

APPENDIX N

SANDAG and SDCWA Forecasting

San Diego Association of Governments (SANDAG) and San Diego County Water Authority (CWA): Regional Growth and Water Demand Forecasting

A. San Diego Association of Governments

1. INTRODUCTION

The San Diego Association of Governments (SANDAG) was formed in 1972 and is the regional planning agency and the technical and information resource for the 18 incorporated cities and County government, who are collectively, the "Association of Governments." SANDAG is governed by a Board of Directors composed of an elected official from each of the 19 local governments. Supplementing the voting members are seven advisory members including the County Water Authority (CWA). In addition to the mandated responsibilities as a regional transportation planning agency and a regional transportation commission, SANDAG provides technical and informational assistance in the areas of demographic and economic analysis, transportation studies, survey design and analysis, criminal justice studies, public facilities location, housing needs analysis, environmental planning, and other types of studies.

SANDAG has been producing long-range forecasts of growth in the region for over 25 years, which are now updated every 4 to 5 years. The latest forecast is called the 2020 Regional Growth Forecast. Two key ingredients drive SANDAG efforts to build accurate and reliable Regional Growth Forecasts. One is the extensive review of the forecast. The guidance, expertise, and insights of the committees and other groups that review the forecast are indispensable to the forecasting process and to the development of accurate information for regional decision-making. The other is that SANDAG's forecasting models and procedures are continually refined and updated to incorporate new information and to reflect state-of-the-art forecasting techniques and advances in computer technology. During 1997 and 1998, SANDAG completed a significant upgrade and revision to the modeling system for use in the 2020 Regional Growth Forecast.

This report describes the procedures and models used to prepare SANDAG's Regional Growth Forecast, which is done in two phases, and identifies its integration into the CWA's demand forecasting. The first phase forecasts population, housing, employment, income, and other growth related information

for the entire San Diego region. This region wide forecast is based on factors such as birth and death rates; domestic and international migration; and national, state, and local economic trends and conditions. The 2020 Region wide Forecast was approved for use by the SANDAG Board in July 1998.

The second phase, the 2020 Cities/County Forecast, allocates the region wide growth to jurisdictions, communities, and other geographic areas within the region. This allocation is based on land use policies, such as general plans, transportation system, and the spatial relationships between activity locations within the region. The 2020 Cities/County Forecast was approved for use by the SANDAG Board in February 1999.

SANDAG is currently in the lengthy process of preparing the 2030 forecast, which should be approved for use by the SANDAG Board in 2002.

2. DEFM-The 2020 Region wide Forecasting Model

The Demographic and Economic Forecasting Model (DEFM) produces the region wide forecast. DEFM is a blend of two widely used forecasting techniques: a cohort-component method for population change and econometric equations for economic factors. Changes in population are caused by natural increase (births minus deaths) and migration patterns. The cohort-component method uses information on age, sex, and ethnic composition and future trends in birth and death rates to forecast population changes due to natural increase. DEFM relates population change from domestic migration (migration from other parts of the US) to the future performance of the region's economy. In particular, job creation, wages, and the supply and demand of labor determine the future levels of domestic migration. International migration (from other countries) is determined by U.S. immigration policy and by the historical share of U.S. immigrants that located in the San Diego region.

The economic portion of DEFM consists of five sectors:

1. construction;
2. prices;
3. employment and output;
4. local revenues and expenditures; and
5. income

DEFM links all five economic sectors directly to each other and to the cohort-component model through equations based on regional, state, and national economic trends. DEFM's equations and statistical procedures accurately reflect the many complex interrelationships that underlie the region's economy.

3. UDM-The 2020 Cities/County Forecasting Model

The Urban Development Model (UDM) allocates the region wide forecast to produce the 2020 Cities/County Forecast. UDM is designed to forecast the location of residential and nonresidential activity within the region. In particular, UDM is based on the spatial interrelationships between economic factors, population and housing factors, land use patterns, and the transportation system.

Four major premises underlie UDM's forecast of residential activities.

- a. Employment location is a primary determinant of the location of residential activities;
- b. The longer the work trip, the less the likelihood that a person makes that trip;
- c. The more land that is available for residential development, the greater the potential for residential growth; and
- d. Residential growth occurs where local land use plans and policies identifies additional capacity for residential development.

UDM captures the link between work place location and residential location through commuting patterns and travel times within the region furnished by the transportation model. By using current and future trends in travel behavior, UDM can account for the other factors that determine where people might live within the region, such as land values, multiple worker households, income, and neighborhood preferences.

After UDM determines the residential location of employed residents, it uses several local factors to derive households (occupied units), housing stock (occupied units plus vacant units), and population. One factor, known as the employed residents per household rate, determines the number of households needed to accommodate the forecast of employed residents. For each area, this factor reflects the characteristics that determine the typical number of workers in each house, such as local unemployment rates, multiple-worker households, labor force participation rates, the age structure, and income. Local vacancy rates and household size (average persons per household) factors determine housing stock and the number of persons living in each household. Finally, UDM produces a forecast of group quarters population (e.g., nursing homes, military barracks, jails, and college dormitories) to complete the population forecast.

Not only does the spatial distribution of employment opportunities influence the location and demand for houses, but the reverse is true as well, especially for population-serving employment such as retail trade and services. UDM handles

this relationship by assuming a lag between residential development and the subsequent location of new jobs. Other factors that determine the future location of employment opportunities within the region are:

- a. Transportation characteristics, including home-based shopping travel behavior;
- b. The existing and previously forecasted locations of employment, reflecting the economies of scale businesses gain by locating near like-businesses; and
- c. The capacity for additional employment growth based on existing land use plans or a specified alternative.

As noted, the availability of land and capacity for development influence the forecast of both residential and employment activities. The demand for these activities, in turn, influences future land supply and capacity. For example, an area adding residential activity consumes land and reduces the capacity for future residential development. Therefore, changes in land supply and capacity affect the allocation of activity in subsequent forecast years. UDM does not allow growth to exceed the capacity implied by the available land and densities.

Some of the forecast outputs that UDM generates are birth rates, death rates, domestic net migration, international net migration, household size, land use, housing structure type, local labor unemployment rate, jobs per housing unit, median household income, and civilian employment by jurisdictions and many other geography areas within the region, down to areas as small as blocks. Of the many outputs that the UDM model produces, the CWA uses a number of these outputs to forecast the water needs of individual member agencies as described in the next session of the report. They are the following: occupied single family housing, occupied multifamily housing, total employment and employment by major industry group, persons per household, housing density, and household income. These are the inputs that go into the CWA CWA-MAIN model.

B. San Diego County Water Authority

1. INTRODUCTION

The mission of the San Diego County Water Authority (CWA) is to provide a safe and reliable supply of water to its member agencies serving the San Diego region. The CWA provides wholesale water supplies to 22 member retail agencies and Pendleton Military Reservation. A mixture of dense urban areas and rural, predominantly agricultural areas characterizes the 1,420 square mile service area of the CWA. The expected rate of population and economic growth coupled with the geographic and climatic diversity of the service area presents a challenge for future water supply and conservation planning.

For ten years the CWA and SANDAG have been working together to link future water supply needs with the forecasted growth for the region. The voters in San Diego County in 1988 passed proposition C, which requires SANDAG to prepare a growth management strategy that includes a water supply element. In response, the CWA and SANDAG entered into a memorandum of agreement (MOA) whereby the CWA agrees to use SANDAG's most recent regional growth forecasts for water supply planning purposes. In addition, the MOA requires the CWA to provide recent information on the future supplies that will meet the growth forecasted for the region. SANDAG has recently established a formal process to measure the progress of future water supply development and its ability to meet the needs of an expanding community. The MOA ensures that the water demand projections for the San Diego region are linked with SANDAG's growth forecasts and that water supply is a component of the overall growth management strategy.

2. WATER PLANS AND REPORTS

To assist in meeting its mission, the CWA has developed the 2000 Urban Water Management Plan (2000 Plan). The 2000 Plan identifies the future water demands forecasted for the CWA's service area through 2020. Based on these forecasts a water supply reliability analysis is conducted that identifies the supplies necessary to meet future demands. The development of a water use forecasting model is the culmination of an extensive data collection endeavor. The process involves database development, water use modeling, calibration of models to historical records, verification of model accuracy, development of a baseline forecast, and the development of forecasts with water conservation. Water demand forecast data is used not only for water resources planning, but also for financial analysis and facility planning.

3. IWR/CWA-MAIN-Water Demand Forecasting Model

To project municipal and industrial (M&I) water use, the Authority utilizes the IWR-MAIN (Institute for Water Resources - Municipal and Industrial Needs) computer model. Several U.S. cities and water agencies, including Metropolitan Water District of Southern California are currently using versions of this econometric model. The IWR-MAIN system is designed to translate local historical demographic, housing, employment, weather and water use data into a customized model that can be used to forecast water demand using projected demographic, housing and employment data, as well as assumptions regarding future water conservation, weather and the price of water.

The CWA's version of this model is called "CWA-MAIN," and is used to forecast municipal and industrial water demand for 22 of its member agencies, excluding Pendleton Military Reservation. The Military Reservation develops and provides the CWA its forecasted demands and projected local supplies. The CWA-MAIN model is calibrated to reflect the unique water use patterns of the San Diego region. Historical and forecasted demographic, housing and employment data are provided by SANDAG under terms of the 1992 memorandum of agreement between the CWA and SANDAG. The CWA has revised the original model completed in 1996, to include the demographic, economic and land use information from the 2020 Cities/County Forecast. Specific model inputs used from the SANDAG forecast include:

- Occupied Single Family Housing;
- Occupied Multi-Family Housing;
- Total Employment and Employment by Major Industry Group;
- Persons per household;
- Housing Density; and
- Household income

The CWA collects and uses the following additional data as well:

- Monthly or bimonthly water sales and number of accounts for major water use sectors,
- Marginal prices for water and wastewater services per billing period,
- Water sales per account for the largest nonagricultural water users within each water district, and
- Information on water conservation programs and drought.

The CWA-MAIN model is comprised of three sets of equations, which calculate water use based on demographic, socioeconomic, and weather variables; separate equations are used for single family, multi-family, and non-residential use. The driver variables are the number of occupied single family units, the