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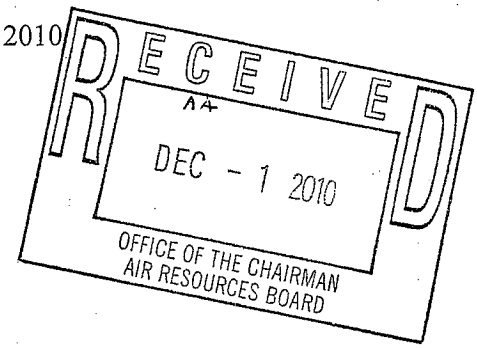

Ms. Mary Nichols
Chair
California Air Resources Board
1001 I Street
Sacramento, CA 95812

RE: Sustainable Communities Strategy Technical Methodology

Dear Ms. Nichols:

Please find enclosed a summary of the technical methods the Metropolitan Transportation Commission (MTC) plans to use in the development and analysis of our sustainable communities strategy as required by Senate Bill 375 (SB 375). We seek your approval of this approach as required by California Government Code Section 65080(b)(2)(J)(i).

MTC and the San Francisco Bay Area have a long history of progressive environmental stewardship. MTC intends to continue this tradition by adopting a sustainable communities strategy that meets the greenhouse gas emission target set for the Bay Area by the California Air Resources Board. The regional transportation plan/sustainable communities strategy will utilize the best components of previous regional planning efforts and will include the types of robust analyses presented in the attached document. The approached described therein fully complies with SB 375.

If you have any questions about the enclosed document, please feel free to contact me at 510-817-5700.

Sincerely,

Steve Heminger
Executive Director

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MTC/ABAG Technical Methodology to Estimate Greenhouse Gas Emissions

Per Senate Bill 375 (SB 375), the Metropolitan Transportation Commission (MTC) and the Association of Bay Area Governments (ABAG) submit the following description of the technical methods we intend to use in the estimation of greenhouse gas (GHG) emissions for MTC's 2013 regional transportation plan.

1. Introduction

Every four years, MTC develops a regional transportation plan that both sets forth a regional vision of how the public transport sector will respond to expected growth patterns and meets federal requirements related to air quality conformity. SB 375 expands the mandate of the regional transportation plan by requiring that transport projects and policies be developed in concert with land use policies and strategies, such that the resulting GHG emissions meet a target set by the California Air Resources Board (CARB). If the plan adopted by the MTC meets CARB's target, then the plan becomes the region's "sustainable communities strategy" (SCS); if the plan does not meet the target, then MTC must develop an "alternative planning strategy" (APS) that demonstrates how the GHG target can be achieved.

As the federally-designated metropolitan planning organization, SB 375 requires MTC to develop and formally adopt either an SCS or APS. ABAG, which serves as the council of governments for the nine counties and 101 cities and towns in the San Francisco Bay Area, performs the regional housing needs assessment (RHNA). Per SB 375, the housing goals established by the RHNA process for the next eight years must be integrated with the SCS. As such, MTC and ABAG will work in close partnership during the development of the SCS.

In regards to technical activities, ABAG will develop and apply methods to estimate future year land use patterns; MTC will develop and apply methods to estimate future year travel patterns. As described below, MTC and ABAG intend to implement integrated planning tools that allow for the estimation of land use and travel patterns through time, with each acting on the other.

MTC and ABAG intend to develop the SCS via two distinct rounds of engagement and analysis. First, we will work with local jurisdictions to create an unconstrained vision scenario that combines dense land use patterns with supportive transportation investments. This scenario will be compared via quantitative measures to both a base year (2005) and forecast year base case. The results of the comparisons will be discussed with stakeholders, elected officials, and the public to determine the Bay Area's preferred approach moving forward.

After building some degree of consensus, MTC and ABAG will build more constrained detailed scenarios that respond to the desires of stakeholders received in the first round tests. Here, we will use our full arsenal of analytical tools – outlined below – to describe how travelers and developers interact with transport supply under detailed policy contexts.

The environmental impact report (EIR) will include the preferred alternative as well as other alternatives per stakeholder interest. The expected schedule for the above activities is as follows:

- Oct 2010 – Feb 2011: Vision scenario development and analysis;
- Mar 2011 – Feb 2012: Detailed SCS scenario development and analysis;
- Mar 2012 – Apr 2013: Environmental impact report preparation and review.

Please also see the Appendix to this document, which presents a graphic overview of our process.

The remainder of this document first describes the technical details of our modeling approach and then explicitly determines the sufficiency of the approach in the context of SB 375 guidance.

2. Technical Methodology

At the time CARB sought input from MTC and ABAG to inform the GHG target setting process, both agencies were in the middle of overhauling our respective analytical tools. As such, the methods used to inform the GHG targets will differ from the methods used to estimate GHG reductions for MTC's next regional transportation plan. Here, a brief overview of the methods used to inform the GHG targets is presented; the methods to be used for the sustainable communities strategy/regional transportation plan are discussed next in the section labeled *Modeling Approach for Sustainable Communities Strategy/Regional Transportation Plan.*

A. Modeling Approach for Target Setting

Prior to Senate Bill 375, ABAG produced and MTC consumed *Projections* data, which are bi-annual land use forecasts. These forecasts are generated by two planning models, specifically (i) *Henry*, which uses input/output-based methods to estimate employment growth, a cohort-survival method to estimate population growth, industry-sector-based statistical models to allocate employment growth to counties, and policy-sensitive measures to predict in-migration and interregional commuting; and, (ii) *Clara*, which allocates jobs and housing to census tracts, based on available land. The *Henry* and *Clara* analytical tools are buttressed with extensive outreach and discussion with local jurisdictions.

MTC's *BAYCAST-90* travel demand model[1] takes, as an input, the land use data produced by ABAG in the *Projections* series. To inform the GHG target setting process, MTC used the *Projections 2009* (current, at the time) forecasts for the 2005, 2020 and 2035 model years. The *BAYCAST-90* travel model is of the traditional, "four-step, trip-based" archetype, with trip generation, trip distribution, travel mode choice, and trip assignment steps. The resident travel model system includes a handful of innovations, including (i) a joint household automobile ownership/number of workers model, which estimates the distribution of households in each travel analysis zone (using nine categories: zero auto, zero workers; one auto, zero workers; …; two or more autos, two or more workers); and, (ii) a simple time-of-day choice model, which predicts, via a binary logit model, whether or not commuters will travel during the two-hour morning and evening peak periods.

BAYCAST-90 generates spatially- and temporally-specific estimates of roadway usage and speed. This information is then input into an emissions model to estimate emitted criteria pollutants as well as carbon dioxide and other greenhouse gases. MTC used the latest version of CARB's emissions factor, or EMFAC 2007, software to estimate these quantities.

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[1] Detailed documentation is available here: http://www.mtc.ca.gov/maps_and_data/datamart/forecast/baycast1.htm.

B. Modeling Approach for Sustainable Communities Strategy/Regional Transportation Plan

As mentioned above, MTC and ABAG are currently in the process of introducing new tools to our analytical framework. On the land use side, ABAG will first use similar methods as previously utilized and described above to produce the *Projections* data to create a land use "base case". The one difference is that a simple, so-called "shift-share" (it estimates the *shift* in the *share* of jobs forecast for the country that will locate in the Bay Area) method will be used to estimate future year employment. The other components of *Henry*, along with *Clara*, will again be used in conjunction with extensive outreach to local jurisdictions to locate and describe households and jobs at the census tract level of geography. To test scenarios, a land use model named *Steelhead* will be integrated with MTC's travel model (described in the next paragraph). The *Steelhead* model is a spatially-explicit economic model that first predicts the location of economic activity, and then simulates the land consumption behavior of developers. *Henry* and the "shift-share" model will inform *Steelhead* with a gross estimate of economic growth and *Clara* will assist *Steelhead* in allocating activities to census tracts. *Steelhead* operates through time, estimating the location of economic activity in one-year intervals. In scenario testing, *Steelhead* will periodically query the MTC travel model for measures of transport impedance (i.e. the difficulty of moving between A and B), thus allowing economic location decisions to respond to transport projects and policies.

On the travel model side, MTC will be replacing the *BAYCAST-90* model system with a so-called "activity-based" model system referred to as *Travel Model One*. *Travel Model One* operates on a synthetic population that includes representative households and persons for each actual household and person in the nine-county Bay Area – both in the base year and in forecast years. A series of travel-related choices are simulated for each household and person within each household; these choices are as follows:

- Usual workplace and school location – Each worker, student, and working student in the synthetic population selects a travel analysis zone in which to work or attend school (or one zone to work and another to attend school);
- Household automobile ownership – Each household, given the household location and demographics as well as each members' work and/or school locations, decides how many vehicles to own;
- Daily activity pattern – Each household determines, together, the daily activity pattern of each household member, the choices being mandatory (go to work or school), non-mandatory (leave the house, but not for work or school), or stay at home.
- Work/school tour frequency and scheduling – Each worker, student, and working student decides how many round-trips they will make to work and/or school, and then schedules a time to leave home for work and/or school as well as a time to return home;
- Joint non-mandatory tour frequency, party size, participation, destination, and scheduling – Each household determines the number and type (e.g. to eat, to visit friends, etc) of "joint" (i.e. two or more members of the same household traveling together) non-mandatory (i.e. not work or school) round trips in which the household will engage, then determines which members of the household will participate, where and at what time the tour (i.e. the time leaving home and the time returning home) will occur;

- Non-mandatory tour frequency, destination, and scheduling – Each person determines the number and type of non-mandatory (e.g. to eat, to visit friends, to shop, etc) round trips to engage in during the model day, where to engage in them, and at what time the simulated person leaves and returns home;
- Tour travel mode – The tour-level travel mode choice decision is simulated for each type of tour, and represents the best mode of travel for the round trip;
- Stop frequency and location – Each traveler or group of travelers decide whether to make a stop on an outbound (from home) or inbound (to home) leg of a travel tour, and if a stop is to be made, where the stop is made, all given the round trip tour mode;
- Trip travel mode – A trip is a portion of a tour, either from the origin to a stop, a stop to another stop, a stop to a destination, etc, and a separate mode choice decision is made for each trip, doing so with awareness of the prior tour mode choice decision;
- Parking location choice – For each vehicle trip destined to a location that charges for parking (a model input), the traveler must choose a parking location;
- Assignment – Vehicle trips for each synthetic traveler are aggregated to build time-of-day-specific matrices that are assigned via the standard static user-equilibrium procedures to the highway network; transit trips are assigned to time-of-day-specific transit networks.

The *Travel Model One* system inherits without modification the *BAYCAST-90* representation of interregional and commercial vehicle travel. MTC did, for the first time, undergo a formal comparison of interregional travel with our neighboring metropolitan planning organizations, specifically the Association of Monterey Bay Area Governments (AMBAG), the San Joaquin Council of Governments (SJCOG), and the Sacramento Area Council of Governments (SACOG). The exercise demonstrated that each of the MPOs is generating fairly consistent estimates of interregional travel; MTC will continue this practice moving forward until the state is able to provide consistent estimates of interregional flows from a state-wide travel model.

Independently, *Steelhead* and *Travel Model One* offer numerous advantages over the previous approach. Specific examples of *Steelhead* advantages include:

- Any manner of land use policies can be tested within *Steelhead*, including the impact of zoning changes, developer incentives/disincentives, and urban growth boundaries.
- After determining whether or not a city is willing to accommodate a certain amount of growth, the model explicitly represents whether or not market conditions exist for that growth to be realized.
- Developer behavior is explicitly modeled, leading to the impact of land markets noted above, but also leading to more nuanced developer behavior, such as the combining of parcels to facilitate larger and more economically viable developments.

Specific examples of *Travel Model One* advantages include:

- Household members consider the choices of each other when making individual travel choices;

- Scheduling decisions for all travel are explicitly modeled and are impacted by congestion;
- The decision to use a high-occupancy toll lane is explicitly modeled and considers the individual traveler's value-of-time; .
- The micro-simulation framework in which individual households and persons are modeled facilitates a wide variety of equity analyses.

When integrated, *Steelhead* and *Travel Model One* offer the ability to explicitly model the interaction of land use and transport, i.e. transport projects will influence the location and intensity of residential and commercial development over time. This approach is a significant step forward from past practices in that it can, among other things, more completely assess the issue of "induced demand".

Air Quality Conformity

In a manner similar to *BAYCAST-90*, *Travel Model One* generates spatially- and temporally-specific estimates of roadway usage and speed. This information is then input into an emissions model to estimate emitted criteria pollutants as well as carbon dioxide and other greenhouse gases. MTC intends to use the latest version of CARB's emissions factor, or EMFAC (2007 at the time of writing), software to estimate emissions.

Per the 1990 Clean Air Act, the proposed regional transportation plan must conform to the latest U.S. Environmental Protection Agency transportation conformity regulations and the Bay Area Conformity State Implementation Plan. The San Francisco Bay Area is currently designated as nonattainment for the national 8-hour ozone standard; a maintenance area for the national 8-hour carbon monoxide standard; and a nonattainment area for the national 8-hour fine particle ($PM_{2.5}$) standard.

Off-Model Analyses

A regional travel model such as *Travel Model One* is not the best tool for describing all types of traveler behavior. In certain instances, we may look beyond the boundaries of the travel model in an attempt to best inform decision makers as to the likely impact of certain policies. For example, *Travel Model One* does not explicitly represent the decision of a traveler to telecommute on the typical day described by the model. As such, the tool may not be ideal for estimating the impact of telecommuting programs on greenhouse gas emissions. A better approach may be to examine the telecommuting research literature for estimates of the efficacy of telecommuting programs relative to reducing vehicle travel.

When undertaking such "off-model" analyses, we will take great care to document our assumptions and clearly justify our approach.

Public Participation Plan

The MTC Public Participation Plan (PPP)[2] will guide outreach efforts throughout the development of the sustainable communities strategy/regional transportation plan. MTC will

[2] Detailed documentation is available here: http://www.mtc.ca.gov/get_involved/participation_plan.htm

engage with the regional agency working group and other advisory committees, as well as through workshops and public hearings. These efforts will fully comply with federal and state requirements, as well as MTC's own high standards for public engagement.

3. Sufficiency Determination

Two sets of standards have been established to guide regional planning agencies in determining whether or not their selected technical approach is adequate. First, Section 1(e) of SB 375 states: "Current planning models and analytical techniques used for making transportation infrastructure decisions and for air quality planning should be able to assess the effects of policy choices, such as residential development patterns, expanded transit service and accessibility, the walkability of communities, and the use of economic incentives and disincentives." The MTC/ABAG analytical approach, as described above, can provide robust insights into each of the example policies listed in SB 375.

The second standard, from *Recommendations of the Regional Targets Advisory Committee (RTAC) Pursuant to Senate Bill 375: A Report to the California Air Resources Board*, states that "a rigorously tested and validated travel demand model with well documented expert peer review will add to the credibility of greenhouse gas estimates." MTC is currently taking *Travel Model One* through a rigorous validation process for two model years; following validation, MTC will embark on a robust model testing program and then seek the guidance of an expert peer review panel. ABAG is currently testing and validating *Steelhead*. Extensive documentation will be developed for each model system.

Appendix: Sustainable Communities Strategy Process Flow Chart

Sustainable Communities Strategy (SCS): Planning Process

OneBayArea Staying on Target

Three Es, Goals and Targets
March 2010 — January 2011

Economy + Environment + Equity

- Greenhouse Gas Target
- Regional Housing Target
- Transportation-Land Use Performance Targets

Scenario Assessment

Round One: Initial Vision Scenario
October 2010 — February 2011

- Local Land Use Information
  - Projections 2009 Update
  - Priority Development Area (PDA) Assessment
- Base Case Scenario
- Start Round One Vision Scenario

Land Use Strategies
- Focus growth in PDAs
- Jobs-housing balance/fit
- Infill development
- Transit supportive development

Transportation Strategies
- Transportation 2035
- Countywide transportation plans
- Transit Sustainability Project
- Pricing strategies
- Potential new revenues
- GHG reduction strategies

Scenario Definition → Analysis → Results

Round Two: Detailed SCS Scenarios
March 2011 — February 2012

25-year Growth Assignment Process/ 8-year Regional Housing Needs Assessment

Land-Use Considerations
- Job formation/growth
- Existing local land-use plans
- Appropriate Priority Development area densities
- Reassess MTC TOD policy
- CEQA streamlining
- Environmental justice

Transportation Considerations
- Transit Sustainability Project
- Transportation project performance
- Pricing strategies
- Technology
- Transportation Demand Management

Scenario Definitions → Analysis → Results → Preferred SCS Scenario

Assessment of Constraints
- Transportation funding availability
- Prior RTP funding commitments
- Housing market factors
- PDA infrastructure needs
- Affordable housing subsidies
- Public acceptance

Plan Technical Analysis and Document Preparation
March 2012 — April 2013

Draft Plan

Technical Analyses
- Environmental Impact Report
- Transportation Conformity Analysis
- Other Analyses

Performance Indicators → Performance Monitoring

Final Plan

ABAG Regional Planning Committee | MTC Policy Advisory Council | Regional Advisory Working Group | Executive Working Group | County and Corridor Working Groups

Ongoing Public and Local Government Engagement (May 2010 through 2013)

November 2010