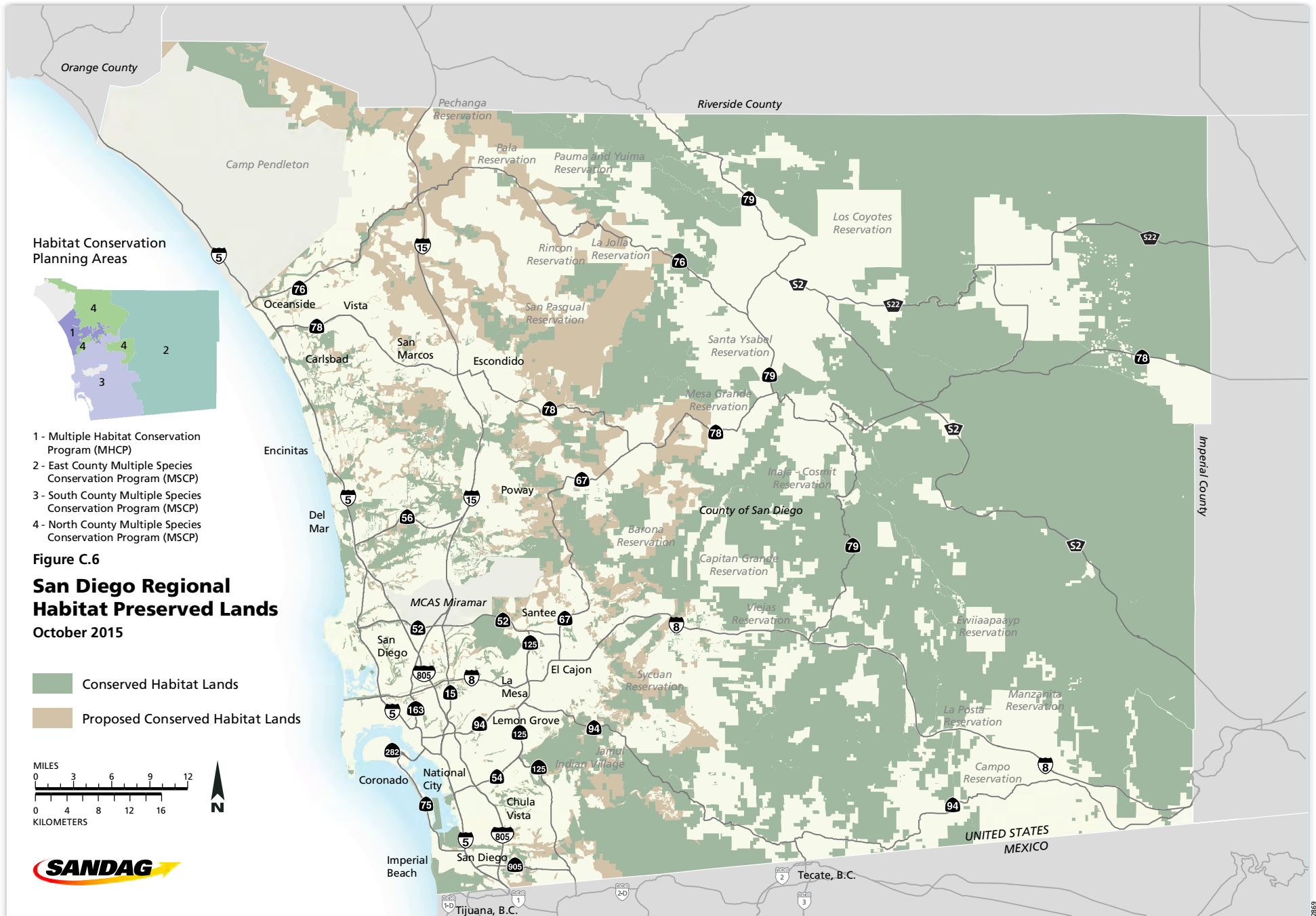
**Rural residential estates may have small orchards or fields

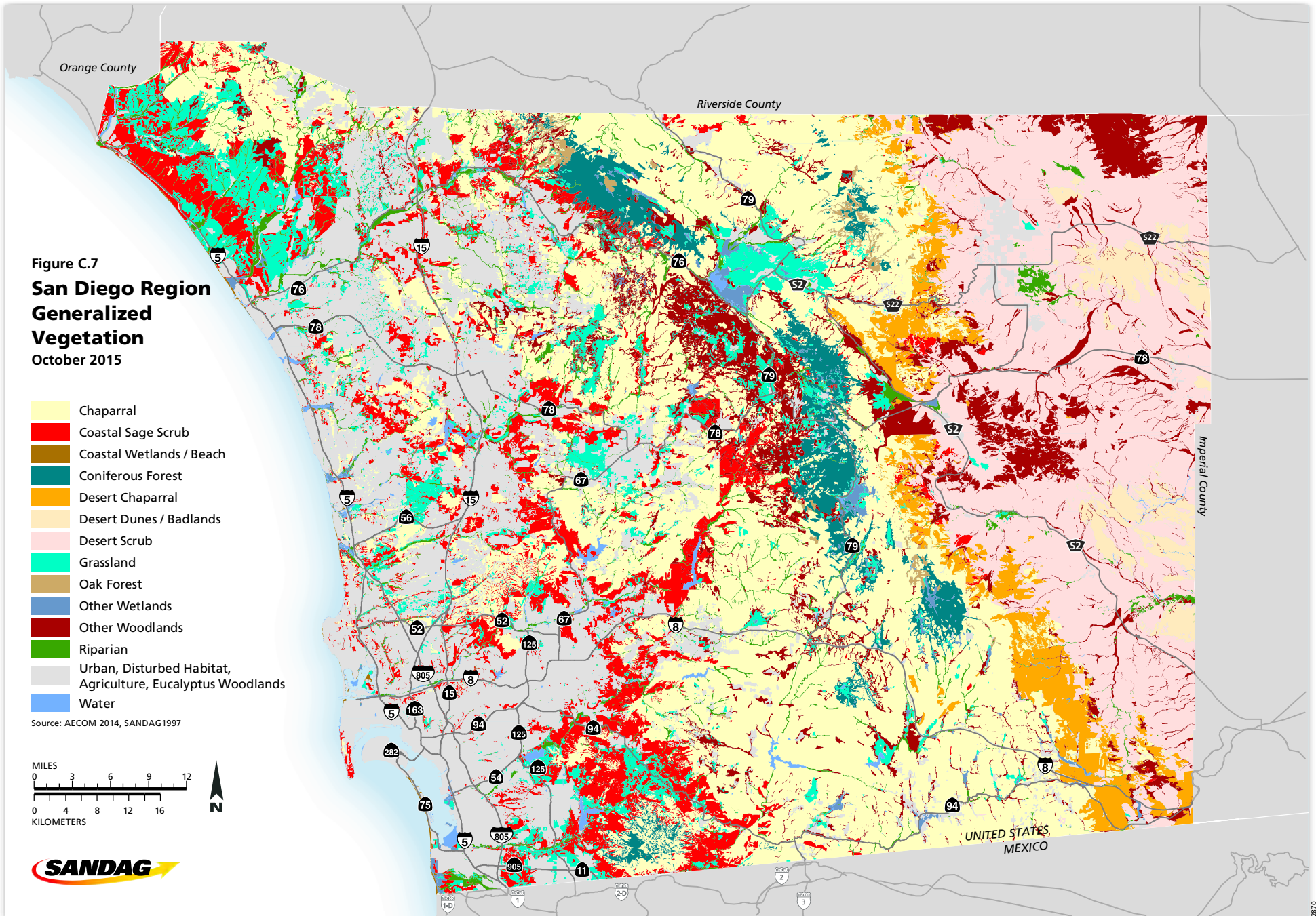












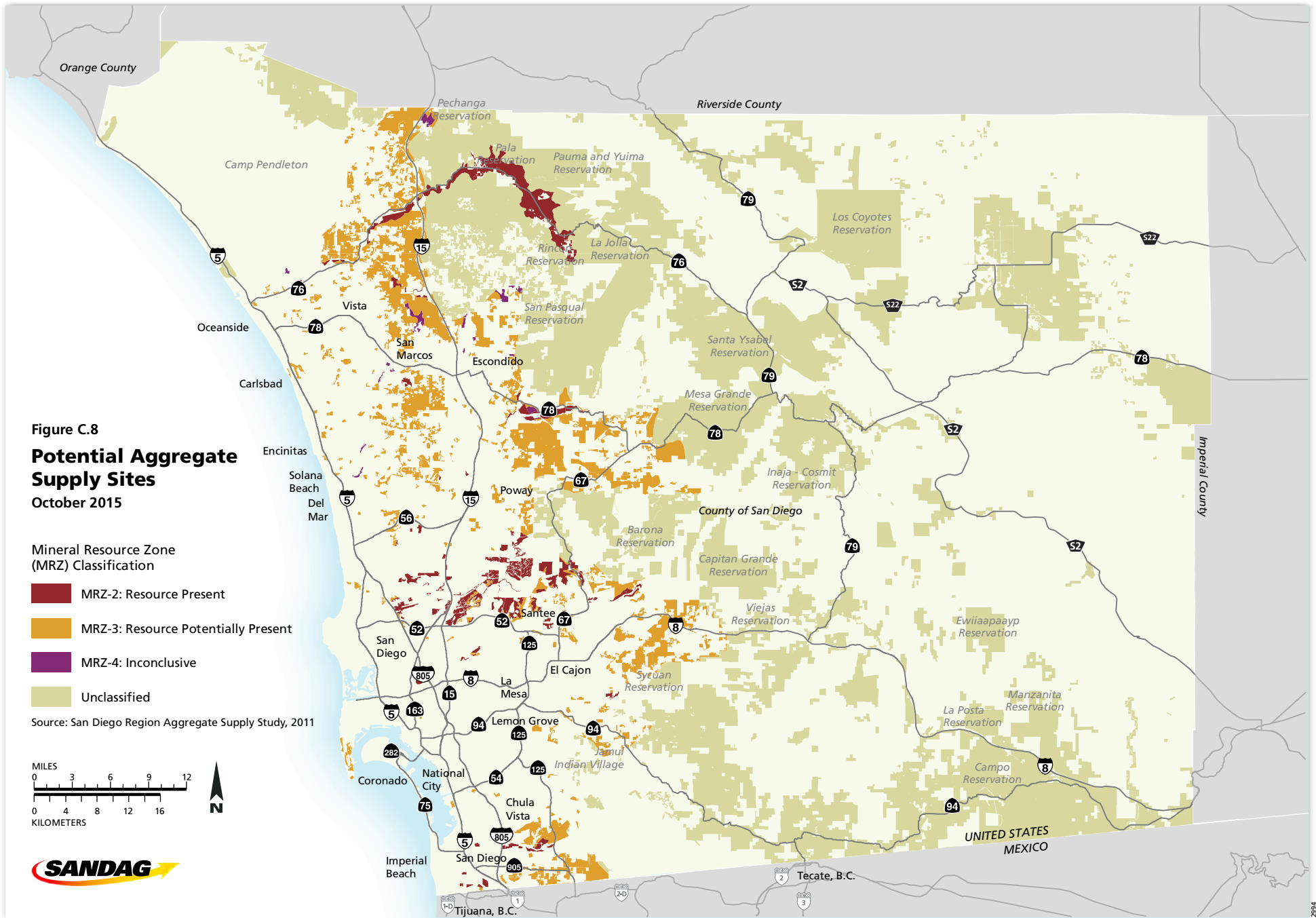
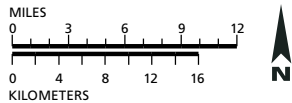


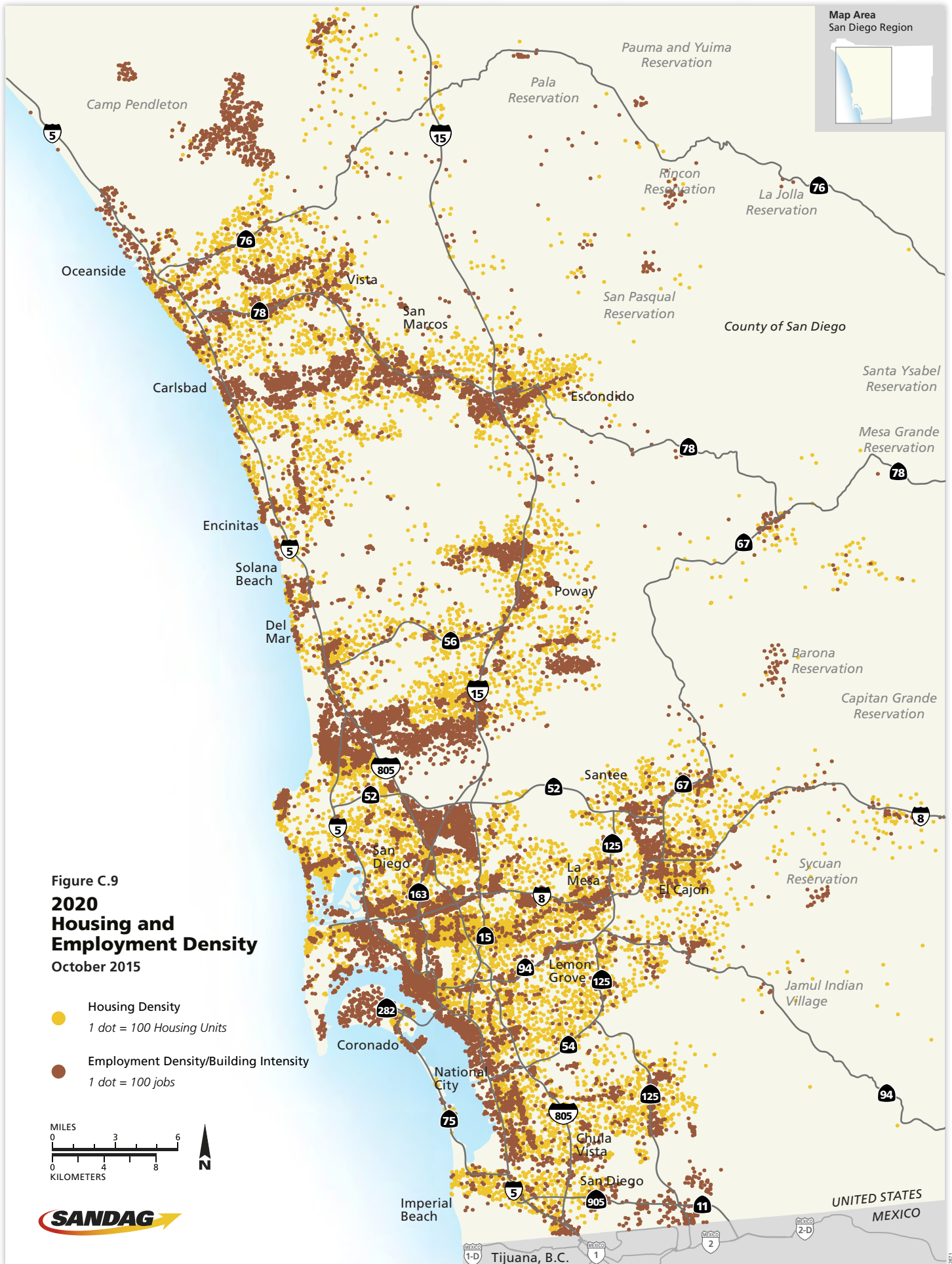
Figure C.8
Potential Aggregate Supply Sites
 October 2015

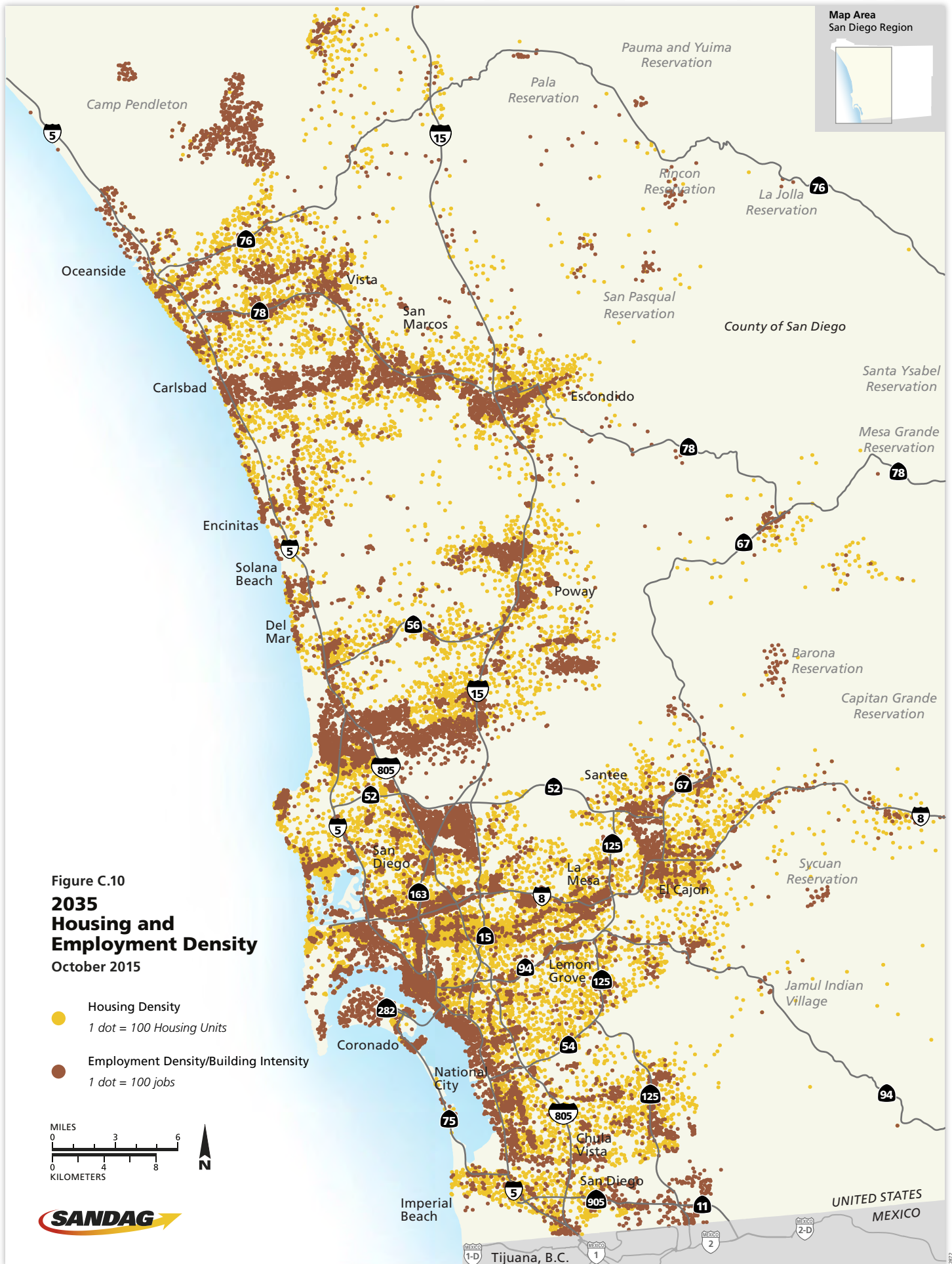
Mineral Resource Zone (MRZ) Classification

- MRZ-2: Resource Present
- MRZ-3: Resource Potentially Present
- MRZ-4: Inconclusive
- Unclassified

Source: San Diego Region Aggregate Supply Study, 2011







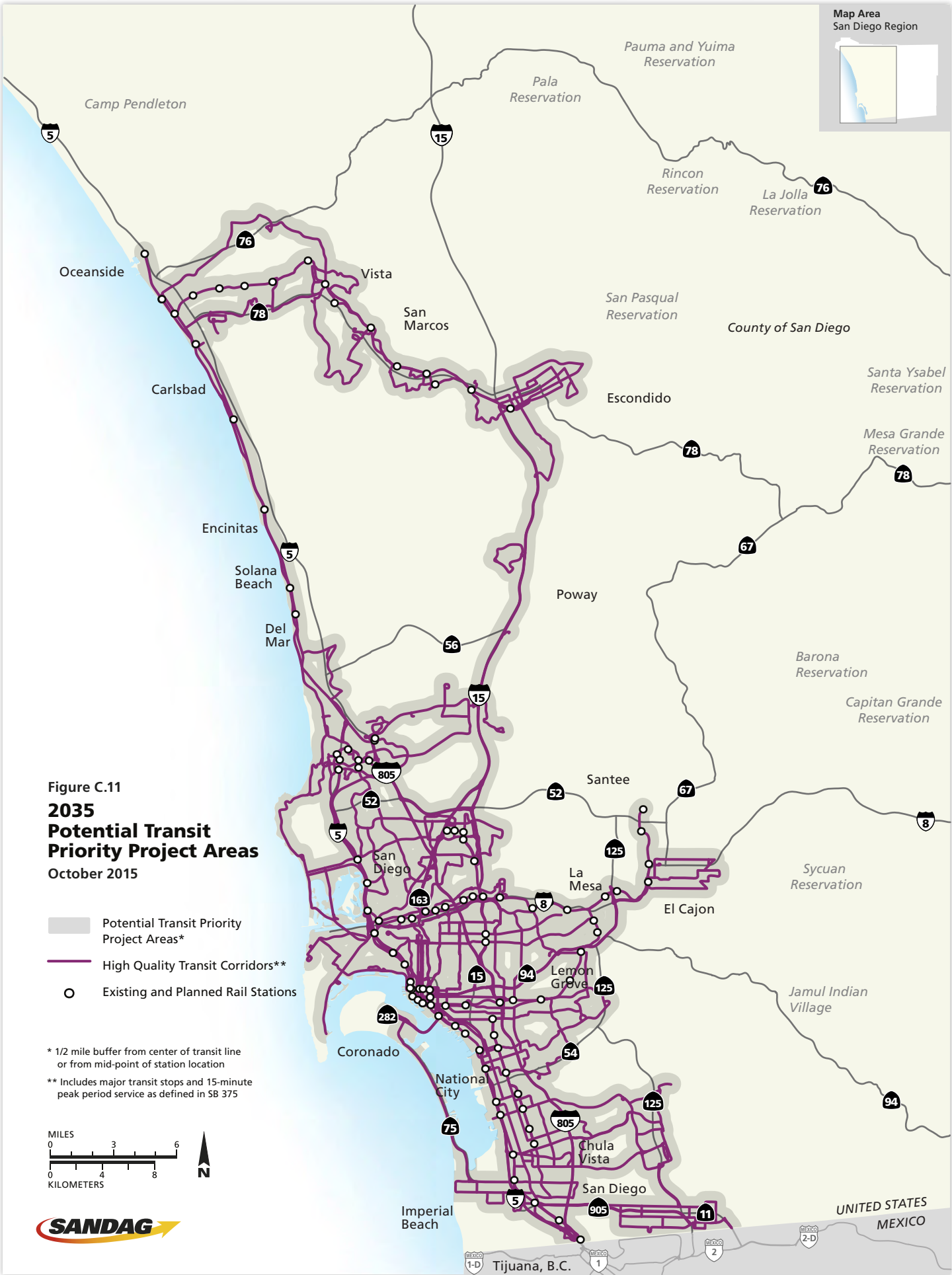
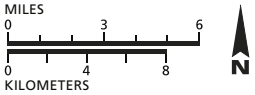


Figure C.11
2035
Potential Transit
Priority Project Areas
 October 2015

- Potential Transit Priority Project Areas*
- High Quality Transit Corridors**
- Existing and Planned Rail Stations

* 1/2 mile buffer from center of transit line or from mid-point of station location
 ** Includes major transit stops and 15-minute peak period service as defined in SB 375



Endnotes

- ¹ Consistent with SB 375, this map identifies the general location of uses, residential densities, and building intensities in 2020. (Government Code Section 65080(b)(2)(B)(i)).
- ² Consistent with SB 375, this map identifies the general location of uses, residential densities, and building intensities in 2035. (Government Code Section 65080(b)(2)(B)(i)).
- ³ <http://www.sandag.org/index.asp?meetingID=3957&fuseaction=meetings.detail>
- ⁴ <http://www.sandag.org/index.asp?meetingID=3851&fuseaction=meetings.detail>



401 B Street, Suite 800
San Diego, CA 92101-4231
(619) 699-1900
Fax (619) 699-1905
www.sandag.org

June 7, 2013

File Number 3100000

Mr. Richard Corey
Executive Officer
California Air Resources Board
1001 I Street
Sacramento, CA 95814

Dear Mr. Corey:

SUBJECT: Technical Methodology to Estimate Greenhouse Gas Emissions from the San Diego Association of Governments Sustainable Communities Strategy

California Government Code 65080(b)(2)(I)(i) requires each Metropolitan Planning Organization to submit a description to the state board of the technical methodology it intends to use to estimate the greenhouse gas emissions from its sustainable communities strategy and, if appropriate, its alternative planning strategy. The enclosed document outlines the planning and modeling methodology the San Diego Association of Governments (SANDAG) intends to use to estimate the greenhouse gas emissions from its sustainable communities strategy and alternative planning strategy, if necessary. I am pleased to inform you the upcoming SANDAG Regional Plan will use an open, activity-based model that will be fully integrated with our new Production Exchange, Consumption, and Allocation System (PECAS) land use and economic model. This advancement will allow for a more detailed review of the interaction between land use and transportation in this plan.

Sincerely,


GARY L. GALLEGOS
Executive Director

GGA/CDA/bga

Attachment: Technical Methodology to Estimate Greenhouse Gas Emissions

MEMBER AGENCIES

- Cities of
- Carlsbad
- Chula Vista
- Coronado
- Del Mar
- El Cajon
- Encinitas
- Escondido
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- San Diego County Water Authority
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Technical Methodology to Estimate Greenhouse Gas Emissions

This report outlines key San Diego Forward: The Regional Plan (Regional Plan) planning efforts and inputs, including a description of its transportation and land use modeling platform. The Regional Plan serves as the San Diego Association of Governments (SANDAG) long-range planning document for the San Diego region, and it also functions as the Regional Transportation Plan and its Sustainable Communities Strategy (2050 RTP/SCS), which will comply with state and federal regulations including California Senate Bill 375 (Steinberg, 2008) and federal air quality conformity.

The Regional Plan brings together the updates of the SANDAG Regional Comprehensive Plan, the long-range blueprint planning document, and the 2050 RTP/SCS. A unified document provides San Diego residents a more accessible document that includes an overall vision for the region with a concrete implementation program. SANDAG anticipates the Regional Plan and its Environmental Impact Report (EIR) will be adopted by the Board of Directors in summer 2015.

What's New in the Regional Plan

The Regional Plan will continue to build on the planning and implementation progress since the adoption of the 2050 RTP/SCS in October 2011. The list below highlights some of the planning work that has been taking place in the San Diego region since 2011:

- An early action program to advance design and construction of projects included in the Regional Bicycle Plan
- A strategy to implement a broader Active Transportation Program that would include Safe Routes to School and Safe Routes to Transit
- Evaluation of alternative land use and transportation scenarios to further reduce projected Greenhouse Gas (GHG) emission levels
- Completion of a new transportation, land use, and economic modeling framework including an Activity-Based Transportation Model and Production Exchange, Consumption, and Allocation System (PECAS)
- Testing public health analytical tools for potential future planning work
- Development of a Regional Transit Oriented Development strategy to foster a greater level of development that supports investments in public transit
- Development of a Regional Complete Streets Policy for use at the regional and local level

In addition to the planning work, SANDAG and its partners are implementing the 2050 RTP/SCS, including the delivery of the following projects:

- SuperLoop Bus Service connecting the University of California San Diego and the adjacent major employment and housing centers of the North University area
- Expansion of the Bayshore Bikeway in Chula Vista
- New Bus Rapid Transit Stations and Managed Lanes along the Interstate 15 corridor

Technical Methodology to Estimate Greenhouse Gas Emissions

- Completion of the State Route 905 connecting the Otay Mesa International Port of Entry to the Interstate 5 and Interstate 805 corridors
- Double tracking of the COASTER and Amtrak LOSSAN corridor through northern San Diego County, including improved pedestrian crossings and tidal lagoon enhancements
- Completion of eight Smart Growth Incentive Program Capital Projects, including the Lemon Grove Main Street Promenade which will provide pedestrian enhancements to integrate planned mixed-use development at an existing light rail station

San Diego Forward: The Regional Plan Work Plan

On February 22, 2013, the SANDAG Board of Directors reviewed the work program for the Regional Plan. The work program provides the overall framework and schedule to develop and adopt the Regional Plan in 2015. Highlights of the work plan include the following activities:

- Engage in public outreach and involvement
- Establish the Regional Plan vision, goals, and policy objectives
- Prepare the 2050 Regional Growth Forecast update (Series 13)
- Refine and develop policy areas
- Incorporate recommendations from more detailed planning studies
- Develop Sustainable Community Strategies (SCS) and Alternative Planning Strategy (if needed)
- Update revenue and cost projections for projects, programs, and services
- Update regional arterial system (as needed)
- Update airport multimodal and rail planning
- Update transportation project evaluation criteria
- Update performance measures for the Regional Plan
- Develop financially unconstrained multimodal transportation scenario
- Develop revenue constrained alternative transportation scenarios and select preferred scenario
- Perform air quality conformity analysis
- Produce draft Regional Plan
- Prepare draft EIR
- Address feedback from public comment period

Technical Methodology to Estimate Greenhouse Gas Emissions

- Adopt final Regional Plan and certify final EIR
- Air quality conformity determination by United States Department of Transportation
- Air Resources Board (ARB) determination on the adopted SCS

Public Involvement Plan

The Public Involvement Plan (PIP) is intended to support the development of the Regional Plan, creating a variety of opportunities for individuals, organizations, agencies, and other stakeholders to provide meaningful input. The PIP was created based on input obtained throughout the fall of 2012 from the SANDAG Board of Directors, Policy Advisory Committees, working groups, surveys, and a public workshop held in October 2012. The PIP was drafted using the guidelines provided by the agency's overall Public Participation Plan, which sets the foundation for specific public outreach approaches. The PIP describes efforts that SANDAG will undertake to secure input on: developing sustainability and land use goals; priorities for transportation projects, programs, and services; transportation networks; infrastructure recommendations; funding alternatives; policies and programs; performance measures; GHG emissions targets; and other related issues.

Implementation of this PIP will accomplish the following:

- Provide a road map to ensure that all interested stakeholders are given the chance to participate in the process
- Reach beyond traditional methods to encourage participation from a wide variety of members of the public
- Communicate the importance of the plan and the opportunities to participate in the process
- Educate the public about SANDAG and its role in the region
- Establish the new Regional Plan as a critical policy document helping to balance our future housing, jobs, land use, transportation, health, social equity, economic, and environmental sustainability needs

This PIP is intended to be a living document. Because of the fluid nature of public participation, this plan may be updated at major milestones and adjusted in response to issues and circumstances that arise throughout the planning process.

Series 13: 2050 Regional Growth Forecast

The Series 13 Regional Growth Forecast serves as the foundation for the Regional Plan and other planning documents (e.g., water, general plans) across the region. SANDAG denotes forecasts by a sequential series number. The forecast under development is known as the Series 13: 2050 Regional Growth Forecast. The forecast used in the 2050 RTP/SCS, adopted in October 2011, was the Series 12: 2050 Regional Growth Forecast.

The regional forecast is developed by SANDAG with input from expert demographers, economists, developers, planners, and natural resource managers. These experts review economic and

Technical Methodology to Estimate Greenhouse Gas Emissions

demographic assumptions about fertility, migration, inflation, and other indicators. In addition to the traditional expert panel review SANDAG conducts, SANDAG also has reviewed the forecast with key stakeholders across the region, including transportation, land use, and economic development advocates.

SANDAG uses its Demographic and Economic Forecasting Model (DEFM) to develop the regional forecast. The DEFM was first developed to support the Series 4 forecast in the late 1970's. The DEFM uses a standard cohort-survival modeling technique along with econometric tools to estimate future growth. The DEFM has a proven track record of accuracy; since Series 4 (1977), on average, it has been within 4 percent of observed population growth.

The DEFM results will feed the sub-regional allocation models to develop city and neighborhood level forecasts. The Series 13 sub-regional forecast will use a new tool called PECAS. This model offers several enhancements beyond the sub-regional forecasting models used in prior forecasts by introducing economic conditions and return on investment calculations into the projections of development, redevelopment, and infill. In addition to new data sources, PECAS continues to rely upon the land use plans, policies, and zoning ordinances of the 18 cities, the County of San Diego, and other land use authorities. To ensure that local plans and policies are accurately reflected in the subregional forecast, the local jurisdictions and member agencies complete a review of its land use inputs (including general plans, planned land use, and housing capacity) via an online review tool.

Once the sub-regional forecast is complete, the detailed demographic forecast is produced. The Program for Age, Sex, and Ethnicity Forecast (PASEF) is a demographic model designed to forecast detailed demographic characteristics at a neighborhood level. PASEF projects population for 18 five-year age groups (0-4, 5-9,...,80-84, and 85+) broken down by gender and ethnicity for the region and smaller geographies.

A more detailed description of the land use forecasting models is included below in the *Modeling the Regional Plan* section of this report.

Evaluation Criteria and Performance Measure Development and Implementation

Project evaluation criteria is one element of a multistep process used to develop the revenue constrained multimodal transportation network for the Regional Plan. Evaluation criteria have been used in previous transportation plans including in the 2050 RTP/SCS. Project prioritization along with other factors such as funding availability, project readiness, and overall network connectivity are considered when developing the proposed transportation network alternatives.

In past transportation plans, SANDAG also has utilized performance measures to evaluate the performance of proposed revenue constrained transportation networks. The performance measures from the 2050 RTP/SCS included metrics to evaluate safety, multimodal mobility and reliability, goods movement, social equity, environmental impacts, and the relationship between land use and transportation. Performance measures are used to compare the proposed network alternatives and serve as a tool to select the preferred revenue constrained network scenario.

SANDAG is currently analyzing both the evaluation criteria and performance measures to incorporate best practices being used in the transportation planning field. Revisions for evaluation criteria are intended to simplify and standardize the criteria across different modal categories.

Technical Methodology to Estimate Greenhouse Gas Emissions

Performance measure revisions will assess the effectiveness of existing measures and consider new components including public health factors. Consultant assistance has been retained to research the best practices of other Metropolitan Planning Organizations (MPO) and various transportation research institutions and to develop refinements of the evaluation criteria and performance measures. The revised transportation project evaluation criteria and the updated performance measures will be presented to the SANDAG Board of Directors in fall 2013 for approval.

Land Use and Transportation Scenarios

The development of alternative land use and transportation scenarios, including the evaluation of potential pricing and parking strategies, is proposed to test strategies that could result in further reductions of GHG emissions beyond those forecasted in the 2050 RTP/SCS. The Series 13 sub-regional forecast will provide the baseline scenario against which alternative scenarios are compared.

Initial work on defining the scenario assumptions will begin in spring 2013, and scenario testing will begin in summer 2013. Through this planning process, various scenarios will be prepared, tested, and analyzed by early 2014, so results can inform the development of revenue-constrained transportation network scenarios.

A consultant team is assisting SANDAG in developing inputs and assumptions to assess the alternative land use and transportation scenarios. The scenarios will be measured against indicators, tested for performance, and refined throughout 2013. Sketch planning and travel demand models will be used in this planning effort.

Modeling the Regional Plan

SANDAG will use an integrated land use, economic, and transportation modeling system to estimate the GHG in the Regional Plan. Over the past five years, SANDAG has developed a new PECAS, Population Synthesizer (PopSyn), Activity-Based Model (ABM), Commercial Travel Model (CTM), and updated its Heavy-Duty Truck Model (HDTM).

The integrated system includes: (1) DEFM; (2) PECAS in conjunction with Urban Development Model (UDM); (3) detailed demographic forecast (PASEF and PopSyn); (4) the ABM and CTM; and (5) the latest Emission Factors (EMFAC) model from ARB (currently EMFAC 2011). Depending on model sensitivity to certain transportation policies, SANDAG will consider using off-model factors (or ARB defined Policies and Practices) as recommended by the Regional Targets Advisory Committee (RTAC). The Regional Plan model will have a base year of 2012.

The first model component, DEFM, is an econometric forecasting model with a demographic module. DEFM produces an annual forecast of the size and structure of the region's economy and a demographic forecast consistent with that future economy. For the economic forecast, DEFM relates historical changes in the region's economy to historical changes in the United States' economy using input-output and econometric methodologies. The demographic module uses a cohort survival model to forecast population by age, gender, and ethnicity. DEFM produces a wealth of data about the region's future economic and demographic characteristics. Among the more important elements are the size and composition of the population, employment by industry sector,

Technical Methodology to Estimate Greenhouse Gas Emissions

household and personal income, housing units by structure type, vacancy status and persons per household, labor force, and school enrollment.

Next, PECAS offers several improvements over more traditional spatial interaction “gravity” models. PECAS attempts to account for variation in the cost and quality of goods and services, as well as individual tastes and preferences. By integrating spatial characteristics (travel distances, land availability) and the economic system (prices, income), PECAS can evaluate a wider range of socio-economic impacts resulting from land use and transportation policies. PECAS is able to model the effects of land use and transportation policies on the wages, rents, productivity, and overall benefit to industrial and socio-economic groups.

PECAS has two component modules: the Activity Allocation (AA) Module and Space Development (SD) Module. The AA Module models the areas in which households and firms locate and who buys what from whom. Households located in one submarket interact with businesses throughout the region by both providing labor and purchasing goods and services. Businesses exchange their products with other businesses located throughout the region and use household labor as part of their production process. The SD Module models the actions of real estate developers who provide space (land use and floor space) in which households and firms can locate, responding to demand from households and businesses in AA for space in certain areas. These modules are run in one-year steps, with SD following AA. As a final step in the PECAS process, zonal control targets for housing and jobs are allocated to the parcel level with the UDM.

The third model component includes PASEF and the PopSyn. PASEF is a demographic model designed to forecast detailed demographic characteristics at a neighborhood level. The detailed demographic forecast comes directly from DEFM, but requires aggregating the single year of age detail into the five-year age groups used in PASEF, and an adjustment for special populations. The model projects population for 18 five-year age groups (0-4, 5-9,...,80-84, and 85+) broken down by gender and ethnicity for the region and smaller geographies. PASEF produces population controls used by the PopSyn.

The PopSyn generates a synthetic population for the region. This synthetic population represents the individual travelers that the ABM will simulate. For each simulation year, a full population is synthesized to match the forecasted socio-economic and housing characteristics of each part of the region at the zonal level. These forecasts, a key ABM input, come from the land use models described above. Synthesis works by replicating a sample of Census or American Community Survey Public Use Microdata Sample records (each containing complete household and individual characteristics) and placing them around the region in such a way that the forecasted characteristics of each zone are matched.

The fourth model component, the ABM, forecasts travel activity. The ABM simulates individual and household transportation decisions that compose their daily travel itinerary. People travel for activities such as work, school, shopping, healthcare, and recreation, and the ABM attempts to predict whether, where, when, and how this travel occurs. The ABM addresses both household-level and person-level travel choices including intra-household interactions between household members. It also offers sensitivity to demographic and socio-economic changes by the enhanced and flexible population synthesis procedures as well as by the fine level of model segmentation.

Technical Methodology to Estimate Greenhouse Gas Emissions

The ABM operates at fine temporal and spatial resolution: a half hour temporal resolution for the tour generation, mode choice, and trip generation. These 30-minute intervals are aggregated into five time-of-day periods for auto, transit, and non-motorized assignment. The ABM takes advantage of the Master Geographic Reference Area (MGRA) zone system, which is the most disaggregate zonal system currently in use in any travel demand model in the United States. The SANDAG current MGRA system consists of 23,000 zones (Series 13 version), which are roughly equivalent to Census block groups. To avoid computational burden, SANDAG relies on a 4,900 Transportation Analysis Zone (TAZ) system for the auto assignment step, but performs transit calculations at the more detailed MGRA level.

While the ABM addresses personal travel, the CTM addresses travel made in the region for non-personal reasons. Commercial travel is defined as heavy-duty truck trips with both origin and destination in San Diego County; professional service vehicle trips such as trips generated by plumbers, gardeners, and electricians; light-duty freight trips such as trips generated by trash trucks, light construction trucks, food delivery vehicle operators; postal and package couriers (such as FedEx and UPS); and at-work business trips generated by company employees.

The CTM is a disaggregate tour-based model used to forecast "local" intra-region commercial travel. The model starts with aggregate tour generation by industry type followed by disaggregate simulation of the tour attributes such as mode, purpose, exact start time, stop purposes, stop locations, and stop durations. The trip list produced by the CTM is transformed into trip tables by vehicle class for assignment with the ABM person trip tables. This model construct allows for more realistic commercial movements over trip-based models since commercial movements tend to have complex tours with a large number of stops.

An external HDTM addresses external to internal, internal to external, and external to external truck trips for San Diego County. The model is based on disaggregated Freight Analysis Framework forecast data. External trucks by commodity are allocated to TAZs based on employment types. Both the CTM and HDTM external model work on the same TAZ system as the ABM.

At the end of the modeling system is the EMFAC model, which takes vehicle miles traveled (VMT) by vehicle class and fuel type, and VMT speed distributions by vehicle class, post processed from the ABM/Commercial Vehicle Model, and calculates the GHG emissions for the SCS.

SANDAG strives to stay in the forefront of forecasting technology by subjecting its efforts to peer review and presenting the methodology at relevant meetings and conferences.

Active Transportation Enhancements

The Active Transportation Model component enhances the ABM to provide greater sensitivity and broader capabilities to address Active Transportation projects and policies and inform the SANDAG policy development and future decision-making. These enhancements include a complete representation of bike and pedestrian networks, and associated attributes such as facility type, distance, and grade; a new Bike-Route Choice Model; and revised and recalibrated trip and tour mode choices in ABM.

The first phase of the Active Transportation Model development is a seven-month project that is anticipated be completed in the second half of 2013. In this phase, a Bike-Route Choice Model will

Technical Methodology to Estimate Greenhouse Gas Emissions

be borrowed from San Francisco County and will be calibrated and validated with San Diego local bike count datasets. In cooperation with the County of San Diego and San Diego State University, SANDAG has installed 28 permanent bicycle count stations around the region to continuously monitor bicycle and pedestrian activity on key regional corridors.

A bike travel behavior survey will be conducted in future phases to estimate a San Diego Bike-Route Choice Model. With these enhancements, the integrated ABM and Active Transportation model can be used to assess the impact of bike and pedestrian investments on bike ridership and pedestrian volume changes, diversion of ridership on parallel facilities, mode share changes, VMT reductions, and GHG emission reductions. The Active Transportation Model will produce a set of non-motorized travel related Regional Transportation Plan (RTP) performance measures.

Emissions Modeling

The latest version of EMFAC (currently EMFAC 2011) will be used to calculate the GHG emissions for the Regional Plan based on the transportation model outputs. The transportation model post processes highway and transit assignment information to create EMFAC input files containing vehicle trips by vehicle class and fuel type, VMT by vehicle class and fuel type, and VMT speed distributions by vehicle class and hour. The current version of EMFAC projects the following GHG pollutants: carbon dioxide, carbon monoxide, nitrous oxides, total hydrocarbons, and methane.

Feedback in the Regional Travel Demand Model

A noteworthy feature of the forecasting process is the feedback of information from one model to another. For example, regionwide projections of economic activity from the DEFM are used in the AA Module of PECAS, and then AA Module results are used for the SD Module of PECAS. Similarly, data from AA are major inputs to the transportation model, and then transportation model data are used in subsequent AA calculations. A key feature of the modeling system is the central role that land use and transportation policies play in determining future travel patterns and the associated location of people, houses, and jobs.

Off-Model Techniques to Measure GHG

While the impacts of certain policy scenarios cannot be measured in the Travel Demand Model, SANDAG may use these policy scenarios to meet its GHG targets established by ARB. In these instances, SANDAG will rely on off-model techniques based on academic literature reviews, collaboration with other MPOs, and consultation with ARB's Policies and Practices Guidelines. Any off-model techniques used will be fully documented and justified in the final RTP, SCS, and/or model documentation.

RTP Consistency with RTAC Target Setting Process

SANDAG anticipates using the methodology described in this report to calculate GHG emissions for the Regional Plan and its SCS as well as the current GHG target setting process as outlined by the RTAC and any subsequent updates by ARB. SANDAG may revise the methodology to be used in the regional plan in consultation with ARB if updated software (e.g., EMFAC 2013) or a more accurate methodology becomes available during the target-setting revision process.

Technical Methodology to Estimate Greenhouse Gas Emissions

Addressing GHG Emissions after 2035 in the Regional Plan

SANDAG will use the modeling methodology outlined in this document to calculate GHG emission for 2020 and 2035 for the SCS as required by California Government Code 65080. SANDAG will perform an analysis of GHG emissions through 2050. As the Regional Plan is being developed, SANDAG will work with the appropriate federal and state agencies to ensure its 2050 methodology is consistent with best practices and conforms to all applicable state and federal regulations.



Air Resources Board



Matthew Rodriguez
Secretary for
Environmental Protection

Mary D. Nichols, Chairman
1001 I Street • P.O. Box 2815
Sacramento, California 95812 • www.arb.ca.gov

Edmund G. Brown Jr.
Governor

August 12, 2013

Mr. Gary Gallegos
Executive Director
San Diego Association of Governments
401 B Street, Suite 800
San Diego, California 92101-4231

Dear Mr. Gallegos:

Thank you for submitting the San Diego Association of Governments' (SANDAG) proposed technical methodology for quantifying the greenhouse gas emissions resulting from the regional Sustainable Communities Strategy (SCS) currently being developed as part of the next regional transportation plan scheduled to be adopted in 2015. Your letter dated June 7, 2013 satisfies the requirement in Government Code section 65080(b)(2)(J)(i) that each Metropolitan Planning Organization submit to Air Resources Board (ARB) a description of the technical methodology that it will use, prior to beginning the region's public process to develop a strategy for meeting SB 375 targets.

We look forward to continuing our collaboration with SANDAG as you begin to prepare the San Diego region's second SCS. We appreciate the fact that SANDAG is undertaking a significant effort to develop new and updated modeling tools, including an Activity Based Model, which will be used in the planning process for the 2015 SCS.

If you have any questions, please contact Ms. Lynn Terry, Deputy Executive Officer, at (916) 322-2739.

Sincerely,


Richard W. Corey
Executive Officer

cc: Ms. Lynn Terry
Deputy Executive Officer

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our website: <http://www.arb.ca.gov>.

California Environmental Protection Agency

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SANDAG Off-Model Greenhouse Gas Reduction Methodology

To forecast the outcomes of the transportation network included in the Regional Plan, SANDAG uses the Activity Based Model (ABM) to estimate performance measures. However, some strategies including carshare, vanpool programs, carpool programs, plug-in electric vehicle (PEV) charging stations, managed lane automation, and transit managed lane automation are not captured fully by the SANDAG ABM or the California Air Resources Board (ARB) Emissions Factor model. These off-model strategies are included to account for their additional reductions of greenhouse gas emissions. This attachment documents both the methodology and explanation of benefits from these off-model strategies.

Carshare

Carshare is one aspect of shared mobility highlighted in San Diego Forward: The Regional Plan. Carshare can provide first mile/last mile connections to transit or fill gaps in the region's transit services by providing an efficient transportation alternative for commute and non-commute trips. A carshare service provides members with access to a vehicle for short-term use, such as Car2Go and Zipcar. Shared vehicles are distributed across a network of locations (or specified service area) within urban communities. Members can access the vehicles at any time with a reservation and are charged by time or by mile. Carshare provides some of the benefits of a personal vehicle without the costs associated with owning one. The SANDAG Transportation Demand Management (TDM) program seeks to incentivize and expand the reach of carshare to employment centers and urban communities that are not currently served by this mobility option and that the private market may be hesitant to enter in order to complement and improve access to regional transit services.

Methodology and calculations

A minimum level of density and supporting land use is required to initiate and sustain most carshare services. The following methodology pertains exclusively to investments in carshare, the shared mobility service type with the greatest amount of history and data available, and for which SANDAG is taking credit for under SB 375 in terms of reduced greenhouse gas emissions. Past research on traditional (or round-trip) carshare models¹ has demonstrated that between 10 percent² and 13 percent³ of the eligible population is expected to join a carshare service. In the San Diego region, the eligible population is defined as anyone age 18 or older, the current minimum age requirement for a carshare membership. Additionally, a residential density threshold was established for each milestone year to determine which portions of the San Diego region are most suited for carshare investment through 2050. In 2020, the assumed minimum residential density is 69 persons per acre or higher and in 2035 and 2050 the assumed minimum residential density is 55 persons per acre or higher.⁴ In line with past research coupled with the recent introduction of one-way⁵ and peer-to-peer⁶ carshare in the San Diego region, a conservative proportion of the region's eligible population living in communities that meet these residential density thresholds was considered to estimate the adoption of carshare in the region over time:

- 2020 – 15% of the eligible population, or approximately 52,791 people
- 2035 – 20% of the eligible population, or approximately 146,914 people
- 2050 – 25% of the eligible population, or approximately 227,615 people

The daily VMT reduction for each milestone year is calculated by multiplying the estimated number of carshare members by seven miles (the average daily VMT reduction per carshare member⁷).

SB 375 emissions reduced by milestone year were calculated by multiplying the average daily VMT reduction for each milestone year by the derived CO₂ emission factor of 0.9484 lbs / mile for 2020, 0.9408 lbs / mi for 2035, and 0.9407 lbs / mi for 2050.⁸

Table 1
Carshare VMT and CO₂ Reduction Results

	2020	2035	2050
Daily VMT Reduction	369,536	1,028,398	1,593,305
SB 375 Emissions (lbs)	350,474	967,506	1,498,870

Vanpools

The Regional Vanpool Program is currently offered by SANDAG. Vanpools have been shown to reduce greenhouse gas emissions since only one (albeit larger) vehicle is required to transport the same number of people that would normally take 7 to 15 single-occupant vehicles to transport. Based on historic trends the program is assumed to grow 13 percent by 2020 (approximately 811 vanpools), 62 percent by 2035 (approximately 1,163 vanpools), and 110 percent by 2050 (approximately 1,512 vanpools). Future growth assumptions are based on restructuring the current \$400 monthly subsidy program to encourage the formation of larger vanpools and sustain program participation, policy changes that reduce barriers to entry, improved program administration, and targeted marketing to key employment industries and underserved populations.

Methodology and calculations

Growth of the Regional Vanpool Program is tied to the assumption of a slight increase in the monthly subsidy over time and available funding for program administration. Eighty percent of all vans are assumed to carry up to eight passengers, and 20 percent of all vans are assumed to carry up to ten passengers.

Average daily VMT reduction calculation for each milestone year:

(Proportion of eight-passenger vans x Number of projected vanpools in the milestone year x Number of total passengers excluding the driver x Average round-trip vanpool commute distance) + (Proportion of ten-passenger vans x Number of projected vanpools in the milestone year x Number of total passengers excluding the driver x Average round-trip vanpool commute miles)

SB375 emissions reduced by milestone year were calculated by multiplying the average daily VMT reduction for each milestone year by the derived CO₂ emission factor of 0.9484 lbs / mile for 2020, 0.9408 lbs / mi for 2035, and 0.9407 lbs / mi for 2050.

Table 2
Vanpool VMT and CO₂ Reduction Results

	2020	2035	2050
Daily VMT Reduction	678,339	972,797	1,264,438
SB 375 Emissions (lbs)	643,349	915,197	1,189,495

Carpools

SANDAG evaluated the investment in a carpool incentive program to promote the use of fewer vehicles to transport the same number of people to and from work. A carpool incentive was pilot tested with select employers in 2012. Based on lessons learned from the pilot, a formal carpool incentive program is expected to launch in the summer of 2016. The proposed program would incentivize the formation of 17,582 new carpools between now and 2050. Based upon anticipated budget and staffing levels, an incentive of \$30 per month per carpooler for three continuous months at a budget of \$100,000 per year⁹ would reasonably accommodate up to 488 new carpools annually.¹⁰

Methodology and calculations

Following the initial three-month incentive period, assumed carpool program retention rates per carpool are 90 percent after one year, 50 percent after two years, 25 percent after three years, and 0 percent after four years.¹¹ It is assumed that approximately 1,293 new carpools carrying 2,716 carpoolers would exist in 2020, 2035, and 2050 based on these retention rates. Carpool size is assumed to be 2.1, and daily VMT per capita is assumed to be 26 miles.¹²

Average daily VMT reduction calculation for each milestone year:

Total number of carpools x Average carpool size (excluding the driver) x Average round-trip commute miles

SB 375 emissions reduced by milestone year were calculated by multiplying the average daily VMT reduction for each milestone year by the derived emission factor of 0.9484 lbs / mile for 2020, 0.9408 lbs / mile for 2035, and 0.9407 lbs / mile for 2050.

Table 3

Carpool VMT and CO₂ Reduction Results

	2020	2035	2050
Daily VMT Reduction	36,986	36,986	36,986
SB 375 Emissions (lbs)	35,078	34,796	34,793

Plug-In Electric Vehicles (PEV) Charging Stations

The State of California has a goal to have 1.5 million zero emissions vehicles (ZEVs) operating in California by 2025. ZEVs include both Plug-in Electric Vehicles (PEVs) and fuel cell electric vehicles. To achieve additional greenhouse gas reductions beyond the state goals, a larger network of electric vehicle charging stations (EVCS) is needed to extend the electric range of plug-in hybrid electric vehicles. SANDAG will establish a Regional Charger Program by setting aside approximately \$30 million of Congestion Management and Air Quality (CMAQ) Improvement Program funds expected between 2020 and 2050 (approximately \$1 million annually) to fund an incentive program for the installation of publicly available EVCS. According to the Electric Power Research Institute (EPRI), one EVCS is needed for every five PEVs, with a breakdown of 75 percent Level 1 EVCS (which adds 2-5 miles of range per hour of charging) and 25 percent Level 2 EVCS (which adds 10-20 miles of range per hour of charging). Increasing the number of publicly available EVCS would reduce greenhouse gas emissions by extending the electric range of plug-in hybrid electric vehicles that would replace gasoline-powered internal combustion engines. The calculations and expected emissions reductions attributed to the Regional Charger Program are shown here.

Methodology and calculations

By 2025, the state’s target is for 15.4 percent of new car sales to be ZEVs; of this, 9 percent would be Plug-in Electric Vehicles (PEVs). SANDAG assumes that after 2025, these percentages for annual sales remain constant, but overall ZEV fleet continues to grow due to vehicle turnover. Currently, plug-in hybrids drive 30 percent of their miles in electric mode and the remainder in gasoline mode. The build-out of a robust charger network would increase this percentage to 41 percent. The 11 percent increase in electric miles from plug-in hybrid vehicles results in the additional greenhouse gas reductions summarized below. The funding for the program would provide incentives for the installation of publicly available EVCS throughout the region. The program currently assumes incentive levels of \$250 per Level 1 EVCS and \$2,100 per Level 2 EVCS, and would add 6,065 EVCS by 2020, 35,697 EVCS by 2035, and 43,376 EVCS by 2050.

**Table 4
Plug-In Hybrid Electric Vehicles and Added e VMT**

	2020	2035	2050
Number of Plug-in Hybrid Vehicles	34,326	182,484	220,882
Daily VMT per vehicle	21.83	20.48	19.90
Total Daily VMT	749,259	3,737,510	4,394,701
eVMT (30%)	224,778	1,121,253	1,318,410
eVMT with Program (41%)	307,196	1,532,379	1,801,827
Added eVMT (11%)	82,418	411,126	483,417
Emission Factor - per mile reduced	0.9484	0.9408	0.9407 lb/mi
CO ₂ reduced	78,167	386,783	454,765 lbs CO ₂

**Table 5
PEV Charging Stations and CO₂ Reduction Results**

	2020	2035	2050
SB 375 Emissions (lbs)	78,167	386,783	454,765

Managed Lane Automation

In 2050, assuming vehicle automation technology becomes available to vehicles accessing managed lane facilities, the managed lane facilities will have 80 percent higher capacity to handle these zero emission vehicles.

Methodology and calculations

SANDAG conducted a model run with 80 percent increased capacity on the managed lane system. Using output from the model run, SANDAG calculated total managed lane (ML) VMT for the SB 375 vehicle classes. To account for all ML vehicles operating as zero emission vehicles, the VMT from ML was removed from the EMFAC inputs. Using the ML VMT modified EMFAC file, an emissions profile was created. The off-model calculation reflects the CO₂ emission differences between the Regional Plan preferred scenario and the automated managed lane scenario.

Table 6**Regional Plan and Managed Lane Automated Scenario CO₂ Emissions**

	2050
2050 Regional Plan CO ₂ Emissions (SB 375)	82,215,442 lbs / day
Automated ML Scenario CO ₂ Emissions	77,896,235 lbs / day
Emissions Difference	(4,319,207) lbs / day

Table 7**Managed Lane Automation and CO₂ Reduction Results**

	2020	2035	2050
SB 375 Emissions (lbs)	–	–	4,319,207

Transit Managed Lane Automation Programs

In 2050, assuming vehicle automation technology becomes available to transit vehicles, the automated transit vehicles would result in lower operating costs that would potentially allow for more frequent service on certain routes and lower fares.

Methodology and calculations

SANDAG conducted a model run with increased transit operations on well utilized transit routes. Using output from the transit operations model run, SANDAG calculated total greenhouse gas emissions for the SB 375 vehicle classes. The off-model calculation reflects the CO₂ emission differences between the 2050 Regional Plan preferred scenario and the automated transit scenario.

Table 8**Regional Plan and Automated Transit Scenario CO₂ Emissions**

	2050
2050 Regional Plan CO ₂ Emissions (SB 375)	82,215,442 lbs / day
Automated Transit Scenario CO ₂ Emissions	81,282,787 lbs / day
Emissions Difference	(932,655) lbs / day

Table 9**Transit Managed Lane Automation and CO₂ Reduction Results**

	2020	2035	2050
SB 375 Emissions (lbs)	–	–	932,655

Summary of Off-Model Strategies

The six off-model greenhouse gas reduction measures described above are projected to reduce daily vehicle miles traveled (VMT) by nearly 3 million miles by 2050, which translates to a daily CO₂ emissions reduction of 4,214 tons per day by 2050 (or approximately 2 lbs. per person) as shown in Table 10.

Table 10
Summary of Off-Model Strategies (CO₂ lbs / day)

	2020	2035	2050
Carshare	(350,474)	(967,506)	(1,498,870)
Vanpools	(643,349)	(915,197)	(1,189,495)
Carpools	(35,078)	(34,796)	(34,793)
Plug-in Electric Vehicle Charging Stations	(78,167)	(386,783)	(454,765)
Managed Lane Automation	–	–	(4,319,207)
Transit Automation	–	–	(932,655)
Total SB 375 CO₂ Off-Model Adjustments	(1,107,068)	(2,304,282)	(8,429,785)

ARB EMFAC 2007 to EMFAC 2014 CO₂ Adjustments

On June 30, 2015, ARB staff transmitted a memorandum to Metropolitan Planning Organization (MPO) technical staff providing “guidance on how to deal with changes arising from different EMFAC versions” for the greenhouse gas quantification determinations for the second round of Sustainable Communities Strategies (SCS). According to the enclosed memorandum, in 2010, ARB established regional SB 375 greenhouse gas targets in the form of a percent reduction per capita from 2005 for passenger vehicles using the ARB Emission Factor model, EMFAC 2007. Since the time when targets were set using EMFAC 2007, ARB has released two subsequent versions, EMFAC 2011 and EMFAC 2014. ARB has updated the carbon dioxide (CO₂) emission rates in EMFAC 2011 and EMFAC 2014, based on recent emission testing data and updated energy consumption for air conditioning. In addition, vehicle fleet mix has been updated in EMFAC 2011 and again in EMFAC 2014 based on the latest available Department of Motor Vehicle data at the time of model development. These changes have lowered the overall CO₂ emission rates in EMFAC 2011 and EMFAC 2014 compared to EMFAC 2007.

ARB staff developed a methodology to allow MPOs to adjust the calculation of percent reduction in per capita CO₂ emissions used to meet the established targets when using either EMFAC 2011 or EMFAC 2014 for their second round RTP/SCS. This method will neutralize the changes in fleet average emission rates between the version used for the first RTP/SCS and the version used for the second RTP/SCS. The adjustment for SANDAG is +2 percent per capita reductions; that is, SANDAG has to reduce the estimated change in CO₂ by two additional percentage points. For example, before the ARB adjustment, SB 375 per capita reductions for 2020 were 17 percent, and after applying the adjustment, the reductions became 15 percent. Table 11 provides a summary of the CO₂ per capita reductions from the on-model components, from the off-model analysis of the six strategies included in this attachment, and the ARB adjustment factor.

Table 11
Summary of CO₂ Per Capita Reductions – On and Off-Model Results

	2020	2035	2050
Per Capita Reduction (On-Model Results Only)	16%	21%	23%
Per Capita Reduction (Off-Model Results Only)	1%	2%	8%
ARB Adjustment Factor	-2%	-2%	-2%
Total Per Capita Reduction	15%	21%	29%

Endnotes

- ¹ Round-trip carshare services require users to return a rented vehicle to the pick-up location (e.g., Zipcar).
- ² Zipcar. <http://www.zipcar.com/business/is-it/greenbenefits>. Accessed August 3, 2015.
- ³ Zhou, B., Kockelman, K., and Gao, R. "Opportunities for and Impacts of Carsharing: A Survey of the Austin, Texas Market", Transportation Research Board, 2009.
- ⁴ Residential density thresholds align with those established for the SANDAG Smart Growth Opportunity Areas. Mixed-Use Transit Corridors require a residential density minimum of 69 persons per acre while Community Center and/or Town Centers align with a residential density minimum of 55 persons per acre. Additional information on SANDAG Smart Growth Opportunity Areas can be found here: http://www.sandag.org/uploads/projectid/projectid_296_14002.pdf.
- ⁵ A one-way carshare service allows a user to rent a vehicle at one location and end the trip at another location within the carshare service area (e.g., car2go).
- ⁶ Peer-to-peer carshare allows vehicle owners to rent their personal cars to others for a daily or hourly rate via a website or mobile app (e.g., RelayRides). This model offers a way in which vehicle owners can maximize vehicle use in lieu of keeping it parked at a single location.
- ⁷ The daily VMT reduction of seven miles per carshare member was established based on academic research: (1) Shaheen and Cohen, "Innovative Mobility Carsharing Outlook" (Summer 2013); (2) Cervero, Golub, and Nee, "City CarShare: Longer-Term Travel-Demand and Car Ownership Impacts", July 2006, Transportation Research Board 2007 Annual Meeting paper.
- ⁸ Emissions rates from EMFAC 2014 v.1.0.7.
- ⁹ Figure not inclusive of marketing and administrative costs.
- ¹⁰ $(\$30 \text{ gift card} + \$2.50 \text{ activation fee per card}) \times 3 \text{ months} \times 2.1 \text{ people per carpool}$.
- ¹¹ Retention rates were based on case study research. In 2009 SANDAG commissioned a study to analyze rideshare incentive programs and develop an incentive program framework for the San Diego region. The study evaluated rideshare incentive programs offered by the San Bernardino Association of Governments (SANBAG) and the Riverside County Transportation Commission (RCTC) and found that 90 percent of participants continued to rideshare after participating in the program. A Transportation Research Board (TRB) study entitled "Duration of Carpool and Vanpool by Rides Clients" evaluates the San Francisco Bay Area ridesharing program and found that 50 percent of participants were still carpooling 30 months after they received assistance from the rideshare program. Research from Denver (Survey of Work Commuters in the Denver Area, DRCOG (2010)) and Virginia (Methodologies for Determining Carpooler and Vanpool Average Life Bases and the Average Fuel Economy of Commuter Vehicles, VHTRC) revealed that the average lifespan of a carpool was between 2.25 - 3.2 years.
- ¹² Per the SANDAG activity-based model.

From: Taylor, Jonathan@ARB [<mailto:jonathan.taylor@arb.ca.gov>]

Sent: Tuesday, June 30, 2015 5:24 PM

To: Daniels, Clint; 'Guoxiong Huang'; Bruce Griesenbeck (BGriesenbeck@sacog.org); David Ory; Tanisha Taylor (Taylor@sjcog.org); ehahn@Stancog.org; Matt Fell (matt.fell@mcagov.org); terri.king@co.kings.ca.us; jeff@maderact.org; Kai Han (KHan@fresnocog.org); RBrady@tularecog.org; Vincent Liu (vliu@kerncog.org); Bhupendra Patel (BPatel@ambag.org); JWorthley@slocog.org; blasagna@bcag.org; 'Andrew Orfila'; Sean Tiedgen (stiedgen@srta.ca.gov); Norberg, Keith@TRPA
Cc: Ken Kirkey; ggarry@sacog.org; Stoll, Muggs; Huasha Liu (LIU@scag.ca.gov) (LIU@scag.ca.gov); Mike Bitner (mbitner@fresnocog.org); rball@kerncog.org; terri.king@co.kings.ca.us; patricia@maderact.org; Marjie.Kirn@mcagov.org; nguyen@sjcog.org; Park, Rosa@DOT; BKimball@tularecog.org; cdevine@bcag.org; hadamson@ambag.org; SDevencenzi@slocog.org; pimhof@sbcag.org; dliittle@srta.ca.gov; Haven, Nick@TRPA; Kalandiyur, Nesamani@ARB; Roberts, Terry@ARB

Subject: Methodology to Adjust EMFAC Output for SB 375 Target Demonstrations

To All MPO Technical Staff,

Now that many of the MPOs are working on their second round of SCSs, and with ARB recently releasing a new version of EMFAC, we want to provide guidance on how to deal with changes arising from different EMFAC versions as you do your GHG quantification determinations for the second round of SCSs.

We request that you use the attached methodology if you will be using a different version of EMFAC for quantifying reductions from your second SCS than the EMFAC version you used for your first SCS. Our intent with this methodology is to maintain the same level of stringency for meeting the current targets even though there are emission rate changes when switching EMFAC versions. When targets are updated next year, they will probably be based on EMFAC 2014, therefore, this methodology would not be required with the new targets until a new version of EMFAC was released to supersede EMFAC 2014. Our plan is to update the methodology at that time.

Please look over this methodology and let us know if you have any questions or concerns. For general questions, please contact me by email at jonathan.taylor@arb.ca.gov or by phone at 916-445-8699. For specific technical questions on the adjustment calculations, please contact Nesamani Kalandiyur at nesamani.kalandiyur@arb.ca.gov or 916-324-0466.

I'd like to take this opportunity to thank all of you for your generous assistance and patience as ARB staff have evaluated your SCSs. I am sure you are all proud of your accomplishments in meeting the goals of SB 375, and we ARB staff look forward to continuing to work with all of you.

Best,

Jon

*Jonathan Taylor, P.E.
Assistant Chief,
Air Quality Planning and Science Division
California Air Resources Board
jonathan.taylor@arb.ca.gov
Ph. 916-445-8699
FAX: 916-322-3646*

Methodology to Calculate CO2 Adjustment to EMFAC Output for SB 375 Target Demonstrations

Background:

In 2010, ARB established regional SB 375 greenhouse gas (GHG) targets in the form of a percent reduction per capita from 2005 for passenger vehicles using the ARB Emission Factor model, EMFAC 2007. EMFAC is a California-specific computer model that calculates weekday emissions of air pollutants from all on-road motor vehicles including passenger cars, trucks, and buses. ARB updates the EMFAC model periodically to reflect the latest planning assumptions (such as vehicle fleet mix) and emissions estimation data and methods. Since the time when targets were set using EMFAC2007, ARB has released two subsequent versions, EMFAC2011¹ and EMFAC2014².

ARB has improved the carbon dioxide (CO2) emission rates in EMFAC2011 and EMFAC2014, based on recent emission testing data and updated energy consumption for air conditioning. In addition, vehicle fleet mix has been updated in EMFAC2011 and again in EMFAC2014 based on the latest available Department of Motor Vehicle data at the time of model development. These changes have lowered the overall CO2 emission rates in EMFAC2011 and EMFAC2014 compared to EMFAC2007.

Purpose:

Some metropolitan planning organizations (MPOs) used EMFAC 2007 to quantify GHG emissions reductions from their first Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS); others used EMFAC 2011. As MPOs estimate GHG emissions reductions from subsequent RTP/SCSs, they will use the latest approved version of EMFAC, but using a different model will influence their estimates and their ability to achieve SB 375 targets. The goal of this methodology is to hold each MPO to the same level of stringency in achieving their SB 375 targets regardless of the version of EMFAC used for its second RTP/SCS.

ARB staff has developed this methodology to allow MPOs to adjust the calculation of percent reduction in per capita CO2 emissions used to meet the established targets when using either EMFAC2011 or EMFAC2014 for their second RTP/SCS. This method will neutralize the changes in fleet average emission rates between the version used for the first RTP/SCS and the version used for the second RTP/SCS. The methodology adjusts for the small benefit or disbenefits resulting from the use of a different version of EMFAC by accounting for changes in emission rates, and applies an

¹ EMFAC2011 was approved by USEPA in March 2013.

² EMFAC2014 is under review for USEPA approval.

adjustment when quantifying the percent reduction in per capita CO2 emissions using EMFAC2011 or EMFAC2014.

Applicability:

The adjustment is applicable when the first RTP/SCS was developed using either EMFAC2007 or EMFAC2011 and the second RTP/SCS will be developed using a different version of the model (EMFAC2011 or EMFAC2014).

- Hold the 2005 baseline CO2 per capita estimated in the first RTP/SCS constant. Use both the human population and transportation activity data (VMT and speed distribution) from the first RTP/SCS to calculate the adjustment.
- Add the adjustment to the percent reduction in CO2 per capita calculated with EMFAC2011 or EMFAC2014 for the second RTP/SCS. This will allow equivalent comparison to the first RTP/SCS where emissions were established with EMFAC 2007 or EMFAC2011.

Example Adjustment Calculation (hypothetical for illustration purposes):

In this example, the first RTP/SCS was developed using EMFAC2007 and the second RTP/SCS using EMFAC2011 to calculate the CO2 per capita.

Step1: Compile the CO2 per capita numbers from the MPO’s first adopted RTP/SCS using EMFAC 2007 without any off-model adjustments for calendar years (CY) 2005, 2020, and 2035 for passenger vehicles.

Calendar Year	EMFAC2007 CO2 Per capita (lbs/day)
2005	30.0
2020	28.8
2035	27.6

Step 2: Calculate the percent reductions in CO2 per capita from the 2005 base year for CY 2020 and 2035 from Step 1.

Calendar Year	EMFAC2007 Percent Reductions (%)
2020	4.0%
2035	8.0%

Step 3: Develop the input files for the EMFAC2011 model using the same activity data for CY 2020 and 2035 from the first adopted RTP/SCS (same activity data used in Step 1) and execute the model.

Step 4: Calculate the CO2 per capita for CY 2020 and 2035 using the EMFAC2011 output from Step 3; do not include Pavley I, LCFS, and ACC benefits for passenger vehicles.

Calendar Year	EMFAC2011 CO2 Per capita (lbs/day)
2020	28.2
2035	27.9

Step 5: Calculate the percent reductions in CO2 per capita for CY 2020 and 2035 calculated in Step 4 from base year 2005 established in Step 1.

Calendar Year	EMFAC2011 Percent Reductions (%)
2020	6.0%
2035	7.0%

Step 6: Calculate the difference in percent reductions between Step 5 and Step 2 (subtract Step 5 results from Step 2 results) for CY 2020 and 2035; this yields the adjustment for the respective CY.

Calendar Year	EMFAC2011 Adjustment (%)
2020	-2.0%
2035	+1.0%

Step 7: Develop the input files for the EMFAC2011 model using the activity data from the new/second RTP/SCS for CY 2020 and 2035 without any off-model adjustments and execute the model.

Step 8: Calculate the CO2 per capita for CY 2020 and 2035 using the EMFAC2011 output from Step 7; do not include Pavley I, LCFS, and ACC benefits for passenger vehicles.

Calendar Year	EMFAC2011 CO2 Per capita (lbs/day)
2020	26.4
2035	26.1

Step 9: Calculate the percent reductions in CO2 per capita for CY 2020 and 2035 calculated in Step 8 from base year 2005 established in Step 1.

Calendar Year	EMFAC2011 Percent Reductions (%)
2020	12.0%
2035	13.0%

Step 10: Add the adjustment factors from Step 6 to the percent reductions calculated for the new/second RTP/SCS (Step 9) using EMFAC 2011 for CY 2020 and 2035.

Calendar Year	Adjusted Percent Reductions (%)
2020	10.0%
2035	14.0%

Follow the same steps to adjust for use of EMFAC2007 or EMFAC2011 to EMFAC2014. Do not include any off-model adjustments during application of the EMFAC adjustment factor.