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May 5, 2010

File Number 2300000

Ms. Mary Nichols
Chair
California Air Resources Board
1001 I Street
Sacramento, CA 95812

Dear Ms. Nichols:

SUBJECT: San Diego Association of Governments (SANDAG) Sustainable Communities Strategy Technical Methodology

SANDAG presents the "technical methodology it intends to use to estimate the greenhouse gas emissions from its sustainable communities strategy and, if appropriate, its alternative planning strategy" as required under California Government Code 65080(b)(2)(I)(i).

SANDAG is a nationally recognized leader in transportation and land use planning and modeling. SANDAG intends to set a positive example for the rest of the state and nation as the first metropolitan planning organization to adopt a Sustainable Communities Strategy under Senate Bill 375 (SB 375) (Steinberg, 2008). The 2050 Regional Transportation Plan and its Sustainable Communities Strategies will build upon previous successes and will include expanded public outreach, enhanced environmental justice analysis, coordination with the public and private partners, and a comprehensive economic analysis. These efforts and others are described in the attached report describing how SANDAG will develop a plan that complies with SB 375.

If you have any questions about the SANDAG Technical Methodology, please feel free to contact me or Clint Daniels of my staff at (619) 699-6946.

Sincerely,

Gary L. Gallegos

GARY L. GALLEGOS
Executive Director

CDAN/EAR/ama

Enclosure

The planning efforts described in this report are key inputs or components for the development of a San Diego Association of Governments (SANDAG) 2050 Regional Transportation Plan (RTP) that will comply with SB 375 and federal air quality conformity. This document also includes an overview of the SANDAG transportation and land use model platform.

Developing the 2050 RTP and SCS

With each RTP update, SANDAG starts the planning process by establishing a framework of goals, policy objectives, and performance measures to guide the development of the Plan. The Board of Directors discussed the 2050 RTP vision, goals, and policy objectives to help reach the 2050 RTP goals in fall 2009.

The 2050 RTP goals are structured into two overarching themes: Quality of Travel & Livability, and Sustainability. Quality of Travel & Livability relates to how the transportation system functions from the individual customer perspective (Mobility, Reliability, and System Preservation & Safety), while Sustainability relates to making progress simultaneously in each of the Three "Es" (Social Equity, Healthy Environment, and Prosperous Economy) from a regional perspective.

The 2050 Regional Growth Forecast is the foundation for the transportation analyses conducted for the development of the 2050 RTP. Additionally, numerous studies currently underway will be incorporated into various RTP alternatives, including recommendations from the Urban Area Transit Strategy, Climate Action Strategy, collaborative projects with Tribal Nations, interregional and binational strategies, and other transportation studies. Additionally, the RTP transportation project evaluation criteria are being revised and are expected to be approved by the SANDAG Board of Directors in May, 2010. The evaluation criteria will be used to rank all transportation projects. This will assist the Board of Directors in determining projects to be included in the 2050 RTP and Sustainable Communities Strategy (SCS). Additionally, revenue projections and project cost estimates will be updated.

Scenario testing as part of the greenhouse gas (GHG) target setting also is underway. It is expected that some elements of any of these scenarios being tested could be used in the development of the SCS. While the scenario testing process is being completed to determine the impact on per capita GHG reduction, further analysis would be required if any of these measures were to be adopted as part of the 2050 RTP.

The SCS must demonstrate how the development patterns and the transportation network, policies, and programs can work together to achieve the GHG emission reduction targets, if there is a feasible way to do so. If a Metropolitan Planning Organization (MPO) cannot meet the targets through the SCS, then the MPO is required to develop an Alternative Planning Strategy (APS) that demonstrates how the emission reduction targets could be achieved.

In essence, the SCS includes four building blocks:

1. Land use component that accommodates regional housing needs and includes protection of habitat and farmland;

2. Transportation networks including highways, transit, and local streets and roads;

3. Transportation demand management strategies; and

4. Transportation system management programs and policies.

Initial RTP and SCS alternatives will be developed in summer/fall 2010 in conjunction with receiving the draft GHG reduction target from the California Air Resources Board (ARB) in June 2010. Plan performance measures are expected to be approved by the SANDAG Transportation Committee in June, 2010. In summer 2010, these performance measures will be used to evaluate the initial RTP/SCS alternatives, including an economic analysis. SANDAG will receive the final GHG reduction target from ARB in September 2010.

Based on input from SANDAG Policy Advisory Committees, working groups, and the public, the preferred 2050 RTP/SCS scenario will be finalized in fall 2010 and will be incorporated into the Draft 2050 RTP and Environmental Impact Report (EIR) which are scheduled to be released in early 2011.

2050 Regional Growth Forecast

SANDAG has completed preliminary land use and economic forecast extending to 2050 that will serve as the initial foundation for the region's first SCS. The regional forecast is based on local land use plans and policies, and is meant to reasonably identify where growth is projected to occur in the region over the long-term. The forecast is completed through a multi-step, collaborative process that involves input from local jurisdictions, citizens, and elected officials.

Recognizing that many of the region's general plans will be updated at least once between now and 2050, SANDAG staff worked with each jurisdiction to aggressively identify areas in the region where general plan designations could potentially change before the forecast horizon.

Urban Area Transit Strategy

An important, new component of the 2050 RTP is the development of an innovative and visionary Urban Area Transit Strategy to significantly increase the attractiveness and use of transit, walking, and biking in the region, and to make transit time-competitive with driving a car. Through this project, three transit network alternatives will be developed and tested with ultimate incorporation

of one of the networks (or a combination or variation thereof) into the development of the 2050 RTP.

Airport Multimodal Accessibility Plan (AMAP)

SANDAG is working with the San Diego County Regional Airport Authority (Authority) on the development of a Regional Aviation Strategic Plan (RASP) and an Airport Multimodal Accessibility Plan (AMAP). The Authority is lead for the RASP, which will identify workable strategies to improve the performance of the regional airport system. SANDAG is the lead for the AMAP, which will develop a multimodal strategy to improve surface transportation access to airports. The development of the RASP and AMAP will be a coordinated process between the Authority and SANDAG. The overall schedule is designed to allow the RASP and AMAP to be incorporated into the 2050 RTP.

Other Key 2050 RTP Tasks

Other major tasks include updates to the project evaluation criteria and plan performance measures, economic analysis of investment strategies, enhanced environmental justice analysis, new revenue projections, revised cost estimates for projects and services, and integration of technology and TDM measures into investment strategies. Additionally, the 2050 RTP will be subject to any new requirements established in the upcoming federal surface transportation reauthorization, which is anticipated to be passed in 2010/2011, and will follow updated California Transportation Commission RTP Guidelines.

RTP Public Participation Plan

SANDAG regularly involves the public in regional planning efforts. A public involvement plan has been prepared for the 2050 RTP, and it will be updated as needed as outreach and involvement strategies are underway. On May 22, 2009, the Board of Directors approved the creation of a new Regional Planning Stakeholders Working Group (SWG) to provide input on the development of key work elements in the planning process, including public involvement opportunities. Additionally, there will be a series of public presentations and workshops and other means for involving the public and receiving input on the work products and draft 2050 RTP. The Board of Directors approved the overall agency-wide Public Participation Plan in December 2009. As a cross-section of stakeholders from various sectors and subregions, the SWG contributed to the development of a 2050 RTP Public Involvement Plan and will assist in its implementation.

Modeling for the 2050 RTP

SANDAG anticipates using five models to estimate the greenhouse gas emissions from its SCS and, if appropriate, its APS: (1) Demographic and Economic Forecasting Model (DEFM), (2) Interregional Commute Model (IRCM), (3) Urban Development Model (UDM), (4) San Diego Regional Travel Demand Model (a four-step transportation forecasting model), and (5) the latest EMission FACtors (EMFAC) model from ARB.[1] Depending on model sensitivity to certain transportation policies, SANDAG will consider using off-model factors (or ARB defined Policies and Practices) as recommended by the Regional Targets Advisory Committee (RTAC). The 2050 RTP model will have a base year of 2008.

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

The second model component is the Interregional Commute Model (IRCM). The purpose of the IRCM is to account for individuals who work in the region but live outside its boundaries.[2] The IRCM predicts the residential location of workers based upon accessibility to job sites, home prices, and the availability of residential land. Inputs to the IRCM include future job sites within our region and

[1] See *2030 Regional Growth Forecast Update: Process and Model Documentation* for an in-depth discussion of SANDAG's modeling platform. < http://www.sandag.org/uploads/publicationid/publicationid_833_3750.pdf>. SANDAG has also has included a new truck model, 4-D indicators, and improved tolling methodology in its models since the last RTP and publication of the model documentation.

[2] The updated guidelines of California Government Code 65080(b)(2)(B) require "each metropolitan planning organization [to] prepare a sustainable communities strategy…identify[ing] areas within the region sufficient to house all the population of the region, including all economic segments of the population, over the course of the planning period of the regional transportation plan." The IRCM does not contradict the intent of the statute. The 2050 Regional Growth Forecast identifies areas within the region sufficient to house all the forecasted population, but many workers will continue to choose to live outside the San Diego region and commute to jobs in the region based upon accessibility to job sites, home prices, and quality of life issues.

potential residential sites located in the San Diego region, Orange County, southwestern Riverside County, Imperial County, and Tijuana/Northern Baja California. The model also accounts for relative home prices across the comparison areas. Additional factors include the forecast of housing unit and employment growth from DEFM and commuting probabilities that vary based on the length of the commute. The output from the IRCM is future housing units containing San Diego region workers that would be built in the region, and those that would be built in surrounding regions.

As the third model component, the Urban Development Model (UDM) allocates growth in the region's economic and demographic characteristics to jurisdictions and other geographic areas within the region. UDM satisfies the federal requirements specified in the Clean Air Act and the Safe, Accountable, Flexible, Efficient Transportation Act: A Legacy for Users (SAFETEA-LU). These legislative acts mandate that transportation plans consider the long-range effects of the interaction between land uses and the transportation system. Among UDM inputs are the current spatial distribution of jobs, housing units, income, and population, land use inputs that include the plans and policies of the 18 cities and the County of San Diego, and the current and future transportation infrastructure. Three major premises underlie the UDM forecast of residential activities: employment location is a primary determinant of residential activity location; the longer a work trip, the less likely a person makes the trip; and increased residential development opportunities translate to greater residential growth potential. Lastly, the interactions between UDM and the transportation model are handled in a sequential manner.

The San Diego Regional Travel Demand Model, the fourth model component, uses the TransCAD software package to forecast travel activity. The transportation model requires two major inputs. The first input is the forecast of housing and nonresidential land uses from UDM. The other key input is the highway and transit system networks. The transportation model uses travel behavior surveys as the basis for the mathematical models in each of the steps. There are four steps to the transportation model. The model generates person trips, then determines trip destinations using a gravity-based model, allocates these trips to various modes, and finally assigns vehicle trips to highway networks and transit trips to transit networks.

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

Emissions Modeling

The latest version of EMFAC (currently EMFAC 2007) and the Pavley I / Low Carbon Fuel Standard post-processing tool will be used to calculate the greenhouse gas emissions for the SCS based on the transportation model outputs. The transportation model post processes highway and transit assignment information to create EMFAC input files containing vehicle trips by vehicle class and fuel type, VMT by vehicle class and fuel type, and VMT speed distributions by vehicle class and hour. The

current version of EMFAC projects the following greenhouse gas pollutants: carbon dioxide (CO_2), carbon monoxide (CO), nitrous oxides (NO_x), total hydrocarbons (THC), and methane (CH_4). SCS targets will be measured in tons of CO_2.

Feedback in the Regional Travel Demand Model

A noteworthy feature of the forecasting and modeling process is the feedback of information from one model to another. For example, information from DEFM is used in the IRCM and then the output from the IRCM is used to modify the output from DEFM. Similarly, data from UDM are major inputs to the transportation model, and then transportation model data are used in subsequent UDM calculations. A key feature of our modeling system is the central role that land use and transportation policies play in determining future travel patterns and the associated location of people, houses, and jobs.

SANDAG Modeling Constraints

While SANDAG strives to stay at the forefront of the state of the practice in modeling, some transportation and land use policy decisions to manage GHG emissions cannot be modeled in the SANDAG Regional Travel Demand Model. These policy scenarios fall into four main categories: cultural shifts, technology breakthroughs, aesthetic (or perception) improvements, and exogenous variables.

Cultural shifts in travel are events that can not be predicted based on historical data. For example, traditional travel demand models in the 1960s and 1970s were not able to accurately model long term travel trends because they did not appropriately account for women entering the labor force in substantial numbers. Future potential cultural trends that are difficult to model include a delayed retirement age or travel activities of large retired population.

Technology breakthroughs are events or eras when travel is affected by major technological advancement. This advancement can be in the form of a new mode choice introduction (e.g. steam locomotive to air travel to high-speed rail) or new technology revolution that affects people's daily activities. The Internet has significantly impacted travel behavior around the world through e-commerce and telecommuting. Future technology breakthroughs include more fuel efficient cars, low cost, high-speed long-distance point-to-point service, and further advancements in telecommunications.

Aesthetic improvements are where future trends cannot be measured well. For example, SANDAG recently completed a Transit Impediments Study identifying personal perceptions of transit including safety, cleanliness, and surroundings. The SANDAG Travel Demand Model is primarily an econometric model that balances travel choices on the basis of cost and time. Adding additional

law enforcement or maintenance staff to monitor transit facilities may impact personal perceptions of safety and cleanliness aboard transit and positively affect transit mode share, but those impacts would not be captured within the SANDAG Travel Demand Model. Similar perception changes would be equally hard to model for highway, bicycle, and pedestrian mode choices.

Finally, exogenous variables impact travel in the San Diego region, but San Diego policymakers have little to no control their implementation or effect. Exogenous variables include the relative economic strength of Mexico, international border security, changes in international trading patterns, global warming, and natural disasters. For example, travel patterns across the international border between San Diego and Baja California changed dramatically after September 11, 2001 as result of increased border security. These impacts could not be adequately predicted in the SANDAG travel model or land use model.

Off-Model Techniques to Measure GHG

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

RTP Consistency with RTAC Target Setting Process

SANDAG anticipates using the same methodology described in this report to calculate GHG emissions for the RTP and its SCS as well as the current GHG target setting process as outlined by the RTAC. SANDAG may revise the methodology used in the RTP in consultation with ARB if updated software (e.g. EMFAC 2010) or a more accurate methodology becomes available after the RTAC target-setting process.

Addressing GHG Emissions in the 2050 RTP

SANDAG will use the modeling methodology outlined in this document to calculate GHG emission for 2020 and 2035 for the SCS as required by California Government Code 65080. The time period after 2035 of the SANDAG 2050 RTP is not subject to SB 375 at this time. As the RTP is being developed, SANDAG will work with the appropriate federal and state agencies to ensure its RTP conforms to all applicable state and federal regulations for the entire time period of the Plan.

Methodology for Identifying Emissions from Interregional Trips

SANDAG gathered data for VMT percentages by trip end location (internal or external) that could be applied to EMFAC output for VMT and CO_2 by vehicle classification. The primary purpose of this exercise was to evaluate emission sources by trip end location as identified in the RTAC report.[3]

First, all vehicle trip tables from the TransCAD 4-Step model are aggregating across all time periods and vehicle modes. In the case of SANDAG, each of three temporal trip tables (AM peak, PM peak, off peak), with four automobile mode choices (single-occupancy vehicle (SOV) toll, SOV non-toll, high-occupancy vehicle (HOV) toll, HOV non-toll), are aggregated to create a total traffic analysis zone to traffic analysis zone (TAZ to TAZ) trip table. To determine a VMT percentage by trip end SANDAG develops an approximate VMT estimate by multiplying the TAZ to TAZ trip table by the TAZ to TAZ network distance. The resultant matrix is partitioned by X-X, I-I, I-X, and X-I by extracting the sections that corresponded to external or internal TAZs. Finally, the summed total VMT by trip end is divided by the total regional VMT to determine the percentage of each trip end type as a percentage of total VMT.

Using the latest version of EMFAC, SANDAG computes the regional travel across all vehicle types and extracts the total VMT and CO_2 emissions for LDA, LDT1, LDT2, and MDV. The values for VMT and CO_2 are multiplied by the regional percentages from the four-step model to produce the VMT and CO_2 by trip end location and EMFAC vehicle class.

Model Improvement Plan

The SANDAG Travel Demand Model is maintained and operated in a two-phase cycle based on the federal RTP requirements. SANDAG is required to adopt an RTP every four years to comply with federal air quality conformity requirements. During the four-year interval, model runs and analysis for the RTP development take approximately 18 months to complete. While model runs for the RTP are being performed, the modeling process (software and methodology) are effectively "frozen" from change. This process allows SANDAG technical and planning staff to compare model results from early in the process with results at the end of the process with consistent modeling assumptions. In the two and a half years between modeling for the RTP, SANDAG staff embarks on an ambitious update schedule for its land use and transportation models. Since the completion of the last RTP, SANDAG has added a truck travel model, enhanced pricing and mode share analysis, and implemented an integrated 4-D model.[4]

[3] Regional Targets Advisory Committee. "Recommendations of the Regional Targets Advisory Committee (RTAC) Pursuant to Senate Bill 375: A Report to the California Air Resources Board." Page 26.

[4] Additional information is available on SANDAG's long-term model improvement program in the SANDAG Model Improvement Plan. <http://www.sandag.org/uploads/publicationid/publicationid_1451_10066.pdf>