4.8 GREENHOUSE GAS EMISSIONS

This section evaluates the potential impacts on global climate change from greenhouse gas (GHG) emissions associated with implementation of the 2050 RTP/SCS. This analysis discusses the scientific basis and regulatory framework surrounding global climate change and provides a quantitative inventory of the GHG emissions that would result from project implementation. Global climate change also has the potential to result in sea level rise, to affect rainfall and snowfall, to affect temperatures and habitats, and to result in many other adverse effects. A summary of existing conditions includes a brief explanation of global climate change to provide a context for understanding the impacts of GHG emissions.

4.8.1 EXISTING CONDITIONS

Global Climate Change

Global climate change (GCC) refers to changes in average climatic conditions on Earth as a whole, including temperature, wind patterns, precipitation, and storms. Global temperatures are moderated by naturally occurring atmospheric GHGs, including water vapor, carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). These gases allow solar (shortwave) radiation into Earth's atmosphere, but absorb longwave radiation. Greater concentrations of GHGs absorb more longwave radiation, thus further warming Earth's atmosphere. Gases that trap heat in the atmosphere are often called greenhouse gases, analogous to the effects of a greenhouse. The accumulation of GHGs in the atmosphere regulates Earth's temperature. Without these natural GHGs, Earth's temperature would be about 61°F cooler. Emissions from human activities, such as electricity production and vehicle use, have elevated the concentration of these gases in the atmosphere.

Human-caused emissions of GHGs in excess of natural ambient concentrations are responsible for intensifying the greenhouse effect and have led to a trend of unnatural warming of Earth's climate, known as global climate change or global warming. It is unlikely that GCC of the past 50 years can be explained without acknowledging the contribution from human activities (IPCC 2007).

Climate change is a global problem. GHGs have atmospheric lifetimes of 1 year to several thousand years. GHGs persist in the atmosphere for long enough time periods to be dispersed around the globe. Although the exact lifetime of any particular GHG molecule is dependent on multiple variables and cannot be pinpointed, it is understood by scientists who study atmospheric chemistry that more CO_2 is emitted into the atmosphere than is sequestered by ocean uptake, vegetation, and other forms of sequestration. Of the total annual human-caused CO_2 emissions, approximately 54 percent is sequestered within 1 year through ocean uptake, by northern hemisphere forest regrowth, and other terrestrial sinks; whereas the remaining 46 percent of human-caused CO_2 emissions remains stored in the atmosphere (Seinfeld and Pandis 1998).

Similarly, impacts of GHGs are borne globally. The quantity of GHGs that it takes to ultimately result in climate change is not precisely known; suffice it to say, the quantity is enormous, and no single project alone would measurably contribute to a noticeable incremental change in the global average temperature, or to global, local, or micro climate. From the standpoint of CEQA, GHG impacts to global climate change are inherently cumulative.

The United Nations Intergovernmental Panel on Climate Change (IPCC) constructed several emission trajectories of GHGs needed to stabilize global temperatures and climate change impacts. IPCC concluded that a stabilization of GHGs at 400 to 450 parts per million (ppm) CO_2 equivalent

concentration is required to keep global mean warming below 3.6ºF (2º Celsius), which is assumed to be necessary to avoid dangerous climate change.

California law defines GHGs as any of the following compounds: CO_2, CH_4, N_2O, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6) (Health & Safety Code, Section 38505(g)). CO_2, followed by CH_4 and N_2O, is the most common GHG that results from human activity.

Global warming potential (GWP) is a concept developed to compare the ability of each GHG to trap heat in the atmosphere relative to another gas; the global warming potential is based on several factors, including the relative effectiveness of a gas to absorb infrared radiation and length of time that the gas remains in the atmosphere ("atmospheric lifetime"). The GWP of each gas is measured relative to CO_2, the most abundant GHG. GHGs with lower emissions rates than CO_2 may still contribute to climate change because they are more effective at absorbing outgoing infrared radiation than CO_2. When accounting for GHGs, emissions are expressed in terms of CO_2 equivalents (CO_2e). The concept of CO_2-equivalency (CO_2e) is used to account for the different GWP potentials of GHGs to absorb infrared radiation.

The reference gas for GWP is CO_2; therefore, CO_2 has a GWP of 1. The other main GHGs that have been attributed to human activity include CH_4, which has a GWP of 21, and N_2O, which has a GWP of 310. Table 4.8-1 presents the GWP and atmospheric lifetimes of common GHGs.

Table 4.8-1
Global Warming Potentials and Atmospheric Lifetimes of GHGs

GHG	Formula	100-Year Global Warming Potential[1]	Atmospheric Lifetime (Years)
Carbon Dioxide	CO_2	1	Variable
Methane	CH_4	21	12±3
Nitrous Oxide	N_2O	310	120
Sulfur Hexafluoride	SF_6	23,900	3,200

[1] GWPs are from the IPCC Second Assessment Report and are used by ARB in the statewide inventory.

Human-caused sources of CO_2 include combustion of fossil fuels (coal, oil, natural gas, gasoline, and wood). Data from ice cores indicate that CO_2 concentrations remained steady prior to the current period for approximately 10,000 years. Concentrations of CO_2 have increased in the atmosphere since the industrial revolution.

CH_4 is the main component of natural gas and also arises naturally from anaerobic decay of organic matter. Human-caused sources of CH_4 include landfills, fermentation of manure, and cattle farming. Human-caused sources of N_2O include combustion of fossil fuels and industrial processes such as nylon production and production of nitric acid. Other GHGs are present in trace amounts in the atmosphere and are generated from various industrial or other uses.

4.8.1.1 Existing GHG emissions

Global GHG Emissions

The United Nations estimated that worldwide emissions in 2007 were 22.7 billion metric tons (MT) CO_2e, of which the United States contributed the greatest percentage after China. Table 4.8-2 shows the top 10 emitters by country or area, which contribute 67 percent of global emissions. When accounting for

GHGs, emissions are typically quantified in MT or millions of metric tons (MMT) and are shown as MMT CO_2e.

Table 4.8-2
Top 10 GHG-Emitting Countries, 2007

Country or Area	MMT CO_2e in 2007[1]	Percent
China	6,538	22%
United States	5,838	20%
India	1,612	5%
Russian Federation	1,537	5%
Japan	1,255	4%
Germany	788	3%
Canada	557	2%
United Kingdom	540	2%
Korea, Republic of	503	2%
Iran (Islamic Republic of)	496	2%

[1] CDIAC 2010

California GHG Emissions

In 2008, California accounted for approximately 7 percent of U.S. emissions. The State of California GHG Inventory, prepared by the California Air Resources Board (ARB), identified and quantified statewide anthropogenic GHG emissions and sinks. The inventory includes estimates for CO_2, CH_4, N_2O, SF_6, HFCs, and PFCs, and is summarized in Table 4.8-3 (ARB 2007, 2010). The inventory is divided into seven broad sectors and categories in the inventory: Agriculture, Commercial, Electricity Generation, Forestry, Industrial, Residential, and Transportation. Transportation was the sector with the largest percentage of GHG emissions, 37 percent, followed by electricity generation (25 percent), and industrial sources (20 percent). The remaining sectors each accounted for less than 10 percent of overall emissions

Table 4.8-3
State of California GHG Emissions by Sector

Sector	Total 1990 Emissions (MMTCO_2e)	Percent of Total 1990 Emissions	Total 2008[1] Emissions (MMTCO_2e)	Percent of Total 2008 Emissions
Agriculture	23.4	5%	28.06	6%
Commercial	14.4	3%	14.68	3%
Electricity Generation	110.6	26%	116.35	25%
Forestry (excluding sinks)	0.2	<1%	0.19	<1%
Industrial	103.0	24%	92.66	20%
Residential	29.7	7%	28.45	6%
Transportation	150.7	35%	174.89	37%
Recycling and Waste			6.71	1%
High GWP Gases			15.65	3%
Forestry Sinks	(6.7)		(3.98)	
Total	425.3	100%	473.66	100%

[1]The latest year of data available by ARB is 2008.

In addition to the State of California GHG Inventory, more specific regional GHG inventories have been prepared for on-road mobile sources and land use emissions.

San Diego County GHG Emissions

Emissions from Land-Use Sources

The University of San Diego, School of Law's Energy Policy Initiative Center (EPIC), has created GHG inventories for San Diego County in 2010. This detailed San Diego County GHG Inventory takes into account the unique characteristics of the region in calculating emissions (EPIC 2011). A summary of the various sectors that contributed to land use, including electricity and waste, stationary source, and off-road mobile source GHG emissions in San Diego County in 2010 is provided in Table 4.8-4. The values exclude on-road transportation estimates as they are described separately below. Sectors not related to regional land use are also excluded (e.g., civil aviation). Total land use GHGs in San Diego County in 2010 are estimated at 14.53 MMT CO_2e.

Table 4.8-4
San Diego County 2010 GHG Emissions by Category

	2010[1]
	MMT CO_2e
Electricity	8.27
Natural Gas End Uses	2.87
Off-road Equipment and Vehicles[2]	1.37
Waste	0.58
Agriculture	0.05
Sequestration	(0.66)
Development	0.18
Wildfires	0.28
Other	1.58
Total (MMT CO_2e)	**14.53**
Land-Use GHG per capita (MT CO_2e/person/year)	4.51

[1]EPIC 2011
[2]Preliminary estimates

Emissions from On-road Transportation Sources

As part of the 2050 RTP/SCS, SANDAG calculated GHG emissions associated with existing on-road transportation sources using ARB's EMission FACtors 2007 (EMFAC~~2007~~) model. EMFAC~~2007~~ calculates CO_2 emissions based on emission factors and vehicle activity. Emission factors vary by vehicle characteristics, including vehicle class, technology type, and model year; and ambient driving conditions such as speed and vehicle miles traveled (VMT). Data are obtained from air basins, regional transportation agencies, and the Department of Motor Vehicles' registration data. Vehicles in the model include light-, medium-, and heavy-duty vehicles; buses; motorcycles; and RVs. EMFAC~~2007~~ outputs emissions for CO_2; USEPA recommends adjusting the output by a factor of 1.05 to account for additional GHGs, CH_4 and N_2O, which are also output by vehicles (USEPA 2005). ~~EMFAC2007 does not include emissions from rail, which were estimated by EPIC (EPIC 2011).~~ Existing emissions total 14.08~~933~~ MMT CO_2e in 2010 for all on-road transportation in the SANDAG region (Table 4.8-5). EMFAC~~2007~~ does not include emissions from rail, which were estimated by EPIC (EPIC 2011). Total transportation-related emissions, including rail, were 14.31 MMT CO_2e in 2010.

In addition, SB 375 requires per capita GHG emissions reductions from cars and light-duty trucks (vehicle classes Light Duty Auto [LDA], Light Duty Truck 1, Light Duty Truck 2, and Medium Duty

Vehicle), as described below in Regulatory Setting. As shown in Table 4.8-5, SANDAG used EMFAC~~2007~~ to calculate 2005 emissions from cars and light-duty trucks. The calculations excluded emissions from trips that originated and ended outside of the SANDAG region, pursuant to the Regional Targets Advisory Committee (RTAC, appointed by ARB) recommendations regarding the factors and methodologies for setting GHG targets (RTAC 2009).

Table 4.8-5
On-road Transportation-related GHG Emissions

SANDAG Transportation Sector	Total GHG Emissions (MMT CO_2e/yr[1])	Per Capita GHG Emissions (lb CO_2/person/day)[3]
2010 Emissions, all on-road sources and rail	14.31~~33~~	N/A
2005 SB 375-related sources[2]	N/A	26

[1] MMT = million metric tons
[2] Cars and light duty trucks
[3] Per capita emissions are based on 2010 total population from the SANDAG 2050 Regional Growth Forecast. Modeled by SANDAG 2011

4.8.2 REGULATORY SETTING

There are numerous laws, regulations, and programs that exist at the federal, state, and local level that apply to the reduction in emissions of GHGs.

Federal Actions

Energy Policy and Conservation Act of 1975

The Energy Policy and Conservation Act of 1975 established the first fuel economy standards for on-road motor vehicles sold in the United States. The National Highway Traffic and Safety Administration (NHTSA), which is part of USDOT, is responsible for establishing additional vehicle standards and for revising existing standards.

Since 1990, the fuel economy standard for new passenger cars has been 27.5 mpg. Since 1996, the fuel economy standard for new light trucks (gross vehicle weight of 8,500 pounds or less) has been 20.7 mpg. Compliance with federal fuel economy standards is determined on the basis of each manufacturer's average fuel economy for the portion of its vehicles produced for sale in the U.S. The Corporate Average Fuel Economy (CAFE) program, which is administered by the U.S. Environmental Protection Agency (USEPA), was created to determine vehicle manufacturers' compliance with the fuel economy standards. The USEPA calculates a CAFE value for each manufacturer based on city and highway fuel economy test results and vehicle sales. Based on the information generated under the CAFE program, the USDOT is authorized to assess penalties for noncompliance.

On October 25, 2010, USEPA and NHTSA announced the first program to reduce GHGs and improve fuel efficiency of medium- and heavy-duty vehicles. Both USEPA's and NHTSA's joint proposed standards for the three main heavy-duty regulatory categories; combination tractors, heavy-duty pickup trucks and vans, and vocational vehicles, and will improve fuel efficiency between 7 and 20 percent among truck classes, and begin with the model year 2014. The agencies are expecting to finalize the rule by July 30, 2011.

Energy Policy Act of 1992

The Energy Policy Act of 1992 (EPAct) was passed to reduce the country's dependence on foreign petroleum and improve air quality. EPAct includes several parts intended to build an inventory of alternative fuel vehicles (AFVs) in large, centrally fueled fleets in metropolitan areas. EPAct requires certain federal, state, and local government and private fleets to purchase a percentage of light duty AFVs capable of running on alternative fuels each year. In addition, financial incentives are included in EPAct. Federal tax deductions will be allowed for businesses and individuals to cover the incremental cost of AFVs. States are also required by the act to consider a variety of incentive programs to help promote AFVs.

Energy Policy Act of 2005

The Energy Policy Act of 2005 was signed into law on August 8, 2005. Generally, the Act provides for renewed and expanded tax credits for electricity generated by qualified energy sources, such as landfill gas; provides bond financing, tax incentives, grants, and loan guarantees for a clean renewable energy and rural community electrification; and establishes a federal purchase requirement for renewable energy.

April 2007 U.S. Supreme Court Ruling

In *Massachusetts et al. vs. Environmental Protection Agency et al.* 549 U.S. 497(2007), the U.S. Supreme Court ruled that GHGs were not excluded from regulation as a pollutant under the Clean Air Act. The Supreme Court did not mandate that USEPA enact regulations to reduce GHG emissions, but found that USEPA could regulate GHGs as a pollutant if it made the appropriate findings under the Clean Air Act.

Corporate Average Fuel Efficiency Standards

In response to the *Massachusetts et al.* ruling, the Bush Administration issued an executive order on May 14, 2007, directing USEPA and USDOT and Department of Energy (DOE) to establish regulations that reduce GHG emissions from motor vehicles, non-road vehicles, and non-road engines by 2008. Further, on December 19, 2007, the Energy Independence and Security Act of 2007 (EISA) was signed into law, which requires an increased CAFE standard of 35 miles per gallon (mpg) for the combined fleet of cars and light trucks by model year 2020.[1] EISA also requires the establishment of interim standards (from 2011 to 2020) that will be the "maximum feasible average fuel economy" for each fleet. On October 10, 2008, the National Highway Traffic Safety Administration (NHTSA) released a final environmental impact statement analyzing proposed interim standards for model years 2011 to 2015 passenger cars and light trucks. NHTSA issued a final rule for model year 2011 on March 23, 2009.

In *Center for Biological Diversity v. National Highway Traffic Safety Administration* 508 F. 3d 508, the Ninth Circuit reviewed the National Highway Traffic Safety Administration's (NHTSA's) Final Rule setting new corporate average fuel economy (CAFE) standards for light trucks. The petitioners challenged the standards under the Energy Policy and Conservation Act (EPCA) and the National Environmental Policy Act (NEPA). The court found a number of problems with the standards as adopted, and held that NHTSA should have included the impacts of climate change in its analysis. The court remanded to NHTSA to promulgate new standards "as expeditiously as possible" and to prepare an Environmental Impact Statement (EIS). In 2008, the Ninth Circuit vacated the 2007 opinion and issued what is considered a stronger opinion. The Court held that NHTSA failed to monetize the value of carbon

[1] In addition to setting increased CAFE standards for motor vehicles, EISA addressed Renewable Fuel Standards (RFS) (Section 202), Appliance and Lighting Efficiency Standards (Section 301–325), and Building Energy Efficiency (Sections 411–441). Additional provisions of EISA address energy savings in government and public institutions, promoting research for alternative energy, additional research in carbon capture, international energy programs, and the creation of "green jobs."

emissions in the ~~CAFÉ~~ CAFE standards and failed to set fuel economy standards and NHTSA was required to prepare a revised EA, or, as necessary, a full EIS.

On May 19, 2009, President Obama announced a national policy for fuel efficiency and emissions standards in the U.S. auto industry. The proposed policy is a collaboration between USDOT and USEPA, with the support of United Auto Workers. The proposed federal standards apply to passenger cars, light-duty trucks, and medium duty passenger vehicles built in model years 2012 through 2016. If finalized, the proposed rule would surpass the 2007 CAFE standards and require an average fuel economy standard of 35.5 mpg in 2016. On May 22, 2009, USDOT and USEPA issued a notice of upcoming joint rulemaking on this issue. On April 1, 2010, USDOT and USEPA established federal rules that set the first-ever national GHG emissions standards and will significantly increase the fuel economy of all new passenger cars and light trucks sold in the United States. The standards set a requirement to meet an average fuel economy of 34.1 mpg by 2016.

Clean Air Act Endangerment and Cause or Contribute Findings

On December 7, 2009, USEPA signed two distinct findings under the federal Clean Air Act (CAA). These findings (74 FR 66945–66546, December 15, 2009) are based on Section 202(a) of the CAA, which states that the USEPA Administrator should regulate and develop standards for "emission[s] of air pollution from any class or classes of new motor vehicles or new motor vehicle engines, which in [its] judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare."

The first finding (Endangerment Finding) addresses whether the concentrations of the six key GHGs (i.e., CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6) in the atmosphere threaten the health and welfare of current and future generations. In the Endangerment Finding, the USEPA Administrator found that atmospheric concentrations of GHGs endanger public health and welfare within the meaning of Section 202(a) of the CAA.

The second finding (Cause or Contribute Finding) addresses whether the combined emissions of GHGs from new motor vehicles and motor vehicle engines contribute to atmospheric concentrations of GHGs, and thus to the threat of climate change. In the Cause or Contribute Finding, the USEPA Administrator found that GHG emissions from new motor vehicles and motor vehicle engines are contributing to air pollution, which is endangering public health and welfare.

These findings do not themselves impose any requirements on industry or other entities. However, this action is a prerequisite to finalizing the USEPA's proposed GHG emission standards for light-duty vehicles, which USEPA proposed in a joint proposal including the Department of Transportation's proposed CAFE standards on September 15, 2009. The final rule was effective January 14, 2010.

Reporting Requirements

The Consolidated Appropriations Act of 2008 (HR 2764) included provisions requiring the establishment of mandatory GHG reporting requirements. USEPA published draft reporting rules on April 10, 2009, and final reporting rules on October 30, 2009. The rules became effective on December 29, 2009, and require suppliers of fossil fuels or industrial GHGs, manufacturers of vehicles and engines, and facilities that emit 25,000 MT or more per year of GHG emissions to submit annual reports to USEPA.

Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)

In 2005, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) was signed into law. The Act provides guaranteed funding for highways, highway

safety, and public transportation totaling $244.1 billion, representing the largest nationwide surface transportation investment ever. The Act follows two bills that highlighted surface transportation funding needs—the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) and the Transportation Equity Act for the 21st Century (TEA-21), which shaped the highway program to meet changing transportation needs throughout the Nation. SAFETEA-LU retains and increases funding for environmental programs of TEA-21, and adds new programs focused on the environment, including:

- Nonmotorized Transportation Pilot, a pilot program for nonmotorized transportation
- Safe Routes to School program
- Congestion Mitigation and Air Quality Improvement (CMAQ) for transportation projects and programs to help meet the requirements of the Clean Air Act

SAFETEA-LU also requires transportation plans include a discussion of types of potential environmental mitigation activities and potential areas to carry out these activities, including activities that may have the greatest potential to restore and maintain the environmental functions affected by the plan.

FHWA/FTA Planning Program Funds to Support Integration of Transportation, Land Use, and Climate Change

In 2008, FHWA issued a guidance memorandum to clarify FHWA/FTA planning requirements 23 U.S.C. 134 and 135, 49 U.S.C. 5303 and 5304 that call for MPOs and State DOTs to consider land use and economic development impacts in their transportation planning processes. The guidance was issued to reiterate and clarify the eligibility and criteria for use of FHWA/FTA funds to support activities addressing the integration of transportation, land use, and climate change.

Transportation Planning for Sustainability Guidebook

Issued in 2011, FHWA issued a guidebook that examines how sustainability considerations could be better incorporated into transportation planning. The guidebook was created for use by any agency that engages in transportation planning and includes:

- Identification of issues for planning sustainable transportation systems
- Review of current practices in the U.S. and abroad
- Potential data sources for assessment of sustainability implementation
- Case studies of sustainability practices that have been implemented in the U.S. and abroad

Regional Action

The Western Climate Initiative (WCI) is a partnership among seven states, including California, and four Canadian provinces to implement a regional, economy-wide cap-and-trade system to reduce global warming pollution. WCI will cap the region's electricity, industrial, and transportation sectors with the goal of reducing the heat-trapping emissions that cause global warming 15 percent below 2005 levels by 2020. California is working closely with the other states and provinces to design a regional GHG-reduction program that includes a cap-and-trade approach. ARB plans to develop a cap-and-trade program that will link California and the other member states and provinces (WCI 2010).

State Action

California has enacted a variety of legislation that relates to climate change, much of which sets goals for GHG reductions within the state. In addition, as discussed below, the California National Resources Agency (CNRA) and Office of Planning and Research (OPR) collaborated on the development of CEQA

Guidelines for the mitigation of GHG emissions and their effects. CNRA adopted amendments to the CEQA Guidelines on December 30, 2009; the amendments became effective on March 18, 2010.

Executive Order S-3-05

In 2005, in recognition of California's vulnerability to the effects of climate change, Governor Schwarzenegger established Executive Order S-3-05, which sets forth a series of target dates by which statewide emission of GHGs would be progressively reduced, as follows: by 2010, reduce GHG emissions to 2000 levels; by 2020, reduce GHG emissions to 1990 levels; and by 2050, reduce GHG emissions to 80 percent below 1990 levels.

Assembly Bill 32

The California Global Warming Solutions Act of 2006, widely known as AB 32, requires ARB to develop and enforce regulations for reporting, verifying, and reducing statewide GHG emissions. The heart of the legislation is the requirement that statewide GHG emissions be reduced to 1990 levels by 2020. California would need to reduce GHG emissions to approximately 15 percent below 2005 levels and 30 percent below business-as-usual predictions of year 2020 GHG emissions to achieve this goal. The bill requires ARB to adopt rules and regulations in an open public process to achieve the maximum technologically feasible and cost-effective GHG reductions.

Climate Change Scoping Plan

On December 11, 2008, as required by AB 32, ARB adopted its Climate Change Scoping Plan (Scoping Plan), which functions as a roadmap for ARB's plans to achieve GHG reductions in California (ARB 2008). The Scoping Plan contains the main strategies California will implement to reduce CO_2e emissions by 169 MMT, or approximately 28.4 percent, from the state's projected 2020 emissions level of 596 MMT of CO_2e under a business-as-usual scenario. The Scoping Plan also breaks down the amount of GHG emissions reductions ARB recommends for each emissions sector of the state's GHG inventory. The Scoping Plan calls for the largest reductions in GHG emissions to be achieved by implementing the following measures and standards:

- improved emissions standards for light-duty vehicles,
- the Low Carbon Fuel Standard,
- energy efficiency measures in buildings and appliances and the widespread development of combined heat and power systems, and
- a renewable portfolio standard for electricity production.

The Scoping Plan states that successful implementation of the plan relies on local governments' land use planning and urban growth decisions because local governments have the primary authority to plan, zone, approve, and permit land development to accommodate population growth and the changing needs of their jurisdictions. ARB further acknowledges that decisions on how land is used will have large effects on the GHG emissions that will result from the transportation, housing, industry, forestry, water, agriculture, electricity, and natural gas emission sectors.

The Scoping Plan expects a reduction of approximately 5.0 MMT CO_2e per year by 2020 from local land use changes associated with implementation of SB 375. The reduction of 5 MMT CO_2e per year represents an estimate of what may be achieved from local land use changes; it is not the SB 375 regional target. ARB established regional targets following the input of the Regional Targets Advisory Committee and a public consultation process.

The Scoping Plan does not include any direct discussion about GHG emissions generated by construction activity. The measures in the Scoping Plan are intended to be developed over the next year and be in place by 2012. Because of an inadequate environmental document, a March 18, 2011 Superior Court decision enjoined CARB from implementation of the measures contained in the Plan. The court said CARB's only failure was an inadequate review of the alternative to its policy decisions; it did recognize CARB's ability to decide on how best reach AB 32's GHG reduction goals. CARB has indicated they will appeal the decision.

Executive Order S-01-07

Governor Schwarzenegger's Executive Order S-01-07 (January 18, 2007) requires a 10 percent or greater reduction in the average fuel carbon intensity for transportation fuels in California regulated by ARB by 2020. ARB identified this Low Carbon Fuel Standard (LCFS) as a discrete early action item under AB 32, and the final ARB resolution (No. 09-31) was issued on April 23, 2009.

Assembly Bill 1493

AB 1493 (Pavley, Vehicular Emissions and Greenhouse Gases), was chaptered into law on July 22, 2002, and required ARB to adopt regulations by January 1, 2005, that would result in the achievement of the "maximum feasible" reduction in GHG emissions from vehicles used in the state primarily for noncommercial, personal transportation. As enacted, the AB 1493 regulations were to become effective January 1, 2006, and apply to passenger vehicles and light-duty trucks manufactured for the 2009 model year or later.

Although USEPA traditionally regulates tailpipe emissions, ARB maintains some regulatory authority due to the severe air quality issues in California. In fact, pursuant to the federal CAA, ARB may implement stricter regulations on automobile tailpipe emissions than USEPA, provided a waiver from USEPA is obtained.

In September 2004, ARB adopted the regulations mandated by AB 1493 and incorporated those standards into the Low-Emission Vehicle (LEV) program. The regulations set fleet-wide average GHG emission requirements for two vehicle categories: passenger car/light-duty truck (type 1) and light-duty truck (type 2). The standards took into account the different global warming potentials of the GHGs emitted by motor vehicles, and were scheduled to phase-in during the 2009 through 2016 model years. If implemented, these regulations would produce a nearly 30 percent decrease in GHG emissions from light-duty vehicles by 2030.

ARB subsequently applied to USEPA for a waiver under the CAA to authorize implementation of these regulations. The waiver request was formally denied by USEPA in December 2007 after California filed suit to prompt federal action. In January 2008, the California Attorney General filed a new lawsuit against USEPA for denying California's request for a waiver to regulate and limit GHG emissions from these automobiles. In January 2009, President Obama issued a directive to USEPA to reconsider California's request for a waiver. On June 30, 2009, USEPA granted the waiver for California for its GHG emission standards for motor vehicles. It is expected that the Pavley regulations will reduce GHG emissions from California passenger vehicles by about 22 percent in 2012 and about 30 percent in 2016, all while improving fuel efficiency.

Renewables Portfolio Standard

Established in 2002 under Senate Bill (SB) 1078 and accelerated in 2006 under SB 107, California's Renewables Portfolio Standard (RPS) requires retail suppliers of electric services to increase procurement

from eligible renewable energy resources by at least 1 percent of their retail sales annually, until they reach 20 percent by 2010.

Governor Schwarzenegger's Executive Order S-14-08 (November 11, 2008) mandated further improvements to the RPS, requiring retail suppliers of electric services to increase procurement from eligible renewable energy resources to 33 percent by 2020. In addition, on September 15, 2009, Governor Schwarzenegger signed Executive Order S-21-09, which requires ARB, under its AB 32 authority, to adopt a regulation consistent with the 33 percent renewable energy target established in Executive Order S-14-08 by July 31, 2010. On February 24, 2011, the state Senate passed a new version of the 33 percent by 2020 Renewable Portfolio Standard (RPS) and Governor Brown signed the bill into law on April 12, 2011.

Senate Bill 375

SB 375 provides for a new planning process to coordinate land use planning and regional transportation plans and funding priorities to help California meet the GHG reductions established in AB 32. SB 375 requires regional transportation plans relevant to project areas developed by Metropolitan Planning Organizations (MPOs), including SANDAG, to incorporate an Sustainable Community Strategy (SCS) in their regional transportation plans that demonstrates how the region would achieve GHG emission reduction targets set by ARB. On September 23, 2010, ARB adopted regional targets for major MPOs. SANDAG's targets are per capita CO_2 emissions reductions of 7 percent by 2020 and 13 percent by 2035 relative to 2005 levels. Under this legislation, local governments retain land use planning authority. The 2050 RTP/SCS EIR is the first RTP in the State of California that must include an SCS and show how the targets will be met.

Energy Conservation Standards

Energy Conservation Standards for new residential and nonresidential buildings were first adopted by the California Energy Resources Conservation and Development Commission in June 1977 and most recently revised in 2008 (Title 24, Part 6 of the California Code of Regulations [Title 24]). Title 24 governs energy consumed by the built environment for commercial and residential buildings in California. This includes the heating, ventilation, and air conditioning (HVAC) system; water heating; and some fixed lighting. Non-building energy use, or "plug-in" energy use, is not covered by Title 24. The standards are updated periodically to allow for consideration and possible incorporation of new energy efficiency technologies and methods. The 2008 Title 24 standards became effective on January 1, 2010, and are applicable to the proposed Project.

California's 2009 Appliance Efficiency Regulations were adopted by the California Energy Commission on December 3, 2008, and approved by the California Office of Administrative Law on July 10, 2009. The regulations include standards for both federally regulated appliances and non-federally regulated appliances. While these regulations are now often seen as "business as usual," they exceed the standards imposed by any other state and reduce GHG emissions by reducing energy demand.

In early January 2010, the California Building Standards Commission unanimously adopted the first-in-the-nation mandatory statewide green building code, referred to as CALGREEN. Taking effect on January 1, 2011, these comprehensive regulations will achieve major reductions in GHG emissions, energy consumption, and water use to create a greener California. CALGREEN requires that every new building constructed in California reduce water consumption by 20 percent, divert 50 percent of construction waste from landfills, and install low-pollutant-emitting materials. It also requires separate water meters for nonresidential buildings' indoor and outdoor water use, with a requirement for moisture-sensing irrigation systems for larger landscape projects and mandatory inspections of energy systems

(e.g., heat furnace, air conditioner, and mechanical equipment) for nonresidential buildings larger than 10,000 square feet to ensure that all are working at their maximum capacity and according to their design efficiencies. ARB estimates that the mandatory provisions will reduce GHG emissions by 3 MMT CO_2 equivalent in 2020.

Senate Bill 97

SB 97,enacted in 2007, required OPR to develop and transmit to CNRA guidelines for the mitigation of GHG emissions and their effects by July 1, 2009 for the California Natural Resources Agency (CNRA) to adopt amendments to the CEQA Guidelines by January 1, 2010.

On December 30, 2009, following an extensive public outreach program, CNRA adopted amendments to the CEQA Guidelines that address GHG emissions and related issues. The adopted amendments became effective on March 18, 2010.

In its Final Statement of Reasons for Regulatory Action (December 2009), CNRA observed:

> Analysis of GHG emissions in a CEQA document presents unique challenges to lead agencies. Such analysis must be consistent with existing CEQA principles, however. Therefore, the Amendments comprise relatively modest changes to various portions of the existing CEQA Guidelines. Modifications address those issues where analysis of GHG emissions may differ in some respects from more traditional CEQA analysis. Other modifications clarify existing law that may apply both to analysis of GHG emissions as well as more traditional CEQA analyses.

The above excerpted language is consistent with the overall spirit of the adopted CEQA Guidelines language, which does not bring about radical changes in CEQA analysis but seeks to affirm that traditional CEQA principles extend to GHG emissions and global climate change.

With respect to the significance assessment, newly added CEQA Guidelines Section 15064.4(b) provides the following:

> A lead agency should consider the following factors, among others, when assessing the significance of impacts from GHG emissions on the environment:
>
> (1) The extent to which the project may increase or reduce GHG emissions as compared to the existing environmental setting;
>
> (2) Whether the project emissions exceed a threshold of significance that the lead agency determines applies to the project;
>
> (3) The extent to which the project complies with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of GHG emissions. Such requirements must be adopted by the relevant public agency through a public review process and must reduce or mitigate the project's incremental contribution of GHG emissions. If there is substantial evidence that the possible effects of a particular project are still cumulatively considerable notwithstanding compliance with the adopted regulations or requirements, an EIR must be prepared for the project.

Assembly Bill 1358

AB 1358, widely known as the Complete Streets Act, was enacted in 2008 to ensure that the transportation plans of California communities meet the needs of all users of the roadway including

pedestrians, bicyclists, users of public transit, motorists, children, the elderly, and the disabled. The bill requires a city or county' s general plan to identify how they will accommodate the circulation of all users of the roadway, including motorists, pedestrians, bicyclists, children, seniors, individuals with disabilities, and users of public transportation, including sidewalks, bike lanes, crosswalks, wide shoulders, medians, bus pullouts, and audible pedestrian signals.

Caltrans Smart Mobility Framework

The Caltrans Smart Mobility Framework (SMF) was developed in two phases (Caltrans 2010). In the first phase, the SMF was developed with technical assistance from USEPA. The SMF established definitions and themes that would address climate change and GHG emissions, the need to reduce per capita VMT, the demand for a safe transportation system that gets people and goods to their destinations, and the commitment to create a transportation system that advances social equity and environmental justice. During the second phase, a guidebook, Smart Mobility 2010: A Call to Action for the New Decade, was developed that provides practical tools and performance-based metrics to evaluate transportation options available in California's urban, suburban, and rural areas. The tools and metrics consider a range of criteria including density, design, configuration, connectivity, safety, parking strategies, mixtures of land uses, availability of transit, complete streets, and open spaces.

2010 California Transportation Commission RTP Guidelines

The 2010 update was prepared to incorporate new planning requirements as a result of SB 375 and to incorporate the addendum to the 2007 RTP Guidelines regarding addressing climate change in RTP preparation (CTC 2010). The Guidelines include the requirement for the MPOs to include a SCS in the RTP and provide best practices for integrating the Smart Mobility Framework, Complete Streets, Context Sensitive Solutions and Corridor System Management Plans into development of the RTP. The updated Guidelines recognizes that the reduction of GHGs has a key priority in the transportation planning process.

Caltrans Climate Action Program

In December 2006, the California Department of Transportation, Business, Transportation, and Housing Agency, issued a Climate Action Program (Caltrans 2010a). The goal of the Climate Action Program is to promote clean and energy efficient transportation, and provide guidance for mainstreaming energy and climate change issues into business operations, and seeks to do so in two ways: to reduce GHG emissions from transportation, through system improvements, lowered congestion, and utilization of intelligent transportation systems; and to reduce GHG emissions from land use sources, including increasing efficiency of facilities, fleets, and equipment through reduction measures and technology. The Climate Action Program emphasizes using technological and market mechanisms for reducing GHG emissions, developing alternative fuels and vehicles, and increasing vehicle efficiency to gain the most reductions.

California Climate Adaptation Strategy

The 2009 California Climate Adaptation Strategy (CAS) summarizes the best known science on climate change impacts in the state to assess climate change vulnerability, and outlines possible solutions to promote resiliency (CNRA 2009). The California Natural Resources Agency (CNRA) has taken the lead in developing this adaptation strategy, working through the Climate Action Team (CAT). Seven sector-specific working groups led by 12 state agencies, boards and commissions, and numerous stakeholders were convened for this effort. The strategy proposes a comprehensive set of recommendations designed to inform and guide California decision makers as they begin to develop policies that will protect the state from a range of climate change impacts.

Local Plans and Policies

SANDAG's Draft 2050 RTP/SCS

SANDAG's Draft 2050 RTP/SCS, which is the proposed project for this EIR, is the blueprint for the region's transportation system over the next 40 years. It a incorporates a Sustainable Communities Strategy (SCS), as required by SB 375, that achieves the region's GHG emission reduction targets set by CARB.

SANDAG's Climate Action Strategy

In 2010, SANDAG published a Climate Action Strategy (CAS) that was prepared under a partnership with the California Energy Commission (SANDAG 2010). The CAS acts as a guide for SANDAG and local governments and policymakers in addressing climate change. The CAS recognizes the importance of local and regional action to achieve statewide climate goals, and identifies how local jurisdictions can participate in achieving the goal. Because local governments have greater control over some areas, the CAS emphasizes those areas where the greatest impact can be made at the local level. These areas include: land use patterns, transportation infrastructure, and related public investment; building construction and energy use; and government operations. In addition, these areas constitute the majority of statewide emissions.

Within the three areas, goals, objectives, and policy measures are introduced to further describe how GHG emissions reductions could be achieved. The goals are to:

- Reduce total miles of vehicle travel
- Minimize GHGs when vehicles are used
- Promote use of low carbon alternative fuels
- Protect transportation infrastructure from climate change impacts
- Reduce energy use in residential and commercial buildings
- Increase use of renewable energy
- Reduce water-related energy use and GHGs
- Protect energy infrastructure from climate change impacts
- SANDAG and local governments lead by example

This framework provides a "toolkit" for local governments to consider using when updating general plans and was the basis for many of the policies listed in the 2050 RTP/SCS, such as reducing total miles of vehicle travel by adopting smart growth.

Greenhouse Gas Inventories and Climate Action Plans

All 18 cities and the County of San Diego have completed a GHG inventory, many prepared as part of the San Diego Foundation's Climate Initiative. A GHG inventory is the first step toward preparing a Climate Action Plan (CAP), which is a document that provides guidance to jurisdictions for achieving GHG reduction goals. Since SANDAG does not implement land use policy, decisions regarding how and when to implement land use strategies that will result in reduced GHG emissions outlined in the SCS will ultimately come from the local-agency level. A CAP provides measures for reducing emissions through policies similar to those in the SCS, such as by encouraging building retrofits or mandating an energy efficiency code in new construction. Many jurisdictions have or are currently preparing climate planning documents, such as the City of Chula Vista, City of Encinitas, the City of San Diego, City of National City, and the County of San Diego.

4.8.3 SIGNIFICANCE CRITERIA

A significant impact is defined as "a substantial or potentially substantial, adverse change in the environment" (CEQA PRC Section 21068). The proposed 2050 RTP/SCS would have a significant impact on GHG gas emissions and climate change if implementation were to:

GHG-1 Increase GHG emissions compared to existing conditions (2010).

GHG-2 Conflict with SB 375 GHG emission reduction targets.

GHG-3 Conflict with applicable GHG reduction plans.

4.8.4 IMPACT ANALYSIS

This section analyzes the potential GHG impacts associated with implementation of the proposed 2050 RTP/SCS. It is organized in sections to address impacts that may occur with the two main components of the 2050 RTP/SCS; regional growth/land use change and transportation network improvements. Analysis for each significance criterion includes a program-level discussion of anticipated impacts in the planning horizon years of 2020, 2035, and 2050. Significant impacts are identified and mitigation measures are provided to reduce such impacts. All data are also shown in Appendix D.

GHG-1 INCREASE GHG EMISSIONS OVER 2010 LEVELS

The 2050 RTP/SCS GHG emissions would be significant if the project caused an increase over existing (2010) levels. This impact threshold has been developed for use in this EIR and may not necessarily be used in future SANDAG or implementing agencies' CEQA documents. In addition to transportation improvements, the 2050 RTP/SCS identifies projected growth for the SANDAG region, which would include substantial increase in population and jobs. This forecasted growth would induce land use change and development, such as increased housing units, as described in Chapter 2. Although the 2050 RTP/SCS focuses development in a compact pattern, development projects would occur, resulting in direct and indirect GHG emissions. Direct emissions include emissions from fuel combustion in transportation and natural gas combustion from stationary sources. Indirect sources include off-site emissions occurring as a result of operations such as electricity and water consumption. EPIC has estimated regional GHG emissions for each year from 1990–2010 and has forecast emissions for 2020 and 2035 (EPIC 2011). Forecasts of regional GHG emissions for 2050 have been developed for this EIR using SANDAG's regional growth factors and historic growth rates in the region.

In addition, land use change induced by growth will require construction activity throughout implementation of the 2050 RTP/SCS. Construction activities, including worker vehicle trips, transport of materials to and from the construction site, and operation of construction equipment, result in GHGs emissions. Construction is generally considered finite and does not last over the life of a project. Emissions due to construction activities are often amortized over the life of the project (e.g., 30 years) and individual project construction characteristics would be included, such as the timing of construction phases and equipment fleet mix. However, due to the scale of development activity associated with implementation of the 2050 RTP/SCS, construction would occur throughout the life of the plan and therefore could be cumulatively significant. Although annual construction-related GHG emissions may vary depending on the number and type of projects being constructed in a given year, anticipated annual construction emissions may be estimated based on forecasted development in the region. To estimate annual construction emissions due to regional growth/land use change, the proportion of development was

estimated for each time period based on forecasted housing units and jobs and average annual emissions were modeled using the emissions model URBEMIS~~2007~~.

For transportation network improvements, the phased project list from Tables 2.0-5 through 2.0-7 of the 2050 RTP/SCS was used to determine the miles and acreage of forecasted construction for each time period, as shown in Table 4.8-6. Annual construction-related GHG emissions will vary depending on the number and types of projects occurring in a given year. However, based on the phased project list for 2020, 2035, and 2050, the number of miles and acres of transportation-related construction that could be reasonably expected for each year were estimated and "average" annual construction was modeled using the Road Construction Emissions Model, Version 6.3.2. Operational emissions were calculated using the SANDAG transportation model, which accounts for VMT and speeds of on-road motor vehicles, and EMFAC ~~2007~~. Existing state measures are in place that would help to reduce emissions related to on-road transportation. LCFS and Pavley (described in Regulatory Setting) would reduce the carbon content of fuels and increase the efficiency of light-duty motor vehicles, respectively. ARB provides a postprocessor tool that estimates reductions in GHGs resulting from implementation of these two programs, and has been used by SANDAG to estimate net GHG emissions.

Table 4.8-6
Forecast Miles and Acreage of Transportation Network Improvements

	Total Miles	Total Acres
2010–2020	1,023	4,495
2020–2035	316	1,269
2035–2050	244	775

A significant impact would occur if the emissions from operational and construction-related activities results in greater GHG emissions than occurred in 2010, which constitutes existing conditions. This is referred to as a mass-emissions metric. Population and jobs are forecast to grow in the SANDAG region through 2050 and therefore it is informative to understand how emissions will change through implementation of the 2050 RTP/SCS and forecasted growth in the region. Therefore, an additional metric is provided, which is a per service population GHG emissions, where service population is the sum of the number of residents and jobs within the region. This metric provides context regarding how emissions are changing relative to regional growth. However, as described in Section 4.8.1, GCC is a cumulative issue and if per-service population GHG emissions decline but mass emissions increase, a significant impact would result.

2020

Regional Growth/Land Use Change

By 2020, population within the region is expected to increase by 310,568 people; housing by 113,062 units; and employment by 118,535 jobs. Land-use emissions include emissions from energy consumption (electricity and natural gas), off-road vehicles and equipment (such as lawn and construction equipment), solid waste, and other activities. Non-land-use emissions are not included, as the 2050 RTP/SCS would not have the ability to affect change to these emissions sectors, including waterborne navigations, aviation, and industrial processes. Predicted increases in population and jobs induce land use change, resulting in additional sources of GHG emissions. The 2050 RTP/SCS supports sustainable growth through creating a compact development pattern. The 2050 RTP/SCS focuses growth in existing urban regions, where transit and infrastructure are already in place. Locating people and jobs near each other and near transit encourages use of transit, carpooling, and active transportation options (biking and

walking), thereby reducing emissions on a per service population basis. Encouraging multi-family developments instead of single-family homes also reduces energy consumption on a per service population basis.

GHG emissions associated with land use in the SANDAG region were forecast to 2020 by EPIC (EPIC 2011). Activities that are not related to regional land use planning, such as civil and military aviation-related emissions, are not included.

When comparing existing land use as shown in Figure 4.11-1 and 2020 land use as shown in Figure 4.11-3, there are no substantial differences in the land use patterns, types, or areas of development. Some locations that would experience the most extensive land use change and development by 2020 would include areas such as eastern Chula Vista along the SR 125 and I-805 corridors; San Diego community planning areas of San Ysidro and Otay Mesa along the SR 905 corridor; City of San Diego coastal and bay communities south of I-8 including Ocean Beach and the Peninsula planning areas; portions of northern Santee; areas north and south of the SR 56 corridor in the San Diego planning areas of Carmel Valley, Del Mar Mesa, Pacific Highlands Ranch, and Torrey Highlands; the San Marcos area near both the SR 78 and I-15 corridors; and within unincorporated County communities such as Fallbrook, Pala-Pauma Valley, and Valley Center along the I-15 and SR 76 corridors. Total land use-based GHG emissions in 2020 are projected to be 16.65 MMT CO_2e, or 15 percent greater than GHG emissions in 2010 (Table 4.8-7).

Table 4.8-7
San Diego County Land Use GHG Emissions, 2020[1]

Category Totals	2020 MMT CO_2e
Electricity	9.46
Natural Gas End Uses	3.31
Off-road Equipment and Vehicles[2]	1.59
Waste	0.74
Agriculture	0.03
Sequestration	(0.65)
Development	0.18
Wildfires	0.28
Other	1.71
Land-Use GHG Emissions	**16.65**
RPS reductions	(2.27)
Construction	0.03
Net Land-Use GHG Emissions	**14.41**

[1] EPIC 2011
[2] Based on preliminary 2010 estimates.

As discussed in Section 4.8.2, Regulatory Setting, many cities and the County have policies to minimize or mitigate GHG emissions from regional growth/land use change. Future projects implemented as part of the 2050 RTP/SCS would be required to adhere to these policies. The primary source of land use-based GHG emissions is from electricity (57 percent). As discussed in Section 4.8.2, there is a statewide renewable energy policy in place that requires retail suppliers of electricity to increase renewable energy resources to 33 percent by 2020. As of 2010, San Diego Gas & Electric (SDG&E), the major supplier of electricity to the SANDAG region, had achieved the use of 11.9 percent of renewable energy resources (CPUC 2011). Accounting for anticipated gains in renewable energy sources that would result in lower electricity-sector GHG emissions, total GHG emissions are expected to be 14.38 MMT CO_2e in 2020.

GHG emissions from land development construction are generally from construction equipment and worker trips. Construction equipment generally consists of heavy-duty vehicles that are not subject to the same efficiency regulations that passenger vehicles must follow (e.g., Pavley), although they would benefit from lower carbon intensity fuel regulations, such as the LCFS. Federal legislation has been proposed that would establish the first fuel efficiency requirements from medium- and heavy-duty vehicles and would begin with the model year 2014 (see Section 4.8.2, Regulatory Setting). If passed, the legislation is expected to increase fuel efficiency by between 7 and 20 percent for medium- and heavy-duty vehicles. However, these efficiencies will be gradual ,beginning in 2014, and depend on the turnover rate of vehicles in medium- and heavy-duty classes and will still result in GHG emissions in 2020, and the regulations would not apply to all construction equipment. Estimated annual construction-related emissions from land development would be 26,600 MT CO_2e, resulting in total regional growth/land use change and related construction emissions of 14.41 MMT CO_2e in 2020, which would be lower than the land use emissions in 2010 of 14.53 and therefore constitute a less than significant impact.

Transportation Network Improvements

On-road transportation emissions include fuel consumption from passenger vehicles, heavy-duty trucks, buses, and other motor vehicles; and rail. Transportation accounts for the greatest proportion of GHG emissions on a regional and state level (EPIC 2011; ARB 2010). As part of the 2050 RTP/SCS, transportation network improvements would be made and compact, mixed-use growth strategies would be encouraged to accommodate increases in population and travel demand, as well as provide means for alternative transportation (mass transit), congestion relief, and land development. The Regional Comprehensive Plan, adopted by the SANDAG Board of Directors in 2004, serves as a blueprint for the region's future growth and development, promoting smarter growth and focusing on locating higher density and mixed-use development close to existing and planned transportation infrastructure. The Regional Comprehensive Plan contains three overarching strategies:

1. Increase the fuel efficiency of vehicles.
2. Use cleaner transportation fuels.
3. Integrate land use and transportation plans, policies, and programs to provide more opportunities for shorter vehicle trips, reduced traffic congestion, and alternatives to driving alone such as carpooling, vanpooling, walking, bicycling, and using public transportation.

The SCS is an essential part of the overall approach, focusing on integrating land use and transportation plans, policies, and programs. In addition, the SCS conclusion summarizes 27 recommended actions, many of which would help the region achieve these strategies, including:

- Refine indicators used to monitor progress toward implementation of the Regional Comprehensive Plan to include additional measures that address sustainability, GHG reductions and public health considerations.
- Update the Smart Growth Concept Map to reflect changes to local land use plans and regional transportation network.
- Use the Smart Growth Concept Map as a basis for allocating smart growth incentives, prioritizing transit service enhancements, and seeking additional smart growth funds.
- Support legislation that provides financial incentives for smart growth projects that helps provide more affordable housing near transit and that addresses fiscal reform issues consistent with the SCS and smart growth principles in the Regional Comprehensive Plan.

- Support increased use of clean, alternative fuels in SANDAG and local jurisdiction-owned vehicle fleets, and the vehicle and equipment fleets of contractors and funding recipients, such as the vehicle fleet for the SANDAG Vanpool Program or for local jurisdiction waste haulers.
- Support planning and infrastructure development for alternative fueling stations and plug-in electric vehicle (EV) chargers.
- Develop or facilitate a regional approach to long-term alternative fuel infrastructure planning that includes the continued development of public-private strategic alliances.
- Assess the impact that increased use of clean, alternative fuels would have on gas tax revenues.
- Integrate alternative fuel considerations into the development of the regional transportation network by, for example, integrating infrastructure for electric vehicle charging into regional park-and-ride lots and transit stations.
- Work with SDGE&E and other stakeholders to mitigate the potential impacts of electric vehicles on the electric grid.

The transportation network improvements that would be implemented between 2010 and 2020 generally include widening and/or installation of HOV lanes and Managed Lanes along portions of I-5, I-15, I-805, SR 78, and SR 94; completion of SR 905 and SR 11; and HOV connector projects along I-805. Some key transit network improvements in place by 2020 would include increases in existing COASTER service, including extension of COASTER service to the San Diego Convention Center and Petco Park. BRT downtown express services from inland and south bay locations would be expanded as well as new BRT routes from the south bay area and along I-15. Rapid bus service would add new routes and streetcar routes would be established. Local bus service would be improved to 15 minutes in key corridors. Double-tracking of the LOSSAN rail corridor would occur to accommodate increased frequency in COASTER and other rail services that utilize this rail line. In addition, the new Mid-Coast Trolley line from Old Town to University Town Center would be constructed and the Trolley Green Line would be extended to downtown San Diego. SANDAG regional on-road transportation-related emissions have been calculated for 2020. The 2050 RTP/SCS encourages compact, transit-oriented development through alternative transit improvements including pedestrian network improvements, safe routes to schools strategies, bicycle network facilities, vanpools, carpools and buspools; however, given the increase in population and jobs, transportation-related GHG emissions would result in 15.56~~61~~ MMT CO_2e. This would lead to greater emissions compared with 2010 (14.31~~33~~ MMT CO_2e) (Table 4.8-8).

Existing state measures are in place that would help to reduce emissions related to motor vehicles. LCFS and Pavley (described in Regulatory Setting) would reduce the carbon content of fuels and increase the efficiency of motor vehicles, respectively. ARB provides a postprocessor tool that estimates reductions in GHGs resulting from implementation of these two programs, and has been used by SANDAG to estimate net GHG emissions in 2020 (Table 4.8-5). Accounting for state measures, GHG emissions from motor vehicles would be reduced through the use of more efficient vehicles and less carbon-intense fuels, reducing transportation-related emissions 16 percent from 2010 levels.

The 2050 RTP/SCS includes transportation improvement projects that would require construction. Fuel and energy consumption associated with worker trips and construction equipment would lead to GHG emissions. For a single project, construction is often amortized over the life of the project and generally considered finite; however, the 2050 RTP/SCS contains projects throughout the implementation period, and projects expected to occur by 2020 include improvements to highways, arterial roadways, and transit services.

Table 4.8-8
SANDAG Regional Transportation GHG Emissions, 2020

	2020 MMT CO_2e
On-road transportation emissions (no rail)[1]	15.0910~~14~~
Rail[2]	0.47
Transportation GHG Emissions	**15.56~~561~~**
LCFS + Pavley reductions[1]	(3.56~~78~~)
Construction[3]	.01
Net Transportation GHG Emissions	**12.004**

[1] SANDAG 2011
[2] EPIC 2011
[3] AECOM 2011

These projects would each have construction emissions associated with them, and although construction for any single project is finite, the number of projects would lead to ongoing construction activities. Although 2050 RTP/SCS is a program-level document and therefore the project-level details necessary to estimate construction emissions are not available, the average annual construction-related emissions may be calculated from the projects listed in the 2050 RTP/SCS phased project list. In 2020, annual construction-related GHG emissions will total 9,700 MT CO_2e/yr, leading to total operation and construction emissions from transportation totaling 12.004 MMT CO_2e/yr.

Conclusion

Transportation and land use change GHG emissions in 2020 are expected to be lower than in 2010, when state-level measures are accounted. Emissions estimates for transportation and land use in 2020 are 26.415 MMT CO_2e, while in 2010, emissions were 28.84586 MMT CO_2e. Thus, implementation of the 2050 RTP/SCS would not substantially increase the GHG emissions from 2010 levels and would result in less than a significant impact in 2020.

2035

Regional Growth/Land Use Change

By 2035, the population of the region is expected to increase by 801,699 people; housing by 268,094 units; and employment by 312,292 jobs over existing 2010 conditions. As shown in Figure 4.11-4, regional land use and development changes are evident by 2035. Some locations that would experience the most extensive land use change and development by 2035 would include continued growth in eastern Chula Vista along the SR 125 and I-805 corridors; San Diego community planning areas of San Ysidro and Otay Mesa along the SR 905 and SR 125 corridors: northeast of the SR 94 corridor in the unincorporated County planning areas of Jamul/Dulzura, Tecate, and Potrero; eastern Poway along the SR 67 corridor; the County planning area of Ramona along the SR 67 and SR 78 corridors; County planning areas of Lakeside and Alpine and the Crest, Granite Hills, Dehesa, Harbison Canyon subregion; and multiple north County planning areas along the 1-15 and SR 76 corridors such as Rainbow, Fallbrook, Bonsall, Pala-Pauma Valley, Valley Center, and Hidden Valley.

The increased density can be seen when comparing the existing housing density to the 2035 housing density, as shown in Figures 4.13-2 and 4.13-8, respectively. Areas of increased residential density by 2035 would be apparent in some coastal cities such as Oceanside and Encinitas, and City of San Diego coastal communities. Also increased density would occur in more inland areas along the I-8 corridor through Mission Valley, College Area, and into the City of La Mesa, as well as eastern Chula Vista along the SR 125 corridor. In the northern portion of the region, land use changes to accommodate growth in

2035 in the form of spaced rural residential development would occur along the I-15 corridor north of Escondido toward the northern county line and in more eastern areas along I-8, SR 67, SR 78, and SR 94. The SR 78 corridor, from Escondido to I-5, would also experience growth and resulting land use density increases of both residential and commercial/office by 2035. As shown in Figure 4.11-4, single-family residential development would increase substantially along this corridor as well as additional commercial and industrial growth. The majority of this growth would be centered around the cities of Vista, San Marcos, and Escondido. The pattern of more dense growth along this segment of the SR 78 corridor is also apparent when comparing the existing housing density to 2035 housing density (see Figures 4.13.2 and 4.13-8 in Section 4.13, Population and Housing). By 2035, some regional growth would be accommodated in the more eastern, rural areas of the region. Development in these areas would be centered mostly along highway corridors, such as SR 78, SR 67, I-8 east of El Cajon, and SR 94, and generally within San Diego County community planning areas. The unincorporated portions of San Diego County are currently undergoing population growth and expansion of residential land use as indicated by a population increase of 14 percent from 2000 to 2010 as shown in Table 4.11-2. When comparing the existing land uses and 2035 land uses in Figures 4.11-1 and 4.11-4, the 2035 land use pattern would generally involve additional residential development in areas that were previously undeveloped open space or at some time in agricultural use (as discussed in Section 4.2).

As discussed in 2020, the 2050 RTP/SCS encourages growth to occur in areas of existing urban development, and near existing and planned transit corridors. In addition, it encourages higher-intensity residential and commercial development. These strategies would increase energy efficiency and encourage use of transit services. However, the amount of new development and redevelopment needed to accommodate expected growth would lead to more GHG-emitting sources.

GHG emissions associated with land use in the SANDAG region were forecast to 2035 by EPIC (EPIC 2011). Activities that are not related to regional land use planning, such as civil aviation, waterborne navigation, and industrial process, are not included. The 14 percent population and 12.1 percent jobs increase from 2020 to 2035 would lead to greater sources for GHG emissions, including residential units, commercial sources, and waste. The total land use-based GHG emissions in 2035 are projected to be 19.93 MMT CO_2e, or 37 percent greater than GHG emissions in 2010 (14.53 MMT CO_2e) (Table 4.8-9).

As stated in Section 4.8.2, state law requires electricity-based GHG reductions. The law requires retail suppliers of electric services to increase renewable energy resources to 33 percent by 2020 and every year after. Therefore, 2.68 MMT CO_2e reductions are likely to occur as a result of the existing legislation. Although the requirement for renewable energy sources may increase, it is speculative at this time. In addition, local laws, regulations, and programs are in place to encourage reduction of GHG emissions that future projects implemented as part of the 2050 RTP/SCS would be required to follow. Although GHG emissions reductions are likely to occur as a result of the laws, regulations, and programs, it is not possible to know precisely the extent of the emissions reductions, especially as they may vary among jurisdictions. As discussed above, growth in population, housing, and jobs would induce substantial development, requiring construction. Construction activities include worker vehicle trips and operation of construction equipment, which emit GHGs. Due to the substantial growth expected by 2035, construction activities and associated GHG emissions have been estimated to be over 48,000 MT CO_2e/year. Therefore, the estimated GHG emissions in 2035, 17.29 MMT CO_2e, would be greater than the baseline GHG emissions of 14.53 MMT CO_2e/year, resulting in a significant impact.

Table 4.8-9
San Diego County Land Use GHG Emissions, 2035[1]

	2035 MMT CO_2e
Electricity	11.21
Natural Gas End Uses	3.93
Off-road Equipment and Vehicles[2]	1.89
Waste	1.08
Agriculture	0.01
Sequestration	(0.63)
Development	0.18
Wildfires	0.28
Other	1.97
Land-Use GHG Emissions	**19.93**
RPS reductions	(2.68)
Land-use Construction	**0.05**
Net Land-Use GHG Emissions	**17.29**

[1] EPIC 2011

[2] Based on preliminary 2010 estimates.

Transportation Network Improvements

The 2050 RTP/SCS includes transportation network improvements that are focused on demand reduction, and improved systems management. Projects proposed by the 2050 RTP/SCS by 2035 include substantial improvements to transit services and highways, with limited arterial roadway improvements. Some key highway improvements in place by 2035 would include continued widening along portions of I-5; additional HOV and Managed Lanes along portions of I-5, I-805, and SR 52; widening of portions of SR 125 and SR 67; and additional freeway and HOV connector improvements. Some important transit projects operational by 2035 would include continued increases in COASTER service, increases in SPRINTER service, increases in downtown area streetcar service, and substantial increases in rapid bus service throughout the region. The Trolley Blue Line would be extended from UTC to Mira Mesa via Sorrento Mesa and Carroll Canyon; the Orange Line would be extended to Lindbergh Field; and a new line from Pacific Beach to El Cajon via Kearny Mesa, Mission Valley, and San Diego State University would be established. Double-tracking along the SPRINTER rail line through the cities of Oceanside, Vista, San Marcos, and Escondido would take place by 2035 as well as continued double-tracking along the LOSSAN corridor.

The 2050 RTP/SCS would accommodate the increased transportation demands associated with a 14 percent population growth and 12.1 percent job growth in the region. SANDAG has estimated the emissions associated with the proposed improvements for 2035 using EMFAC~~2007~~ (Table 4.8-10). Modeling accounted for GHG emissions from cars, trucks, motorcycles, buses, trains, and other on-road vehicles, and the estimated GHG emissions from on-road transportation in 2035 would be 18.445~~54~~ MMT CO_2e, an increase over baseline emissions of 14.31~~33~~ MMT CO_2e.

State measures that regulate transportation-related emissions include LCFS and Pavley. These measures call for reduced carbon content in fuels and increased fuel efficiency in passenger vehicles. Although the efficiencies do not increase after 2020, they do not expire, and reductions in GHG emissions would continue as a result. SANDAG modeled the GHG emissions expected in 2035 using ARB's post-processor. In addition, the 2050 RTP/SCS includes transportation improvement projects that would require construction. Fuel and energy consumption associated with worker trips and construction equipment would lead to annual GHG emissions of 6,415 MT CO_2e, for total annual transportation-related emissions of 12.88~~94~~ MMT CO_2e/yr, which is less than baseline emissions. Therefore,

implementation of the 2050 RTP/SCS would not increase transportation-related GHG emissions above baseline levels, and, therefore constitutes a less than significant impact.

Table 4.8-10
SANDAG Regional Transportation GHG Emissions, 2035

	2035 MMT CO_2e
On-road transportation emissions (no rail)[1]	17.77~~86~~
Rail[2]	0.68
Transportation GHG Emissions	**18.44~~55~~4**
LCFS + Pavley reductions[1]	(5.57~~86~~1)
Construction[3]	.01
Net Transportation GHG Emissions	**12.88~~94~~**

[1] SANDAG 2011
[2] EPIC 2011
[3] AECOM 2011

Conclusion

Regional growth/land use change GHG emissions in 2035 are expected to be greater than in 2010, while transportation-related GHG emissions are expected to be lower than in 2010. The total emissions expected in 2035 for both regional growth/land use change and transportation network improvements would be 30.17~~82~~4 MMT CO_2e, accounting for state measures and including construction-related emissions. Compared with the estimated 2010 emissions of 28.84~~58~~6 MMT CO_2e, this represents an increase over baseline conditions. Therefore, implementation of the 2050 RTP/SCS would lead to an overall increase in GHG emissions in 2035 compared to 2010 levels and constitutes a significant impact for which mitigation measures are described in Section 4.8.5.

2050

Regional Growth/Land Use Change

By 2050, the population of the region is forecast to increase by 1,160,435 people; housing by 379,664 units; and employment by 501,958 jobs over existing conditions. As shown in Figure 4.11-5, new growth and land use changes in 2050 per the 2050 RTP/SCS are apparent throughout the region. Areas of substantial land use change and development, beyond that described in 2035 would include significant industrial development in the County's Otay planning area and San Diego Otay Mesa community surrounding the East Otay Mesa POE; throughout County planning areas located along the international border including Tecate, Potrero, Campo/Lake Morena, Boulevard, and Jacumba; throughout the Ramona and Julian planning areas in the unincorporated County; throughout other northeastern County planning areas including North Mountain, Desert, and Borrego Springs; and continued development throughout County planning areas located north and east of Escondido extending to the northern border with Riverside County including Rainbow, Fallbrook, Bonsall, Pala-Pauma Valley, Valley Center, Hidden Valley, Twin Oaks Valley, and North County Metro.

Increased population density from 2010 through 2050 can be seen when comparing Figures 4.13-1 and 4.13-10, respectively. Increased density is most apparent in City of San Diego communities near the downtown area near I-5 and I-805 and along the I-8 corridor to the east. As with the growth expected in 2020 and 2035, growth in 2050 would require land development to accommodate forecasted growth. The 2050 RTP/SCS encourages growth in urban areas near existing or planned transit, and increased intensity of development projects. Urban centers in the western third of the San Diego region would have most available land developed with single- and multi-family uses, commercial and office uses, and industrial

uses. Consistent with the goals of the 2050 RTP/SCS, the dense growth within existing urban centers with high accessibility to transit options allows for the creation of communities that are more sustainable, walkable, transit-oriented, and compact. Substantial dense growth within the urban centers corresponds with major transportation corridors such as I-5, I-8, I-15, and I-805 and these are also alignments that would have extensive transit opportunities. Similar to the description in the 2035 analysis, growth would continue in more eastern locations of the region, such as east of I-15 in the northern area, east of SR 67 through the middle portion of the region, and east of SR 94 in the southern area. However, by 2050, spaced rural residential development would have expanded beyond areas along existing transportation corridors and established rural communities and into areas with very minimal development at present. As shown in Figure 4.11-5, some of these areas include northeast of Escondido to SR 76, areas east of Camp Pendleton, and areas north and south of the SR 78 corridor. Large pockets of land currently used for agricultural purposes would be developed with spaced rural residential uses. As shown in Figure 4.11-5, by 2050, a substantial pocket of industrial development would be located along the planned SR 905 corridor in conjunction with the new Otay Mesa East POE at the international border with Mexico. This is a newly developing area that is planned for mainly industrial use and is highly dependent upon the planned construction of SR 11, SR 905, and the Otay Mesa East POE.

The EPIC study forecasts GHG emissions to 2035 only. To forecast emissions to 2050, growth factors based on SANDAG's projected population growth (for electricity, natural gas, off-road equipment, and waste) and historic growth by sector (all other categories) were used to forecast to 2050. Emissions from activities that are not related to regional land use planning, such as civil aviation, water-borne navigation, and industrial processes are not included.

Total land use-based GHG emissions in 2050 are projected to be 21.85 MMT CO_2e, or 50 percent greater than GHG emissions in 2010 (Table 4.8-11).

Table 4.8-11
San Diego County Land Use GHG Emissions, 2050[1]

	2050
Electricity	12.21
Natural Gas End Uses	4.28
Off-road Equipment and Vehicles[2]	2.06
Waste	1.18
Agriculture	0.01
Sequestration	(0.62)
Development	0.17
Wildfires	0.28
Other	2.27
Land-Use GHG Emissions	**21.85**
RPS reductions	(2.92)
Land-use Construction	**0.04**
Net Land-Use GHG Emissions	**18.96**

[1] AECOM
[2] Based on preliminary 2010 estimates.
Totals may not match due to rounding.

As in 2020 and 2035, the primary source of land use-based GHG emissions is from electricity (approximately 50 percent). The RPS requires 33 percent of electricity to be derived from renewable sources by 2020 and every year after; it is expected that this law will be fully phased in by 2050. Unless additional measures are adopted, this level will be maintained in 2050, which would reduce GHG emissions associated with electricity consumption. Accounting for anticipated gains in renewable energy sources that would result in lower GHG emissions, electricity-based GHG emissions would be 2.92 MMT

CO_2e lower by 2050. Estimated construction-related emissions would increase emissions by 41,000 MT CO_2e, resulting in total land use-based GHG emissions of 18.96 MMT CO_2e. Therefore, implementation of the 2050 RTP/SCS would increase land use GHG emissions above baseline levels of 14.53 MMT CO_2e, and this constitutes a significant impact.

Transportation Network Improvements

By 2050, most of the highway, transit, and active transportation (bicycle and pedestrian) improvements, along with other infrastructure projects, would be in place and operational in accordance with the proposed 2050 RTP/SCS. Some key highway improvements that would be in place by 2050 would include widening portions of SR 52, SR 56, SR 76, SR 94, SR 125, and I-5; additional HOV lanes and Managed Lanes along segments of I-805, I-5, I-15, SR 94, SR 125, and SR 54; and freeway and HOV connector improvements. Important transit improvements in place by 2050 would include the extension of Trolley lines and increased Trolley service frequency. The Trolley Green Line would be extended to Downtown-Bayside; a new line connecting San Diego State University to Downtown San Diego via El Cajon Boulevard/Mid-City would be constructed; and a line from University Town Center to Palomar Trolley Station in the South Bay via Kearny Mesa, Mission Valley, Mid-City, and National City would be established.

The 2050 RTP/SCS focuses transportation improvements on highway projects from 2035 to 2050, with few transit projects and no arterial roadway projects proposed. The proposed improvements would be made to accommodate increases in population and commuters, and to provide congestion relief.

SANDAG regional transportation-related emissions have been calculated for 2050. However, on-road travel is still expected to increase in 2050, resulting in 21.154~~23~~ MMT CO_2e in 2050, or a 48 percent increase from 2010 levels of 14.31~~33~~ MMT CO_2e (Table 4.8-12).

Table 4.8-12
SANDAG Regional Transportation GHG Emissions, 2050

	2050 MMT CO_2e
On-road transportation emissions (no rail)[1]	20.2156
Rail[2]	0.98
Transportation GHG Emissions	**21.14~~523~~**
LCFS + Pavley reductions[1]	(6.475~~0~~)
Construction[3]	.01
Net Transportation GHG Emissions	**14.68~~974~~**

[1] SANDAG 2011
[2] EPIC 2011
[3] AECOM 2011

Existing state measures are expected to continue to be in place that would help to reduce emissions related to on-road transportation. LCFS and Pavley would be fully phased-in, and SANDAG estimated the net GHG emissions in 2050 after accounting for the state measures. Accounting for state measures, GHG emissions from transportation would be reduced through the use of more efficient vehicles and less carbon-intense fuels, reducing transportation-related emissions in 2050. The 2050 RTP/SCS includes transportation improvement projects that would require construction. As with 2020 and 2035, annual construction emissions are based on anticipated transportation network improvements. In 2050, construction-related GHG emissions are expected to be approximately 6,200 MT CO_2e, increasing total transportation-related emissions to 14.68~~974~~ MMT CO_2e/yr. Therefore, implementation of the 2050 RTP/SCS would increase transportation-related GHG emissions above baseline emissions of 14.31~~33~~ MMT CO_2e and therefore constitutes a significant impact.

Conclusion

Land-use and transportation-related GHG emissions in 2050 are expected to be greater than in 2010. The total emissions expected in 2050 would be 33.64~~570~~ MMT CO_2e, accounting for state measures. Compared with the estimated 2010 emissions of 28.845~~86~~ MMT CO_2e, this represents an increase over baseline conditions. Therefore, implementation of the 2050 RTP/SCS would lead to an overall increase in GHG emissions compared to baseline levels and constitutes a significant impact for which mitigation measures are described in Section 4.8.5.

GHG-2 SB 375 GHG EMISSION REDUCTION TARGETS

GHG-2 analyzes a narrower range of GHG emissions than GHG-1. As described in Regulatory Setting, SB 375 requires ARB to develop regional GHG emission reduction targets, compared to 2005 emissions, for cars and light trucks for 2020 and 2035 for each of the state's MPOs. Each MPO is to prepare an SCS as part of the RTPs in order to reduce GHGs by better aligning transportation, land use, and housing. For SANDAG, the targets are to reduce per capita CO_2 emissions 7 percent below 2005 levels by 2020 and 13 percent below 2005 levels by 2035. Because ARB has not developed a target for 2050, no analysis is provided for that year. Determining the per capita GHG emissions requires modeling future VMT by passenger vehicles and light trucks that emit GHGs and dividing that number by the total population. SANDAG estimated the per capita 2005 emissions as 27.4 pounds CO_2e per person per day (lbs CO_2e/person/day).

2020

Regional Growth/Land Use Change

By 2020, population within the region is expected to increase by 310,568 people; housing by 113,062 units; and employment by 118,535 jobs. When comparing existing land use as shown in Figure 4.11-1 and 2020 land use as shown in Figure 4.11-3, there are no substantial differences in the land use patterns, types, or areas of development. Some locations that would experience the most extensive land use change and development by 2020 would include areas such as eastern Chula Vista along the SR 125 and I-805 corridors; San Diego community planning areas of San Ysidro and Otay Mesa along the SR 905 corridor; City of San Diego coastal and bay communities south of I-8 including Ocean Beach and the Peninsula planning areas; portions of northern Santee; areas north and south of the SR 56 corridor in the San Diego planning areas of Carmel Valley, Del Mar Mesa, Pacific Highlands Ranch, and Torrey Highlands; the San Marcos area near both the SR 78 and I-15 corridors; and within unincorporated County communities such as Fallbrook, Pala-Pauma Valley, and Valley Center along the I-15 and SR 76 corridors.

GHG emissions reductions achieved through SCS land use strategies are incorporated in the following analysis of transportation network improvement emissions reductions.

Transportation Network Improvements

The transportation network improvements that would be implemented between 2010 and 2020 generally include widening and/or installation of HOV lanes and Managed Lanes along portions of I-5, I-15, I-805, SR 78, and SR 94; completion of SR 905 and SR 11; and HOV connector projects along I-805. Some key transit network improvements in place by 2020 would include increases in existing COASTER service, including extension of COASTER service to the San Diego Convention Center and Petco Park. BRT downtown express services from inland and south bay locations would be expanded as well as new BRT routes from the south bay area and along I-15. Rapid bus service would add new routes and streetcar routes would be established. Local bus service would be improved to 15 minutes in key corridors.

Double-tracking of the LOSSAN rail corridor would occur to accommodate increased frequency in COASTER and other rail services that utilize this rail line. In addition, the new Mid-Coast Trolley line from Old Town to University Town Center would be constructed and the Trolley Green Line would be extended to downtown San Diego.

ARB requires SANDAG to reduce per capita CO_2 emissions from passenger cars and light-duty trucks 7 percent below 2005 levels by 2020. Implementation of the proposed 2050 RTP/SCS would lead to transportation improvements that reduce congestion, increase transit options, and encourage biking and walking. SANDAG has estimated that the per capita 2005 emissions from passenger vehicles resulted in ~~26.4~~27.4 lbs CO_2e/person/day in the region. SANDAG modeled emissions for passenger vehicles in 2020 using EMFAC ~~2007~~ and the Pavley Post Processor and estimated the per capita emissions would be 23.6 lbs CO_2e/person/day, resulting in a 14 percent reduction from 2005 levels, exceeding the target set by ARB.

In addition, state measures have been adopted that will reduce the carbon intensity of fuels (LCFS) and increase the fuel efficiency in passenger vehicles (Pavley) by 2020. Accounting for state measures, per capita transportation-related GHG emission would be 17.~~6~~ 5 lbs CO_2e/person/day, or a 36 percent reduction in per capita emissions compared to 2005 levels (Table 4.8-13). Therefore, implementation of the 2050 RTP/SCS would not conflict with SB 375 targets and would result in a less than significant impact.

Table 4.8-13
SANDAG SB 375-related Transportation CO_2 Emissions, 2020

	lbs CO_2e per person per day, 2020
Per Capita Emissions	23.6
Percent Reductions from 2005 (27.4 lbs CO_2e/person/day)	-14%
Per Capita Emissions w/ Pavley + LCFS	~~16~~7.~~6~~17.5
Percent Reductions from 2005 w/ Pavley + LCFS	-36%

[1] Includes only EMFAC Vehicle Classes Light Duty Auto (LDA); Light Duty Truck 1, Light Duty Truck 2, and Medium Duty Vehicle for I-I, I-X, and X-I trips. X-X trips are excluded.

Modeled by SANDAG 2011 and adjusted for CO_2e.

Conclusion

Implementation of the proposed 2050 RTP would result in less than significant impacts related to SB 375 targets.

2035

Regional Growth/Land Use Change

By 2035, the population of the region is expected to increase by 801,699 people; housing by 268,094 units; and employment by 312,292 jobs over existing 2010 conditions. As shown in Figure 4.11-4, regional land use and development changes are evident by 2035. Some locations that would experience the most extensive land use change and development by 2035 would include continued growth in eastern Chula Vista along the SR 125 and I-805 corridors; San Diego community planning areas of San Ysidro and Otay Mesa along the SR 905 and SR 125 corridors: northeast of the SR 94 corridor in the unincorporated County planning areas of Jamul/Dulzura, Tecate, and Potrero; eastern Poway along the SR 67 corridor; the County planning area of Ramona along the SR 67 and SR 78 corridors; County planning areas of Lakeside and Alpine and the Crest, Granite Hills, Dehesa, Harbison Canyon subregion;

and multiple north County planning areas along the 1-15 and SR 76 corridors such as Rainbow, Fallbrook, Bonsall, Pala-Pauma Valley, Valley Center, and Hidden Valley.

The increased density can be seen when comparing the existing housing density to the 2035 housing density, as shown in Figures 4.13-2 and 4.13-8, respectively. Areas of increased residential density by 2035 would be apparent in some coastal cities such as Oceanside and Encinitas, and City of San Diego coastal communities. Also increased density would occur in more inland areas along the I-8 corridor through Mission Valley, College Area, and into the City of La Mesa, as well as eastern Chula Vista along the SR 125 corridor. In the northern portion of the region, land use changes to accommodate growth in 2035 in the form of spaced rural residential development would occur along the I-15 corridor north of Escondido toward the northern county line and in more eastern areas along I-8, SR 67, SR 78, and SR 94. The SR 78 corridor, from Escondido to I-5, would also experience growth and resulting land use density increases of both residential and commercial/office by 2035. As shown in Figure 4.11-4, single-family residential development would increase substantially along this corridor as well as additional commercial and industrial growth. The majority of this growth would be centered around the cities of Vista, San Marcos, and Escondido. The pattern of more dense growth along this segment of the SR 78 corridor is also apparent when comparing the existing housing density to 2035 housing density (see Figures 4.13.2 and 4.13-8 in Section 4.13, Population and Housing).

By 2035, some regional growth would be accommodated in the more eastern, rural areas of the region. Development in these areas would be centered mostly along highway corridors, such as SR 78, SR 67, I-8 east of El Cajon, and SR 94, and generally within San Diego County community planning areas. The unincorporated portions of San Diego County are currently undergoing population growth and expansion of residential land use as indicated by a population increase of 14 percent from 2000 to 2010 as shown in Table 4.11-2. When comparing the existing land uses and 2035 land uses in Figures 4.11-1 and 4.11-4, the 2035 land use pattern would generally involve additional residential development in areas that were previously undeveloped open space or at some time in agricultural use (as discussed in Section 4.2). GHG emissions reductions achieved through SCS land use strategies are incorporated in the following analysis of transportation network improvement emissions reductions.

Transportation Network Improvements

Some key highway improvements in place by 2035 would include continued widening along portions of I-5; additional HOV and Managed Lanes along portions of I-5, I-805, and SR 52; widening of portions of SR 125 and SR 67; and additional freeway and HOV connector improvements. Some important transit projects operational by 2035 would include continued increases in COASTER service, increases in SPRINTER service, increases in downtown area streetcar service, and substantial increases in rapid bus service throughout the region. The Trolley Blue Line would be extended from UTC to Mira Mesa via Sorrento Mesa and Carroll Canyon; the Orange Line would be extended to Lindbergh Field; and a new line from Pacific Beach to El Cajon via Kearny Mesa, Mission Valley, and San Diego State University would be established. Double-tracking along the SPRINTER rail line through the cities of Oceanside, Vista, San Marcos, and Escondido would take place by 2035 as well as continued double-tracking along the LOSSAN corridor. SB 375 requires SANDAG to reduce per capita GHG emissions from passenger cars and light-duty trucks 13 percent below 2005 levels by 2035. As with 2020, the 2050 RTP/SCS includes proposed transportation improvements that would lead to reduced congestion and increased transit options. SANDAG modeled emissions for passenger vehicles in 2035 and estimated the per capita emissions would be ~~22.6~~23.8~~.9~~ lbs CO_2e/person/day, resulting in a 13 percent reduction from 2005 levels, meeting the target set by ARB for SANDAG.

Similar to 2020, state measures will be in place that would augment the reductions achieved by the 2050 RTP/SCS through reduced carbon intensity of fuels (LCFS) and increased fuel efficiency in passenger

vehicles (Pavley). Accounting for state measures, per capita transportation-related GHG emission would be ~~14.6~~5.~~5~~15.4 lbs CO_2e/person/day, or a 4~~4~~3 percent reduction in per capita emissions compared to 2005 levels, far exceeding the target set forth by ARB through SB 375 (Table 4.8-14). Therefore, implementation of the 2050 RTP/SCS would not conflict with SB 375 targets and would result in a less than significant impact.

Table 4.8-14
SANDAG SB 375-related Transportation GHG Emissions, 2035

	2035 lbs CO_2e per person per day, 2020[1]
Per Capita Emissions	~~22.6~~3.~~9~~23.8
Percent Reductions from 2005 (2~~6~~6.0~~7.4~~ lbs CO_2e/person/day)	-13%
Per Capita Emissions w/ Pavley + LCFS	~~14.6~~5.~~5~~15.4
Percent Reductions from 2005 w/ Pavley + LCFS	-4~~4~~3%

[1] Includes only EMFAC Vehicle Classes Light Duty Auto (LDA); Light Duty Truck 1, Light Duty Truck 2, and Medium Duty Vehicle for I-I, I-X, and X-I trips. X-X trips are excluded.
Modeled by SANDAG 2011.

Conclusion

Implementation of the proposed 2050 RTP would result in less than significant impacts related to SB 375 targets.

Because ARB has not developed a target for 2050, no analysis is provided for that year.

GHG-3 CONFLICT WITH APPLICABLE PLANS

A GHG impact would be considered if it conflicted with applicable GHG reduction plans, policies, or regulations. Two GHG reduction plans are applicable to the 2050 RTP/SCS: the SANDAG Climate Action Strategy (CAS) and the ARB Scoping Plan.

The CAS identifies goals, objectives, and policy measures in the areas of transportation, land use, buildings, and energy use. The CAS addressed measures and resources to help local governments reduce emissions from their operations and in their communities. A major purpose of the CAS is to identify land use and transportation policy measures that would help the SANDAG region meet or exceed its SB 375 targets for reducing GHG emissions from passenger cars and light-duty trucks.

In addition, ARB's Scoping Plan functions as a roadmap for plans to achieve GHG reductions in California as defined in AB 32, which calls for GHG emissions to be reduced to 1990 levels by 2020. The Scoping Plan contains the main strategies California will implement to reduce CO_2e emissions by 169 MMT, or 28.4 percent below the state's projected 2020 emissions level of 596 MMT CO_2e under a business-as-usual (BAU) scenario. In the absence of reliable 1990 GHG emissions estimates, ARB recommends an equivalent metric of 15 percent below 2005 GHG emissions. In the SANDAG region, EPIC has estimated land use and transportation emissions for 2005 to be 13.64 and 15.90 MMT CO_2e, respectively (EPIC 2011).

Because the Scoping Plan time horizon is limited to 2020, analysis of conflicts with the Scoping Plan is presented for the year 2020 only, not for 2035 or 2050. The Governor's Executive Order EO-S-3-05 sets a

goal that statewide GHG emissions be reduced to 80 percent below 1990 levels by 2050, but the EO does not constitute a "plan" for GHG reduction, and no state plan has been adopted to achieve the 2050 goal.

2020

Regional Growth/Land Use Change

By 2020, population within the region is expected to increase by 310,568 people; housing by 113,062 units; and employment by 118,535 jobs. The expected increase in population and jobs by 2020 would lead to a need for additional housing units and other GHG-emitting sources. The 2050 RTP/SCS focuses development on urbanized areas that are near existing or anticipated transit to reduce GHG emissions.

When comparing existing land use as shown in Figure 4.11-1 and 2020 land use as shown in Figure 4.11-3, there are no substantial differences in the land use patterns, types, or areas of development. Some locations that would experience the most extensive land use change and development by 2020 would include areas such as eastern Chula Vista along the SR 125 and I-805 corridors; San Diego community planning areas of San Ysidro and Otay Mesa along the SR 905 corridor; City of San Diego coastal and bay communities south of I-8 including Ocean Beach and the Peninsula planning areas; portions of northern Santee; areas north and south of the SR 56 corridor in the San Diego planning areas of Carmel Valley, Del Mar Mesa, Pacific Highlands Ranch, and Torrey Highlands; the San Marcos area near both the SR 78 and I-15 corridors; and within unincorporated County communities such as Fallbrook, Pala-Pauma Valley, and Valley Center along the I-15 and SR 76 corridors.

The CAS identifies policy measures that, if implemented, would increase clean energy and efficiency in buildings, reduce energy use in residential and commercial buildings, increase use of renewable energy, and reduce water-related energy use and GHGs. The 2050 RTP/SCS emphasizes compact urban development of multi-family housing units that tend to be more energy efficient than single-family residences. As part of the implementation of the SCS, CEQA streamlining incentives would be given to projects that are consistent with the SCS, including residential/mixed-use projects that follow specific land use designations and density requirements, thereby increasing energy efficiency. Therefore, implementation of the 2050 RTP/SCS would not impede the CAS and would constitute a less than significant impact.

AB 32 legislation requires that the state achieve 1990-level emissions by 2020, or an equivalent of 15 percent reductions from 2005 levels by 2020. Based on the GHG Inventory for land use in San Diego County created by EPIC, 2005 emissions were 13.64 MMT CO_2e. A 15 percent reduction would require 2020 emissions to be 11.59 MMT CO_2e. EPIC forecast emissions for San Diego County are predicted to be 16.65 MMT CO_2e in 2020 (Table 4.8-15). The forecasts do not include reductions from the Scoping Plan. As discussed previously, state law requires electricity providers to attain 33 percent of their energy supply from renewable sources by 2020. As of 2010, SDG&E had attained 11.9 percent renewables, and the additional GHG reductions that are expected by 2020 due to the legislation would lower GHG emissions. Similar to the discussion in Impact GHG-1, construction would result from regional growth, accounting for 0.03 MMT CO_2e/yr. Accounting for state reductions and construction emissions, GHG emissions in 2020 for land use would be 14.41 MMT CO_2e. Other measures that were included in the Scoping Plan have not been adopted or are not yet in place (such as cap-and-trade) and therefore have not been included in the GHG reductions calculations, which would result in lower GHG emissions than estimated in Table 4.8-15. GHG emissions resulting from regional growth/land use changes and including only reductions from the RPS would result in an increase over 2005 emissions. The goals of AB 32 are not met solely based upon the 2050 RTP/SCS. However, the 2050 RTP/SCS encourages compact development, which is aligned with the goals of the Scoping Plan and therefore does not impede it. Achieving the goals of AB 32, as stated in the Scoping Plan, will require a combination of efforts and

regulations at the state and local levels, including regional authorities such as SANDAG. Through the 2050 RTP/SCS, SANDAG promotes and encourages its jurisdictions to align with the Scoping Plan and therefore the impact is less than significant.

Table 4.8-15
San Diego County Land Use GHG Emissions, 2020

	2020 MMT CO_2e
Land-Use GHG Emissions	16.65
Land-use Construction Emissions	0.03
RPS reductions	2.26
Net Land-Use GHG Emissions[1]	**14.41**
AB 32 Target (15% below 2005 levels by 2020)	11.59

[1] Total may differ due to rounding.

Transportation Network Improvements

The 2050 RTP/SCS focuses transportation network improvements on transit, systems management, and demand management, lowering the need to drive alone and making roadways more efficient in order to reduce GHG emissions.

The transportation network improvements that would be implemented between 2010 and 2020 generally include widening and/or installation of HOV lanes and Managed Lanes along portions of I-5, I-15, I-805, SR 78, and SR 94; completion of SR 905 and SR 11; and HOV connector projects along I-805. Some key transit network improvements in place by 2020 would include increases in existing COASTER service, including extension of COASTER service to the San Diego Convention Center and Petco Park. BRT downtown express services from inland and south bay locations would be expanded as well as new BRT routes from the south bay area and along I-15. Rapid bus service would add new routes and streetcar routes would be established. Local bus service would be improved to 15 minutes in key corridors. Double-tracking of the LOSSAN rail corridor would occur to accommodate increased frequency in COASTER and other rail services that utilize this rail line. In addition, the new Mid-Coast Trolley line from Old Town to University Town Center would be constructed and the Trolley Green Line would be extended to downtown San Diego.

The CAS promotes policies that would reduce VMT, minimize GHGs in transportation, and promote use of low-carbon alternative fuels. The 2050 RTP/SCS includes many transit upgrades and additions that encourage transit ridership, and include TDM and TSM projects that would reduce GHG emissions in transportation through more efficient traffic flow. In addition, implementation of the SCS provides CEQA streamlining incentives to projects that are consistent with the SCS, including transit priority projects, which would reduce VMT and GHG emissions. Therefore, implementation of the 2050 RTP/SCS would not impede the CAS and would constitute a less than significant impact.

AB 32 legislation requires that the state achieve 1990-level emissions by 2020, or an equivalent of 15 percent reductions from 2005 levels by 2020. EPIC estimated 15.90 MMT CO_2e in transportation-related GHG emissions in 2005. A 15 percent reduction would require 2020 emissions to be 13.52 MMT CO_2e (Table 4.8-16). Forecast GHG emissions in 2020 would be 15.56~~1~~ MMT CO_2e, based on forecasted VMT, ridership of buses, trains, and rails, and other on-road transportation sources. This represents an increase over 2005 conditions. However, state measures have been adopted that will lower the carbon intensity of fuels (LCFS) and increase the efficiency of passenger vehicles (Pavley). SANDAG modeled the emissions reductions associated with these two state measures and estimated that 2020 emissions would be reduced by 3.56~~7~~8 MMT CO_2e. Including emissions from transportation-related construction,

estimated at 0.01 MMT CO_2e/yr, would result in total transportation-related emissions of 12.004 MMT CO_2e, or a 24 percent decrease over 2005 conditions. Similar to regional growth/land use change, SANDAG is not the only entity that will work to achieve the goals in the Scoping Plan. However, SANDAG has more direct control over regional transportation network improvements and, with the efforts at the state level, the estimated emissions from transportation in 2020 would be less than required by AB 32. Therefore, implementation of the 2050 RTP/SCS would not impede the Scoping Plan and would constitute a less than significant impact.

Table 4.8-16
SANDAG Regional Transportation GHG Emissions, 2020

	2020 MMT CO_2e
On-road transportation	**15.556**~~15.61~~
On-road transportation + Pavley + LCFS	(3.567)~~(3.58)~~
Transportation-related construction[2]	0.01
Total transportation-related emissions	**12.00**~~**12.04**~~
AB 32 Target (15% below 2005 levels by 2020)	13.52

[1] SANDAG 2011 (non-rail sources) and EPIC 2011 (rail)
[2] AECOM 2011

Conclusion

Land use changes and transportation improvements within the 2050 RTP/SCS emphasize compact urban development near transit and focus transportation network improvements where transit is encouraged and traffic flow efficiency is maximized through demand and system management. These are aligned with the policies outlined in the CAS and therefore implementation of the 2050 RTP/SCS would not impede the CAS and would constitute a less than significant impact.

Land-use GHG emissions in 2020 are expected to be greater the GHG emissions target set by AB 32, while transportation-related GHG emissions are expected to be lower than the target. The total emissions expected in 2020 would be 26.415 MMT CO_2e for land use and transportation-related emissions and accounting for state measures (Table 4.8-17). According to AB 32, emissions in 2020 must be equal to 1990 levels, or 15 percent below 2005 levels. Based on the forecasted inventories described above, this would require emissions to be no greater than 25.11 MT CO_2e in 2020. The forecasted emissions are greater than 25.11 MMT CO_2e; therefore, implementation of the 2050 RTP/SCS would lead to an overall increase in GHG emissions compared to 2005 levels.

Table 4.8-17
SANDAG Regional Transportation GHG Emissions, 2020

	2020 MMT CO_2e
Land-Use GHG Emissions	14.41
Transportation GHG Emissions	12.0064
Net Forecast GHG Emissions	**267.4105**
AB 32 Target (15% below 2005 levels by 2020)	25.11

The Scoping Plan sets out additional reductions that would achieve the goals of AB 32 if fully implemented. As of this writing, many of the policies in the Scoping Plan have not been implemented, such as cap-and-trade, and therefore are not quantified in the GHG reductions that may be achieved. In addition, SANDAG is one of many agencies that will work to achieve the goals of AB 32. Through the 2050 RTP/SCS, the goals of the Scoping Plan are further encouraged and promoted through compact

development, mixed-use development, and transit-oriented transportation. Therefore, the 2050 RTP/SCS assists and does not impede the Scoping Plan and the impact is less than significant.

2035

Regional Growth/Land Use

By 2035, the population of the region is expected to increase by 801,699 people; housing by 268,094 units; and employment by 312,292 jobs over existing 2010 conditions. The expected increase in population and jobs by 2035 would lead to a need for additional housing units and other GHG-emitting sources. As shown in Figure 4.11-4, regional land use and development changes are evident by 2035. The 2050 RTP/SCS focuses development on urbanized areas that are near existing or anticipated transit to reduce GHG emissions. Some locations that would experience the most extensive land use change and development by 2035 would include continued growth in eastern Chula Vista along the SR 125 and I-805 corridors; San Diego community planning areas of San Ysidro and Otay Mesa along the SR 905 and SR 125 corridors: northeast of the SR 94 corridor in the unincorporated County planning areas of Jamul/Dulzura, Tecate, and Potrero; eastern Poway along the SR 67 corridor; the County planning area of Ramona along the SR 67 and SR 78 corridors; County planning areas of Lakeside and Alpine and the Crest, Granite Hills, Dehesa, Harbison Canyon subregion; and multiple north County planning areas along the 1-15 and SR 76 corridors such as Rainbow, Fallbrook, Bonsall, Pala-Pauma Valley, Valley Center, and Hidden Valley.

The increased density can be seen when comparing the existing housing density to the 2035 housing density, as shown in Figures 4.13-2 and 4.13-8, respectively. Areas of increased residential density by 2035 would be apparent in some coastal cities such as Oceanside and Encinitas, and City of San Diego coastal communities. Also increased density would occur in more inland areas along the I-8 corridor through Mission Valley, College Area, and into the City of La Mesa, as well as eastern Chula Vista along the SR 125 corridor. In the northern portion of the region, land use changes to accommodate growth in 2035 in the form of spaced rural residential development would occur along the I-15 corridor north of Escondido toward the northern county line and in more eastern areas along I-8, SR 67, SR 78, and SR 94. The SR 78 corridor, from Escondido to I-5, would also experience growth and resulting land use density increases of both residential and commercial/office by 2035. As shown in Figure 4.11-4, single-family residential development would increase substantially along this corridor as well as additional commercial and industrial growth. The majority of this growth would be centered around the cities of Vista, San Marcos, and Escondido. The pattern of more dense growth along this segment of the SR 78 corridor is also apparent when comparing the existing housing density to 2035 housing density (see Figures 4.13.2 and 4.13-8 in the Population and Housing section). By 2035, some regional growth would be accommodated in the more eastern, rural areas of the region. Development in these areas would be centered mostly along highway corridors, such as SR 78, SR 67, I-8 east of El Cajon, and SR 94, and generally within San Diego County community planning areas. The unincorporated portions of San Diego County are currently undergoing population growth and expansion of residential land use as indicated by a population increase of 14 percent from 2000 to 2010 as shown in Table 4.11-2. When comparing the existing land uses and 2035 land uses in Figures 4.11-1 and 4.11-4, the 2035 land use pattern would generally involve additional residential development in areas that were previously undeveloped open space or at some time in agricultural use (as discussed in Section 4.2).

As stated above, the CAS promotes policies that would increase energy efficiency and reduce energy consumption. By encouraging compact development, the 2050 RTP/SCS would also promote energy efficiency and therefore would align with the CAS. Therefore, implementation of the 2050 RTP/SCS would not impede the CAS and would constitute a less than significant impact.

Transportation Network Improvements

The expected increase in population and jobs by 2035 would lead to additional VMT. The 2050 RTP/SCS focuses transportation network improvements on transit, systems management, and demand management, lowering the need to drive alone and making roadways more efficient in order to reduce GHG emissions.

Some key highway improvements in place by 2035 would include continued widening along portions of I-5; additional HOV and Managed Lanes along portions of I-5, I-805, and SR 52; widening of portions of SR 125 and SR 67; and additional freeway and HOV connector improvements. Some important transit projects operational by 2035 would include continued increases in COASTER service, increases in SPRINTER service, increases in downtown area streetcar service, and substantial increases in rapid bus service throughout the region. The Trolley Blue Line would be extended from UTC to Mira Mesa via Sorrento Mesa and Carroll Canyon; the Orange Line would be extended to Lindbergh Field; and a new line from Pacific Beach to El Cajon via Kearny Mesa, Mission Valley, and San Diego State University would be established. Double-tracking along the SPRINTER rail line through the cities of Oceanside, Vista, San Marcos, and Escondido would take place by 2035 as well as continued double-tracking along the LOSSAN corridor.

As stated above, the CAS promotes reduced VMT, minimization of GHGs in transportation, and increased use of low-carbon alternative fuels. The 2050 RTP/SCS includes transit network, TDM, and TSM projects that would reduce GHG emissions in transportation through more efficient traffic flow. In addition, implementation of the SCS provides CEQA streamlining incentives to projects that are consistent with the SCS, including transit priority projects, which would reduce VMT and GHG emissions. Therefore, implementation of the 2050 RTP/SCS would not impede the CAS and would constitute a less than significant impact.

Conclusion

As discussed for 2020, the land use changes and transportation improvements expected as a result of implementation of the 2050 RTP/SCS focus on transit and compact development near transit centers. The intent of the CAS is to identify measures and resources that would help local governments reduce GHG emissions, including those related to SB 375. Therefore, implementation of the 2050 RTP/SCS would be aligned with the CAS and help to implement the goals and policies within the CAS. T~~t~~herefore, implementation of the 2050 RTP/SCS would not impede the CAS and would constitute a less than significant impact.

The Scoping Plan does not have targets established beyond 2020 and therefore the impacts to the Scoping Plan are not analyzed for 2035.

2050

Regional Growth/Land Use

By 2050, the population of the region is forecast to increase by 1,160,435 people; housing by 379,664 units; and employment by 501,958 jobs over existing conditions. As shown in Figure 4.11-5, new growth and land use changes in 2050 per the 2050 RTP/SCS are apparent throughout the region. Areas of substantial land use change and development, beyond that described in 2035 would include significant industrial development in the County's Otay planning area and San Diego Otay Mesa community surrounding the East Otay Mesa POE; throughout County planning areas located along the international border including Tecate, Potrero, Campo/Lake Morena, Boulevard, and Jacumba; throughout the Ramona and Julian planning areas in the unincorporated County; throughout other northeastern County planning

areas including North Mountain, Desert, and Borrego Springs; and continued development throughout County planning areas located north and east of Escondido extending to the northern border with Riverside County including Rainbow, Fallbrook, Bonsall, Pala-Pauma Valley, Valley Center, Hidden Valley, Twin Oaks Valley, and North County Metro.

Increased population density from 2010 through 2050 can be seen when comparing Figures 4.13-1, and 4.13-10, respectively. Increased density is most apparent in City of San Diego communities near the downtown area near I-5 and I-805 and along the I-8 corridor to the east. The expected increase in population and jobs by 2050 would lead to a need for additional housing units and other GHG-emitting sources. Although the 2050 RTP/SCS focuses development on urbanized areas that are near existing or anticipated transit to reduce GHG emissions GHG emissions have historically increased with population and job growth. Urban centers in the western third of the San Diego region would have most available land developed with single- and multi-family uses, commercial and office uses, and industrial uses. Consistent with the goals of the 2050 RTP/SCS, the dense growth within existing urban centers with high accessibility to transit options allows for the creation of communities that are more sustainable, walkable, transit-oriented, and compact. Substantial dense growth within the urban centers corresponds with major transportation corridors such as I-5, I-8, I-15, and I-805 and these are also alignments that would have extensive transit opportunities. Similar to the description in the 2035 analysis, growth would continue in more eastern locations of the region, such as east of I-15 in the northern area, east of SR 67 through the middle portion of the region, and east of SR 94 in the southern area. However, by 2050, spaced rural residential development would have expanded beyond areas along existing transportation corridors and established rural communities and into areas with very minimal development at present. As shown in Figure 4.11-5, some of these areas include northeast of Escondido to SR 76, areas east of Camp Pendleton, and areas north and south of the SR 78 corridor. Large pockets of land currently used for agricultural purposes would be developed with spaced rural residential uses. As shown in Figure 4.11-5, by 2050, a substantial pocket of industrial development would be located along the planned SR 905 corridor in conjunction with the new Otay Mesa East POE at the international border with Mexico. This is a newly developing area that is planned for mainly industrial use and is highly dependent upon the planned construction of SR 11, SR 905, and the Otay Mesa East POE.

As stated above, the CAS promotes policies that would increase energy efficiency and reduce energy consumption. By encouraging compact development, the 2050 RTP/SCS would also promote energy efficiency and therefore would align with the CAS. Therefore, implementation of the 2050 RTP/SCS would not impede the CAS and would constitute a less than significant impact.

Transportation Network Improvements

By 2050, most of the highway, transit, and active transportation (bicycle and pedestrian) improvements, along with other infrastructure projects, would be in place and operational in accordance with the proposed 2050 RTP/SCS. Some key highway improvements that would be in place by 2050 would include widening portions of SR 52, SR 56, SR 76, SR 94, SR 125, and I-5; additional HOV lanes and Managed Lanes along segments of I-805, I-5, I-15, SR 94, SR 125, and SR 54; and freeway and HOV connector improvements. Important transit improvements in place by 2050 would include the extension of Trolley lines and increased Trolley service frequency. The Trolley Green Line would be extended to Downtown-Bayside; a new line connecting San Diego State University to Downtown San Diego via El Cajon Boulevard/Mid-City would be constructed; and a line from University Town Center to Palomar Trolley Station in the South Bay via Kearny Mesa, Mission Valley, Mid-City, and National City would be established.

Conclusion

As discussed for 2020 and 2035, the land use changes and transportation improvements expected as a result of implementation of the 2050 RTP/SCS focus on transit and compact development near transit centers. These are aligned with the policies outlined in the CAS and therefore implementation of the 2050 RTP/SCS would not impede the CAS and would constitute a less than significant impact.

The Scoping Plan does not have targets established beyond 2020 and therefore the impacts to the Scoping Plan are not analyzed for 2050.

4.8.5 MITIGATION MEASURES

The following mitigation measures aim to reduce impacts related to GHG emissions to less than significant levels. These mitigation measures are general and programmatic in nature, and would be supplemented in project-specific CEQA/NEPA documents.

GHG-1 INCREASE GHG EMISSIONS

2035, 2050

GHG-A SANDAG shall update future Regional Comprehensive Plans and Regional Transportation Plans/Sustainable Community Plans to incorporate policies and measures that lead to reduced GHG emissions. Such policies and measures may be derived from the General Plans, local jurisdictions' Climate Action Plans, and other adopted policies and plans of its member agencies that include GHG mitigation and adaptation measures or other sources.

GHG-B San Diego region cities and the County government can and should adopt and implement Climate Actions Plans (also known as Plans for the Reduction of Greenhouse Gas Emissions as described in CEQA Guidelines Section 15183.5 Tiering and Streamlining the Analysis of Greenhouse Gas Emissions) that contain the following information:

a) Quantify GHG emissions, both existing and projected over a specified time period, resulting from activities within their respective jurisdictions;

b) Establish a level, based on substantial evidence, below which the contribution to GHG emissions from activities covered by the plan would not be cumulatively considerable;

c) Identify and analyze the GHG emissions resulting for specific actions or categories of actions anticipated within their respective jurisdictions;

d) Specify measures or a group of measures, including performance standards, that substantial evidence demonstrates, if implemented on a project-by-project basis, would collectively achieve the specified emissions level;

e) Establish a mechanism to monitor the plan's progress toward achieving that level and to require amendment if the plan is not achieving specified levels; and

f) Be adopted in a public process following environmental review.

CAPs should, when appropriate, incorporate planning and land use measures from the California Attorney General's latest list of example policies to address climate change at both the plan and project level.

Specifically, at the plan level, land use plans should, when appropriate, incorporate planning and land use measures from the California Attorney General's latest list of example policies to address climate change (http://ag.ca.gov/globalwarming/pdf/GP_policies.pdf), including, but not limited to policies from that web page such as:

- Smart growth, jobs/housing balance, transit-oriented development, and infill development through land use designations, incentives and fees, zoning, and public-private partnerships
- Create transit, bicycle, and pedestrian connections through planning, funding, development requirements, incentives and regional cooperation, and create disincentives for auto use
- Energy and water-efficient buildings and landscaping through ordinances, development fees, incentives, project timing, prioritization, and other implementing tools

In addition, they should also incorporate, when appropriate, policies to encourage implementation of the Attorney General's list of project specific mitigation measures available at the following web site: http://ag.ca.gov/globalwarming/pdf/GW_mitigation_measures.pdf, including, but not limited to measures from the web page such as:

- Adopt a comprehensive parking policy that discourages private vehicle use and encourages the use of alternative transportation
- Build or fund a major transit stop within or near development
- Provide public transit incentives such as free or low-cost monthly transit passes to employees, or free ride areas to residents and customers
- Incorporate bicycle lanes, routes and facilities into street systems, new subdivisions, and large developments
- Require amenities for non-motorized transportation, such as secure and convenient bicycle parking.

They should also incorporate, when appropriate, planning and land use measures from additional resources listed by the California Attorney General at the following web page: http://ag.ca.gov/globalwarming/ceqa/resources.php.

SANDAG will assist local governments in preparing CAPS and other climate strategies through continued implementation of the SANDAG Climate Action Strategy and Energy Roadmap Program. The Climate Action Strategy provides a toolbox of land use, transportation, and related policy measures and investments that help implement the 2050 RTP/SCS through reducing GHG emissions. Policy measures also are identified for buildings and energy use, protecting transportation and energy infrastructure from climate impacts, and to help SANDAG and local jurisdictions reduce GHGs from their operations. Through the Energy Roadmap Program, SANDAG will continue to provide energy planning assistance to local governments to reduce local energy-related GHG

emissions. SANDAG's Climate Action Strategy can be found at: http://www.sandag.org/uploads/publicationid/publicationid_1481_10940.pdf

In addition, CAPs should also incorporate analysis of climate change adaptation, in recognition of the likely and potential effects of climate change in the future regardless of the level of mitigation (San Diego Foundation Focus 2050 report) and in conjunction with Executive Order S-13-08, which seeks to enhance the State's management of climate impacts including sea level rise, increased temperatures, shifting precipitation, and extreme weather events by facilitating the development of State's first climate adaptation strategy.

GHG-C SANDAG shall and implementing agencies can and should require Best Available Control Technology (BACT) during construction and operation of projects, including:

a) Solicit bids that include use of energy and fuel efficient fleets;

b) Solicit preference construction bids that use BACT;

c) Employ use of alternative fueled vehicles;

d) Use lighting systems that are energy efficient, such as LED technology;

e) Use CEQA Guidelines Appendix F, Energy Conservation, to create an energy conservation plan; ~~and~~

f) Streamline permitting process to infill, redevelopment, and energy-efficient projects;

g) Use an adopted emissions calculator to estimate construction-related emissions;

h) Use the minimum feasible amount of GHG-emitting construction materials that is feasible;

i) Use of cement blended with the maximum feasible amount of flash or other materials that reduce GHG emissions from cement production;

j) Use of lighter-colored pavement where feasible;

k) Recycle construction debris to maximum extent feasible; and

l) Plant shade trees in or near construction projects where feasible.~~.~~

4.8.6 SIGNIFICANCE AFTER MITIGATION

GHG-1 INCREASE IN GHG EMISSIONS

2035, 2050

Implementation of Mitigation Measures GHG-A through GHG-C would reduce GHG emissions through adoption of measures and policies that encourage GHG emissions reduction in regional plans, adoption of Climate Action Plans by member agencies, and using BACT during construction and operation of implemented projects. Many of the California Attorney General suggestions for GHG emission reduction are already imbedded in the 2050 RTP/SCS, and SANDAG member agencies will be applying both planning and project-level suggestions to future individual land use and transportation projects.

The projected increase in GHG emissions from baseline levels in 2035 and 2050 would primarily be due to changes in regional growth/land use. While the mitigation measures listed would encourage reduction in GHG emissions, they do not provide a mechanism that guarantees GHG emission reductions. Additional measures that were considered but found infeasible included the following:

a. Requiring all vehicles driven within the San Diego region to be zero-emission vehicles (ZEVs) or requiring all vehicles driven within the region to be powered by renewable energy was found to be infeasible due to the rate of turnover of vehicles on the roadway and limited number of ZEVs available. ARB has estimated that 50 percent of passenger cars are retired from service in 16.09 years and 18.63 years for light-duty trucks (ARB 2004). As of 2010, there were an estimated 26,905,700 vehicles in California (EMFAC ~~2007~~), with only 1.7 million ZEVs or low-emission vehicles (CPUC 2011). Similarly, conversion of existing vehicles to renewable energy fuel sources would likely result in greater demand than supply of renewable energy fuels.

b. Requiring all future construction be net-zero energy use. While renewable energy is available and a feasible option for obtaining a portion of a project's energy needs, it is infeasible for all projects to have net-zero emissions. For projects with consistent-energy requirements, such as hospitals or manufacturing centers, renewable energy may not fulfill operational standards. In addition, some energy-consuming services that are part of new projects may not be feasible to change to renewable sources at the project level. For example, water is transported from long distances and a project may not be able to affect the power source for water transport. Similarly, wastewater is generally treated at a central location and operated independently from a project. For each project to treat its own wastewater with renewable energy sources may cause other environmental impacts.

c. Requiring all future construction activity to include only retrofitted equipment. Some construction equipment may be retrofitted to significantly reduce the GHG emissions associated with construction activities; however, not all equipment has retrofit components and is therefore technologically infeasible at this time.

Implementation of the 2050 RTP/SCS would result in an increase in GHG emissions as a result of the growth in population, housing, and employment. Consequently, GHG-1 would remain a significant and unavoidable impact in 2035 and 2050.

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