

LOCAL TRANSPORTATION MODEL CONSISTENCY GUIDELINES

SANTA CLARA COUNTY TRANSPORTATION AUTHORITY
CONGESTION MANAGEMENT PROGRAM

ADOPTED | JANUARY 1995

UPDATED | MAY 2009

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Santa Clara Valley Transportation Authority CONGESTION MANAGEMENT PROGRAM

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Introduction

On January 1, 1995, the Santa Clara Valley Transportation Authority (VTA) was designated as the County's Congestion Management Agency. The Congestion Management Program (CMP) legislation requires that congestion management agencies develop a uniform database and model for evaluating transportation impacts of land-use decisions consistent with the regional model and databases, and that the CMAs approve any computer models use by the member jurisdictions for these purposes. The Santa Clara VTA has developed a Countywide Transportation Model (Countywide Model) that is consistent with the methodologies used by the Metropolitan Transportation Commission (MTC) Regional Travel Demand Models and databases, and therefore meets the intent of the Congestion Management Program (CMP) requirements in Santa Clara County. This document presents the process to be used by member agencies to develop local (subarea) transportation models that are consistent with the Countywide Model and to describe the process used by the VTA to evaluate and certify local model consistency. Local jurisdictions are required to complete a consistency finding if the local models are to be used for CMP facility transportation impact analysis in Deficiency Plan analysis. If a local jurisdiction is developing a travel demand model that includes a traditional four-step process to evaluate landuse and transportation changes to forecast General Plan updates and other major development/roadway impacts (which could also have inter-jurisdictional implications), the VTA will require a consistency finding. Local jurisdictions that develop local traffic models using vehicle trip-generation rates to evaluate local intersection impacts not with the typical four-step modeling process will not be required to develop a model consistency finding.

It should be understood that local transportation models are not expected to exactly replicate the results of the Countywide models, just as the Countywide model is not expected to replicate the MTC Regional models. Instead, local models must be developed using information and techniques consistent with those used by the Countywide models, and the results of the local models must be reasonably consistent with the Countywide models. One of the most important reasons for differences between the local and Countywide models is that the local models typically include much finer detail in the transportation networks and socioeconomic databases. Thus the local models will be more effective in evaluating certain local conditions, such as intersection level-of-service and arterial roadway operations, than the larger Countywide models.

Therefore, the VTA encourages local jurisdictions to prepare more local subarea models to address local transportation planning needs and issues.

The purpose of this document is to describe the process the local agencies should consider in order to develop models consistent with the VTA Countywide models, and the steps that will be required to certify model consistency. It should be noted that local jurisdictions can use the VTA Countywide models directly by requesting the data and model application scripts prepared by VTA modeling staff and then running the models in-house. However, this would primarily represent a useful starting point, as the local jurisdictions may want to add more network and model detail in order to accomplish local-level analysis. In addition, there would still be a requirement that the local jurisdictions prepare and provide documentation to VTA staff in order to document model consistency.

Chapter 1. VTA Transportation Model and Database Requirements

1.1 Definitions

A transportation model is an analytical tool that predicts travel patterns based upon spatial relationship between socio-economic characteristics of population and employment locations, tripmaking and economic-related activities in those areas and interconnecting transportation facilities, including roadways, transit and bicycle and pedestrian modes of travel.

The databases are comprised of input data that is used by the transportation models to generate travel demand. For the Countywide models, there are three basic types of input data:

- Land use and socioeconomic data in each traffic analysis zone (TAZ), including population, households, employed residents and jobs by category,
- Characteristics of the transportation system, such as number of lanes, speed, capacity, transit stops and frequencies,
- Pricing characteristics such as parking costs, transit fares and auto operating costs.

Since the database consists of the basic input data required by the transportation models, the database and model together are oftentimes simply referred to as the transportation model.

1.2 Statutory Requirements

The CMP statute, specifically California Government Code 65089 (c), states the following:

The agency, in consultation with the regional agency, cities, and the county shall develop a uniform database on traffic impacts for use in a countywide transportation computer model and shall approve transportation computer models of specific areas within the county that will be used by local jurisdictions to determine the quantitative impacts of development on the circulation system that are based on the countywide modeling assumptions and conventions.

The computer models shall be consistent with the modeling methodologies adopted by the regional planning agency. The databases used in the model shall be consistent with the databases used by the regional planning agency. Where the regional agency has jurisdiction over two or more counties, the databases used by the agency shall be consistent with the database used by the regional agency.

The statute implies two levels of consistency. First the countywide models and databases must be consistent with the MTC regional models and the Association of Bay Area Governments (ABAG) socioeconomic databases. And second, the local transportation models and databases must be consistent with the VTA Countywide models.

In addition to developing a countywide model for the VTA, the CMP statute requires that the CMA approve computer models used by the local jurisdictions to determine transportation impacts of land-use decisions on the CMP system. In order to be approved by the VTA, local transportation models must meet consistency tests with respect to the VTA Countywide model and databases. It is important to keep in mind that consistency is not defined as replication. There may be valid reasons for local models to use assumptions and methodologies that differ from those used by the VTA Countywide models. However, assumptions that differ from those used by the Countywide model must be documented and identified as characteristics specific to the local jurisdiction model. Prior to the use of different local model assumptions, it is recommended that the local jurisdictions coordinate with VTA modeling staff to discuss specific local assumptions and ensure there are valid reasons for applying such assumptions.

1.3 Model Consistency Requirements

In order to assure the consistency of a local transportation model with the VTA model, the following basic elements must be followed:

- The transportation models must be of a form that can produce the following:
 1. Person trip productions and attractions by traffic analysis zone,
 2. Person trip distribution,
 3. Mode choice (or mode split factoring, if applicable), and
 4. Vehicle assignments.
- The transportation models must be able to produce AM and PM peak hour (or 3-hour or 4-hour peak period) vehicle volumes from the assignment process.

Including all of these elements at a minimum will ensure that a consistent evaluation of the local transportation models can be provided.

1.4 Database Consistency Requirements

In order to assure the consistency of a local transportation model database with the VTA model database, the following basic elements must be followed:

- The socioeconomic databases used by the local jurisdiction in the local models are required to be consistent with the VTA databases for areas outside of the local jurisdictions sphere-of-influence. Within the local jurisdiction, different socioeconomic data assumptions can be used provided there is adequate documentation.
- The transportation network database used by the local jurisdiction model must be consistent with the VTA CMA system of roadways, at a minimum, outside of the local

jurisdiction sphere-of-influence. Within the local jurisdiction, additional network detail can be added provided there is adequate documentation.

- Local models should be validated with existing count data for a base year.

Including all of these elements at a minimum will ensure that a consistent evaluation of the local transportation databases can be provided.

Chapter 2. VTA Transportation Model and Databases

This section describes the VTA Countywide model and databases. It also outlines how the VTA model may be used by local jurisdictions to develop the local transportation models.

2.1 VTA Model Documentation

The VTA Countywide models have been recently updated and will be formally documented in a Technical report to be produced in the first quarter of 2009. This document will be made available to local jurisdictions as a reference manual regarding model methodologies, data inputs and model outputs. This document will summarize the traffic analysis zone system, socioeconomic data inputs, network assumptions and model outputs summarized in a format for use by the local jurisdictions in the development of the local transportation models. In addition to VTA model documentation, local jurisdictions are encouraged to obtain and review MTC model documentation.

2.2 Socioeconomic and Network Databases

The VTA produces electronic versions of the Countywide model socioeconomic databases and transportation networks and distributes these elements to local jurisdictions regularly. Socioeconomic data and network data is distributed to local jurisdictions free of charge when requested. Currently, VTA maintains socioeconomic databases developed from ABAG Projections 2007 series datasets allocated to the smaller traffic analysis zones in Santa Clara County. VTA works with the local jurisdictions to verify, and if required modify the allocations of socioeconomic inputs within each jurisdiction received from ABAG. VTA currently maintains zonal socioeconomic data for the years 2005, 2015, 2030 and 2035 reflecting ABAG Projections 2007 datasets. These files exist in DBF formats and in GIS shapefiles, and are distributed to local jurisdictions upon request. It should be noted that VTA implements biennial updates of the socioeconomic databases as the new ABAG projections become available. Once the ABAG Projections 2009 datasets have been incorporated into the VTA model structure, forecasts years will be expanded to include 2005 through 2035 in 5 year increments, consistent with ABAG.

Transportation networks used by the VTA are consistent with assumptions made by MTC, with some refinements to reflect local conditions, particularly for the transit networks. These networks are continually reviewed and updated and are available for the years 2005, 2015, 2030 and 2035, and are consistent with assumptions made by both MTC and VTA to include projects funding in the Regional Transportation Plan and VTP 2035. These data sets can be distributed in DBF format, shapefile format or in the CUBE network format.

2.3 Use of the VTA Model Data in Local Jurisdiction Models

The VTA Countywide model is implemented in the CUBE Voyager software package. While it is not a requirement that local jurisdictions use the CUBE software, there are many advantages to implementing local models in CUBE. The VTA Countywide model input data and actual model data files can be used by local jurisdictions when developing local transportation models. In some cases, local jurisdictions may use the VTA Countywide model files (for example networks and trip tables for highway assignments) directly if no additional detail is required for certain analysis. However, if additional detail is required in the local models, the VTA Countywide model files and model scripts can be purchased at a nominal fee for direct use by the local jurisdictions. This price does not include purchase of the CUBE software package, which must be purchased separately by the local jurisdiction. Since there are a variety of options that can be pursued by the local agencies when developing a local transportation model, it is recommended that the local agencies consult with VTA staff prior to actual model development.

Chapter 3. Local Transportation Model Consistency Guidelines

This section describes the guidelines to be followed by the local jurisdictions when developing local models to ensure as reasonably practical that the local models are consistent with the VTA Countywide models and apply basic standard modeling methodologies. These guidelines will be used by the VTA to evaluate and approve the local transportation models.

3.1 Land Use and Socioeconomic Databases

The local models must use land use and socioeconomic databases consistent with the databases published and used by the VTA. VTA currently uses the ABAG Projections 2007 data series, allocated to the 1490 VTA Countywide model traffic analysis zones from the larger 366 Santa Clara County MTC regional model zone structure. However, local jurisdictions are free to use earlier versions of ABAG Projections series subject to documentation of such use. Local jurisdictions must respect the Sphere-of-Influence (SOI) control totals of population, households and jobs as documented by ABAG Projections for adjacent jurisdictions. However, within the jurisdiction SOI, for local modeling and planning purposes, the local jurisdictions are free to update the local areas with updated socio-economic data (population, households, jobs, etc.) if the updates to base year data can be verified with ground truth information, i.e., actual counts of housing units and jobs and verification through the base year model validation results. Local jurisdictions can split VTA traffic analysis zones, however, these new local zones must nest within VTA traffic analysis zones. Local jurisdictions can aggregate VTA Countywide model zones outside of their respective jurisdictions (provided socioeconomic data control totals are preserved) if required, however, this may require recalibration of the trip distribution and mode choice models, which must be documented.

3.2 Transportation Networks

The local models must use roadway and transit networks consistent with those published and used by the VTA. The local transportation model must include all elements of the CMP networks and network attributes both within the jurisdiction and with Santa Clara County, however, network detail may be aggregated outside of Santa Clara County. The local model must at a minimum distinguish between the following roadway types:

- Freeways,
- Expressways,
- Freeway ramps (metered and un-metered),
- Arterials, and
- HOV facilities.

Additional roadway categories deemed appropriate may be added by the local jurisdiction.

If transit networks are to be developed, the local model must at a minimum distinguish between the following transit submode types and use VTA Countywide model coding conventions (coding conventions will be provided in the model documentation):

- Heavy rail,
- Commuter rail,
- Light rail,
- Express bus,
- Local bus,
- Community bus, and
- Free shuttles.

Supporting transit subnetworks for walk-access and drive-access links also must follow VTA Countywide model coding conventions.

3.3 Trip Purposes

The local models must separately represent and describe internal trip purposes. The Countywide models use the following trip purposes:

- Home-based Work,
- Home-based Shop/Other,
- Home-based Social-Recreational,
- Home-based Grade school,
- Home-based High school,
- Home-based College/University,
- Air-passenger to San Jose Mineta International Airport, and
- Non-home-based

The local jurisdictions are free to recommend additional internal trip purposes or combine trip purposes (with the exception of home-based work trips) if they are felt to be important components of local travel, however, these additions must be documented. External trips made to and from outside of the 13-County VTA model region should be consistent with those assumptions used by the VTA Countywide models.

3.4 Trip Generation

Trip generation models estimate the magnitude of trip productions and trip attractions, or trip-making activity, made within each TAZ. The local transportation model must provide an estimate of person trip productions and attractions for each trip purpose, and these must be estimated by using the VTA trip generation equations. The local jurisdiction can recommend use of different trip generation equations, however, justification and documentation will be required. Local models are not required to adhere to trip generation production and attraction control totals

that precisely match the VTA Countywide model totals, but rather, the resulting local model productions and attractions should be a function of the socioeconomic data inputs.

3.5 Trip Distribution

Trip distribution models are used to determine the direction of travel, or flows, of person trips made between each TAZ. The local models shall provide separate trip distribution models for each trips purpose. Home-based work trip distribution shall use congested travel times as the measure of impedance, or a combination of peak and off-peak travel times weighted to peak times. Non-work trip distribution models will use either off-peak travel times as the impedance measure or a combination of peak and off-peak travel times, weighted to off-peak times. Trip attractions shall be balanced to trip productions. If applicable and practical, the local jurisdictions shall report County-to-County and MTC superdistrict-to-superdistrict summary tables of trips by purpose from the trip distribution models. The use of and values of any trip distribution k-factors used in the local models will also need to be documented.

3.6 Mode Choice/ Mode Split

Mode choice models split out the person trips into the different modes of travel, including drive-alone, carpools, transit bike and walk modes. The local models must at a minimum split out the total person trips into the various modes of drive-alone auto, shared-ride 2 person auto, shared-ride 3+ person auto, transit, bike and walk. Local models are free to use either mode split factors derived from the VTA Countywide models to develop trips by mode, or use the VTA Countywide model mode choice model equations. Any mode choice constant recalibration shall be documented by the local jurisdictions. Local jurisdictions should report trips by mode developed from the local models at the County-level for comparison to the VTA Countywide model results.

If mode choice models are implemented by the local jurisdictions, travel input parameters used in mode choice must be consistent with the VTA Countywide models, including at a minimum the following elements for base and forecast years:

- Auto operating and maintenance costs,
- Auto terminal times,
- Parking costs,
- Transit fares, and
- Tolls

3.7 Time-of-Day Factors

Time-of-day factors are used to split out the daily trips into the vehicle trips used in the assignment process. Local models should at a minimum develop peak hour vehicle trips for the

AM and PM peak hour time periods. The local jurisdictions should use the VTA Countywide model time-of-day factors, however, these may be adjusted in order to achieve more reasonable local validation results. Any revisions to the VTA Countywide model time-of-day factors must be documented.

3.8 Highway Assignment

Peak hour or peak period vehicle trips shall be assigned to the roadway networks using an equilibrium capacity restraint method. Local models should use the VTA Countywide model speed, capacity and volume-delay functions for the highway assignment, however, more local methods may be used if this results in improved validation results. Any departure from the VTA Countywide model assumptions must be documented. The local models should report output vehicle-miles of travel by facility type and selected screenline volumes for comparison to the assignment results of the VTA Countywide models. At a minimum, volume comparisons should be provided for facilities at the Santa Clara County line Screenlines and for a cordon around the local jurisdiction SOI boundaries.

3.9 Transit Assignment

If applicable, transit pathbuilding and assignment procedures used by the local models shall be consistent with methods used in the VTA Countywide models. Daily transit boardings by line for the VTA system should be reported by the local models for comparison to the VTA Countywide model results, if applicable.

3.10 Model Validation

Local jurisdictions must provide a base year validation of both highway and transit volumes, if transit assignments are applicable. VTA will not prescribe validation targets or goals for local models, however, VTA encourages local jurisdictions to apply best practices and follow national (Federal Highway Administration) and/or local (Caltrans and VTA) validation guidelines.

Chapter 4. Local Model Review: Evaluation and Acceptance Procedure

This section describes the procedure for a local jurisdiction to submit the local transportation model for review and approval by the VTA, and describes the evaluation and approval process.

4.1 Model Submission

In order to be evaluated for consistency with the VTA Countywide models and databases, a report must be submitted to the CMA on the local transportation model. The local model report shall include the following information at a minimum:

- Overall structure of the local model and the traffic analysis zone system,
- Trip purposes defined in the model,
- Methodology for the development of land-use and socio-economic databases for the models, and the horizon years presented in the modeling scenarios,
- Development of the transportation networks,
- Methodology and output for trip generation,
- Methodology and output for trip distribution,
- Methodology and output for mode choice or mode split,
- Assumptions for time-of-day factors,
- Methodology and output for vehicle assignments,
- Methodology and output for transit assignments, if applicable,
- Model validation summaries and comparisons to observed data for the base year model,
- Model forecast results, and
- Description and justification for significant differences between the local model and the VTA Countywide models

4.2 Evaluation by VTA CMA Staff

VTA staff will prepare a staff review of the local transportation model report. Working in consultation with local agency staff prior to finalization of the local model review, the findings of the VTA staff review will subsequently be presented at a meeting of the Systems Operations Management Working Group (SOMWG). The SOMWG will make a report to the VTA Technical Advisory Committee, recommending approval or rejection of the submitted model including explicit reasons for the recommendation.

4.3 Technical Advisory Committee (TAC) Review

The TAC will consider the model report submitted to the VTA, the results of the staff review and the report of the SOMWG . The TAC will recommend appropriate action regarding consistency

findings of the submitted model. The TAC may recommend that acceptance of the local model be placed on the consent calendar of the next CMA Board of Directors meeting.

4.4 VTA Board of Director Action

Acceptance of the local transportation models may be placed on the consent calendar of the VTA Board of Directors for action.