# Series 14 Regional Growth Forecast Documentation and Sustainable Communities Strategy Land Use Pattern Subregional Allocation

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# Chapter One: Overview

SANDAG has produced economic and demographic forecasts for nearly 50 years, and transportation forecasts for nearly four decades. The *Series 14 Regional Growth Forecast* ("Series 14 RGF") will be the fourteenth forecast completed since SANDAG began developing regional growth forecasts.[1] Each forecast process contains a set of assumptions, input data, computations, and model interactions, the output of which serves as an integral part of the SANDAG planning processes as well as a valuable resource to other governmental and private organizations in the region.

Evolving trends, policies, and data necessitate changes in forecasting methodologies, which is why each SANDAG forecasting effort is unique from its previous iteration. To ensure that forecasts maintain best practices, SANDAG subjects each effort to peer reviews by other forecasting professionals and experts from across the United States. Forecasting at SANDAG is an open process in that the models, inputs, and results are presented to professionals and policymakers at public forums. Many of the inputs directly come from jurisdictions and reflect current local planning assumptions and policies.

All forecast versions are comprised of both a regional total for housing, jobs, and population as well as a small area forecast of the regionwide data to the subregional areas of the county. *Sustainable Communities Strategy* (SCS) refers to the subregional allocation method that was used to determine the location of units, population, and jobs to the small area geographies of the region which relies both on the general plans of the local jurisdictions as well as on the densification of certain areas in the region that support the SCS vision and goals. The resulting subregional allocation is referred to as the SCS land use pattern.

California Senate Bill 375 (Steinberg, 2008) ("SB 375") requires that metropolitan planning organizations ("MPOs") include a SCS in its regional transportation plan ("RTP"). SANDAG includes its RTP, SCS, and Regional Comprehensive Plan in one planning document called San Diego Forward: the 2021 Regional Plan ("2021 RP"). The Series 14 RGF and its SCS land use pattern are used in the 2021 RP which puts forth a forecasted development pattern driven by regional goals for sustainability, mobility, housing affordability, and economic prosperity. As required by SB 375, the SCS land use pattern accomplishes the following:

1. When combined with the transportation network, it achieves the regional greenhouse gas emission targets;
2. accommodates the Regional Housing Needs Assessment ("RHNA") Determination; and

utilizes the most recent planning assumptions. This report presents a description of the SANDAG forecast models used in the Series 14 RGF SCS land use pattern, including some of the key inputs, assumptions, and computations for each of the components as well as the flow of data throughout the suite of models.

## 1.1 Historical Perspective

SANDAG has produced forecasts of demographic and economic growth in the region since 1971. Transportation forecasting at SANDAG began in 1981. Regional growth and transportation forecasts

[1] An earlier version of the Series 14 Regional Growth Forecast was used in the 2019 Federal Update to the Regional Plan. Information on this forecast and the 2019 Regional Plan can be found online at: https://www.sdforward.com/2019-federal-rtp

support long range transportation and regional planning efforts such as the Regional Transportation Plan and Sustainable Communities Strategy (RTP/SCS), corridor and major capital investment studies, and a wide range of other regional planning initiatives. Local jurisdictions use the forecasts for general plan updates and capital facilities planning, including environmental impact reports (EIR), as well as for local transportation planning. Other agencies, such as the San Diego County Water Authority and the San Diego Regional Energy Office, use aspects of the SANDAG forecasts to develop plans for providing essential services.

The SANDAG forecasts anticipate changes in the region and its communities based on computer models and the best available information at the time the forecast is produced. Any housing or population forecast represents only one possible pattern of future growth in the region. They are meant to help policy- and decision-makers prepare for the future and are not an expression for or against growth. Additionally, as time passes, changes to plans and policies may result in a different pattern of development for any given year.

Similar to the processes used to create the *Series 13 Regional Growth Forecast* ("Series 13 RGF"), the Series 14 RGF includes assumptions about how local plans and policies may evolve over time in response to the region's continuing growth. Most current local plans typically only project ten or twenty years in the future. Starting with the Series 13 RGF the horizon year was set to 2050. To bridge this gap, SANDAG began the forecast with adopted general plans and policies from the 18 incorporated cities and the unincorporated county. Then, local jurisdictions were asked to provide detailed feedback on how land use plans may change in the future. Hence, the Series 14 RGF provides an assessment of where change may occur in the coming decades.

This jurisdiction-provided capacity was the basis for developing the SCS land use pattern. Several factors were used to develop assumptions for additional capacity in each jurisdiction beyond the local jurisdiction's anticipated capacity in order to meet the requirements of the SCS as discussed above. These factors will be discussed in more detail in Chapter 3.

## 1.2 Committees, Peer Review, and Board of Directors Guidance

SANDAG forecasts are developed using a collaborative process where staff works closely with a wide range of professionals outside of the agency. For the Series 14 RGF SANDAG convened several panels of demographic, housing, and economic experts from state and local agencies, local universities, and the private sector. These panels reviewed the model structure, data inputs, and assumptions. Feedback and recommendations from these groups is incorporated into the model.

SANDAG also relies on the Regional Planning Technical Working Group ("TWG") for advice on the forecast, including local land use assumptions that are among the more important inputs to the forecasting process, as well as to provide information to jurisdictions, communities, and other areas within the region. This working group includes the local jurisdictions' planning directors or their designees and representatives from other agencies within the region that use the forecast data for facility and infrastructure planning. When developing the SCS land use pattern, the TWG was consulted about the need to make assumptions about where development would occur in the future in order to meet the goals of the SCS for the 2021 RP.[2]

[2] Regional Planning Technical Working Group meeting agenda available online at: https://www.sandag.org/uploads/meetingid/meetingid_5614_28817.pdf

In developing the Series 14 RGF the Board of Directors provided input on some of the regionwide assumptions that would be used in the forecast; specifically, the Board of Directors were asked to review and approve three assumptions that were new to the Series 14 Regional Growth Forecast process ("Series 14 RGF process at a meeting on May 25, 2018:[3]

First, the Series 14 RGF classifies some units in the region as "unoccupiable" because they are presumed to be vacant due to their use as vacation homes or short-term rentals that some units in the region would be classified as "unoccupiable" because they are presumed to be vacant due to their use as vacation homes or short-term rentals. Accounting for these units in the Series 14 RGF process means that about 57,000 units will not be used to house the future population in the region. The methodology for determining the number and location of unoccupiable units in the region is discussed in more detail in Chapter 2 Section 4.2.

Second, the Series 14 RGF should include accessory dwelling units (ADUs) as available capacity on existing single-family lots. The inclusion of this ADU capacity would account for recent legislation that encourages creation of ADUs to increase the housing supply in the state. In 2019 California Assembly bills 881 (Bloom) and 671 (Friedman) were passed, requiring cities and counties to adopt an ADU policy that makes it easier to build these types of units.[4] This assumption creates capacity for about 20,000 ADUs in the county that are available in the forecast to house the future population in the region.

Third, the Series 14 RGF assumes that region's vacancy rate would increase to four percent by 2040 which would be maintained through the end of the forecast period. This assumption acknowledges that the present-day vacancy rate I the region is less than two percent bus assumes a rising vacancy rates in the forecast period would reflect planning for a healthy housing market, which the California Department of Housing and Community Development ("HCD"), and the PRP panelists consider to be a five percent vacancy rate. A four percent vacancy rate also recognizes that both state and local housing policy has recently focused on accelerating housing production.

These board-approved assumptions ensure that the growth forecast provides enough housing to accommodate all the population growth in the region and does not assume that state and local housing policy are rapidly changing to address conditions of overcrowding and lack of. In this way, the Series 14 RGF is considered a projection of housing need in the region.

An integral part of the Series 14 RGF process is the inclusion of SANDAG's Peer Review Process (PRP) during several phases of model and data development. SANDAG convenes meetings with internal and external subject-matter experts to review projects for data, process, and methodological assumptions or changes. Although SANDAG incorporated expert advice before the Series 14 RGF, the implementation of PRP procedures instituted a more standardized process for how expert review is integrated into SANDAG's data and modeling workflows.

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[3] May 25th, 2018 Board of Directors meeting agenda available (page 854 of the pdf) at: https://www.sandag.org/uploads/meetingid/meetingid_4785_23865.pdf

[4] For more information on housing programs and policies please see 2021 Regional Plan Housing fact sheet, accessible at: https://sdforward.com/docs/default-source/2021-library/5335-rp-policyonepagers-04housing_final_en.pdf?sfvrsn=14b3fe65_2

For the Series 14 RGF SCS land use pattern, nine PRP meetings were held to review the new methodology to forecast population, jobs, and housing at the regional and subregional levels.[5] Two of these panels included demographic, economic, planning, and forecasting specialists from outside of the agency. The external panels concentrated on regional data and assumptions, which identified several improvements that are incorporated into the Series 14 RGF process or, due to time constraints for developing the Series 14 RGF, that will be considered for incorporation in future regional forecasting efforts.

## 1.3 Quality Assurance and Control

Along with PRPs, as a part of the agency's *Plan of Excellence*, SANDAG developed a formal Quality Assurance/Quality Control (QA/QC) program to review all data products and reports.[6] The QA/QC program is independent from the development teams to ensure that the review is thorough, unbiased, and consistent.

Each version of the Series 14 RGF generated throughout the development process underwent a QA/QC review. The results of these reviews were then shared with the forecasting team and documented. If components that need changes or adjustments were identified during the process, those changes were made, and a new version of the forecast is developed. Additional review was conducted until the latest version of the Series 14 RGF passed through quality assurance and control without recommendations for revision.

## 1.4 Modeling components

The Series 14 RGF is composed of a suite of models that each develop one or more components of the forecast output. This suite of models consists of two main components: (1) the San Diego Demographic and Economic model (SanDE), the region-wide forecasting model, and (2) the Integrated Land Use, Demographic, and Economic Model (iLUDEM), the subregional allocation model. SANDAG continually refines and evaluates these models to incorporate updated techniques and information as necessary. A list of the variables that are available from the Series 14 RGF process are included in Appendix A.

The suite of models used in the Series 14 RGF process is new from previous forecasting cycles and was developed to improve alignment between the subregional and regional data using a disaggregate process. This system ensures that data for small areas sum to larger areas. A development effort to create this a disaggregate model in 2015 resulted in the suite of models discussed in this document.

### 1.4.1 SanDE

[5] PRP 0 Forecast Review meeting held on March 1, 2017; PRP 21 Housing Estimates meeting held on November 13, 2017; PRP 30 Review Regionwide Forecast meeting held on February 14, 2018; PRP 39 Regional Forecast (1-Finalized Subregional) meeting held on June 13, 2018; PRP 50 Subregional Housing Allocation meeting held on February 5, 2019; PRP 92 Effects of DOF Changes on the Regional Forecast held on January 31, 2020; PRP 99 SCS Land Use Scenario Parts 1 and 2 held on May 28, 2020 and August 20, 2020 respectively; PRP 123 Forecast Scenarios meeting held on March 24, 2021; PRP 124 Forecast Scenarios Land Use Analysis meeting held on April 14, 2021

[6] More information on SANDAG's Plan of Excellence can be accessed online at: https://www.sandag.org/index.asp?fuseaction=about.excellence

SanDE is a rates-based model that develops the demographic information at the regional level. The purpose of SanDE is to produce a demographic forecast consistent with the future population in the region. The major input to SanDE is the population projections developed by the California Department of Finance (DOF). The DOF periodically develops a population projection series by detailed demographic characteristics for every county in California. The SanDE model then applies cohort-specific rates to the population to arrive at all the socioeconomic detail needed for the forecast.

SanDE produces data about the region's future economic and demographic characteristics that are used to develop the variables needed for the Series 14 RGF. Data such as the size and composition of the population, employment by industrial sector, household income, housing units by structure type, occupancy status of housing units, and persons per household are produced by the SanDE model. More detail about how these regionwide data are used by the SanDE model to develop the Series 14 RGF are in Chapter 2.

### 1.4.2 iLUDEM

After the regionwide data are developed from the SanDE model, the iLUDEM process allocates this growth of population, jobs, and housing to subregional geographies. The output from this subregional forecast is then utilized by the activity-based model (ABM) for transportation planning purposes. For the SCS Land use pattern subregional allocation, the iLUDEM process uses the location of housing capacity along with the location of jobs and transportation investments to determine where future housing units and jobs will be located in the region. More information on the iLUDEM process can be found in Chapter 4.

Among the inputs to the iLUDEM process are the current spatial distribution of jobs, housing units, income, and population. A critical element is the land use input and the goals of the SCS land use pattern for the 2021 RP.

*Figure 1. Regional Growth Forecast and Subregional Allocation Flow*

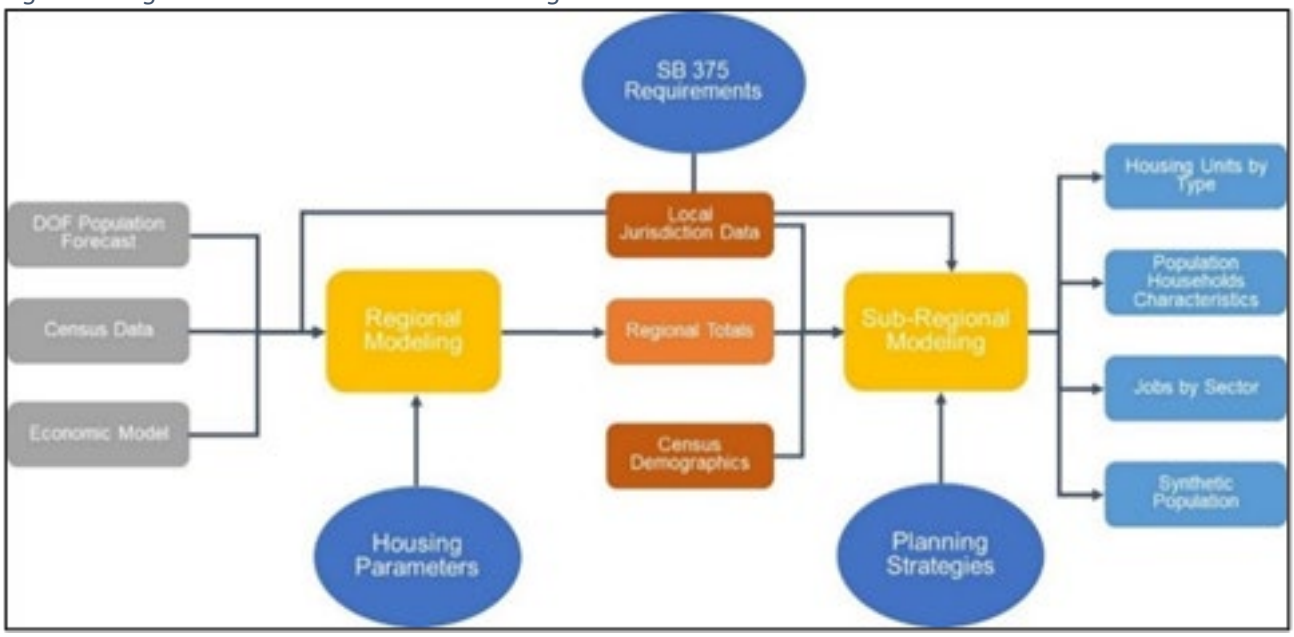



Figure 1 shows the general flow of input and feedback of the Regional Growth Forecast and its subregional allocation. Once the data and assumptions are determined for the regionwide forecast, population, housing, and jobs are allocated to the subregional geographies using local land use plans and policies. The output from the subregional forecast is used in the transportation model to support regional planning efforts.

## 1.5 Changes in Forecast Assumptions

The Series 13 RGF forecasted a population in the region of about 3.98 million persons by the year 2050, whereas the Series 14 RGF forecasts a population of about 3.74 million persons. The main reason for this difference between previous forecast versions is described in this Section. There are other subregional differences between forecast versions, as well. These differences in the subregional forecast will be discussed in more detail later in this document (see Chapter 5: Comparing the Regional Growth Forecasts).

### 1.5.1 DOF projections vs Demographic Economic Forecasting Model

As described above, the Series 14 RGF process uses the DOF population projections as an input to determine the regionwide job and housing unit count. In the Series 13 RGF process and in prior processes, a regionwide forecasting model called the Demographic Economic Forecasting Model (DEFM) was developed and used by SANDAG. Because the Series 14 RGF process uses the DOF population projections data as a control, the population in each year aligns with the DOF data.[7] The DOF projections used in the Series 14 RGF were developed in late 2019 and finalized in early 2020. Notably, these projections have a lower population total for most California counties, including San Diego.

[7] The specific ways that the DOF population totals differ from the population data used in the Series 14 RGF relate to the estimation of the group quarters and household population and is discussed in more detail later in this document (see section 2.2.3 of Chapter 2).

In 2017 Assembly Bill 1086 (Daly) was passed, which provides that HCD and councils of governments ("COG") must consult if the difference between the population forecast developed by a COG for use in its regional transportation plan and the total regional population forecast developed by the DOF is greater than 1.5 percent.[8] This is a revision to the previous statutory language which included a threshold of 3.0 percent. Because the threshold is smaller than in previous forecasts, SANDAG decided to control to the population totals from DOF instead of developing new population totals for use in the Series 14 RGF process. An item describing the proposed approach was presented to the Board of Directors meeting on December 15, 2017.[9]

### 1.5.2 Integration with the Yearly Population and Housing Estimates Data

The subregional allocation process iLUDEM is new to the Series 14 RGF process. An important element of this model is its integration of the forecast data with the yearly population and housing estimates data that are also developed by SANDAG. The iLUDEM uses the latest vintage of population estimates as the base data of the forecast. The intention of this change was to facilitate yearly updates to the forecast as well as ensure alignment with SANDAG estimates.

### 1.5.3 Parcel-based land use

Another change to the Series 14 RGF process is the use of parcel-based inputs. In previous forecasts, inputs for the subregional modeling efforts used subparcel-based information, which assigned a land use code and dwelling unit count at a subparcel-level when appropriate. For the Series 14 RGF process, the decision was made to develop the forecast inputs at the parcel-level to align with the data development effort of the new subregional allocation model. This entailed an additional data development effort of assigning a singular land use to the parcels that have more than one land use.

## 1.5 Organization of This Document

The remainder of the report details the SANDAG forecasting system used in the Series 14 RGF process, including individual model features and components, assumptions and parameters, and other major input requirements.

Chapter 2 discusses features of the regionwide forecasting model SanDE. Chapter 3 describes the derivation of housing and employment capacity based on land use plans and policies and special analyses as a part of the SCS land use pattern. While not a specific model per se, the process SANDAG undertook to develop capacity that would help reach the goals of the SCS is a critical aspect of the SANDAG forecasting system. Chapter 4 describes the subregional allocation process iLUDEM and how areas were prioritized for development. Finally, Chapter 5 presents the key differences in assumptions between the Series 13 RGF (published in 2015) and the Series 14 RGF. In each case, the summary model descriptions are designed to provide insight into the process and a basic understanding of the relationships among the models and the data requirements.

[8] AB 1086 https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB1086

[9] Meeting agenda from the December 15th, 2017 Board of Directors meeting is available at: https://www.sandag.org/uploads/meetingid/meetingid_4610_22971.pdf

# Chapter Two: Regionwide Forecasting Model

SanDE uses cohort-specific rates developed from a variety of historical data sources to project detailed sociodemographic and economic information. In conjunction with the population projections from the DOF, SanDE produces annual projections of pertinent variables to the forecast horizon year of 2050. This section will describe the components of this model and some of the high-level output produced for the Series 14 RGF.

## 2.1 Regional Modeling System

The SanDE model uses a rates-based approach to forecasting the population, housing, and jobs at the regional level. The county-level population projections from the DOF have race and ethnicity information as well as a breakdown by sex and single years of age. These projections are publicly available in a downloadable file.[10] After obtaining the county-level projections from DOF, a series of rates are applied to the population in SanDE's demographic model and economic model separately. These two components of SanDE produce the economic and sociodemographic variables needed for planning and research purposes. The sections below will describe in more detail how each component of the regionwide forecast is developed.

## 2.2 Demographics

The population from the Series 14 RGF is comprised of detailed demographic information for all residents of the region. As previously discussed, the DOF projections used as controls provide single years of age, sex, and race and ethnicity detail for the total population in the region. Race and ethnicity are a mutually exclusive designation, meaning that Hispanic residents are assigned to their own category and can be of any race while all other race groups represent non-Hispanic populations. The eight racial or ethnic categories are: (1) Hispanic (Any Race), (2) Non-Hispanic White, (3) Non-Hispanic Black, (4) Non-Hispanic American Indian or Alaskan Native, (5) Non-Hispanic Asian, (6) Non-Hispanic Native Hawaiian and Other Pacific Islanders, (7) Non-Hispanic Some Other Race (Other), and (8) Non-Hispanic Two or More races.

The population from the Series 14 RGF also provides information on the population by type--group quarters or household--in the region. Once developed, the same sociodemographic detail available for the total population is also available for the population by type.

### 2.2.1 Population Characteristics

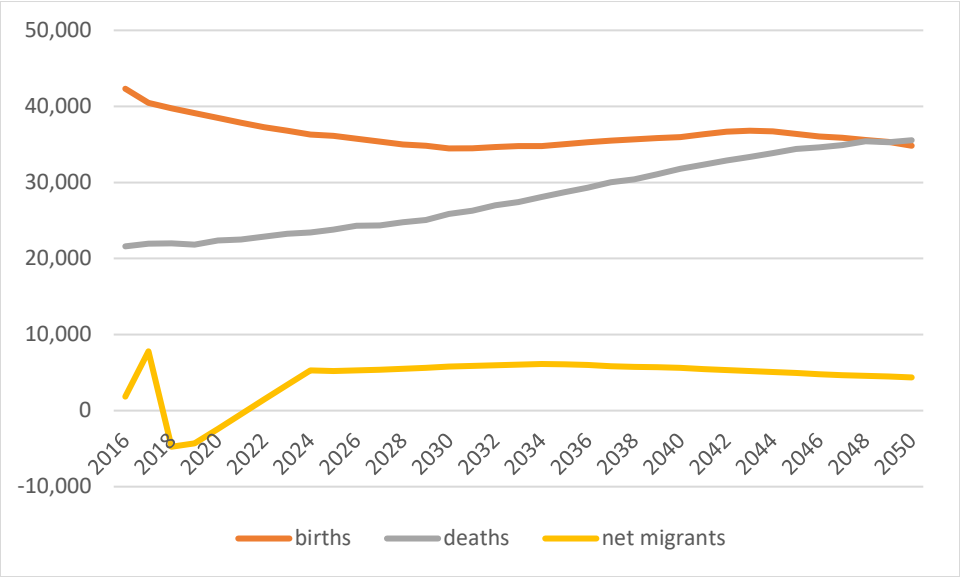
The DOF projects the population by race and ethnicity, sex, and age, therefore the SanDE model does not account for changes to the composition of the population. Other characteristics of the population, such the active-duty military population and their dependents, and labor force participation, are derived from external data sources. A description of these sources and the assumptions used to forecast them are contained in the subsequent sections of this chapter.

### 2.2.2 Components of Population Change

[10] Information about and the latest data from the DOF population projections are available online at: https://www.dof.ca.gov/Forecasting/Demographics/Projections/
Once the series is revised, the DOF replaces the older series with the new series online. To access the data used in the Series 14 RGF (which is no longer available online) please contact SANDAG staff.

Births, deaths, and migration are the three demographic measures by which a population can change. Together, these measures are referred to as "components of change". Separately looking at these three components can provide further insight into the population of interest, such as how and why it grows or changes over time. The DOF provides tables with the components of change data for each projection series that is released to the public.

*Figure 2. Components of Population Change*




*Source: Department of Finance Components of Change, January 2020 Projection Series*

Figure 2 shows the three components of change for the total population in the region between 2016 and 2050. As we can see, the projected deaths exceed projected births by the end of the forecast period. This, when combined with projected low levels of net migration, means that the population is expected to decline due to more deaths than births in the region. Data before 2020 reflect real levels of net migration in the region, showing a dip to negative overall migration. However, for the forecast years, dips in migration or other components of change are not forecasted. Therefore, migration is projected to level out and stay very low through the horizon year.

### 2.2.3 Group Quarters Population

The population of a given area is comprised of household population (the population living in households), and group quarters population (the population living in group quarters facilities such as dorms, barracks, or assisted living homes). San Diego has several universities with residence halls as well as group quarters facilities for personnel living on military installations. The population living in these facilities should be treated differently from the household population in the region because the characteristics of this population and where this population lives in the region tend to stay the same over time.

The data used to parse the group quarters population from the DOF total population come from a few sources. The DOF's annual *Dorms and Exclusions Report* is a major data source, containing the population living in military, college, or other group quarters facilities by jurisdiction. This information provides the count of the group quarters population in the region; however, SANDAG

develops and maintains additional group quarters facilities data as a supplement to the *Dorms and Exclusions Report* such as the location of group quarters facilities in the region.

It is important to know the location of group quarter facilities within the region because, as stated above, the demographic composition of their population does not change greatly over time. This is true for any region, but the measurement of this population is especially important in San Diego County because of the substantial military and college population. Although the individuals who live in military, college, or other group quarters facilities do change, the demographic make-up of that population stays fairly constant. Typically, when someone leaves a group quarters facility, they are "replaced" by someone with similar demographic characteristics. For example, if a student lives in a dorm in one year, then the next year moves out, they are likely replaced by a student of the same age who has a similar living situation (meaning they live with roommates or alone). Knowing the location and count of this population in the region allows SANDAG staff to hold the characteristics and size of this population constant in these specific locations to account for unique changes.

The group quarters population also has certain considerations that need to be modeled in terms of their participation in the labor force. Individuals living in student housing are assumed to be full-time students, and military personnel living in barracks are assumed to be active-duty military. Both of these populations do not participate in the civilian labor force in the same manner as the rest of the county's residents. The models account for this distinction when projecting income and employment for the residents of the region.

### 2.2.4 Military Population Living in Households

Of course, not all active-duty military personnel live in barracks or on military installations. Many active-duty personnel in the region live in households, either alone, with their families, or with roommates. Just as with the active-duty military population who live in group quarters facilities, it is also likely that the active-duty military population who live in households maintain a similar demographic composition over time. For this reason, it is also important to identify the location of the active-duty military population living off-base.

The active-duty military population is estimated using decennial census data from 2010 and American Community Survey (ACS) data post-2010.[11] The count of military dependents is derived from the Defense Manpower Data Center's yearly report on the demographics of the military population in the country.[12] After developing an estimate of these populations, their characteristics are held mostly stable over the forecast time frame.

### 2.2.5 Household Population and Total Households

The population living in households comprises the majority of the region's population, and this population and their characteristics are treated differently from the way group quarters population are treated in the Series 14 RGF process.

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[11] For more information on the American Community Survey and how to access data, please visit https://www.census.gov/acs/www/data/data-tables-and-tools/
For more information on the 2010 decennial census and to access data, please visit https://www.census.gov/programs-surveys/decennial-census/data/datasets.html

[12] *Demographics Profile of the Military Community*, Defense Manpower Defense Center. (Latest version accessible at: 2019 DEMOGRAPHICS PROFILE OF THE MILITARY COMMUNITY (militaryonesource.mil))

The household population is initially created by subtracting the group quarters population by cohort from the total population by cohort, the latter figure provided by the DOF projections. The count of households in the region is derived from estimates from the 2010 decennial census and ACS data, similar to the development of the active-duty military population described above. For the future year count of households, headship rates derived from 2010 decennial census data are applied to the future household population.

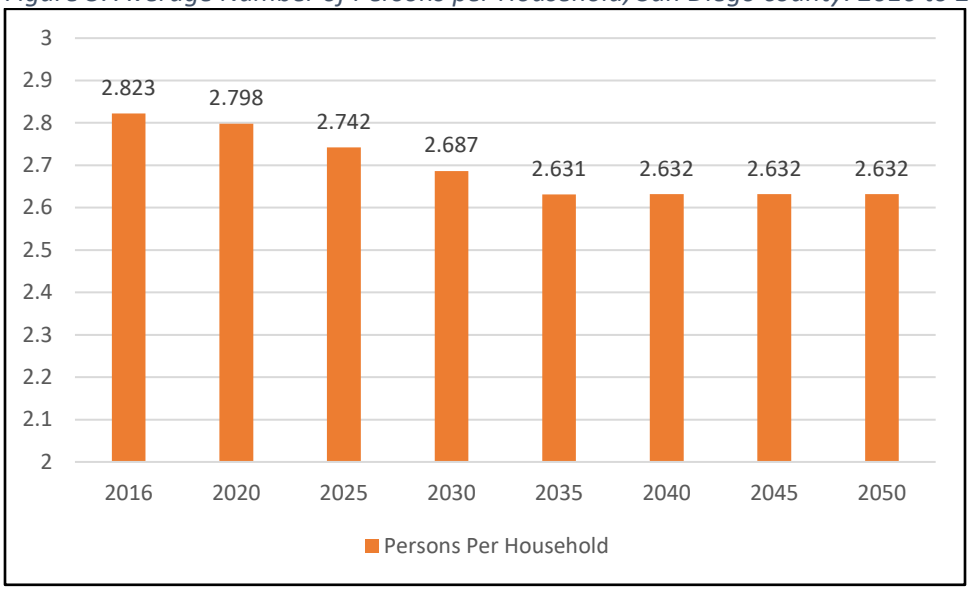
Headship rates calculate the likelihood of someone forming a household, as well as who will be a member of their household based on their characteristics and data on historical headship rates by cohort. These rates are developed for each age, race and ethnicity, and sex cohort and are applied to the population. This is how the SanDE process develops the household population and how it determines the size and characteristics of the population that are placed into households in the region in later steps of the modeling process.

SANDAG staff presented the assumption of declining household headship rates over the forecast time frame to the Board of Directors at its May 25, 2018 meeting.[13] This assumption was made based on the analysis of data which shows that populations with an older median age have smaller household size than populations with a younger median age. This decline is the effect of the headship rates changing to reflect the ageing population that maintains their household even as the members of the household leave to form their own households, or due to one or more members of a household dying, in which case their household would dissolve with the remaining members moving elsewhere or staying in place and reducing their household size. The assumption that household size will decline effects not only the composition of households in the region, but the total number of households that the population requires to live in the region.

Based on these household headship rates, it is assumed that a region-level average household size of 2.632 will be reached in 2036 and will be maintained at this rate through the forecast time frame. This rate is obtained by converging to household headship rates from the 2010 decennial census between the forecast base year of 2016 and the target year of 2036. Figure 3 shows the average household size from the Series 14 RGF.

[13] May 25th, 2018 Board of Directors meeting agenda available at: https://www.sandag.org/uploads/meetingid/meetingid_4785_23865.pdf

*Figure 3. Average Number of Persons per Household, San Diego county: 2016 to 2050*




*Source: SANDAG Series 14 Regional Growth Forecast and SCS Land Use Pattern*

## 2.3 Economics

The next component of the Series 14 RGF process develops the economic characteristics of the population in the region. This module of the SanDE model is run separately from the demographic module and uses the cohort-specific demographic data that are output from that process along with several external data sources to estimate jobs, employment, income, and unemployment in the region. A flow chart of the economic model can be found in Appendix B.

### 2.3.1 Labor Force Participation

Similar to household headship rates, labor force participation rates are calculated using 2010 decennial census and ACS data to estimate the likelihood that an individual will work outside the home given their demographic characteristics. These cohort-specific rates are applied to the cohort-specific population to derive this subsection of the population.

One focus of the PRP 30 meeting which included external experts was whether, and to what degree, future labor force participation rates should change over time. The Series 14 RGF assumes a slight increase to the labor force participation of the population over age 65 because of the region's population ageing and because of improvements in health which makes it possible for someone to work later in their lives than generations before them.

Specifically, by 2050, a composite rate is calculated based on the 2010 decennial census data and 2007-2016 1-year ACS Public Use Microdata Sample (PUMS) data.[14] Labor force participation was at a historic low in 2010 because of the slow recovery after the Great Recession. When using a composite of these rates, labor force participation rises to the highest observed rate for each race and ethnicity, sex, and age cohort up to the forecast horizon year. The differences between racial and ethnic cohorts also decrease so that all rates begin to converge by 2050. Once labor force

[14] For more information about the ACS PUMS data and to access data online, please visit: https://www.census.gov/programs-surveys/acs/microdata/access.html

participation rates are applied to the population, the total labor force in the region can be calculated. This labor force in the region is then used to estimate other economic variables in the forecast.

### 2.3.2 Unemployment

Unemployment in the region is derived from the labor force in the region. Once the labor force is calculated, cohort-specific unemployment rates are applied to that cohort-specific population. Next, the SanDE model computes the initial total unemployed population in the region by summing up the cohort-specific unemployment.

The PRP 30 meeting attendees also provided input on expected future unemployment rate in the region. From this discussion, the assumption was made to reach and maintain an unemployment rate of five percent. An unemployment rate of five percent represents the 23-year average for the San Diego Region. In the Series 14 RGF, this rate was achieved by 2020 and maintained until 2050.

Maintaining an unemployment rate of five percent is accomplished by computing an unemployment rate adjustment factor by dividing the target unemployment rate of five percent by the initial unemployment in the base year. This adjustment is then applied to employment in the region until the target rate is obtained. Cohort-specific unemployment is then obtained by applying the unemployment rate adjustment factor to the initial cohort-specific unemployment.[15]

### 2.3.3 Workforce

Next, the cohort-specific unemployed population is subtracted from the cohort-specific labor force to arrive at the cohort-specific workforce in the region. The sum of this cohort-specific workforce is the total regional workforce. Assumptions about the future workforce in the region are implicit in the labor force and unemployed population in the region. The workforce population is used later in the economic module to calculate in- and out-commuting in the region.

### 2.3.4 In- and Out-Commuting

During the PRP 30 meeting, the external panelists were asked about the assumptions of in- and out-commuting in the forecast.[16] It was agreed that both in- and out-commuting rates should rise over the forecast time period. This is because of rising housing costs that may prompt some workers to look outside the region for housing, as well as employment in adjacent areas that might pull workers from the region into other areas.

In- and out-commuting counts are taken from tabulations of ACS data called the County-to-County Commuting Flows data.[17] These data use the ACS data collected on a person's primary workplace location and links it to their place of residence. With these two pieces of data linked, a commuting flow is generated which can measure how many people flow into and out of a given county for work.

Using these data, staff then computes the rate of out-commuters and in-commuters, applying that rate to the total workforce that was calculated in an earlier step. Next, the workforce employed locally (non-

[15] All data and rate development for the demographic and economic modeling components of the Series 14 RGF were developed before the COVID-19 pandemic and therefore do not reflect the economic or social conditions in the region during that time period.

[16] PRP 30: Review DEFM Forecast, held on February 14, 2018

[17] Information on the ACS County-to-County Commuting Flows data is available on the US Census Bureau website: https://www.census.gov/topics/employment/commuting/guidance/flows.html

commuters) is calculated by subtracting the out-commuters from the total workforce. With the local workforce calculated, the count of jobs attributed to local workers can be found by applying the local jobs rate to the local workforce. Lastly, the regional jobs rate is applied to the number of jobs attributed to the local workforce to arrive at the total number of jobs for the region.

The San Diego Region is also unique because of its proximity to the Mexican border. Trips are also made by either Mexican or US citizens who live in Mexico and commute daily from San Diego for work over the international border. These cross-border trips are accounted for in the Series 14 RGF process. The *2016 Border Delay Survey* is the source of the daily in-flow data on workers who commute to San Diego County from Mexico.[18] The survey consists of 9,852 responses, representing a sample of persons crossing by foot or by privately owned vehicle (POV), or in commercial vehicles.

The *Border Delay Survey* data were analyzed to develop an estimate of the number of persons who commute into the county from Mexico daily for work. The percentage of respondents living in Mexico who reported that they commute to San Diego county daily for work was applied to data on the daily traffic flow that crosses over the border. Information on the number of border crossings is available from the Bureau of Transportation Statistics.[19] By applying the percent of the population who reported commuting daily to San Diego county to the total number of persons who cross the border daily, an estimate of about 4,000 persons is developed to represent the population who live in Baja California and commute to San Diego county every day for work. The Series 14 RGF process uses this estimate to account for in-commuting from Mexico to the region.

### 2.3.5 Employment by Sector

The California Economic Development Department (EDD) develops periodic, county-level projections of jobs by two-digit North American Industry Classification System codes (NAICS2) for a ten-year time period. NAICS2 codes are representative of the sector of that given industry.[20] The latest projections available when the Series 14 RGF process was developed are from 2012 and provide sector-specific projections of employment for San Diego County to 2022.[21] These projections were used to calculate proportions of employment in each sector as a part of the total employment in the region. These proportions are then applied to the future total employment in the region to develop the future sector-specific employment in the region.

### 2.3.6 Total Annual Pay by Sector

Historical data from 1990 to 2014 on annual average pay by NAICS2 sector for San Diego County from the Bureau of Labor Statistics' (BLS) Quarterly Census of Employment and Wages (QCEW) are used to

[18] Information on the number of border crossings is available from the Bureau of Transportation Statistics, accessible online: https://www.bts.gov/browse-statistical-products-and-data/border-crossing-data/border-crossingentry-data

[19] Information on the number of border crossings is available from the Bureau of Transportation Statistics, accessible online: https://www.bts.gov/browse-statistical-products-and-data/border-crossing-data/border-crossingentry-data

[20] For more information on NAICS codes please visit: https://www.census.gov/programs-surveys/economic-census/guidance/understanding-naics.html

[21] EDD Employment Projections are accessible online at: https://www.labormarketinfo.edd.ca.gov/data/employment-projections.html

develop projections of total annual pay by sector.[22] Annual pay is converted from current dollars to 2016 dollars in the BLS dataset by using the BLS consumer price index (CPI) data.[23]

The total annual pay for wage and salary jobs in each sector is computed by applying the future sectoral average annual pay to the jobs in each of the NAICS2 sectors. The assumption is made that differentials in pay across the sectors will stay constant over the forecast time period; however, pay for all sectors increases by 1.15% annually to reflect overall wage growth in the region.

### 2.3.7 Income

Income for residents of the region is derived from several sources and are applied to the cohort-specific population and other components calculated in earlier steps. The flow chart for the income model can be seen in Appendix C.

Income forecasts for San Diego County residents are developed for the following income sources:

1. Wage and salary;
2. Other (e.g., Veteran Administration benefits, alimony, unemployment, and compensation, etc.);
3. Self-employed;
4. Interest and dividends;
5. Public assistance;
6. Retirement;
7. Social security, and;
8. Supplemental security

Data on income by type from the ACS are used to calculate per capita rates of income by source. Cohort-specific rates of income by source are applied to the cohort-specific population developed in earlier modules of the forecast. Next, the total earned, and unearned income are derived by summing up the value of specific unearned income types.

### 2.3.8 Household Income

During the PRP 30 meeting, staff asked the participants to weigh in on how median income should grow throughout the forecast time frame. All of the participants agreed that the target median household income should be between $70,000 and $75,000.

Before median income can be calculated, each household should be assigned a discrete income value. This is based on both the ACS summary file tabulated data and the ACS PUMS.[24] These data provide both a median income value and a count of households in each categorical income value. The SanDE process uses these two pieces of information along with the median income goal provided by the PRP 30 participants to create a distribution of households by income for the region.

### 2.3.9 Income by Source

To develop forecast data on future non-wage income, data from the ACS on income from sources such as self-employed, retirement, social security, supplementary security, public assistance, as well as interest, dividends, and rental income are used. Other income such as Veteran's Affairs (VA) payments, unemployment compensation, and alimony is also accounted for in this estimate. Data are available for

[22] BLS QCEW data are accessible online at: https://data.bls.gov/cew/apps/data_views/data_views.htm#tab=Tables
[23] BLS CPI data are accessible online at: https://www.bls.gov/regions/west/ca_sandiego_msa.htm
[24] ACS summary file data are available from the US Census Bureau's online data portal at: data.census.gov

eight age cohorts (18-24, 25-34, 35-44, 45-54, 55-59, 60-64, 65-74, and 75 plus). The income attributed to these other sources is also held constant over the forecast period based on historic percentages of persons reporting income from these sources.

## 2.4 Housing

The number of housing units that are forecasted in the Series 14 RGF process is derived from the household population in the region and the number of housing units needed to house that population and obtain and maintain a healthy vacancy rate in the region. There are several external controls and exogenous variables that influence the housing construction in the region over the forecast horizon. Namely the vacancy rate, assumptions about headship rates, and accounting for unoccupiable units that were determined by the Board of Directors vote and from feedback received from subject matter experts. These elements interact with data on households and population that have already been derived to determine the number and timing of housing units that are created by the SanDE model.

Based on the expectation of declining household size during the forecast period, the supply of new housing units needed to:

1) meet the demand of the growing forecasted population;
2) reach the target of 4% regional vacancy rate by 2040, and;
3) converge to the household headship rates from the 2010 decennial census data by 2036

Several constraints were put on the housing unit forecast that create an increase in housing unit supply in the first half of the forecast. To meet these targets, forecasted housing units increased from the current rates of construction and throughout the 2020s. This rate would then be assumed constant until the early 2030s, when the constrained targets were closer, at which point the number of units added per year would decline again.

Data on historical housing construction shows that an average of 12,500 units were built annually in the region between 2000 and 2010. This represents a time in the region when construction was more prolific, and construction declines towards the end of the decade with the beginning of the Great Recession. At the height of construction between 2000 and 2010 about 15,000 units were built annually. Since 2010, only about 7,400 units were constructed annually on average, showing that the region has not returned to the pre-recession rates of construction. According to data from the Real Estate Research Council of Southern California, the highest observed construction took place in 1986 when more than 43,000 units were built. The Series 14 RGF assumes that housing will be constructed at a rate of less than 13,000 units annually based on the historical levels of development in the region between 2000 and 2010.[25]

### 2.4.1 Unoccupiable Units

Another exogenous variable that affects the number of new units in the regionwide forecast is the assumption that some units are available to be occupied by the resident population in the region. These units are referred to as “unoccupiable” in the Series 14 RGF and are typically second homes or vacation rentals that may be vacant for most of the year but are not available for rent or sale for year-round occupancy. This assumption was also discussed at the May 25, 2018 Board of Directors meeting and

[25] Information on the Real Estate Research Council of Southern California is available online at: https://www.cpp.edu/cba/real-estate-research/

at the PRP 30 meeting. Leaving these units as "unoccupiable" is congruous with other efforts to forecast a "healthy" housing market in the region.

The estimate of unoccupiable units is derived from single-year ACS data from 2007 to 2016 on vacancy rates in San Diego County. Census tracts that have higher vacancy rates than adjacent tracts are flagged as having vacation rentals or second homes that are unlikely to be available for long-term rentals or for purchase. The count of unoccupiable units from each tract is estimated based on the total number of units and the number of vacant units in the tract. The number of vacant units is reduced based on calculating the number of units which would make the vacancy rate in the tract more comparable to adjacent tracts.

These data show that the number of "unoccupiable" units has fluctuated between 50,000 and 65,000 over that ten-year period. SANDAG estimates that on average annually, there are 57,000 units in the region that are not available to house the San Diego County residents. In the Series 14 RGF process, these units would not be available to house the resident population in the region. Table 1 shows the count of estimated unoccupiable units in each jurisdiction. Unoccupiable units are held constant for the entire forecast period.

*Table 1. Estimate of Unoccupiable Units by Jurisdiction*

| Jurisdiction | Unoccupiable Units |
|---|---|
| Carlsbad | 2,100 |
| Chula Vista | 1,500 |
| Coronado | 1,900 |
| Del Mar | 400 |
| El Cajon | 600 |
| Encinitas | 900 |
| Escondido | 1,000 |
| Imperial Beach | 200 |
| La Mesa | 100 |
| Lemon Grove | 200 |
| National City | 300 |
| Oceanside | 3,400 |
| Poway | 100 |
| San Diego | 17,300 |
| San Marcos | 400 |
| Santee | 400 |
| Solana Beach | 500 |
| Vista | 700 |
| Unincorporated | 7,200 |
| Region Total | 39,200 |

*Source: SANDAG estimate*

# Chapter Three: Land Use Plans and Policies

Determining the amount and location of housing unit and employment capacity in the region is key to allocating the growth forecast to jurisdictions, communities, and neighborhoods. These capacities represent key policy inputs to the forecasting process, reflecting current land use plans and policies as well as the implementation of smart growth development strategies throughout the region. Land use data collected from the local jurisdictions provides policy inputs to the iLUDEM.

Previous to the Series 13 RGF, the forecasts developed for the regional planning efforts approached the subregional allocation differently. The Series 8 Forecast, released in 1995, simply assumed slight residential density increases across the board in all jurisdictions. That approach was criticized as arbitrary and not addressing the nexus between land use and transportation.

The 2020 Forecast, released in 1999, was the first SANDAG attempt to model future smart growth development patterns. Residential and employment capacity was added throughout the urban areas of the region in the form of transit-oriented development within walking distance of approximately 150 current and future transit stops, called transit focus areas (TFA). In areas where several TFAs were clustered, however, the resulting land use patterns sometimes were too far removed from current plans, causing concern for some jurisdictions.

The 2030 Cities/County Forecast was developed as a component of the Regional Comprehensive Plan (RCP). This forecast was based on current plans and policies of the incorporated jurisdictions and the draft General Plan update for unincorporated areas. No smart growth areas other than those contained in the current plans and policies of the jurisdictions were included in the land use assumptions.

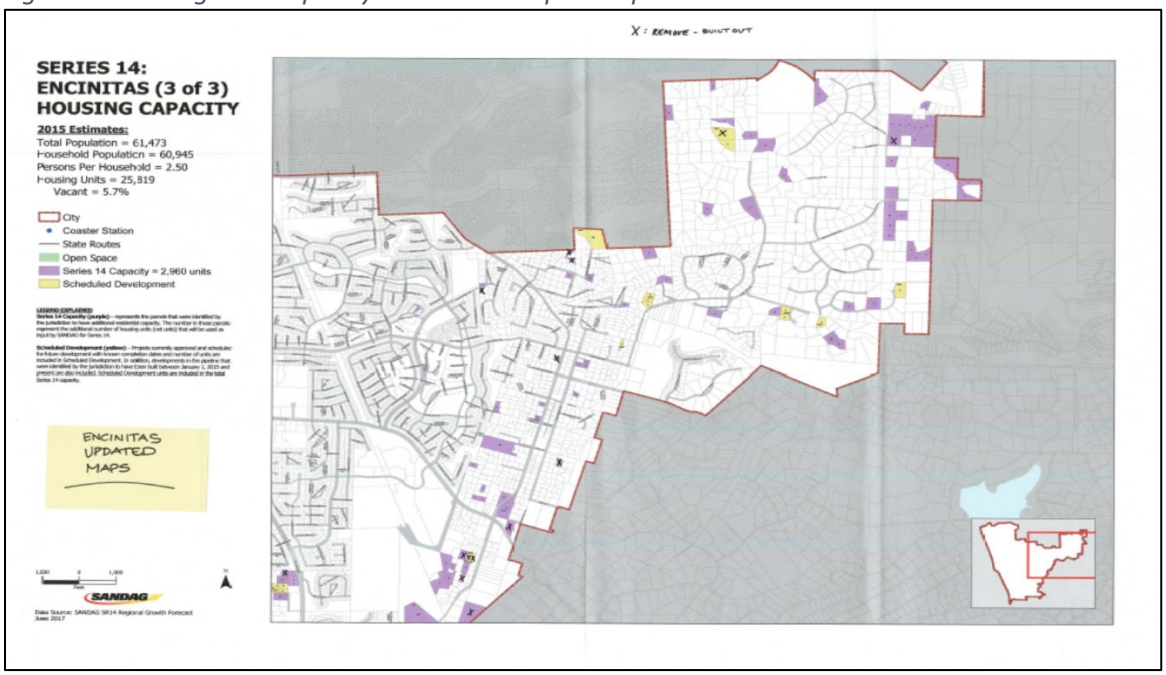
Starting with Series 13 RGF, SANDAG staff worked directly with local jurisdictions to understand how local land use plans and policies might change and evolve in the next forty years. Through this process the subregional forecast is based primarily on local land use plans, many of which have been recently updated.[26]

For the Series 14 RGF process, SANDAG staff relied on planning staff from each of the local jurisdictions to provide the inputs necessary to reflect increased housing unit and job capacity throughout the region through 2050. To facilitate this process, SANDAG develops a series of maps for 17 of the 19 jurisdictions (capacity for the City of San Diego and the unincorporated county are developed similarly but use GIS files due to their size). These maps display parcel-level capacity that was developed during this process for the Series 13 RGF as a starting point. The Series 13 RGF capacity is adjusted to account for development that occurred in the years since the Series 13 RGF. Jurisdictions then assess which capacity is no longer relevant or whether there are additional areas that could accommodate future housing development.

Figure 4 shows an example of one of these maps for the City of Encinitas. This shows their comments and feedback that was eventually used to develop housing unit capacity for use in the forecast.

[26] More information on the history of regional growth forecasts at SANDAG can be found on the SANDAG website (see https://www.sandag.org/index.asp?subclassid=118&fuseaction=home.subclasshome).

*Figure 4. Housing Unit Capacity Collection Map Example*




*Source: SANDAG*

Each jurisdiction was additionally asked to provide SANDAG with information about "scheduled development" projects. These are development projects that are either currently under construction or have final approval and financing.

Next, SANDAG staff creates a GIS dataset for the region that coded all the housing capacity from the jurisdictional review. This dataset is used during the subregional allocation process to indicate where future additional housing units could be accommodated. This process is iterative, involving several months' worth of effort on the part of SANDAG and local staff.

## 3.1 Housing Capacity

The starting point for the SCS land use pattern is the parcel-level capacity data collected from the local jurisdictions. The Series 14 RGF SCS land use pattern necessitates the development of additional capacity in the region in order for each jurisdiction to meet its RHNA allocation, and for the region to meet a 19 percent reduction in greenhouse gas (GHG) emissions by 2035 relative to 2005 as required by the California Air Resources Board (CARB) in the 2021 RP. Reaching this reduction in GHG emissions means that the region must reduce vehicle miles traveled (VMT) by its residents, because GHG is a function of VMT. One way the Series 14 RGF SCS land use pattern aimed to reduce VMT is to focus future housing unit and job development in areas in the region where transit use is more common, and place future housing units and jobs closer together and where future transportation investments are more likely.

SANDAG staff from the Data, Analytics and Modeling department (DAM) and Planning developed the methodology to create this pattern of future housing unit growth during several collaborative meetings. For all jurisdictions in the region, housing unit growth is placed within Mobility Hubs and selected Smart Growth Opportunity Areas (SGOAs). SANDAG made substantive changes to the amount and location of the parcel-level housing unit capacity data collected from the local jurisdictions within Mobility Hubs

and SGOAs in the case that 1) there was not enough capacity to accommodate a jurisdiction's RHNA allocation, and/or 2) there was not enough capacity within the Mobility Hub or SGOA to accommodate the future housing unit growth. This methodology was reviewed and refined during two PRP meetings that were held in 2020.[27]

The RHNA, mandated by state law, quantifies the need for housing and informs land use planning efforts to identify existing and future housing needs resulting from the growth in population, jobs, and the size of households. During the RHNA process, HCD determined that 171,685 housing units will need to be planned for in the San Diego region over an eight-year period (2021-2029). SANDAG developed a methodology to allocate this total to the local jurisdictions and the Board of Directors adopted the 6th Cycle RHNA Plan at its July 10, 2020 meeting.[28]

Because existing general plans for four jurisdictions did not yet include land use designations with zoning to accommodate the 6th Cycle RHNA Plan allocations, SANDAG developed a methodology to identify additional capacity. Specifically, the SCS land use pattern includes adjustments to the local planning assumptions in four jurisdictions to accommodate the 6th Cycle RHNA allocations: Del Mar, Coronado, Solana Beach, and Lemon Grove.[29] For the City of Del Mar, in-progress zoning amendments are reflected in the SCS land use pattern.[30] The cities of Coronado, Solana Beach, and Lemon Grove had not initiated the housing element revision process at the time the forecasted development pattern was needed for the SCS. Therefore, to accommodate these jurisdictions' 6th Cycle RHNA allocations, SANDAG increased residential density on parcels with selected land use in Mobility Hubs and in SGOAs previously identified by the cities. This process is covered in detail in Chapter 4 Section 1.5.

Mobility Hubs are communities with a high concentration of people, destinations, and travel choices. They offer on-demand travel options and supporting infrastructure that enhance connections to high-quality Transit Leap services while helping people make short trips to local destinations around the community on Flexible Fleets.[31] Mobility Hubs can span one, two, or a few miles based on community characteristics and are uniquely designed to fulfill a variety of travel needs while strengthening sense of place. In the SCS land use pattern, forecasted housing unit and job growth are focused within these areas of the region, which overlap with areas identified by local jurisdictions for increased density such as SGOAs and transit priority areas.

Not all jurisdictions have a Mobility Hub within their city-limits. For these jurisdictions, the boundaries of their SGOAs are used as a proxy for an area that supports current and future transportation investments

[27] PRP 99 SCS Land Use Scenario Forecast Part One held in March 2020, and Part Two held in July 2020
[28] July 10, 2020 Board of Directors meeting agenda available at: https://www.sandag.org/uploads/meetingid/meetingid_5410_27706.pdf
[29] Guidance from the California Transportation Commission's 2017 Regional Transportation Plan Guidelines for Metropolitan Planning Organizations provides that assumptions differing from historical trends or existing general plans may be required when "existing general plans do not yet include land use designations with zoning to accommodate the existing RHNA and cannot accommodate the next RHNA without amendment of land use designations and rezoning; local governments have not yet completed a scheduled rezoning program of an adopted housing element; or existing plans reflect ordinances, policies, voter-approved measures, or other standards which prevent the jurisdiction from accommodating the RHNA" (p. 148).
[30] Del Mar zoning amendments: delmar.ca.us/751/NCPC-Zoning-Amendment
[31] More information on Mobility Hubs in the region is accessible at: https://www.sdforward.com/mobility-planning/mobilityhubs

and mixed-use development that include housing and jobs. SGOAs were created in consultation with each of the local jurisdictions.[32]

For the SCS land use pattern, scheduled development events were only included if they were in-progress inside of Mobility Hubs" or were inside of Mobility Hubs or the selected SGOAs. Specifically, one important scheduled development event that is included in the SCS land use pattern is the revitalization of the Navy Old Town Campus (OTC) on the current site of the Naval Information Warfare Systems Command (NAVWAR) facilities near Old Town San Diego. SANDAG and the Navy entered into an agreement to establish the timeline for NAVWAR redevelopment. One concept being explored includes a Central Mobility Hub at the OTC property with supportive land use such as housing, retail, and office space.[33] Specifically, the SCS land use pattern includes 9,570 additional housing units as multi-family developments on the NAVWAR site.

The capacity for the Series 14 RGF additionally assumes accessory dwelling units on five percent of all single-family lots of at least 5,000 square feet in each jurisdiction. This equates to roughly 20,000 additional units of housing capacity throughout the region outside of the rural villages of the unincorporated area. This is consistent with a report from the San Diego Housing Commission that projected a rate of ADUs occurring on about 5% of available single-family zoned parcels. Including lots 5,000 square feet or larger ensures that ADUs are assumed to be possible in all areas of the region, including the more urbanized areas where lot size is smaller. As discussed in Chapter 1 Section 1.2, the methodology for developing the number of ADUs assumed to be available for future housing unit development was agreed upon by the Board of Directors at its May 25, 2018 meeting.

## 3.2 Employment Capacity

Along with housing unit capacity in the region, the iLUDEM process uses capacity for future jobs to develop the subregional allocation of employment in the region. Similar to the discussion above about housing unit densification, for the Series 14 RGF SCS land use pattern, the employment capacity in the region was developed based on the employment capacity from the Series 13 RGF and concentrated in Mobility Hubs throughout the region as well as from nonresidential scheduled development events to allocate near-term jobs.

For the Series 14 RGF, employment capacity in the region is developed based on the employment capacity from the Series 13 RGF with adjustments for the distribution of current employment. Additional capacity for future employment comes from two sources other than nonresidential scheduled development events: adjusted employment capacity that was identified during the jurisdiction outreach process in for the Series 13 RGF, and vacant job spaces that are assigned where current employment exists in the base year of the forecast.[34] Both of these types of capacity in the region are developed at the parcel-level and are industry-specific.

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[32] More information on SGOAs is accessible at:
https://www.sandag.org/uploads/projectid/projectid_296_13993.pdf

[33] More information on the Central Mobility Hub is accessible at:
https://www.sandag.org/index.asp?classid=13&subclassid=9&projectid=612&fuseaction=projects.detail

[34] Information and programming related to the creation of base year jobs and job spaces are available on SANDAG's GitHub: https://github.com/SANDAG/sandag_urbansim/blob/master/etl/sql/views/job_spaces.sql

Because job growth is concentrated in the Mobility Hubs, the amount of job capacity developed from the above-described process was not enough to accommodate all the job growth for the forecast period. In order to accommodate all the forecasted jobs, the existing job capacity was increased on all job spaces within the Mobility Hubs. Similar to residential scheduled development events, only in-progress nonresidential events or events that occur within Mobility Hubs are included. Additionally, the Central Mobility Hub and OTC property revitalization includes almost two million square feet of office and retail space and 443 hotel rooms, all of which are forecasted to support employment in the SCS land use pattern.

Nonresidential events are also how military jobs increase over the forecast time period. During the data collection process, SANDAG received information on installation expansions and timing for additional personnel to be added to those local installations. Other than these scheduled development events, additional employment in the forecast is civilian. Similarly, staff collected input from the local universities on anticipated expansions from both their planning staff and online information in order to estimate the number of future employees for each university. Government and military jobs are only placed on parcels that are the location of government and military jobs in the base year of the forecast. This means that government and military job growth will occur outside of Mobility Hubs.

https://github.com/SANDAG/sandag_urbansim/blob/master/etl/sql/views/jobs_private.sql
https://github.com/SANDAG/sandag_urbansim/blob/master/etl/sql/views/jobs_selfemployed.sql
https://github.com/SANDAG/sandag_urbansim/blob/master/etl/sql/views/jobs_gov.sql
https://github.com/SANDAG/sandag_urbansim/blob/master/etl/sql/views/jobs_mil.sql

# Chapter Four: Subregional Forecasting Model

## 4.1 iLUDEM

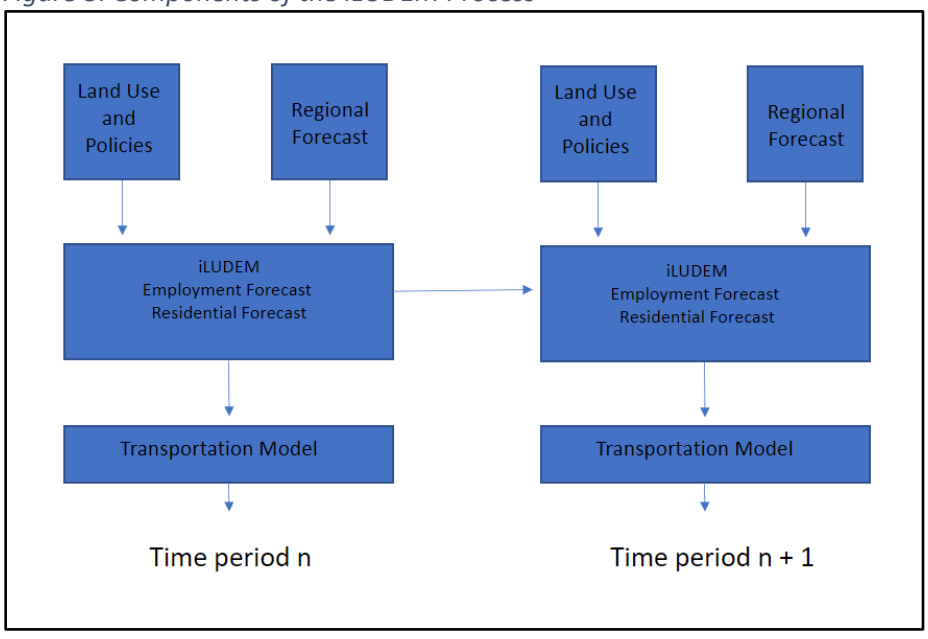
The iLUDEM process allocates employment, population, housing, and income from the regional forecast to produce the Series 14 RGF SCS land use pattern. It is designed to forecast the location of residential and nonresidential activity within the region. In the SCS land use pattern, the iLUDEM process allocates housing based on the availability of housing and job capacity in the region within the Mobility Hubs.

### 4.1.1 Overview and Key Relationships

The iLUDEM process has three main components. The first component allocates residential units, the second component allocates regional employment, and the final component provides a forecast of demographic and economic characteristics of both the jobs and the population in the region. This includes occupied units (households), population by characteristics, household income, and employment by industrial classification. The iLUDEM process allocates this regional information to housing units, jobs, and population at a small geographic scale, specifically to over 800,000 parcel polygons in San Diego County. These polygons are geographic areas based on the tax assessor's parcel data. These parcel polygons are referred to as "parcels" for the remainder of this document.

After the iLUDEM determines the location of additional housing units in a given year, it uses several factors to place the resident population in those units and allocate region-level jobs to subregional areas. Figure 5 illustrates the major components of the iLUDEM and its relationships to the regional forecast controls, and the interactions of this information between two time periods. The iLUDEM process provides a forecast at one-year intervals; however, data are typically displayed in 5-year increments.

*Figure 3. Components of the iLUDEM Process*




*Source: SANDAG*

### 4.1.2 Housing units, parcel-level

After the number of units at the regional level are calculated, the number of units needed in each of the 19 jurisdictions is determined for every year of the forecast. These jurisdiction-level controls are determined by an analysis of the available capacity in each jurisdiction and the number of units allocated to each jurisdiction based on RHNA. The iLUDEM process then allocates the needed units to the parcels within each jurisdiction using a criterion developed during several PRP meetings held at SANDAG. Although the iLUDEM process uses parcel-level capacity to allocate housing units throughout the region, outputs are generated at the Master Geographic Reference Area (MGRA)-level for use as inputs to SANDAG's Activity Based Model (ABM). MGRAs are a SANDAG-created geographic area and are comparable in size to census blocks and cover the entire region. MGRAs are the building blocks of all other standard SANDAG geographies and typically MGRA-level data are aggregated to provide tabulations at higher geographic levels such as Community Planning Areas, Traffic Analysis Zones, jurisdictions, or census geographies.

The iLUDEM process first assigns scheduled development events based on start or end date information that was provided to SANDAG during the capacity collection process. These units are prioritized over other housing unit capacity. This means that if a jurisdiction has both scheduled development capacity and the capacity developed for the SCS land use pattern as discussed in Chapter 3 Section 3.1, the scheduled development events are selected first before other available parcels. Parcels with a high amount of capacity are typically capped at 250 units added per year, with some exceptions for certain projects. This means that for large parcels and some scheduled development projects with more than 250 total units, the project will be built over multiple years.

Not all jurisdictions have scheduled development projects for every year; therefore, the units built in the region are a combination of scheduled development and units resulting from the jurisdiction's capacity developed for the SCS land use pattern.

Once parcels are developed with housing units, that capacity is no longer available for future development. No demolition of units occurs during the iLUDEM process. The capacity that was developed is added to the parcels in addition to any existing units.

### 4.1.3 Employment, parcel-level

Employment at the parcel-level is allocated from the regional totals in a similar way; however, there are no jurisdiction-level controls of employment totals, so the region-level employment is allocated to parcels in one step. Employment capacity is industry-specific, meaning that additional jobs will be filled based on the available spaces of a given industry (depending on the number of jobs that need to be allocated to that industry). This means that the number of jobs being developed in any given jurisdiction is not based on control targets, but rather the industry-specific targets developed at the regional level and industry-specific capacity. Parcels are selected randomly when there are multiple sites available for jobs of a given industry that need to be built.

Nonresidential scheduled development events are treated similarly to residential scheduled development events. Jobs on these sites are developed before the development of job growth on other parcels within Mobility Hubs. Very large projects are developed over multiple years and do not exceed 250 jobs in a given year. Next, the iLUDEM process selects which parcels will be developed in the region for each year of the forecast based on the SanDE process' controls for additional employment at the region-level. Future jobs are then placed on the parcels with capacity, with high-capacity parcels favored

over parcels with less capacity. This process is repeated for each year until the yearly region-level controls are met.

### 4.1.4 Socioeconomic Characteristics

The characteristics of population are assigned once the units have been allocated throughout the San Diego region. This process is informed by several external datasets that use historical subregional allocations to determine where future growth should occur by the characteristics of a resident, such as race and ethnicity, sex, age, population type (household or group quarters), income level of the household, and structure type of the housing unit (single-family, multi-family, or mobile home). These historical rates or proportions are applied to the population living in a given housing unit to develop the forecast by socioeconomic characteristics.

#### *Occupied housing units*

"Households" are another term to refer to occupied housing units. The count of households is a function of housing units in the region and the characteristics and size of the household population in the region (compared to the population living in group quarters facilities). At the subregional-level, the count of households is derived from cohort-specific household headship rates that measure the likelihood that a person, given their demographic characteristics, would be the head of a household. When applied to the population, this gives the total number of households that will be formed given the race and ethnicity, age, and sex distribution of that population. These household headship rates were informed by Summary File data from the 2010 decennial census, which allows rates to be estimated at the census block-level.[35]

#### *Group quarters population*

The group quarters population is distributed to the subregional areas based on the location of group quarters facilities. SANDAG staff create an annual spatial dataset that contains the locations of such facilities in the region.

Group quarters population characteristics are developed based on the 2010 decennial census data at the census block-level. This cohort-specific population is allocated to group quarters facilities based on the characteristics of the people and the type of facilities. For example, persons in college dorms or residence halls would be in their late teens and early twenties and would have a racial, ethnic, and sex distribution that was observed in the 2010 decennial census. Compare this to the sociodemographics of the population living in assisted living facilities, which are also considered group quarters.

#### *Jobs by type*

As discussed above, civilian, and military employment is assigned to job spaces in the region based on the location of subregional capacity for jobs. Once this employment is placed, the industry of that job is assigned based on general plan information. These attributes inform the development type for each parcel. Jobs are assigned to spaces based on the development type of the parcel where there is job capacity in order to meet the industry-specific targets set at the regional level.

#### *Housing units by type*

[35] For more information on the 2010 decennial census Summary Files and how to access the data, please see: https://www.census.gov/prod/cen2010/doc/sf1.pdf

Once housing units are forecasted to occur in the region, the structure type needs to be assigned to the unit. In SANDAG data products, housing structure is broken into four types: single-family attached, single-family detached, multi-family, or mobile homes. These categories align with the Census Bureau definitions of structure type.[36] The designation of single-family attached and detached are new to the Series 14 RGF. Previously, all single-family units were referred to as "single-family detached units". For the purposes of the Series 14 RGF, "single-family attached units" refers to units that share a wall, but not a floor or ceiling, with an adjacent unit. These units are commonly referred to as townhomes or rowhomes.

To forecast future housing growth by structure type, the iLUDEM process classifies each constructed unit based on the count of units constructed and development type of the given parcel. For scheduled development event units, the jurisdictions identify the structure type of the new units during the outreach process, which is then used to classify future units that are a part of a scheduled development event.

#### *Household income to households*

Household income is developed based on the distribution of income in the 2010 decennial census and ACS data. The distribution of median income and households by grouped income category in these external data sources inform the subregional distribution of households by income category. Median income grows over the forecast period as determined in the SanDE model, and these increases apply to the subregional areas, as well. Measures are instituted at the subregional level to ensure that the distribution of household income remains similar to the distribution in the base year and estimates data.

### 4.1.5 Key Assumptions to Develop the SCS Land Use Pattern Subregional Housing Allocation

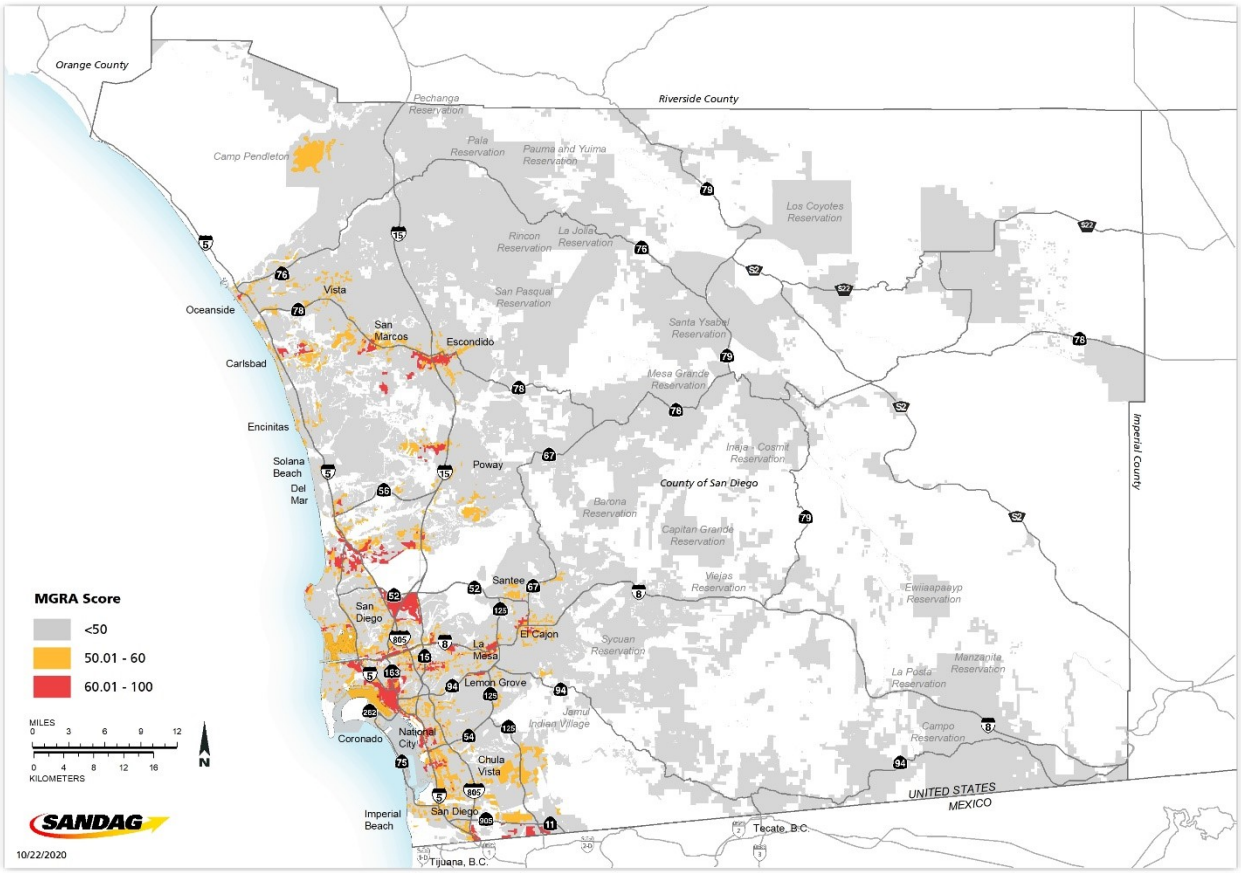
Several key assumptions inform the detail of the subregional forecast. During several PRP meetings and internal discussions, SANDAG staff from the DAM and Planning departments made decisions about how to prioritize the subregional areas that show capacity for future housing units. Incorporating feedback from planning and modeling staff ensured that the approach included a pattern of development that aligns with the goals of the SCS land use pattern. The decision to utilize the Mobility Hubs and selected SGOAs as boundaries for the forecasted housing unit and job growth for the Series 14 RGF represents a continuing trend in the San Diego region to provide more housing and jobs in the existing urbanized areas of the region.

During the process for the 2021 RP, SANDAG staff, in conjunction with outside consultants, identified and scored MGRAs on a scale of 0-100 based on a propensity analysis that used a number of evaluation criteria. Each MGRA received a score based on the Mobility Hub propensity analysis results and a land use mixing criterion. MGRAs associated with conserved lands or military installations were identified as "constraints" and excluded from the scoring. The land use mix score was calculated based on the percentage of MGRA acreage associated with land use types that are complementary to residential uses. Data used in the propensity analysis include the employment for 2018, 2035, and 2050, weighted population density, number of local street intersections per square mile, vehicle miles traveled (VMT) per capita in 2016, proximity to "activity centers" such as hospitals, schools, airports, hotels, military

[36] Information about the Census Bureau definitions of housing by structure type are available online: https://www.census.gov/construction/chars/definitions/

installations, shopping centers, and universities/colleges. Figure 4 shows these propensity analysis scores by MGRA for the region.

*Figure 4 MGRA Scoring for San Diego Region*




*Source: SANDAG Propensity Analysis Results*

This scoring informed development of the Mobility Hubs boundaries in the region and helped prioritize parcels for development in the SCS land use pattern. In general, higher scored areas are more favorable to future housing development and parcels without existing capacity that had both selected land uses, and high scores were assigned additional capacity for the purposes of the SCS land use pattern. Within high-scoring MRGAs, SANDAG selected land use codes that could be considered for future residential uses Appendix D shows the parcel-based land uses that were considered for additional capacity.

*Table 2. SCS Land Use Pattern Capacity Prioritization and Densification*

| Priority | Area Type | Score | Other Criteria | Capacity Used |
|---|---|---|---|---|
| 1 | Mobility Hub or SGOA | Any | Residential scheduled development; also includes in-progress developments outside of Mobility Hubs or SGOAs | Existing planned capacity |
| 2 | Mobility Hub | >= 60 | Existing planned capacity | Existing planned capacity |
| 3 | Mobility Hub | >= 60 | No planned capacity but selected land uses | 25 du/acre assigned |
| 4 | SGOA | >= 50 | Existing planned capacity | Existing planned capacity |
| 5 | Mobility Hub | < 60 | Existing planned capacity | Existing planned capacity |
| 6 | SGOA | >= 50 | No planned capacity but selected land uses | 20 du/acre assigned |
| 7 | SGOA | < 50 | Existing planned capacity | Existing planned capacity |
| 8 | Any | Any | Outside Mobility Hub and SGOA, not scheduled development, or non-selected land use for housing | None |

Ultimately, 17 jurisdictions are assigned additional capacity by densifying parcels within Mobility Hubs or select SGOAs in the method described in Table 2. These 17 jurisdictions increased capacity by using the criteria in priorities 3 and 6 which increases the capacity to 25 or 20 units per acre within these specified areas, respectively. The only jurisdictions that did not receive some amount of additional capacity during this process are the cities of Imperial Beach and Vista, because these jurisdictions had adequate capacity within Mobility Hubs that was collected during the capacity outreach process as described in Chapter 3.

With the parcels prioritized as described in Table 2, the iLUDEM proceeds as follows for each jurisdiction or CPA (subregion):

1) Parcels are checked for phasing information. If a parcel's phasing information is not set to start in the year that is being modeled, then it is set aside.
    a. Some scheduled development phasing was changed to fall between 2021-2035 if it would have started earlier or later. This was only done when needed to accommodate jurisdictions' RHNA allocations that had minimal excess capacity in the forecast. For example, any scheduled development event in Del Mar, Coronado, Solana Beach, and Lemon Grove was assumed to start and end between 2021 and 2035 to accommodate those jurisdictions' RHNA allocations.
2) The amount of capacity on a given parcel is limited to 250 units per year (with some exceptions for the phasing of residential scheduled developments requested by the local jurisdictions);
3) Next, parcels that had some capacity utilized in the prior year and have remaining capacity are prioritized, followed by scheduled development capacity, then all other capacity;
4) After the parcels are sorted as described in step three, they are further sorted by the prioritization described in Table 2, with the lower priority scores being ranked as more favorable than higher scores, and;

5) Lastly, within these subgroups, parcels are sorted and randomly selected until enough capacity is available to meet the subregional targets for the year.

For the SCS land use pattern the capacity developed is more than enough to accommodate the number of forecasted housing units in the region. Some of the ADU capacity developed for other versions of the subregional allocation are included in the pool of available units if they fall within a Mobility Hub or select SGOAs and are treated like SCS land use pattern capacity as described above. This means the ADU capacity is available along with capacity from the jurisdictions and the scheduled development events and may be randomly selected in the parcel selection process.

A number of checks were used to distribute capacity across Mobility Hubs, SGOAs, and jurisdictions in the SCS land use pattern. First, any jurisdiction that needed more capacity to accommodate RHNA allocations is capped at the RHNA allocation number. This check ensures that no more housing units are assumed than necessary if existing general plans did not yet include land use designations with zoning to accommodate the 6th Cycle RHNA Plan allocations. All jurisdictions' housing capacities are forecasted to accommodate their RHNA allocations between 2021 and 2035. Capacity in priorities 6 and 7 from Table 2 (SGOAs with added density or lower favorability scores) are only needed to meet RHNA allocations and are not required in the following steps.

Second, after selecting all scheduled development capacity and the capacity needed to meet RHNA allocations (using the priority system described above), the iLUDEM process evaluated how much capacity was already utilized in every combination of Mobility Hub and jurisdiction relative to the amount of capacity available in the original general plan capacity. Any area that had already utilized more capacity than originally provided by the jurisdiction was removed so that assumptions for additional densification occurred only where necessary. Remaining areas are assigned capacity for utilization using the prioritization metrics in Table 2 but are again capped at 100% of the original provided capacity.

Finally, there is more capacity than needed in the priority 5 group (existing planned capacity with lower favorability scores in Mobility Hubs). To distribute this, each unique combination of Mobility Hubs and jurisdictions below their planned capacity utilization is evenly distributed units as a percentage relative to their planned capacity. This step allocates approximately 18,500 units across five jurisdictions, with nearly 16,000 of those assigned to the City of San Diego.[37]

[37] Priority 5 group distribution: Carlsbad 1,044, El Cajon 39, Imperial Beach 469, San Diego 15,881, and Vista 1,134.

# Chapter Five: Comparing the Forecasts

This section contrasts the primary assumptions and results of the prior forecast (the Series 13 RGF used in the 2015 RTP) with the Series 14 RGF. For the most part, the differences in assumptions reflect revised data that were available for the Series 14 RGF effort, as well as differences in methodology between the two forecasting models. Results from the Series 14 RGF SCS land use pattern at the jurisdiction-level can be found in Tables E.1 through E.3 in Appendix E.

## 5.1 Base Years

When a forecast is produced, the first decision made is to select the base year, or starting year, of the forecast. The base year represents the most current information about the region's population, job count, and housing. The base year for the Series 13 RGF was 2012, and 2016 for the Series 14 RGF. Years beyond the base year are forecasted and no longer represent the most current information; instead, these forecasted years represent one possible outcome of development given the assumptions, data sources, and methodology that has been discussed in this document.

Because the process of developing the forecast occurs over several years, new data become available after the base year is set. A feature of the iLUDEM process is that the estimates data are integrated into the forecast models. For the Series 14 RGF model runs, the 2018 vintage of estimates is used to supplement the base year data. This vintage of estimates was created in 2018 and includes data for 2016, 2017 and 2018 that are integrated into the forecast data. So, in the case of Series 14 RGF, the first three years of the forecast represent on-the-ground development and population and 2019 is the first year of forecasted data.

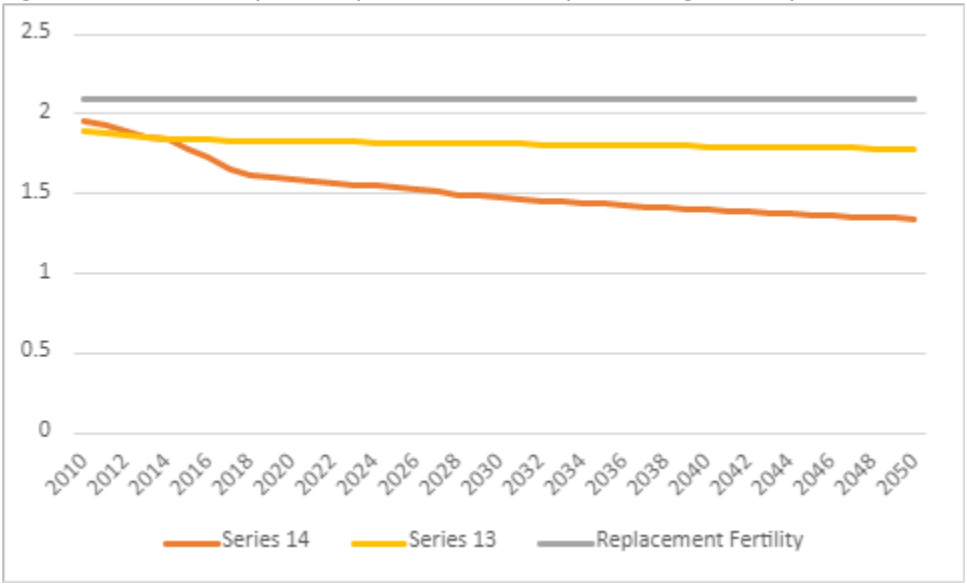
### 5.2.1 Fertility Rates

Fertility rates in the Series 14 RGF are derived from or controlled to the population projections from the DOF. Assumptions about fertility, mortality, and migration are inherent to the DOF projection series and are reflected in the total population data that are provided by demographic detail.

Figure 6 illustrates the changes to the total fertility rates over the forecast time period. Total fertility is the hypothetical number of children a woman would have in her lifetime given the present-day fertility rates of a given location. For reference, replacement fertility, the "level of estimated fertility that is necessary for a population to reproduce itself, assuming no in-migration or out-migration" is also included in the figure.[38] Over the past few decades birth rates declined in the San Diego region, much like the rest of the world. The expectation is that fertility will continue to decline in the later years of the Series 14 RGF.

[38] Livingston, Gretchen. *Is US Fertility at an all-time low? Two of three measures point to yes.* May 22, 2019 accessible at: https://www.pewresearch.org/fact-tank/2019/05/22/u-s-fertility-rate-explained/

*Figure 5. Total Fertility and Replacement Fertility, San Diego County: 2010-2050*




*Source: SANDAG Series 13 Regional Growth Forecast, Series 14 Regional Growth Forecast*

### 5.2.2 Household Size

The differences in household size, by forecast, are presented in Table 2. Household size is inversely related to household formation. For example, lower household formation rates for the same population mean that, on average, more persons will live in each house. Future household formation rates decline more notably in Series 14 compared to Series 13 based on the assumption that the San Diego region's household size will move toward the household size of 2.63 persons per household for San Diego County according to data from the 2010 decennial census.

*Table 2. Average Persons per Household, Series 13 RGF and Series 14 RGF: 2012-2050*

| Forecast Version | 2012 | 2016 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|---|
| Series 14 | n/a | 2.82 | 2.80 | 2.74 | 2.69 | 2.63 | 2.63 | 2.63 | 2.63 |
| Series 13 | 2.76 | n/a | 2.82 | 2.82 | 2.83 | 2.82 | 2.81 | 2.80 | 2.81 |

*Source: SANDAG Series 13 Regional Growth Forecast, SANDAG Series 14 Regional Growth Forecast*

### 5.2.3 Labor Force Participation

Labor force participation rates determine the age, sex, and racial and ethnic composition of the labor market from a given population mix. Higher participation rates mean that more local residents will be in the local labor market, reducing the need for in-migration to fill jobs. During PRP 30, experts met to determine possible future labor force participation rates for the region. The consensus is that labor force participation rates should rise over time, meaning that more people will enter into or remain in the labor force in the future compared to current conditions. Specifically, labor force participation rates of those over age 65 should increase, which follows recent trends of later retirement among American workers.

### 5.2.4 Income

Income is assumed to grow modestly, by about 0.3 percent per year regionwide over the forecast time period. There is also the assumption that median household income in the region will

only slightly increase and stay between $70,000 and $75,000 for the duration of the forecast. Both of these assumptions were vetted by the attendees of PRP 30. This median income is lower than what was assumed in the Series 13 RGF and is reflective of the stagnating income in the region that has been observed over the past ten years.

## 5.3 Changes to Land Use Policies

For housing unit and employment capacities, the forecast begins with land use plans and policies that were collected during the outreach process in the Series 13 RGF. These are then adjusted to account for development since 2012. In most cases, the horizon year of these local land use plan inputs are 2020 or 2030. Since the horizon year of the Series 14 RGF is 2050, it extends 20 or more years beyond the horizon year of local land use plans. To account for future development that might occur outside of the scope of their general plans, SANDAG staff worked with local jurisdictions to understand ways in which plans might change in the coming decades. These additional land use inputs are derived from draft plan updates, rezoning programs, and other locally recommended alternatives.

This process resulted in an increase of about 200,000 units of capacity in the region between the base year of the Series 13 RGF and the current Series 14 RGF base year. This increase is due to the updated capacity information provided by the jurisdictions, as well as updates to some of the community plans in the City of San Diego and to El Cajon's Transit District, which both show capacity for more housing units than in the past. Lastly, as shown below in Table 3, 19,557 units of capacity are developed as accessory dwelling units, this capacity was not assumed for the Series 13 RGF process.

As discussed in Chapter 3, additional housing unit capacity was developed as a part of the Series 14 RGF SCS land use pattern. Not all the capacity that was developed for the Series 14 RGF baseline subregional allocation was used in the SCS land use pattern because of the concentration of development in the Mobility Hubs. Therefore, any capacity that fell outside the Mobility Hubs or select SGOAs was not used in the SCS land use pattern. Table 3 shows the resulting housing unit capacity from the Series 13 RGF and the Series 14 RGF SCS land use pattern.

*Table 3. Projected Housing Unit Capacity by Jurisdiction, 2012 and 2016*

| Jurisdiction | Series 14 Capacity SCS Land Use Pattern (2016) | Series 14 ADU Capacity (2016) | Series 13 Capacity (2012) |
|---|---|---|---|
| Carlsbad | 6,752 | 1,627 | 21,155 |
| Chula Vista | 28,458 | 19,951 | 55,643 |
| Coronado | 1,427 | 4 | 241 |
| Del Mar | 254 | 1 | 687 |
| El Cajon | 10,623 | 157 | 14,386 |
| Encinitas | 1,649 | 97 | 4,306 |
| Escondido | 15,140 | 3,806 | 14,996 |
| Imperial Beach | 3,622 | 201 | 2,064 |
| La Mesa | 13,973 | 587 | 13,024 |
| Lemon Grove | 2,513 | 134 | 3,253 |
| National City | 8,744 | 1,045 | 20,127 |
| Oceanside | 6,476 | 1,731 | 14,370 |
| Poway | 1,764 | 13 | 6,534 |
| San Diego | 269,478 | 35,934 | 339,391 |
| San Marcos | 10,696 | 6,638 | 32,285 |
| Santee | 4,026 | 413 | 11,044 |
| Solana Beach | 1,088 | 86 | 1,410 |
| Vista | 4,879 | 484 | 111,058 |
| Unincorporated | 5,294 | 3,158 | 17,880 |
| Region Total | 396,856 | 76,067 | 683,854 |

*Source: SANDAG Series 13 Regional Growth Forecast, SANDAG Series 14 Regional Growth Forecast SCS Land Use Pattern Subregional Allocation*

Similar to housing unit capacity in the region, a part of the data development process for the Series 14 RGF requires projected employment capacity for the region. Employment capacity for the Series 14 RGF is derived from the Series 13 RGF capacity that is adjusted for development between 2012 and 2016, along with employment capacity from vacant job spaces that are in buildings that have jobs in the base year of 2016. As discussed in Chapter 3, additional employment capacity in Mobility Hubs is developed to densify employment in the region. In Table 4, there is a comparison between the employment capacity by jurisdiction. Because there is limited space to place all the future jobs in the region into Mobility Hubs, the jobs capacity is reduced from the Series 13 RGF. Only enough capacity to meet the regionwide employment totals was projected for the SCS land use pattern.

*Table 4. Projected Employment Capacity, Series 13 RGF (2012) and Series 14 RGF SCS Land Use Pattern (2016) by Jurisdiction*

| Jurisdiction | Series 14 SCS Land Use Pattern Job Capacity | Series 13 Job Capacity |
|---|---|---|
| Carlsbad | 23,556 | 21,155 |
| Chula Vista | 44,056 | 55,643 |

| | | |
|---|---|---|
| **Coronado** | 1,919 | 241 |
| **Del Mar** | 108 | 687 |
| **El Cajon** | 19,497 | 14,386 |
| **Encinitas** | 1,919 | 4,306 |
| **Escondido** | 11,403 | 14,996 |
| **Imperial Beach** | 1,393 | 2,064 |
| **La Mesa** | 6,678 | 13,024 |
| **Lemon Grove** | 1,363 | 3,253 |
| **National City** | 9,222 | 20,127 |
| **Oceanside** | 3,479 | 14,370 |
| **Poway** | 1,009 | 6,534 |
| **San Diego** | 253,815 | 339,391 |
| **San Marcos** | 20,179 | 32,285 |
| **Santee** | 1,848 | 11,044 |
| **Solana Beach** | 989 | 1,410 |
| **Vista** | 5,138 | 17,880 |
| **Unincorporated** | 36,402 | 111,058 |
| **Region Total** | 443,973 | 683,854 |

*Source: SANDAG Series 13 Subregional Capacity, SANDAG Series 14 SCS Land Use Pattern Subregional Capacity*

## 5.4 SCS Land Use Pattern Subregional Forecast Results

The iLUDEM is used to produce the subregional allocation of the Series 14 RGF. Most of the differences between the iLUDEM process and the models used in earlier forecast versions are the result of the land use assumptions and how they translate into housing stock and employment allocations.

The differences in housing unit forecasts by jurisdiction in the year 2050 are presented in Table 5. Overall, about 20,000 fewer units are developed by 2050 in the Series 14 RGF SCS land use pattern versus the Series 13 RGF; however, the differences are not evenly distributed throughout the county. Because of the concentration of units in the Mobility Hubs and selected SGOAs to achieve the goals outlined for the SCS, the SCS land use pattern projects about 187,000 fewer total housing units in the Unincorporated county, about 2,300 less units in the city of National City, and about 1,900 less units in the City of Santee. The largest increase is seen in the City of San Diego which is projected to add over 600,000 more units compared to the Series 13 RGF. The SCS land use pattern also projects an additional 1,000 or more total housing units in the cities of Carlsbad, Chula Vista, Escondido, and San Marcos compared to the Series 13 RGF.

*Table 5. Count of Housing Units in Series 13 RGF and Series 14 RGF SCS Land Use Pattern by Jurisdiction, 2050*

| Jurisdiction | Series 14 RGF SCS Land Use Pattern Housing Units | Series 13 RGF Housing Units | Difference (Series 14 RGF SCS – Series 13 RGF) |
|---|---|---|---|
| Carlsbad | 52,727 | 50,505 | 2,222 |
| Chula Vista | 109,474 | 108,273 | 1,201 |
| Coronado | 10,486 | 9,801 | 685 |
| Del Mar | 2,778 | 2,674 | 104 |
| El Cajon | 40,467 | 40,810 | (343) |
| Encinitas | 27,690 | 27,686 | 4 |
| Escondido | 60,618 | 56,034 | 4,584 |
| Imperial Beach | 11,576 | 11,528 | 48 |
| La Mesa | 34,398 | 33,405 | 993 |
| Lemon Grove | 10,467 | 10,526 | (59) |
| National City | 22,410 | 24,736 | (2,326) |
| Oceanside | 71,359 | 70,942 | 417 |
| Poway | 18,017 | 17,839 | 178 |
| San Diego | 711,018 | 95,703 | 615,315 |
| San Marcos | 41,016 | 37,337 | 3,679 |
| Santee | 21,969 | 23,886 | (1,917) |
| Solana Beach | 7,364 | 7,121 | 243 |
| Unincorporated | 35,964 | 222,948 | (186,984) |
| Vista | 181,501 | 40,181 | 141,320 |
| Region Total | 1,471,299 | 1,491,935 | (20,636) |

*Source: SANDAG Series 13 Regional Growth Forecast, SANDAG Series 14 Regional Growth Forecast and SCS Land Use Pattern Subregional Allocation*

Table 6 presents a comparison for employment in the Series 14 RGF and Series 13 RGF SCS land use pattern. The county-level differences in jobs between the two forecasts are larger when compared to the differences between the housing units. In the Series 14 RGF, about 174,000 more jobs are added by 2050 when compared to the Series 13 RGF. This is mostly due to higher labor force participation rates and a larger working age population in the Series 14 RGF compared to the Series 13 RGF. Looking at the results at the jurisdiction-level, the largest difference is in the City of San Diego which adds more than 131,000 jobs over the forecast period based on the SCS land use pattern. Similar to the reduction observed in housing units between the Series 13 RGF and the Series 14 RGF SCS land use pattern, the Unincorporated County also is projected to add about 20,000 fewer jobs over the forecast time period.

*Table 6. Series 13 and Series 14 SCS Land Use Pattern Jobs by Jurisdiction, 2050*

| Jurisdiction | Series 14 RGF SCS Land Use Pattern Jobs | Series 13 RGF Jobs | Difference (SR 14 RGF SCS – SR 13 RGF) |
|---|---|---|---|
| Carlsbad | 97,507 | 85,757 | 11,750 |
| Chula Vista | 116,185 | 114,550 | 1,635 |
| Coronado | 28,771 | 29,275 | (504) |
| Del Mar | 4,586 | 4,726 | (140) |
| El Cajon | 67,135 | 49,826 | 17,309 |
| Encinitas | 30,753 | 29,551 | 1,202 |
| Escondido | 68,924 | 59,081 | 9,843 |
| Imperial Beach | 6,946 | 4,857 | 2,089 |
| La Mesa | 36,729 | 36,552 | 177 |
| Lemon Grove | 10,335 | 8,656 | 1,679 |
| National City | 60,875 | 39,839 | 21,036 |
| Oceanside | 50,756 | 53,998 | (3,242) |
| Poway | 36,216 | 37,173 | (957) |
| San Diego | 1,140,676 | 1,008,793 | 131,883 |
| San Marcos | 62,306 | 64,328 | (2,022) |
| Santee | 20,100 | 18,570 | 1,530 |
| Solana Beach | 11,027 | 8,803 | 2,224 |
| Vista | 49,115 | 48,814 | 301 |
| Unincorporated | 187,376 | 208,256 | (20,880) |
| Region Total | 2,086,318 | 1,911,405 | 174,913 |

*Source: SANDAG Series 13 Regional Growth Forecast, SANDAG Series 14 Regional Growth Forecast and SCS Land Use Pattern Subregional Allocation*

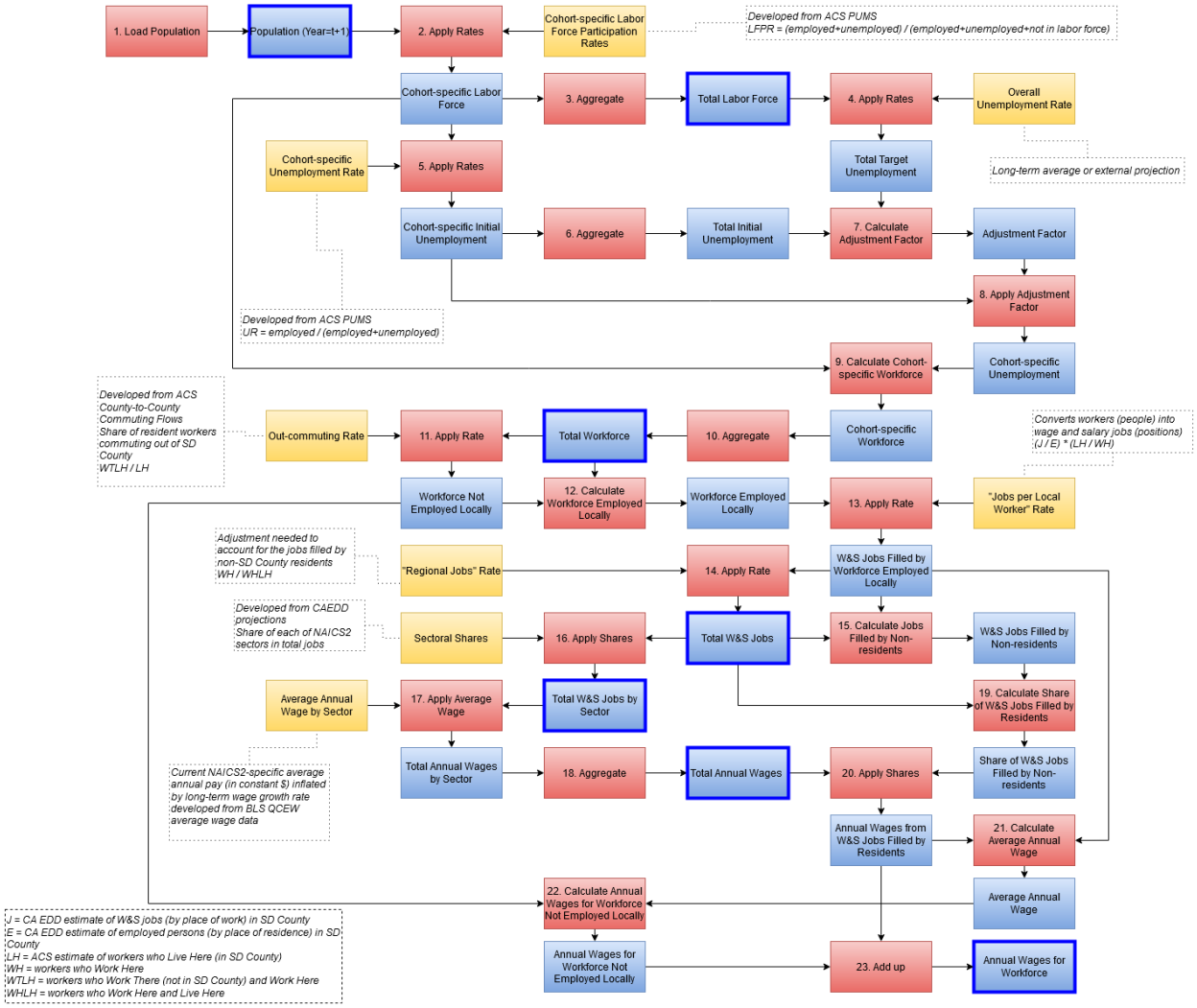
# Appendix A: List of Series 14 Regional Growth Forecast Variables

| Table Name | Column | Data Type | Description | Values |
|---|---|---|---|---|
| **age** | yr_id | smallint | year | |
| **age** | mgra_id | int | id for master reference geographic area (mgra) | |
| **age** | age_group_id | smallint | age group id | 1) Under 5<br>2) 5 to 9<br>3) 10 to 14<br>4) 15 to 17<br>5) 18 and 19<br>6) 20 to 24<br>7) 25 to 29<br>8) 30 to 34<br>9) 35 to 39<br>10) 40 to 44<br>11) 45 to 49<br>12) 50 to 54<br>13) 55 to 59<br>14) 60 and 61<br>15) 62 to 64<br>16) 65 to 69<br>17) 70 to 74<br>18) 75 to 79<br>19) 80 to 84<br>20) 85 and Older |
| **age** | population | int | count of population in each group | |
| **age_sex_ethnicity** | yr_id | smallint | year | |
| **age_sex_ethnicity** | mgra_id | int | id for mgra | |
| **age_sex_ethnicity** | age_group_id | smallint | age group id | |
| **age_sex_ethnicity** | sex_id | smallint | sex id | |
| **age_sex_ethnicity** | ethnicity_id | smallint | ethnicity id | |
| **age_sex_ethnicity** | population | int | count of population in each group | |
| **ethnicity** | yr_id | smallint | year | |
| **ethnicity** | mgra_id | int | id for mgra | |
| **ethnicity** | ethnicity_id | smallint | ethnicity id | 1) Hispanic<br>2) Non-Hispanic, White<br>3) Non-Hispanic, Black<br>4) Non-Hispanic, American Indian or Alaska Native<br>5) Non-Hispanic, Asian<br>6) Non-Hispanic, Hawaiian or Pacific Islander<br>7) Non-Hispanic, Other<br>8) Non-Hispanic, Two or More Races |
| **ethnicity** | population | int | count of the population in each group | |
| **household_income** | household_income_id | int | unique id for each household income group | |
| **household_income** | yr_id | smallint | year | |
| **household_income** | mgra_id | int | id for mgra | |

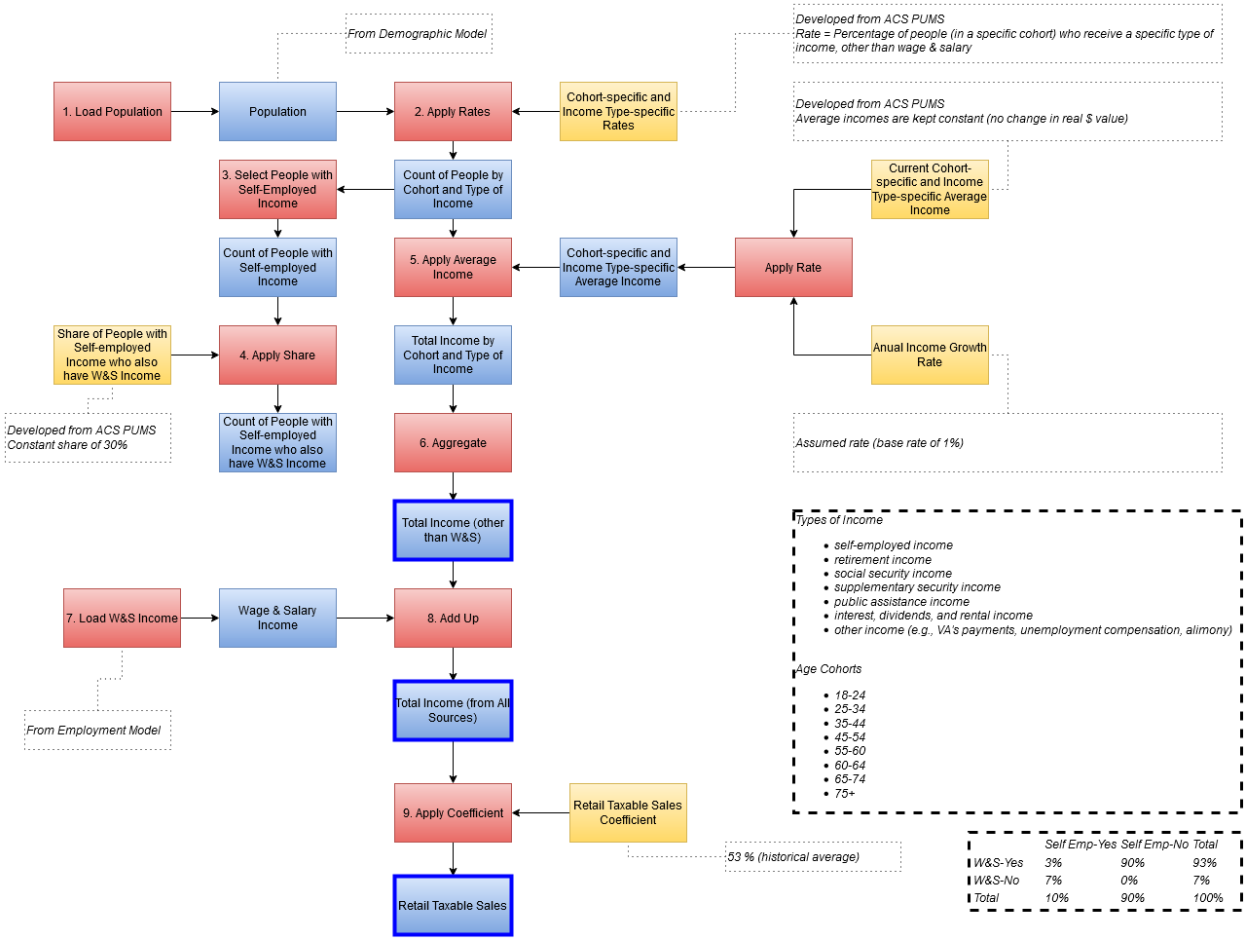
| | | | | |
|---|---|---|---|---|
| **household_income** | income_group_id | int | income group category id | 11) Less than $15,000<br>12) $15,000 to $29,999<br>13) $30,000 to $44,999<br>14) $45,000 to $59,999<br>15) $60,000 to $74,999<br>16) $75,000 to $99,999<br>17) $100,000 to $124,999<br>18) $125,000 to $149,999<br>19) $150,000 to $199,999<br>20) $200,000 or more |
| **household_income** | households | int | count of households | |
| **housing** | housing_id | int | unique housing unit id | |
| **housing** | yr_id | smallint | year | |
| **housing** | mgra_id | int | id for mgra | |
| **housing** | structure_type_id | smallint | id for the structure type of the household | 3) Multifamily<br>4) Mobile Home<br>5) Single-family<br>6) Detached<br>7) Single-family Attached |
| **housing** | units | int | count of units | |
| **housing** | unoccupiable | int | count of unoccupiable units | |
| **housing** | occupied | int | count of occupied units | |
| **housing** | vacancy | float | count of vacant units | |
| **jobs** | yr_id | smallint | year | |
| **jobs** | mgra_id | int | id for mgra | |
| **jobs** | employment_type_id | smallint | id for the employment type (industry) | 1) Military<br>2) Agriculture and Mining<br>3) Construction<br>4) Manufacturing<br>5) Wholesale Trade<br>6) Retail Trade<br>7) Transportation, Warehousing, and Utilities<br>8) Information<br>9) Finance and Real Estate<br>10) Professional and Business Service<br>11) Education and Healthcare<br>12) Leisure and Hospitality<br>13) Office Service<br>14) Government<br>15) Self-Employed |
| **jobs** | jobs | int | count of jobs for each employment type category | |
| **population** | yr_id | smallint | year | |
| **population** | mgra_id | int | id for mgra | |

| | | | | |
|---|---|---|---|---|
| **population** | housing_type_id | smallint | housing type id | 1) Household Population<br>2) Group Quarters - Military<br>3) Group Quarters - College<br>4) Group Quarters - Other |
| **population** | population | int | count of population for each housing type id | |
| **sex** | yr_id | smallint | year | |
| **sex** | mgra_id | int | id for mgra | |
| **sex** | sex_id | smallint | sex id | 1) Female<br>2) Male |
| **sex** | population | int | count of the population | |

# Appendix B: Economic Model Flow Diagram



# Appendix C: Income Model Flow Diagram



## Appendix D: Land Use Types

| Land Use Code | Description | Included in Housing Subarea Land Use Mixing Score | Identified as Opportunity for Residential Redevelopment (Tier 1B Area) |
|---|---|---|---|
| 1120 | Single Family Multiple-Units | | X |
| 1190 | Single Family Residential Without Units | | X |
| 1200 | Multi-Family Residential | | X |
| 1280 | Single Room Occupancy Units (SRO's) | | X |
| 1290 | Multi-Family Residential Without Units | | X |
| 1300 | Mobile Home Park | | X |
| 1501 | Hotel/Motel (Low-Rise) | | X |
| 1503 | Resort | | X |
| 2103 | Light Industry - General | X | |
| 4111 | Rail Station/Transit Center | X | |
| 4114 | Parking Lot - Surface | | X |
| 4115 | Parking Lot - Structure | | X |
| 4116 | Park and Ride Lot | | X |
| 5002 | Regional Shopping Center | X | X |
| 5003 | Community Shopping Center | X | X |
| 5004 | Neighborhood Shopping Center | X | X |
| 5006 | Automobile Dealership | | X |
| 5007 | Arterial Commercial | X | X |
| 5008 | Service Station | | X |
| 5009 | Other Retail Trade and Strip Commercial | X | X |
| 6000 | Office | X | |
| 6001 | Office (High-Rise) | X | |
| 6002 | Office (Low-Rise) | X | X |
| 6003 | Government Office/Civic Center | X | |
| 6102 | Religious Facility | X | X |
| 6103 | Library | X | |
| 6104 | Post Office | X | X |
| 6109 | Other Public Services | X | X |
| 6801 | SDSU/CSU San Marcos/UCSD | X | |
| 6802 | Other University or College | X | |
| 6803 | Junior College | X | |
| 6804 | Senior High School | X | |
| 6805 | Junior High School or Middle School | X | |

| | | | |
|---|---|---|---|
| 6806 | Elementary School | X | |
| 7202 | Stadium/Arena | | X |
| 7210 | Other Recreation - High | X | |
| 7601 | Park - Active | X | |
| 9101 | Vacant and Undeveloped Land | | X |
| 9501 | Residential Under Construction | | X |
| 9502 | Commercial Under Construction | X | X |
| 9504 | Office Under Construction | X | |
| 9505 | School Under Construction | X | |
| 9700 | Mixed Use | X | X |

# Appendix E: Regional Growth Forecast Sustainable Communities Strategy Land Use Pattern, Jurisdictional-level Results

## Table E.1 Total Housing Units by Jurisdiction, 2016 to 2050

| Jurisdiction | 2016 | 2025 | 2035 | 2050 | Change (2016 - 2050) | |
|---|---|---|---|---|---|---|
| | | | | | Number | Percent |
| Carlsbad | 46,152 | 47,855 | 51,433 | 52,727 | 6,575 | 14.2% |
| Chula Vista | 82,794 | 91,635 | 95,621 | 109,474 | 26,680 | 32.2% |
| Coronado | 9,577 | 9,802 | 10,486 | 10,486 | 909 | 9.5% |
| Del Mar | 2,611 | 2,674 | 2,778 | 2,778 | 167 | 6.4% |
| El Cajon | 36,012 | 37,582 | 39,830 | 40,467 | 4,455 | 12.4% |
| Encinitas | 26,040 | 26,750 | 27,690 | 27,690 | 1,650 | 6.3% |
| Escondido | 48,462 | 54,910 | 58,990 | 60,618 | 12,156 | 25.1% |
| Imperial Beach | 9,756 | 10,212 | 11,265 | 11,576 | 1,820 | 18.7% |
| La Mesa | 25,760 | 28,404 | 32,282 | 34,398 | 8,638 | 33.5% |
| Lemon Grove | 9,032 | 9,476 | 10,467 | 10,467 | 1,435 | 15.9% |
| National City | 16,641 | 17,908 | 22,410 | 22,410 | 5,769 | 34.7% |
| Oceanside | 65,851 | 67,816 | 71,359 | 71,359 | 5,508 | 8.4% |
| Poway | 16,606 | 17,092 | 18,017 | 18,017 | 1,411 | 8.5% |
| San Diego | 531,423 | 592,143 | 676,236 | 711,018 | 179,595 | 33.8% |
| San Marcos | 30,539 | 34,681 | 34,931 | 41,016 | 10,477 | 34.3% |
| Santee | 20,525 | 21,161 | 21,889 | 21,969 | 1,444 | 7.0% |
| Solana Beach | 6,497 | 6,684 | 7,364 | 7,364 | 867 | 13.3% |
| Vista | 32,195 | 33,404 | 35,317 | 35,964 | 3,769 | 11.7% |
| Unincorporated | 174,082 | 178,027 | 181,501 | 181,501 | 7,419 | 4.3% |
| Region Total | 1,190,555 | 1,288,216 | 1,409,866 | 1,471,299 | 280,744 | 23.6% |

*Source: Series 14 Regional Growth Forecast and SCS Land Use Pattern Subregional Allocation*

## Table E.2 Total Population by Jurisdiction, 2016 to 2050

| Jurisdiction | 2016 | 2025 | 2035 | 2050 | Change (2016 - 2050) | |
|---|---|---|---|---|---|---|
| | | | | | Number | Percent |
| Carlsbad | 113,179 | 116,163 | 119,681 | 122,302 | 9,123 | 8.1% |
| Chula Vista | 265,357 | 284,835 | 288,141 | 323,469 | 58,112 | 21.9% |
| Coronado | 24,512 | 24,896 | 25,669 | 25,901 | 1,389 | 5.7% |
| Del Mar | 4,284 | 4,384 | 4,524 | 4,715 | 431 | 10.1% |
| El Cajon | 105,276 | 106,425 | 109,207 | 110,841 | 5,565 | 5.3% |
| Encinitas | 62,625 | 63,476 | 64,157 | 64,591 | 1,966 | 3.1% |
| Escondido | 150,978 | 165,127 | 169,922 | 174,398 | 23,420 | 15.5% |
| Imperial Beach | 28,041 | 28,902 | 30,499 | 31,271 | 3,230 | 11.5% |
| La Mesa | 60,980 | 65,822 | 71,455 | 75,276 | 14,296 | 23.4% |
| Lemon Grove | 26,710 | 27,367 | 29,238 | 29,784 | 3,074 | 11.5% |
| National City | 61,350 | 69,072 | 79,986 | 82,487 | 21,137 | 34.5% |
| Oceanside | 176,666 | 178,385 | 181,020 | 184,283 | 7,617 | 4.3% |
| Poway | 49,986 | 50,664 | 51,744 | 52,124 | 2,138 | 4.3% |
| San Diego | 1,399,925 | 1,493,403 | 1,599,353 | 1,646,129 | 246,204 | 17.6% |
| San Marcos | 94,258 | 102,775 | 103,903 | 120,247 | 25,989 | 27.6% |
| Santee | 56,434 | 57,501 | 57,773 | 58,268 | 1,834 | 3.2% |
| Solana Beach | 13,860 | 14,171 | 15,089 | 15,262 | 1,402 | 10.1% |
| Vista | 102,933 | 104,302 | 105,707 | 107,732 | 4,799 | 4.7% |
| Unincorporated | 512,156 | 513,178 | 513,280 | 516,993 | 4,837 | 0.9% |
| Regional Total | 3,309,510 | 3,470,848 | 3,620,348 | 3,746,073 | 436,563 | 13.2% |

*Source: Series 14 Regional Growth Forecast and SCS Land Use Pattern Subregional Allocation*

## Table E.3 Total Jobs by Jurisdiction, 2016-2050

| Jurisdiction | 2016 | 2025 | 2035 | 2050 | Change (2016 - 2050) | |
|---|---|---|---|---|---|---|
| | | | | | Number | Percent |
| Carlsbad | 76,617 | 83,955 | 90,701 | 97,507 | 20,890 | 27.3% |
| Chula Vista | 74,078 | 83,027 | 98,701 | 116,185 | 42,107 | 56.8% |
| Coronado | 26,888 | 27,283 | 27,978 | 28,771 | 1,883 | 7.0% |
| Del Mar | 4,476 | 4,494 | 4,536 | 4,586 | 110 | 2.5% |
| El Cajon | 48,408 | 52,526 | 59,516 | 67,135 | 18,727 | 38.7% |
| Encinitas | 28,812 | 29,264 | 29,950 | 30,753 | 1,941 | 6.7% |
| Escondido | 58,323 | 60,758 | 64,686 | 68,924 | 10,601 | 18.2% |
| Imperial Beach | 5,621 | 5,948 | 6,407 | 6,946 | 1,325 | 23.6% |
| La Mesa | 30,188 | 31,647 | 34,145 | 36,729 | 6,541 | 21.7% |
| Lemon Grove | 9,099 | 9,368 | 9,846 | 10,335 | 1,236 | 13.6% |
| National City | 42,218 | 54,193 | 57,419 | 60,875 | 18,657 | 44.2% |
| Oceanside | 47,256 | 48,317 | 49,909 | 50,756 | 3,500 | 7.4% |
| Poway | 35,297 | 35,508 | 35,865 | 36,216 | 919 | 2.6% |
| San Diego | 892,828 | 953,977 | 1,046,814 | 1,140,676 | 247,848 | 27.8% |
| San Marcos | 41,527 | 47,021 | 54,548 | 62,306 | 20,779 | 50.0% |
| Santee | 18,499 | 18,829 | 19,494 | 20,100 | 1,601 | 8.7% |
| Solana Beach | 10,064 | 10,277 | 10,648 | 11,027 | 963 | 9.6% |
| Vista | 44,105 | 45,253 | 47,133 | 49,115 | 5,010 | 11.4% |
| Unincorporated | 152,115 | 160,102 | 173,179 | 187,376 | 35,261 | 23.2% |
| Regional Total | 1,646,419 | 1,761,747 | 1,921,475 | 2,086,318 | 439,899 | 26.7% |

*Source: Series 14 Regional Growth Forecast and SCS Land Use Pattern Subregional Allocation*