

**Pinellas County MPO 2035 Long Range  
Transportation Plan**

**Tampa Bay Regional Travel Demand Model  
Documentation**

**December 9, 2009**

## **Travel Demand Forecasting for the Long-Range Transportation Plan (LRTP)**

The Pinellas County Metropolitan Planning Organization (MPO) uses the Tampa Bay Regional Planning Model (TBRPM) for travel demand forecasting in its transportation planning process. It was used to evaluate the travel demand needs based on the socioeconomic conditions expected to prevail in the planning horizon year of 2035.

The regional model includes five counties and has been developed and maintained through a coordinated process involving state and local transportation and planning agencies. The TBRPM is a four step model currently validated to a base year of 2006 with forecast years of 2025 and 2035 (TBRPM v7.0).

In order to participate in the development, review and oversight of the forecasting process, the Pinellas County MPO is a member of a technical advisory body referred to as the Technical Review Team (TRT). This is part of an overall process for regional transportation planning in the Tampa Bay area. The TRT consists of technical staff representatives from the FDOT District 7, each of the four District 7 MPOs (Hillsborough, Pinellas, Pasco, and Hernando), Citrus County, and other intermodal transportation and travel demand management agencies. The TRT meets bi-weekly and members provide input and review for overall technical guidance in the forecasting process. In addition, the members keep their respective bodies informed of the progress, results and decisions of this group.

To support the regional approach in forecasting travel demand, a letter of understanding was signed by which the three MPOs in the TMA and Hernando County comply with regional TMA requirements. Also, technical responsibilities, lines of communication and review are conducted under the regional planning process of the West Central Florida MPO Chairs Coordinating Committee (CCC) under the supervision of the MPO Staff Directors in the region.

To support the Plan development process, the Pinellas County MPO staff followed the process of reviewing the planning assumptions and forecasting methods with the MPO Technical Coordinating Committee. Interviews were also conducted with local government planning staffs, and elected officials. The MPO Technical Coordinating Committee has had the opportunity to review the goals, objectives and policies which reflect the planning assumptions as well as forecasting methods for socioeconomic data and travel demand.

Because the travel demand forecasting activities of the MPO are based on the use of a regional model, FDOT District 7 Intermodal Systems Development, as coordinator of the modeling activities in the Tampa Bay region, has been

responsible for convening peer review panels for the regional model (TBRPM) before the development of the current model version. An additional assessment was later provided for the transit model. The transit model assessment was conducted in 2007.

The purpose of the transportation model peer review was to evaluate the model's operation and the next phase of improvements to the TBRPM. All aspects of the model were to be reviewed and the panel was given free reign to deliberate in any way they saw fit.

The purpose of the transit model assessment was to prepare findings of the transit model quality assurance and analysis focusing on the model's compatibility with FTA New Starts guidance, the transit model design and methodology, as well as to prepare user benefit tests, and to review user instructions. The following persons participated in the peer review of the model:

TBRPM peer review participants included:

- Thomas Rossi, Cambridge Systematics;
- Ram Pendyala, University of South Florida;
- Rob Schiffer, Post Buckley Schue & Jernigan;
- Bill Olsen, URS Greiner Woodward Clyde; and
- Scot Leftwich, Leftwich Consulting Engineers.

Transit Model assessment participants included:

- Dave Schmitt, AECOM; and
- Jeffrey Bruggeman, AECOM.

The TBRPM recommendations arising from the peer review included:

- Deletion of the Lakeland area from the model;
- Examine possibility of time of day model procedure or peak spreading procedure;
- Separate school trip purposes;
- Separate non-home based trips into work and other purposes;
- Test alternative cross-classification structures and auto ownership models;
- Conduct special generator surveys, separate airport and university purposes, test regional shopping mall special generators;
- Apply recommended trip distribution recommendations; and
- Obtain additional survey data for mode choice model and on-board transit surveys

The Transit Assessment recommendations included:

- Correct path weights and mode choice coefficients as recommended;
- Apply on-board transit survey results to the model; and
- Correct file issues relating to source codes and output file retention.

The current TBRPM was updated in 2008 and 2009. During 2005, the model was converted from the TRANPLAN format to CUBE-VOYAGER. In addition, several changes were also made in 2007 to the mode choice model over the standard FSUTMS models. These enhancements include adoption of a new nested logit structure, and refinements in auto ownership categories.

Additional updates to the travel demand model structure since 2005 included the following:

- Fully implemented Cube Voyager structure with TP+TrnBuild for transit modeling;
- Recalibrated friction factors by trip purpose for DISTRIB calculations;
- Revised light and heavy truck trip friction factors;
- Revised constants and coefficients for the mode choice nested logit model by purpose;
- New nested logit structure with the adoption of the Miami North Corridor mode choice application (separated local and express buses with commuter rail and local rail);
- Use TrnBuild for transit network and assignment with Sidecon/Walkcon/Autocon user defined program for transit connector generation;
- Converted network files to true shape GIS based networks; and
- Enhancement of MOE Reporting for the Cube Voyager Environment.

Currently, the TBRPM functions as a traditional four step model. The four basic steps to the process of travel demand forecasting, include the following:

- **Trip Generation** – The TBRPM utilizes a lifestyle trip generation model to determine the total number of productions for each trip purpose by lifestyle category (Permanent resident, seasonal resident, & retiree) and auto ownership (0, 1, 2, & 3+ autos). Also, employment and enrollment are disaggregated into more detailed categories to determine the number of attractions by each trip purpose;
- **Trip Distribution** – The TBRPM determines the origins and destinations of trips through the application of a gravity model. In travel demand modeling, a gravity equation is used to calculate how strongly trips are attracted to a traffic analysis zone (TAZ) based upon the size/intensity of the land use and its distance from the production TAZ. Travel characteristics are determined from household surveys;
- **Mode Choice** – The TBRPM uses the nested logit model structure in the Mode Choice step to determine how trips will occur. Through this step it is decided whether trips will occur by automobile, or by a transit mode. For highway trips, the Mode Choice step is also used to determine whether the trip maker will drive alone or share a ride. For transit trips, Mode Choice determines what type of transit will be used (local bus, express bus, or fixed guideway transit), as well as access mode; and

- **Trip Assignment** – For the TBRPM, an equilibrium model is used to determine which route highway and transit trips will follow. This step involves selecting the ‘best’ path, which is generally the shortest and/or fastest route between two locations.

In order to calibrate the travel demand modes, information on travel characteristics data was collected by consultant staff. The following surveys were implemented as listed below:

- Household surveys (2000/2007);
- Cordon line surveys (2003/2008);
- Truck attraction survey (2003);
- Seasonal resident surveys (2000/2007);
- Trip attraction surveys (2000);
- Hotel/Motel surveys (2000/2008); and
- Onboard transit surveys (2004/2005).

The trip generation model was enhanced with the complete update of the trip attraction model resulting from a major trip attraction (employer/employee) survey conducted in 2000 and a truck attraction survey in 2003, which provided attraction rates by purpose. For all the person trip purposes, the employee and area type coefficients for the trip attraction equations were updated.

In addition, the trip production rates by lifestyle and purpose were set based on a 2007 Household Travel Characteristics Study. Furthermore, trip production rates were set according to the results from the Seasonal resident survey as well as the Hotel/Motel survey.

For the Mode Choice model, the TBRPM adopted a mode choice model from another urban area, Miami. This mode choice model was used for the Miami North Corridor Studies, and is approved by FTA and fully compatible with the existing framework of FSUTMS.

Calibration targets for auto occupancy were derived from household surveys that were weighted and expanded by trip purpose and auto ownership. The transit target matrix for the transit modes (i.e., local bus, premium mode, park-and-ride and kiss-and-ride) was prepared based upon the on-board transit survey.

In preparation for the LRTP updates conducted in 2009, several of the previous travel surveys were updated and the results were used to calibrate the current travel demand forecasting Model. These included:

- Household surveys (2007);
- Cordon line surveys (2008);
- Hotel/Motel surveys (2008); and

- Express bus surveys (2008).

The 2000 Household Survey was previously performed between February 10 and April 3 to coincide with the 2000 Census and this area's peak for seasonal residents. A random sample of households within the Tampa Bay Region collected a total of 1,977 valid surveys. An update to this survey included the 2007 Household Survey which was conducted as focus groups for each of the 13 types of lifestyles the TBRPM is designed for. A total of 496 additional households were surveyed.

The following table summarizes the total number of highway links within the TBRPM model by Area Type and Facility Type (Functional Classification):

**Numbers of Links in 2006 Network by Facility Type and Area Type**

<b>TOTAL NUMBER OF LINKS</b>						
<b>Facility Type</b>	<b>CBD</b>	<b>Fringe</b>	<b>Residential</b>	<b>OBD</b>	<b>Rural</b>	<b>Total</b>
Freeway	18	14	443	88	45	<b>608</b>
Divided Arterial	60	43	1,709	1,472	28	<b>3,312</b>
Undivided Arterial	41	46	987	224	97	<b>1,395</b>
Collector	136	121	3,401	347	314	<b>4,319</b>
One-Way Facilities	272	156	187	120	0	<b>735</b>
Ramps	16	40	445	114	20	<b>635</b>
Toll Facilities	9	28	287	20	12	<b>356</b>
<b>Total</b>	<b>552</b>	<b>448</b>	<b>7,459</b>	<b>2,385</b>	<b>516</b>	<b>11,360</b>

The 2006 TBRPM transit network consists of the region's four existing transit agencies: the Hillsborough Area Regional Transit (HART) Authority in Hillsborough County; the Pinellas Suncoast Transit Authority (PSTA) in Pinellas County, Pasco County Public Transit (PCPT) in Pasco County, and TheBUS in Hernando County. There was no fixed route transit service in Citrus County in 2006.

A compatible transit network was coded to accurately reflect each scheduled route followed by the buses on the actual street routes to the maximum extent possible. This included designating stops at street intersections, zone loading points, Park-n-Ride locations and at points where transfer to other transit routes were available.

The TBRPM v7.0 has a total of 3000 TAZs with an additional twenty-nine (29) external stations for a total TAZ count of 3029.

Hillsborough County = 758 internal zones, Pinellas County = 741 internal zones, Pasco County = 371 internal zones, Hernando County = 235 internal

zones, and Citrus County = 92 internal zones.

The TBRPM includes a refined set of non-home based trip purposes. These trip purposes were reclassified as the following categories:

- Non-Home-Based Work;
- Non-Home-Based Other;
- Light Truck;
- Heavy Truck;
- Taxi;
- EE Trips; and
- EI Trips.

Non-home based work/other, light truck, heavy truck and taxi are based on attraction equations. Productions for TAZs by each aforementioned purpose are set to be equal to their attractions.

The TBRPM trip attraction model includes 3 area types (CBD, Mature Urban and Suburban, and Suburban Fringe and Rural) and 5 employment types (Industrial, Regional Commercial, Local Commercial, Regional Service, and Local Service).

The truck trip attraction model developed for the TBRPM consists of two equations: one for light trucks and one for heavy trucks. Light trucks typically serve local service and delivery needs, with only limited line-haul uses while heavy trucks primarily serve longer distance line-haul trips.

Non-home based travel is also considered in the estimation of external trips, or through traffic. The external trip module in the TBRPM requires an external trip table that contains through vehicle trips between the external stations of the model. The volumes and characteristics of EE vehicle trips were estimated based upon the cordon line survey.

The Pinellas County MPO recognizes that in addition to person-travel demand growth, the freight and business travel are major components of transportation demand that impact the economic viability and development of the urban area. At the same time, as Pinellas County is reaching buildout, the costs of providing additional capacity have increased dramatically. The MPO uses operational management strategies (ITS/ATMS) and the results of its congestion management program (such as Strategic Corridor Studies) to reduce congestion and prioritize projects. The MPO is also seeking multimodal solutions such as rail transit to reduce person-travel demand capacity needs, and will be using the recommendations of its Goods Movement Study to respond to freight transportation demand in coordination with the results of the ongoing FDOT Tampa Bay Region Goods Movement Study.

The TBRPM trip attraction model includes equations to forecast trips by light trucks and heavy trucks. Light trucks typically serve local service and delivery needs, with only limited line-haul uses while heavy trucks primarily serve longer distance line-haul trips.

Future demand placed on intermodal links are reviewed using measures of effectiveness developed to evaluate the economic impacts on the highway system and transit service such as:

- User costs and average congested travel speed (highway) to major activity centers by roadway segment;
- Comparison of lane miles and average travel speed to major activity centers by transit;
- Percent of freeway lane miles with V/C ratio greater than 1.0 and transit share to activity centers – Productions;
- Transit mode share to major activity centers – Attractions by location; and
- Average Volume/Capacity Ratio weighted by truck Vehicle Miles of Travel (VMT), by facility type.

The Tampa Bay Regional Planning Model (TBRPM) uses measures of effectiveness (MOE) to evaluate community impacts and environmental justice impacts, as well as transit system mode share of the alternatives being tested in support of the transportation plan development process. Those MOE are:

- Highway and bus route miles within and outside environmental justice areas;
- Average trip length by purpose and facility type within environmental justice areas;
- Accessibility to environmental justice areas; and
- Percent mode share by geographic area and transit mode share within the urban service area.

Under Section 174 of the Clean Air Act, it is recognized that the MPO is the designated planning agency to conduct both the continuing, cooperative and comprehensive transportation planning process under Section 134 of title 23, United States Code, and the air quality maintenance planning process required under Section 110 of the Clean Air Act.

In anticipation of the Pinellas County urban area being a part of the presumed area of non-attainment for ozone within the Core-Based Statistical Area, the MPO staff has consulted with the System Planning staffs of FDOT to work in coordination with MPOs to enhance and update the FSUTMS/CUBE travel demand software. Work is already underway to develop a mobile source emissions estimate module to interface with the MOVES Emission Factor Model for use in analyses required by the transportation conformity process.