SOUTHEAST REGIONAL PLANNING MODEL VI
2000 and 2030 Models

TECHNICAL REPORT 2

Model Calibration and Validation

Submitted To:
Florida Department of Transportation - District IV

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January 2008

Commonly Used Abbreviations

AADT	Annual Average Daily Traffic
AM	Peak Period (for reference to Transit model)
AT	Area Type
BCT	Broward County Transit
BO	Broward
BPR	Bureau of Public Roads
BRT/LRT	Bus Rapid Transit/Light Rail Transit
CBD	Central Business District
CL	County Line
COMB	Combination Trucks
CTPP	Census Transportation Planning Package
CV	Cube-Voyager
DA	Drive Alone
DF	Dampening Factor
DU	Disutility/Dwelling Unit
EB	Express Bus
EE	External-External
EI/IE	Internal-External
FDLES	Department of Labor and Employment Security, State of Florida
FDOT	Florida Department of Transportation
FHWA	Federal Highway Administration
FLL	Ft. Lauderdale Hollywood International Airport
FSUTMS	Florida Standard Urban Transportation Model Structure
FT	Facility Type
FTA	Federal Transit Administration
GIS	Geographic Information System
HBNW/HBO	Home-Based-Non-Work/Home-Based-Other
HB-School (HBSCH)	Home Based School
HB-Shop (HBSHP)	Home Based Shopping
HBSocRec (HBSCR)	Home-Based-Social-Recreation
HB-Work (HBW)	Home Based Work
HCM	Highway Capacity Manual
HEVAL	Highway Evaluation Routine
HH	Household
H/M	Hotel/Motel
HOV	High Occupancy Vehicle
IE	Internal-External
IVT	In-Vehicle Time
KNR	Kiss-n-Ride
LB	Local Bus
LOS	Level of Service
MD/MI	Miami-Dade
MD/MIDDAY	Off-peak period (for reference to Transit model)
MPO	Metropolitan Planning Organization
MR	Metrorail
MTF	Model Task Force
MV	Metromover

NCHRP	National Cooperative Highway Research Program
NHB	Non-Home-Based
NHBO	Non-Home-Based-Other
NHBW	Non-Home-Based-Work
NPTS	National Person Transportation Survey
OBD	Outer Business District
OD	Origin-Destination
PB	Palm Beach
PCWALK	Percent Walk
PNR	Park-n-Ride
PT	Public Transportation
PTMS	Portable Traffic Monitoring Sites
QRFM	Quick Response Freight Manual
RMSE	Root Mean Square Error
SEFTCS	Southeast Florida Travel Characteristics Survey
SERPM	Southeast Regional Planning Model
SIC	Standard Industrial Classification
SOV	Single Occupancy Vehicle
SPDCAP	Speed-Capacity
SR	Shared Ride
Std. Dev.	Standard Deviation
STP	Special Tabulation Product
SU	Single Unit Trucks
T	Truck Percent
TAZ	Traffic Analysis Zone
T/L	Trip Length
TOD	Time-of-Day
TMIP	Travel Model Improvement Program
TR	Tri-Rail
TTMS	Telemetered Traffic Monitoring Sites
USDOT	United States Department of Transportation
V/C	Volume over Count Ratio
VHT	Vehicle Hours of Travel
VHT-V/C	VHT Volume over Count Ratio
VIPER	Visual Planning Environment
VMT	Vehicle Miles of Travel
VMT-V/C	VMT Volume over Count Ratio
VPD	Vehicle per Day
YR	Year

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1. INTRODUCTION

The Southeast Regional Planning Model (SERPM) is a multimodal travel demand model covering the three urban counties of Southeast Florida – Palm Beach, Broward and Miami-Dade. In this report, the terms urban and county models are used interchangeably. Version 6 of SERPM (SERPM6) is the latest version and uses Cube-Voyager (CV) and TRNBUILD as the new FSUTMS modeling platform for highway and transit travel estimation. This report describes calibration and validation of the model.

The scope of services written in July 2005 envisioned that there would be some departures from the plan as the Consultants, Department and Citilabs learn more about the evolving CV software, and Citilabs enhances the software. The primary objective of SERPM6 scope was to enhance the model network descriptions so that travel speeds on both highway and transit networks are accurately modeled, and to enhance the model so that consistent speeds are used in every step. The model base year was 2000 and 2030 was the horizon year. A time-of-day (TOD) modeling process was developed to better replicate the variations of travel behavior, traffic congestion, traffic operations and transit operations throughout the day. It was envisioned that the Consultant would perform the following efforts as part of model development:

- Collect and review model data
- Develop highway and transit networks to suit CV modeling process (Voyager and PT)
- Refine travel time estimation process
- Implement a new capacity calculation process
- Model intersection delays (at a minimum, incorporate freeway and ramp intersection delays)
- Develop a TOD model
- Calibrate and validate the model

The Scope of Services specifies the continuation of the Southeast Florida Regional Transportation Planning Travel Characteristics Study to update the Southeast Florida Regional Planning Model and produce the sixth version, SERPM6.

SERPM6 includes "true" time of day modeling, with a peak and off-peak period modeled for all three main trip purposes (HBW, HBNW and NHB). Previous versions of SERPM applied peak skims to all HBW trips and off-peak skims to non-work purposes.

SERPM6 implements varying levels of time-of-day modeling for distribution, transit paths and skimming, mode choice and assignments. Right after trip generation, trips are distributed as peak and off-peak trips. Separate distributions are also made with trips with and without vehicles. Transit peak and off-peak periods are modeled separately. After mode choice, the highway peak period trips are subdivided again to AM- and PM-peak periods. The assignments from all periods are then combined and assigned trips are compared to 24-hour traffic counts, and transit assignments are compared to ridership counts. To evaluate the period model, period specific traffic counts also were assembled and entered into the network database. The three periods, totaling 24 hours that are modeled in SERPM6 are:

1. **AM-Peak Period (6:30-9:30 am)**
2. **PM-Peak Period (3:30-6:30 pm)**
3. **Off-peak Period (9:30 am – 3:30 pm, 6:30 pm – 6:30 am)**

SERPM6 builds on the recent updates of the MPO models as well as SERPM5 (revised). SERPM6 follows the standard 4-step process (trip generation, trip distribution, mode split and assignment) to estimate travel demand. *Trip Generation* determines the total number of trips produced and attracted each day for each trip purpose. *Trip Distribution* finds the number of person trips that go between all pairs of zones. The *Mode Split* step finds the number of trips using each available mode between a production/attraction zone pair. The *Trip Assignment* step determines which route highway and transit

trips will follow. The end results include traffic volumes, and transit boardings, line volumes and mode-of-access data.

SERPM6 included many improvements that were implemented in earlier versions of SERPM. Both 2000 and 2030 MPO models were used to develop the 2000 and 2030 SERPM6 models. Many of the improvements implemented in the MPO models were also carried into the regional model. The regional model has 4,050 internal zones of which 115 are "dummy" zones. These dummy zones provide room for expansion. The dummy zones were numbered as 1567-1600 (34 zones), 2503-2550 (48 zones) and 4017-4050 (33 zones) in Palm Beach, Broward and Miami-Dade counties, respectively. With the external stations there are 4,134 zones.

The SERPM6 transit model includes many features not seen in previous models. One of the he most notable new features is the use of two distinct transit-modeling packages, PT and TRNBUILD. Public Transport (PT) is Cube-Voyager's public transportation module. It was designed to be a multi-path path-builder (i.e., it can recognize and evaluate two or more distinct paths on a single OD interchange). However, discussions with Citilabs indicated that it could operate similar to a single-path path-builder (i.e., similar to FSUTMS-Tranplan). Significant testing during model development indicated that additional enhancements would be needed for PT to operate consistently as a single-path path-builder, as required by the mode choice mode, and as required by FTA for "New Starts" transit studies. It was agreed by the model development team to use TRNBUILD as PT's ongoing enhancement process would exceed SERPM6's development schedule. To minimize the differences between SERPM6 and the forthcoming new FSUTMS transit model standards, it was agreed to use PT for network coding and generating access connectors and TRNBUILD for path building, skimming and assignment. A process within the model stream converts the PT-formatted network and access connectors to TRNBUILD format; users do not have to convert any data.

The process by which the travel demand model is refined until it closely replicates observed travel patterns (both speeds and counts/ridership) is called validation. This report describes the process and results by which SERPM6 was validated to replicate 2000 transportation system conditions. The validated model parameters were then applied and tested with the 2030 SERPM6 model.

1.1 Report Organization

This report is the second of three technical reports and presents the model validation efforts and results of both 2000 and 2030 SERPM6 models. The model was run with CV Version 3.1. In this report, the term calibration and validation are used interchangeably. In fact, calibration and validation are separate tasks, although many transportation planners/modelers try to do both at the same time. Calibration applies to each step in the modeling process, while validation applies to the model as a whole. In calibration, each model step has one or more parameters that can be adjusted to assure that the step is replicating known travel behavior. Very often calibration is performed by statistical methods. Validation primarily involves comparing a base-year forecast to known traffic levels (counts and ridership). A poor quality validation would indicate the need for additional calibration.

This calibration and validation report is divided into thirteen chapters and five appendices.

- Chapter 1, **INTRODUCTION**, describes the model enhancements, model process and report organization.

- Chapter 2, **HIGHWAY NETWORK**, describes new CV network, revised facility and area type codes, the traffic counts, new speed and capacity estimation processes.

- Chapter 3, **EXTERNAL TRIP MODEL**, contains a description of the external model and its validation.

- Chapter 4, **TRIP GENERATION MODEL**, summarizes the key aspects of lifestyle trip generation model, the rates used in the model and the results.

- Chapter 5, **HIGHWAY PATH AND SKIMS**, describes the paths and skims used in model validation.

- Chapter 6, **TRIP DISTRIBUTION MODEL**, provides the description of the enhanced trip distribution model. It then summarizes and compares the key results.

- Chapter 7, **TRANSIT NETWORK, PATH, SKIM AND FARE**, describes the transit network, path, skim and fare. Numerous tables are used to summarize the model results.

- Chapter 8, **MODE CHOICE MODEL**, describes the mode choice model. It uses the revised nested logit structure of SERPM5 (revised version) for mode choice analysis. Numerous tables and figures are used to summarize the model results.

- Chapter 9, **TRANSIT ASSIGNMENT MODEL**, summarizes and compares the results of the transit assignment process.

- Chapter 10, **HIGHWAY ASSIGNMENT MODEL**, describes parameters and results of the assignment process and compares the results against established criterion.

- Chapter 11, **TRUCK ASSIGNMENT MODEL**, describes truck assignment process, and then compares truck loadings and truck counts.

- Chapter 12, **SUMMARY AND CONCLUSION**, provides the highlights of the SERPM6 model validation process.

- Chapter 13, **LIST OF REFERENCES**, provides list of references on recent SERPM, other Florida and other national resources referenced in technical reports of SERPM6.

- Appendix A, **Model CUBE Keys and PROFILE.MAS**, summarizes the model parameters that are either entered as Cube keys or in master profile file (PROFILE.MAS). Both 2000 and 2030 parameters are listed in this appendix.

- Appendix B, **Description of Unloaded and Loaded Network Attributes**, presents the selected parameters of unloaded and loaded highway networks.

- Appendix C, **Selected Validated Model Parameters**, presents the several validated model parameters, which were referenced in this report.

- Appendix D, **Selected Transit Model Summary Results**, presents twelve summary tables of transit models that are referred in chapters 8 and 9.

- Appendix E, **Travel Time and Delay Section Speed Comparison by Period and Direction**, presents detailed summaries of each observed section that are referred in chapter 10.

1.2 Model Enhancement Summary

The development of the 2000 and 2030 Southeast Regional Planning Models represents a new generation of modeling techniques applied to the urban models for Palm Beach, Broward and Miami-Dade Counties. SERPM6 is outgrowth of SERPM5, as modified to respond to issues raised by the Federal Transit

Administration. The transit model also contains some new elements resulting from conversations with the FTA throughout the model development process.

SERPM6 adopts the mode choice structure of the revised SERPM5 model. The original SERPM5 transit model was revised to restructure the modes and to reduce the number of logit constants. FTA has stated that some models are "over specified," and prefers a model that reacts logically to provide reasonable forecasts, rather than one that is calibrated to detailed access/modes and market segments. Revisions to mode structure of the transit model were made to follow good transit modeling practice. Highlights of the changes in the mode structure follow:

- All buses are grouped and assigned TRNBUILD mode codes to distinguish premium and limited stop routes.
- The Metromover mode is separated from Metrorail. Metromover is then assigned to the bus mode.
- A new mode (BRT/LRT) was added.
- Both Park-N-Ride and Kiss-N-Ride nests allow bus and Metromover modes.

SERPM6 is a time-of-day model, is implemented in the Cube/Voyager (CV) platform and uses floating point matrices. All other earlier versions of SERPM were FSUTMS/Tranplan based models and used integer matrices. Separate distributions are made for peak and off-peak periods. The transit part of the model estimates peak and off-peak travel. Later, for highway assignments, the trip tables are further partitioned into AM peak period, off-peak and PM-peak period travel. It includes many of the improvements that were implemented in earlier versions of SERPM. Both 2000 and 2030 MPO models were used to develop the 2000 and 2030 SERPM6 models. Many of the improvements that were implemented in the recent MPO models were also carried into the regional model. Following is a list of the improvements that were implemented in SERPM6:

- SERPM6 includes a new process to estimate the free-flow speeds based on posted speed limits and signalization data. The lookup tables for speeds are completely eliminated.
- The new capacity estimator process emulates the capacities published in the Florida Quality and Level of Service Manual, which is based on the *2000 Highway Capacity Manual*.
- SERPM6 uses the lifestyle trip generation process. A regional version of this model was developed for SERPM5 and numerous revisions were made to fit into the CV process and to read the area types estimated dynamically through CV scripts. Separate production structures were used for the work and non-work purposes.
- The trip generation model implements (1) revised trip attraction rates based on area types and employment categories; and, (2) revised trip attraction rates calibrated from the 1999 Southeast Florida Travel Characteristics Survey.
- The SERPM6 trip generation model has 11 trip purposes. The Non-Home-Based purpose was divided into Non-Home-Based Work (NHBW) and Non-Home-Based Other (NHBO) purposes. An airport purpose was added. The trip production rates of visitors were updated from the 1999 Southeast Florida Visitor Survey.
- The regional trip generation routine separates the zero auto household trips from trips by households with autos. Households with and without autos have different distribution patterns.
- The trip generation process employs time-of-day factors to estimate the peak and off-peak trips by purpose. The initial time-of-day diurnal factors were developed from the 1999 South Florida travel characteristics surveys.
- It implements a new truck model with a structure similar to the one recommended in the Quick Response Freight Manual (QRFM). The truck model includes three truck purposes (four-tired, Single Unit and Combination), treating trucks as a separate mode from generation through assignment.

- It treats internal-external trips as internal trips and improves the modeling of these trips by eliminating the internal-external purpose.
- It includes school trips as a separate trip purpose and uses a refined methodology for school trip distribution.
- The final trip tables were distributed twice; once with free-flow skims and once with congested skims for the peak and off-peak period distribution. Multiple feedback distributions were used for simulation of peak period distribution and for equilibrium of speeds in the peak period pre-assignment.
- Trips for households with autos were distributed using highway skims, while zero-auto households were distributed with transit skims.
- It implements an automated turning routine that manages the traditional turn penalties and prohibitors and generates new penalty records for right, through and left turns.
- SERPM6 implements a logit model to separate the non-motorized trips from the motorized trips. The motorized trips are then used in the analysis of highways and transit. Thus, the number of highway and transit (motorized) trips is sensitive to "walkability" characteristics of the TAZs.
- It implements a policy sensitive highway-only model by restricting the mode-choice set to the auto modes for peak period pre-assignments.
- It develops new transit period models to estimate transit ridership for the peak and off-peak periods.
- It implements three periods (AM peak, PM peak and off-peak) highway models with delays expected at freeway and ramp merges explicitly evaluated.
- SERPM6 implements the facility specific volume-delay functions that were originally used in SERPM4. Separate CONFAC factors were used for each period model. These factors are also facility specific for peak-hour to peak-period ratios. The UROAD factors are used to estimate LOS-E capacity from LOS-C capacity.
- It generates an external truck trip table that is used in a separate truck assignment. The external vehicle trip tables also are subdivided into drive-alone and shared-ride for the High Occupancy Vehicle (HOV) assignment.
- The toll model parameters are rigorously examined and revised for the highway assignments.
- For the regional model, the MPO's employment data were indexed to a common data source (Florida Department of Labor and Economic Security - FDLES).
- It incorporates an HOV model, where access to the HOV links is controlled using access links.
- The model explicitly evaluates delays that are expected to occur at freeway-ramp merges.
- SERPM6 has a built-in mode choice constant update process, which adjusts constants to match observed modal targets.
- The revised SERPM5 and SERPM6's "Grouped/Incremental" mode structure has significantly fewer constants to validate. User has the option to use expanded geographical constants that provide user more control of over origin-destination of transit trips, if necessary.
- Some of SERPM5 user-written programs were converted to Voyager programs.

The SERPM6 transit model includes many improvements over the previous SERPM5 edition. Revisions were made to follow good transit modeling practice and the latest FTA New Starts requirements. The changes made to the mode choice programs revolved mainly around the changes made to the transit network, path and assignment steps. However, some of the changes to the current version of the model are

comprehensive rather than "piece-meal" adjustments. Some notable changes to the transit model are as follows:

- Reviewing and modifying transit networks, including…
    - Maintaining a single transit route file for peak and off-peak periods in PT format,
    - Restructuring the mode definitions, and
    - Separating out the rail platform of the fixed-guideway systems (Tri-Rail and Metrorail) from the bus platform on the street layer to take into account the time it take to move up the escalator ("escalator time") from the street to the rail platform;
- Reviewing and adjusting to auto-to-transit speed curves;
- Reviewing transit paths, including…
    - Revising the AUTOCON program to include the station cost on the access paths,
    - Building walk and transfer non-transit connectors using PT in FSUTMS-Voyager,
    - Modifying transit path parameters ("favorable/unfavorable" run time factors, maximum run time, number of transfer, and transit path "cliffs", etc.), and
    - Building transit paths and skims in TRNBUILD;
- Revising the mode choice module, including…
    - Modifying trip distribution process for zero-auto households slightly,
    - Revising the mode choice and non-motorized programs according to the changes in the model structure;
- In transit assignment,
    - Developing a new user-written program to summarize the transit assignment results and
    - Performing time-of-day transit assignment; and
- Converting some SERPM5 user-written programs to the native Voyager environment.
- The model implements Tri-Rail fares based on the number of fare zones traveled.

1.3 Model Process

The model includes both transit and highway modes. The highway component of SERPM6 estimates traffic for three periods (AM Peak, PM peak and off-peak). The transit model of SERPM6 produces true peak and off-peak estimates. In addition, period estimates are automatically summed to produce 24-hour model estimates. The model with transit modes in this report is referred to as the "full" model. Many of the SERPM6 model features are different from the standard FSUTMS. The most notable ones are listed below:

Trip Generation:

- Zonal data are kept in the TAZ shape file DBF
- The method estimates trips for the standard FSUTMS purposes, plus school, airports and trucks - eleven trip purposes
- Employment is indexed to BEBR data to rationalize MPO employment data
- Lifestyle trip generation is used for each county, where productions and attractions are estimated on the basis of zonal households, persons, workers vehicles and presence or absence of children
- The attraction model uses employment and households and dynamically estimated area types
- Ps and As are combined and balanced using a revised special generator process
- Generation and distribution are run separately for households with and without autos

- Trips for households with and without autos are maintained are distributed separately
- Productions and attractions are allocated to either the peak period or the off-peak period at the trip generation stage of model stream

Network:

- A CV network represents the transportation network
- Speeds and capacities are calculated from roadway attributes
- Area types other than CBD are dynamically estimated from the density of population and employment

Highway Paths:

- Turn penalties and prohibitors include a generalized procedure for left and right turns and through movements

Distribution:

- Public school (school district-based) trip tables are created from the school files
- Peak and off-peak period trips are distributed separately
- The model uses a policy sensitive highway-only mode choice analysis
- The pre-assignment uses congested highway skims
- Peak period feedback loops for distribution, mode-choice and assignments are used to produce "stable" congested speeds for distribution and transit skims

Transit Network, Path and Skim:

- A single transit route file in PT format is used in the transit network model
- Transit connections at fixed guideway stations have detailed micro-coding
- Transit-only links were coded in the highway network
- The station data are coded on the highway network nodes
- The transit speeds curves were modified with the time of day speeds
- Walk connectors and transfer connectors are generated using PT's GENERATE function
- A revised custom-written program generates auto connectors
- The PT2TRNB program converts PT network to TP+ TRNBUILD network
- Transit path, skim and assignment use the TRNBUILD routine.
- Fares are incorporated mimics the complex fare structure of the transit system
- Fare-zone based Tri-Rail fares are used
- Paths and skims are created for peak and off-peak period walk and auto access to (1) bus and mover, (2) BRT/LRT (new mode), (3) Metrorail and (4) Tri-Rail

Mode Choice:

- Zero-auto household trips are distributed separately
- Non-motorized trips are removed from the trip table
- Includes an "incremental" nested logit mode-choice structure with fewer constants
- The nested logit model is applied by purposes and periods
- The mode choice routine includes a process to update modal utility constants to match a file of transit target ridership

Period Model Trip Tables:

- Uses post mode-choice factors to estimate AM, PM-peak trip tables

Highway Assignments:

- Uses multiple volume-delay functions
- Assignments are multimodal (drive alone, shared ride and trucks) using the iterative equilibrium method
- Warm-up assignments to explicitly estimate ramp and freeway merge delays

- Uses separate assignments for each period

Highway Evaluation:

- Produces county specific evaluation outputs for cars and trucks
- Produces separate period evaluation outputs

Transit Assignments:

- Produces true period-specific transit assignments

As in SERPM5, a truck model (generation, distribution and assignment) was implemented. The truck trip table developed by the distribution model contains internal-internal and internal-external trips by periods. In fact, internal-external trips are part of internal-internal trips. The external-external truck table is first constructed by Frataring the external-external vehicle trip table. The truck trip table is then assigned to the network simultaneously, with drive-alone and HOV autos, based on the link travel times iteratively adjusted in the multimodal equilibrium assignments.

The overall structure of the model is shown in the form of a flowchart in **Figure 1-1**. It has 13 component modules. The macro flowchart identifies all the user-supplied input files that are used by each of the modules. It also shows all the SERPM6 specific programs used in these modules. Users should consult sections 2.4 and 2.6 of Technical Report 3 (Model Application Guidelines) for detailed description of the each input/output files as well as custom-written programs. A brief description of the 13 main modeling modules is presented below. These components are processed in a serial fashion to complete the travel demand simulation.

1. **PILOT** – Creates CONTROL.MAS, TITLE.MAS files and error reporting files
2. **EXTERNAL** – Creates EE matrices by time periods (peak-AM/PM and off-peak)

3. **TRIP GENERATION**
   1. Creates P/As by trip purposes (11) and HH car categories (all cars, 0-car, 1+cars)
   2. Separates trips by periods (peak, off-peak)
   3. Computes/Uses density based area types

4. **HIGHWAY NETWORK** - Computes
   1. Free-Flow speeds (New Process) and
   2. Capacities (New process)

5. **HIGHWAY PATHS AND SKIMS** – Develops …
   1. Automated turning penalties, and
   2. Low and High Occupancy (LOV/HOV) Free-Flow (FF) Skims for GM and Mode Choice (Highway-Only & Full Version)

6. **DISTRIBUTION**
   A. Peak Period – Implements two feedback loops of distribution, motorized trips, highway-only (HO) mode-choice; pre-assignment and congested skims as follows:
      1. Performs a free-flow distribution of AM peak period trips
      2. Separates motorized trips from non-motorized trips
      3. Runs the HO mode choice model
      4. Performs an AM peak period pre-assignment
      5. Develops (LOV/HOV) congested skims for the gravity model and mode-choice run
      6. Performs congested flow distribution for peak period trips
      7. Develops trip tables for final mode-choice
      8. Develops combined loaded network for use in congested transit path and skimming

Figure 1-1: **Model Macro Flow Chart**
Southeast Regional Planning Model VI

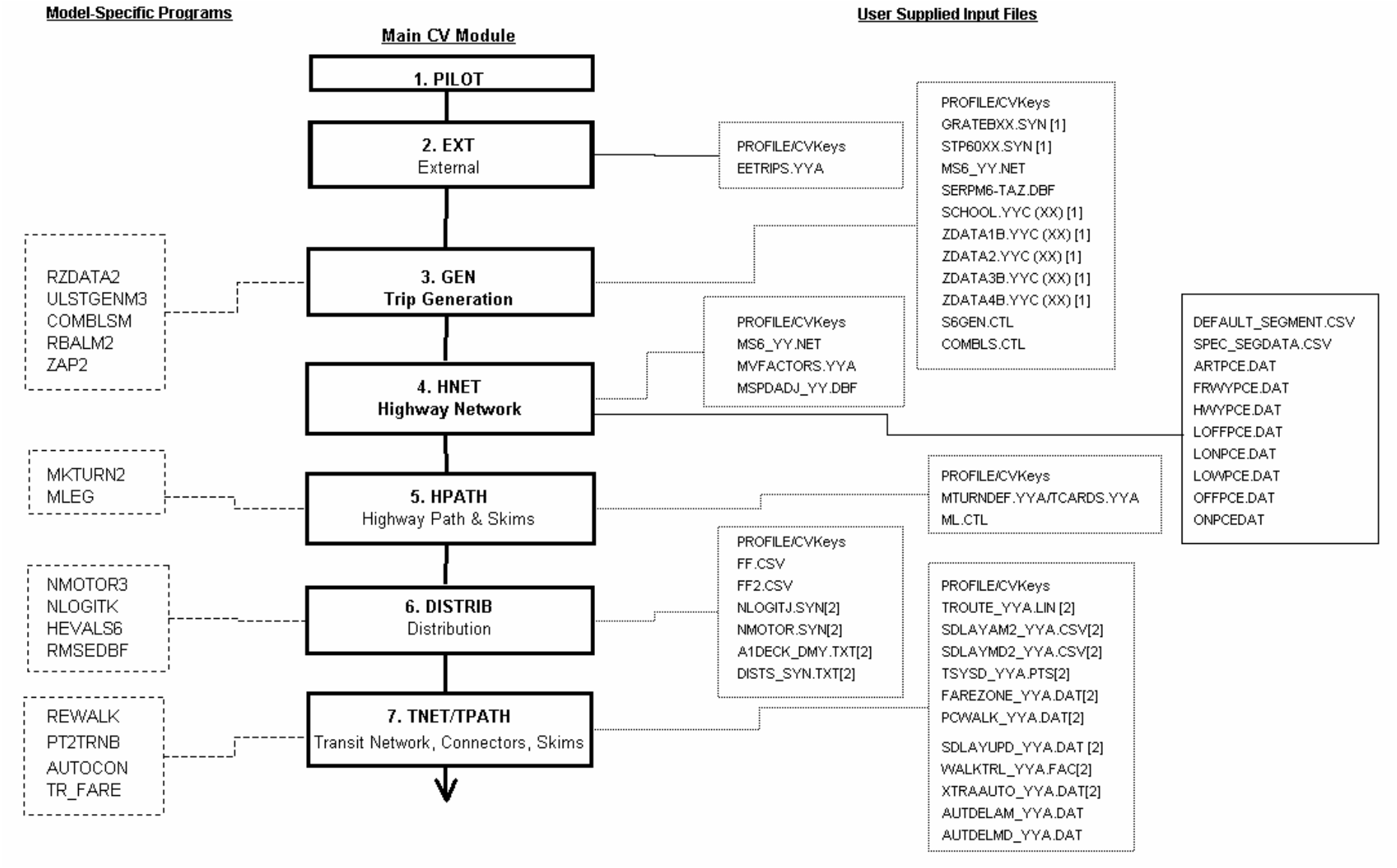
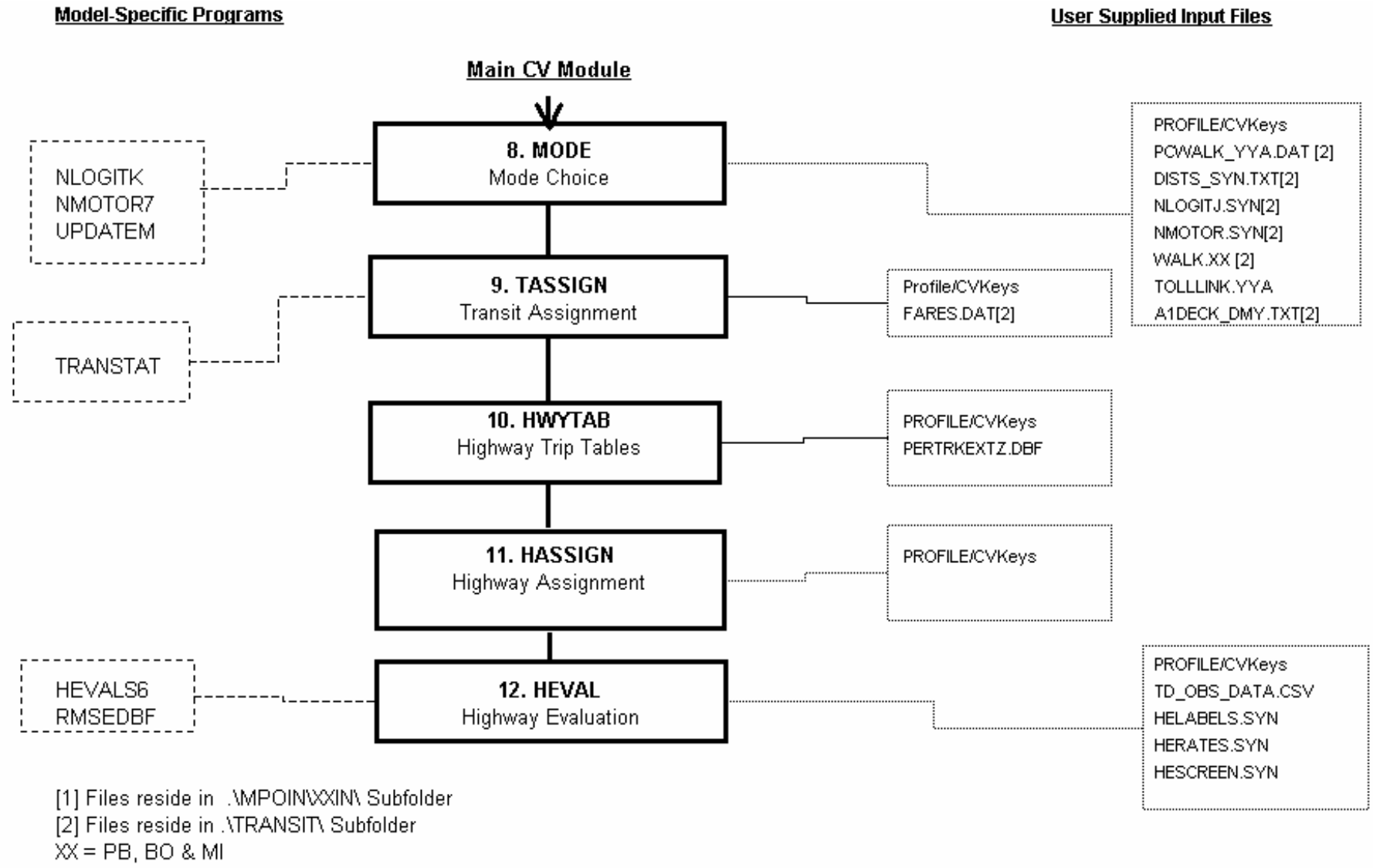


Figure 1-1 (Continued)



B. Off-Peak Period

9. Performs FF Distribution of off-peak period trips
10. Develops trip tables for final mode-choice

7. **TRANSIT NETWORK, CONNECTORS, PATHS AND SKIMS** – Develops
   1. Network and Connectors by period (peak and off-peak) – PT based
   2. Transit Path and Skims by mode, access and period – TRNBUILD based

8. **MODE CHOICE**
   1. Performs zero-car household trip distribution for peak- and off-peak periods
   2. Separates motorized and non-motorized trips for each period
   3. Combines peak and off-peak motorized trips
   4. Runs full seven-purpose mode choice program
   5. Develops peak and off-peak transit trip tables

9. **TRANSIT ASSIGNMENT**
   1. Performs peak and off-peak transit assignments by access and path – TRNBUILD based
   2. Develops line and link summaries

10. **HIGHWAY TRIP TABLES** – Develops three (AM, PM and midday) highway trip tables by level of auto occupancy, and truck trips.

11. **HIGHWAY ASSIGNMENT**
    1. Performs multi-class highway assignments (warm-up and final) for each of three periods
    2. Computes freeway and ramp merging delays
    3. Renames period loaded attributes and apply correction for truck units
    4. Combines period specific loads for 24-hour loading

12. **HIGHWAY EVALUATION** – Performs
    1. Period-specific HEVAL/RMSE summaries,
    2. 24-hour HEVAL/RMSE summaries by region and counties,
    3. Truck summaries, and,
    4. Additional tabulations

The SERPM6 catalog keys have different values for the base 2000 (validation) and 2030 cost-feasible model runs. **Appendix A** has complete description of each of the catalog keys. SERPM6's PROFILE.MAS file, which now only controls operations for the trip generation and a few mode-choice parameters, is presented in **Appendix A**.

1.4 Model Update Summary of SERPM 601 and 602

The initial Southeast Regional Planning Model Version 6 (SERPM6) was updated to address concerns that were identified in the face-to-face meeting with FTA. The updated version (SERPM601/602) removed the "spline function" that was used in SERPM6. The transit nesting logit coefficients in the lowest nest were flipped to ensure that the nesting coefficients decrease at each of the lower nest compared to higher level nests. Three user written programs (PT2TRNB, NLOGITK and AUTOCON) also were modified. The changes in these programs include:

PT2TRNB

- Removed fixed guideway (rail) spline function for headway adjustments

AUTOCON

- Added Auto Operation Cost (AOC) which was missed in the original SERPM6 release
- Included parking costs that are now adjusted by inflation and auto occupancy factors

NLOGITK

- Fixed a do loop that is correctly performed UB calculations
- Changed UB data file floating-point variables from R*8 to R*4 and double-checked all other data file variables for consistency
- Changed the MINRUN report echo from "minutes" to "miles"
- Flipped the sign of constants echoed in IVTT-equivalent minutes
- Eliminated double-counting of Auto Operation Costs (AOC)
- Removed the $3 parking cost for KNR Metrorail paths only
- Corrected NHB parking cost in PNR Metrorail paths
- Made KNR paths have 1.5 fewer minutes of station terminal time (i.e., fixed value) than the equivalent PNR path, assuming that more walking time was required for parking than drop-off
- Corrected reporting of a few detailed mode-choice ASCII outputs

In addition, both 2000 and 2030 networks were updated to include the following changes:

- Change the Culmer Metrorail station parking cost to 9999 and change ACTIVEFLAG to zero
- Change ACTIVEFLAG on all KNR-only stations (i.e., those with PARKINGCOSTAM/MD=9999) to zero

The model mode choice utility constants were revalidated with the changes described above. This memorandum reports the revised constants (see **Tables 8-7** and **Figure C-1**).

In the SERPM602 model, a new key (FARESTRUC) was added to handle the transit fares for years other than 2000 and 2030. The values of this new key for 2000 and 2030 models are set as BASE and FUTURE, respectively. For any interim year model run, the value of this key should be FUTURE. Transit fares for the 2030 model used 2006 transit fares and an INFL1 (Transit fare inflation) parameter from PROFILE.MAS (a value of 0.85), which converts the 2006$ fares to 2000$. If the FARESTRUC key is set to FUTURE, users should not change the value of INFL1 for interim years.

The highway model results of SERPM601/602 are nearly identical to those of SERPM6. On the other hand there are some changes in the transit results. The most pronounced changes occurred in the Tri-Rail ridership estimates for the 2030 model runs.

2. HIGHWAY NETWORK

The SERPM6 highway network is a Cube Voyager format network and can be viewed using VIPER. The network was built initially from the MPO networks and then updated during the course of model validation. The input networks of Palm Beach and Broward CV networks, while that of Miami-Dade was a TRANPLAN based network. **Table 2-1** presents the zone and node correspondence of the MPO and regional networks. There are enough gaps in node and zone numbers for the each MPO in the regional numbering system. Users should use these unused zone and node numbers for any alternatives where additional network coding is required. The nodes numbers of 30,000 or more are used for transit only nodes and are coded after initial networks were built.

Numerous new attributes were added to the network for both highway and transit modeling. **Table B-1** of Appendix B describes the attributes of the unloaded highway network. The highway network consists of general use links, toll links and restricted use facilities, which are limited to Highway Occupancy Vehicles (HOV).

The facility and area types of SERPM6 network are very different than those of the previous SERPM versions as well as the MPO models. The SERPM6 model uses new processes for the speeds and capacities of the network. The user-coded turning penalties and prohibitors are entered in MTURNDEF file. The toll plaza characteristics data are directly read from CV network (see items 28- 36 of **Table B-1**). Users should consult Technical Report 3 (Model Application Guidelines) for details of any input and output files.

This study incorporates the standard FSUTMS Toll Facility Model with a few revisions for the delay computation. In general, the toll model accounts for increases in travel time and cost on toll links representing both the delays associated with toll plazas and imposition of a toll. High Occupancy Vehicle (HOV) lanes are represented as special links. HOV lane information includes type of access control.

2.1 Revised Facility and Area Type Codes

The SERPM6 highway network uses revised facility and area type classifications. These new classifications are required to incorporate the new processes initial model speeds and capacities. The new area type coding is an enhancement and the users are not required to code any area type other than CBD area types. The area type codes are now based on zonal properties are either calculated or read from the TAZ attributes.

After the initial networks were built, the networks were refined to include the new facility types. The new facility type definition came from developing of new capacity calculation process. The revised facility types (FTC1 and FTC2) along with other attributes for capacity calculation are shown in **Table 2-2**.

A revised "dynamic" area type was coded on the networks. The area types shown on TAZ layer DBF file (see SERPM6.DBF) are for display purposes. The process extracts the existing area types (AT2_OLD or AT1_OLD) from the network primarily to identify CBD areas. It then calculates the activity density based area types for all the non-CBD areas using following equation.

$$ADEN(I) = [POP(I) + B * EMP(I) / AREA(I) = PDEN(I) + B * EDEN(I)$$

Where,

ADEN(I)	= activity density in zone I
POP(I)	= population in zone I
EMP(I)	= total employment in zone I
AREA(I)	= total "usable" area of zone I in acres
PDEN(I)	= population density in zone I
EMP(I)	= employment density in zone I
B	= regional population to employment ratio

Table 2-1: **MPO and Regional Zone and Node Correspondence Table**
Southeast Regional Planning Model VI

TAZ/Node	County	MPO Model Low		MPO Model High	REGIONAL Model Low		REGIONAL Model High	Offset	Extra Regional Dummy
	Palm Beach (PB)	1	-	1566	**1**	-	1566	0	
INTERNAL	Broward (BO)	1	-	902	1601	-	2502	1600	
TAZ	Miami-Dade (MD)	1	-	1466	2551	-	**4016**	2550	
	PB	1567	-	1597	1567	-	1597	0	1598-1600
DUMMY	BO	NONE			2503	-	2550	0	
TAZ	MD	1467	-	1500	4017	-	4050	2550	
	PB	1598	-	1619	**4051**	-	4072	2453	
EXTERNAL	BO	903	-	943	4073	-	4113	3170	
TAZ	MD	1501	-	1521	4114	-	**4134**	2613	
NODES-2000	PB	1667	-	9038	**4998**	-	12369	3331	
Network [*]	BO	1001	-	7976	13001	-	19976	12000	
	MD	1522	-	9925	21001	-	**29404**	**19479**	
NODES-2030	PB	1667	-	9177	**4998**	-	12508	3331	
Network [*]	BO	1001	-	8057	13001	-	20057	12000	
	MD	1522	-	10077	21001	-	**29556**	**19479**	

[*] Additional regional nodes (numbers >= 30,000) were added to network after initial network development process.

Table 2-2: **Facility Type Codes and Capacity Calculation Attributes**
Southeast Regional Planning Model VI

FTC1: MAJOR Classification	FTC2: MINOR Classification	Capacity Lookup Table	Capacity Calculation Attributes							Capacity Adjustment Attributes		
			FREEWAY (FRWY)	UNINTERRUPTED (UNINTRP)	HOV	KTOLL	LOWSPEED (LOWSPD)	SIGNAL SPACING (SIG_SPACE)	POSTED SPEED (POSTSPD)	TWOWAY	DIVIDED	LEFTTURN
10 FREEWAYS	11 Freeway Segments	FRWYPCE.DAT	1									
20 UNINTERRUPTED ROADWAYS	21 Uninterrupted Segments	HWYPCE.DAT		1				> 1.5	>40	X	X	X
40 HI-SPEED (Arterials)	41 >= 35 MPH	ARTPCE.DAT						<= 1.5	>=35	X	X	X
50 CENTROID CONNECTORS	51 Internal	n/a										
	52 External	n/a										
60 LOW SPEED (Collectors)	61 < 35 MPH	LOWPCE.DAT					1		< 35	X	X	X
70 RAMPS	71 On	ONPCE.DAT										
	72 Loop On	LONPCE.DAT										
	73 Off	OFFPCE.DAT										
	74 Loop Off	LOFFPCE.DAT										
	75 Freeway-to-Freeway (included in FRWY)	FRWYPCE.DAT	1									
80 HOV	81 Freeway Segments	FRWYPCE.DAT	1		1							
	82 Uninterrupted Segments	HWYPCE.DAT	1		1							
	83 AM and PM Peak Only Ramps	**n/a**			**1**							
	84 AM Peak Only Ramps	**n/a**			**1**							
	85 PM Peak Only Ramps	**n/a**			**1**							
	86 All Day Ramp	**n/a**			**1**							
90 TOLL	91 Freeway Segments	FRWYPCE.DAT	1			1						
	92 Uninterrupted Segments	HWYPCE.DAT	1			1						
	93 On	TONPCE.DAT				1						
	94 Off	TOFFPCE.DAT				1						
	95 Toll Plaza	n/a				1						

NOTES:

1. Posted Speed and Signal Spacing determine the "Uninterrupted" designation for Non-Toll and Non-HOV facilities.
Toll and HOV facilities are considered to be freeway segments. CDs, Expressways, and Parkways are considered Uninterrupted regardless of posted speed.

2. All possible variables/adjustments are shown here; some may not be triggered for a given link depending on whether the roadway is divided, is oneway and/or has a left-turn bay.

Three types of exception areas (water, parks, and roadway right-of-way) were excluded to define the "usable" areas. The new area type for each of the subject links is based on zonal activity densities of TAZs with an influence area of one mile of distance from the link middle point. The population and employment of all TAZs within one mile of radius are accumulated to define this new density based area types. All these calculations are done in Cube-Voyager scripts. Users do not need to code any area types other than the CBD area that is determined from the existing area types. The new density based area types (SATx) of SERPM6 model are shown in **Table 2-3.**

Table 2-3: **Density Based Area Type Description**
Southeast Regional Planning Model VI

Area Type (SATx)	DESCRIPTION	ADEN/Acre Range
SAT1 (Existing AT1-CBD)	**CBD**	**Existing CBD (not variable)**
SAT2 (Comparable to AT2-Fringe)	**High Density (non-CBD)**	**More than 49.6**
SAT3 (Comparable to AT4-OBD)	**Medium Density (non-CBD)**	**>22.9 & <=49.6**
SAT4 (Comparable to AT3-Residential)	**Low Density (non-CBD)**	**>3.1 & <=22.9**
SAT5 (Comparable to AT5-Rural)	**Very Low Density (non-CBD)**	**>=0 & <=3.1**

In order to compare the model VMT statistics for the 2000 and 2030 models, it is necessary to know the changes in the lane-miles between these models. A summary of the lane miles and system miles by the facility types were made for the whole region and each of the counties separately. **Table 2-4** presents these summaries along with changes and percent changes between the 2000 and 2030 SERPM6 networks.

There are 13,666 and 16,498 lane-miles of roadway for the 2000 and 2030 SERPM6 networks. High Speed Arterials (FTC2=41) have the highest number of lane miles (8,957 in 2000 and 10,143 in 2030).

For the SERPM region, there are 21% and 9% increase in lane-miles and system-miles between 2000 and 2030, respectively. By facility type, the percent changes in lane-miles vary from 13% (High Speed Arterials) to 170% (HOV facility). Among the counties, percent changes in lane-miles and system-miles are higher in Palm Beach County (36% - lane-miles, 15% - system-miles) and lowest in Broward County (12% - lane-miles and 2% - system-miles). These statistics reflect the coding conventions that were used in each county as well as the planned improvements.

Table 2-4: **Comparison of Lane-Miles and System-Miles of 2030 and 2000 Networks by Facility Type**
Southeast Regional Planning Model VI

0. ALL Counties

Facility Type	Year 2000 Model				Year 2030 Model				Growth (2030/2000)	
	Lane Miles	% Lane Miles	System Miles	% System Miles	Lane Miles	% Lane Miles	System Miles	% System Miles	Lane Miles	System Miles
1. Freeway (11)	1,225	9.0%	362	8.4%	1,420	8.6%	366	7.8%	1.16	1.01
2. Uninterrupted Roadways (21)	319	2.3%	117	2.7%	570	3.5%	123	2.6%	1.79	1.05
4. High Speed Arterials (41)	8,957	65.5%	2,394	55.5%	10,143	61.5%	2,485	52.7%	1.13	1.04
6. Low Speed Collectors (61)	2,096	15.3%	838	19.4%	2,624	15.9%	935	19.8%	1.25	1.12
7. Ramps (71-75, 93,94)	285	2.1%	216	5.0%	367	2.2%	263	5.6%	1.29	1.22
8. HOV (81-84)	93	0.7%	93	2.2%	251	1.5%	228	4.8%	2.70	2.45
9. Toll Facility (91-92)	692	5.1%	291	6.7%	1,123	6.8%	316	6.7%	1.62	1.09
ALL Facility:	13,666	100.0%	4,311	100.0%	16,498	100.0%	4,715	100.0%	1.21	1.09

1. Palm Beach County

Facility Type	Year 2000 Model				Year 2030 Model				Growth (2030/2000)	
	Lane Miles	% Lane Miles	System Miles	% System Miles	Lane Miles	% Lane Miles	System Miles	% System Miles	Lane Miles	System Miles
1. Freeway (11)	275	7.3%	92	7.5%	362	7.0%	92	6.5%	1.32	1.00
2. Uninterrupted Roadways (21)	236	6.3%	83	6.8%	449	8.7%	85	6.0%	1.90	1.03
4. High Speed Arterials (41)	2,674	70.9%	747	61.1%	3,264	63.5%	798	56.6%	1.22	1.07
6. Low Speed Collectors (61)	345	9.1%	156	12.8%	581	11.3%	198	14.0%	1.69	1.27
7. Ramps (71-75, 93,94)	49	1.3%	44	3.6%	75	1.5%	63	4.5%	1.53	1.43
8. HOV (81-84)	16	0.4%	16	1.3%	91	1.8%	91	6.4%	5.80	5.80
9. Toll Facility (91-92)	176	4.7%	85	7.0%	317	6.2%	83	5.9%	1.81	0.98
ALL Facility:	3,771	100.0%	1,222	100.0%	5,139	100.0%	1,410	100.0%	1.36	1.15

Table 2-4 (Continued)

2. Broward County

Facility Type	Year 2000 Model				Year 2030 Model				Growth (2030/2000)	
	Lane Miles	% Lane Miles	System Miles	% System Miles	Lane Miles	% Lane Miles	System Miles	% System Miles	Lane Miles	System Miles
1. Freeway (11)	439	9.8%	120	9.2%	504	10.0%	121	9.1%	1.15	1.00
2. Uninterrupted Roadways (21)	73	1.6%	32	2.5%	111	2.2%	36	2.7%	1.53	1.12
4. High Speed Arterials (41)	3,011	67.0%	706	54.2%	3,303	65.6%	717	54.1%	1.10	1.02
6. Low Speed Collectors (61)	552	12.3%	223	17.1%	600	11.9%	225	16.9%	1.09	1.01
7. Ramps (71-75, 93,94)	88	2.0%	61	4.7%	89	1.8%	63	4.7%	1.01	1.04
8. HOV (81-84)	51	1.1%	51	3.9%	51	1.0%	51	3.8%	1.00	1.00
9. Toll Facility (91-92)	277	6.2%	110	8.4%	375	7.4%	113	8.5%	1.35	1.03
ALL Facility:	4,492	100.0%	1,303	100.0%	5,032	100.0%	1,325	100.0%	1.12	1.02

3. Miami-Dade County

Facility Type	Year 2000 Model				Year 2030 Model				Growth (2030/2000)	
	Lane Miles	% Lane Miles	System Miles	% System Miles	Lane Miles	% Lane Miles	System Miles	% System Miles	Lane Miles	System Miles
1. Freeway (11)	511	9.5%	150	8.4%	554	8.8%	153	7.7%	1.08	1.02
2. Uninterrupted Roadways (21)	10	0.2%	2	0.1%	10	0.2%	2	0.1%	1.00	1.00
4. High Speed Arterials (41)	3,271	60.5%	942	52.7%	3,576	56.5%	970	49.0%	1.09	1.03
6. Low Speed Collectors (61)	1,200	22.2%	459	25.7%	1,443	22.8%	512	25.9%	1.20	1.11
7. Ramps (71-75, 93,94)	148	2.7%	112	6.2%	203	3.2%	137	6.9%	1.37	1.23
8. HOV (81-84)	26	0.5%	26	1.5%	109	1.7%	86	4.4%	4.14	3.26
9. Toll Facility (91-92)	239	4.4%	96	5.4%	432	6.8%	120	6.1%	1.81	1.25
ALL Facility:	5,404	100.0%	1,787	100.0%	6,327	100.0%	1,979	100.0%	1.17	1.11

Note: Statistics for Palm Beach, Broward and Miami-Dade Counties are generated from SERPM6 runs.

2.2 HOV Lane Coding and HOV Facility Model

The SERPM6 model incorporates a flexible method of handling of HOV (high occupancy vehicle) lanes not by restricting the modes allowed to use the HOV lanes, but restricting the modes that can use the ramps that access HOV lanes for the model period. The model allows a mix of SOV (Single Occupancy Vehicle) and HOV external-external trips to model the external HOV trips. In the SERPM6 model external-internal trips are simulated like internal-internal trips. The HOV and SOV tables are assigned to the network using the HOV option of the equilibrium assignment program.

In the SERPM6 model networks, the HOV facility types (**see Table 2-2**) were defined as follows:

- FTC2 81-82: These are the main HOV facility types. The HOV links are coded as parallel facilities to the respective general-purpose links.
- FTC2 83: Ramps connecting general-purpose lanes and HOV lanes, restricting to the HOV trip table during AM and PM peak hours.
- FTC2 84: Ramps connecting general-purpose lanes and HOV lanes, restricting to the HOV trip table during AM peak hours only.
- FTC2 85: Ramps connecting general-purpose lanes and HOV lanes, restricting to the HOV trip table during PM peak hours only.
- FTC2 86: Ramps connecting general-purpose lanes and HOV lanes, restricting to the HOV trip table during the entire 24-hour day.

Using this procedure, it is possible to control the HOV alternative completely through network coding without modifying the scripts. The highway network consists of general use links, toll links, and restricted-use facilities, which are limited to high occupancy vehicles.

In SERPM6, HOV access links were coded with a special facility type (types 83 through 86) that is recognized by the highway assignment program for restricted assignment of a special trip purpose. Interested readers should consult EXCLUDEGROUP keyword of PATHLOD statement of the highway assignment scripts to see how the HOV modeling is implemented in CV. The restriction to use (EXCLUDEGROUP) is defined through the ADDTOGROUP statement. The ADDTOGROUP in highway assignment script allows facility types excluded (EXCLUDEGROUP) to use HOV facilities during the "XX" time period.

In the HOV model, the HOV table is assigned along with other highway tables in a single run using the equilibrium assignment technique. The same initial speeds were used during the first iteration of equilibrium highway loading for both general purpose and HOV links. For subsequent iterations, the congestion on the mixed flow links will automatically make the HOV times more attractive. To represent the difficulty encountered in weaving in and out of the carpool lanes, turning penalty cards were coded for the access and egress links. The penalty also discourages short trips from using the HOV links. The model's time penalty was determined for these access links through iterative model runs.

2.3 Initial Speeds and Capacities

Speeds, capacities and volume/delay functions play an important role in nearly all facets of the travel demand model. While the speeds in the FSUTMS default lookup table provide a good estimate of free-flow speeds, some modelers have been somewhat dissatisfied with the results of their use. A common example would be when a roadway is greatly over- or under-assigned, and an examination of the free-flow speed suggests that it was clearly too high or too low. This occurrence is particularly evident in the case of parallel streets, one of which is greatly over-assigned and the other under-assigned. Often it is found that inappropriate speeds have been used, and the relationship between the speeds of the parallel facilities is incorrect. Some of the studies suggest collecting data to determine the relationship between posted speeds and actual free-flow speeds. While this might produce the best local estimates of speeds, data collection is costly and time-consuming, and is not funded for the SERPM model update.

The TMIP report describes two methods for estimating free-flow speeds, one based on the Highway Capacity Manual (HCM), and the other based on NCHRP 3-55(2). The HCM method requires geometric and signal spacing data, which may not be available. The NCHRP method, which is the procedure recommended in NCHRP Report 387, relies on posted speeds for urban and rural uninterrupted flow, and posted speed, signal spacing and timing data for urban interrupted flow. The consultant's preliminary recommendation for SERPM6 update is the NCHRP 3-55(2) method. A summary of the method appears below.

Uninterrupted flow, posted speed greater than 50 mph:
Mean speed= 0.88(Posted speed) + 14
Uninterrupted flow, posted speed less than or equal to 50 mph:
Mean speed= 0.79(Posted speed) + 12

The plots of posted and initial free-flow speeds are shown in **Figure 2-1**. The NCHRP 365 equation has a step function at 50 mph posted speed and has caused inconsistencies in speeds during initial model development process. The consultant removed this step function by developing a second order equation to posted speeds. During later part of model validation efforts, two second order functions, one for freeways and one for surface streets, were used in the model. **Figure 2-1** exhibits all these functions along with the parameters of the second order equations.

The speeds of the signal-controlled facilities are further adjusted according to following equation.

$$S_f = L/[L/S_{mb} + N(D/3600)]$$

Where,

S_f = Free-flow speed for an urban interrupted facility.
L = Length of the facility
S_{mb} = Mid-block free-flow speed=0.79(Posted speed) + 12
D = Average delay per signal (seconds)

and,

$$D = DF * 0.5 * C(1 - g/C)^2$$

Where,

DF = (1-P)/(1-g/C) where: P= proportion of vehicles arriving on green
g = the effective green time (seconds)
C = Cycle length (seconds)

When P is unknown, NCHRP 387 recommends the following default values:

DF = 0.9 for uncoordinated actuated signals
= 1.0 for uncoordinated fixed time signals
= 1.2 for coordinated signals with unfavorable progression
= 0.9 for coordinated signals with favorable progression
= 0.6 for coordinated signals with highly favorable progression

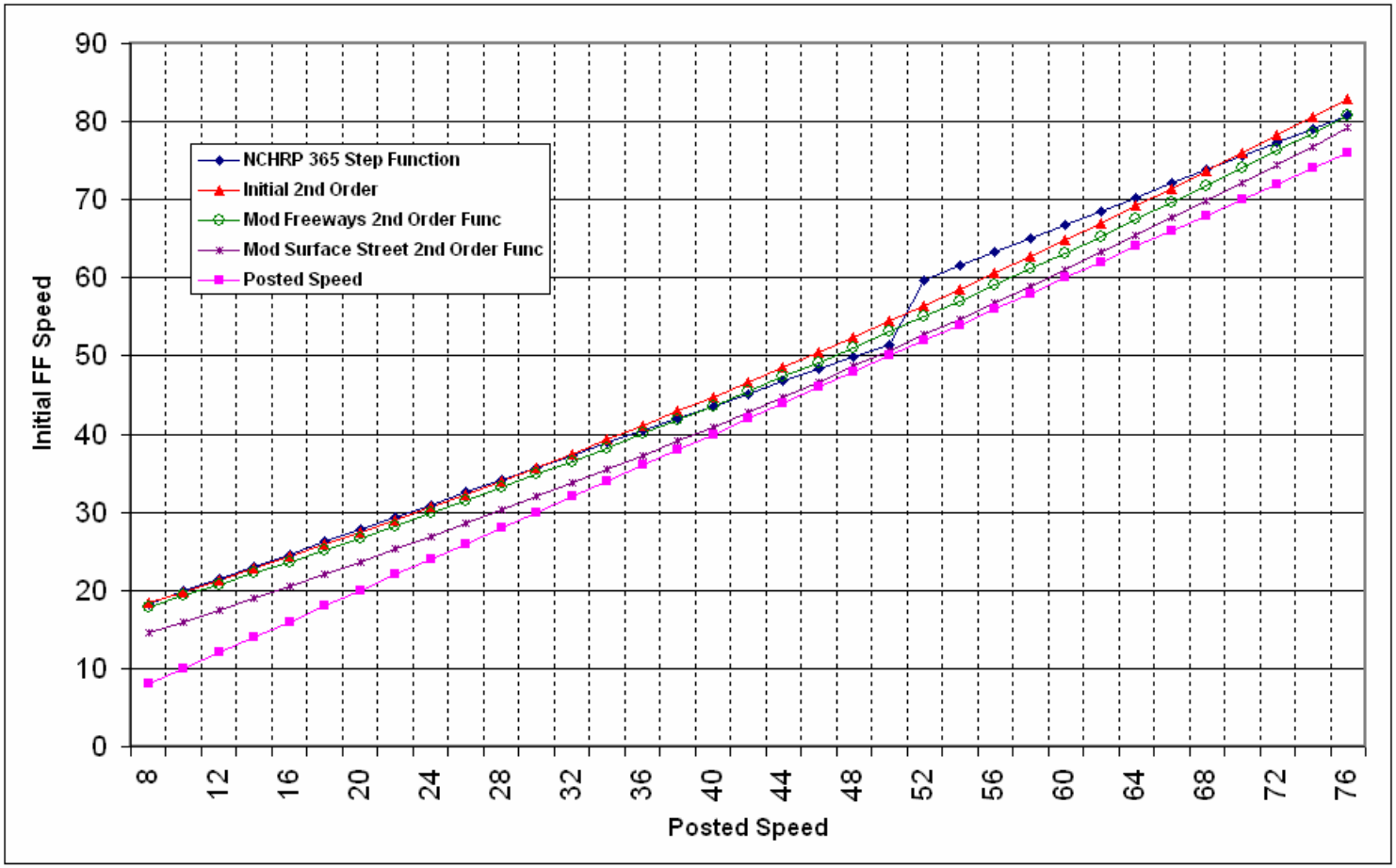
The following data are required to apply this free-flow estimation process.

- Posted speed for all links
- Location of signalized intersections
- Distance between signals for signal controlled areas
- An assessment of progression to estimate DF

Additional data on signal timing would enhance the accuracy. The desirable additional data are:

- G/C
- Cycle length for individual signalized intersections

Figure 2-1: **Initial Free-Flow Speed Curves**
Southeast Regional Planning Model VI



NCHRP 387 Step Function:

Uninterrupted flow, posted speed greater than 50 mph:
Initial FF speed= 0.88 *(Posted_Speed) + 14
Uninterrupted flow, posted speed less than or equal to 50 mph:
Initial FF Speed = 0.79 *(Posted_Speed) + 12

Second Order Fitted Function:

Initial FF Speed = C + A*(Posted_Speed) + B * (Posted_Speed)^2

	C	A	B
Initial Fitted Function:	12.88634	0.65735	0.00348
Modified Freeway Function:	12.56418	0.64058	0.00340
Modified Surface St Function:	9.10000	0.65735	0.00348

The free flow speed estimation is part of the model stream for SERPM and is fully automated. The highway network module and its sub-modules (see **Figures F-3 to F-5 of TR3**) are used to derive the speeds and capacities of the network.

One of the problems in the original methodology is that it is possible that cross-streets that approach a common node or intersection would be assigned different cycle-lengths, when they really must have the same cycle length. Similarly, the total g/C for the intersection might not sum to 1.0. Thus, a change in the method was made to rationalize the values for all links approaching a common node. All other links on signal segments are governed by the segment parameters.

If one or more signalized nodes on a segment contain cycle length value, the highest cycle length value specified would be used as the cycle length for that segment. Otherwise, default values would be used. If a g/C value is available, it should be specified on the link records for all movements for that particular intersection. The user must ensure that manually specified g/C values for all movements add up to 100 percent.

In the absence of detailed g/C data, a procedure has been put in place that uses default facility type specific g/C values as specified in DEFAULT_SEGMENT.CSV. The default values for incoming links into a signalized node are further modified. This is done to consider effect of intersection of different or same facility types and also to ensure that g/C values for two movements adds up to 100 percent.

This procedure assumes that a signalized intersection has at least two movements (e.g., a through street and a cross-street). For a signalized node with two or more incoming links, the default g/C value for all links is temporarily assigned. Then, using the maximum and minimum g/C value from among the temporary values, relative proportions to each other are calculated. These proportions are then reassigned as g/C values to the corresponding links. No more than two links with the highest default values are assigned the maximum proportion value. The rest of links are assigned minimum proportion values. This is done to remain consistent with the assumption of two movements, and that the maximum signal leg cannot have more than two links while the rest of the links would overlap in the second signal leg.

The Cube-Voyager "signal" sub-module (see **Figure F-4 of TR3**) automatically incorporates this revised methodology for estimating free-flow speeds. The model user may have to deal with this for two purposes:

- If the model user wants to add a new set of coordinated signals (additional SEGID), then all the links expected to be part of this segment must have same number in the "SEGID" field on the link layer. These SEGIDs must be unique and not be in use already. All the new signalized nodes should have a value "1" in the SIGLOC attribute on the node layer. The user must specify this value for all new signals.
- If the modeler wants to update signal data or test a new signal at a particular intersection that is already part of a segment. All the new signalized nodes should have a value "1" in the SIGLOC attribute on the node layer. The user must specify this value for all new signals. For updating link records, if the g/C ratio is available for all incoming links then it must be specified on the link layer. The list of all free flow speed estimation process attributes is as shown below.

  Link Attributes
  GC_RATIO* - If signalized and data is available, g/C ratio for the upstream node. In absence of local, default data would be used from DEFAULT_SEGMENT.CSV.

  Node Attributes
  SIGLOC - Should either have a value of 1 or 0. (1 for signalized and 0 for non-signalized)

CYC_LEN* - If signalized and data is available, cycle length in seconds. In absence of local, default data would be used from DEFAULT_SEGMENT.CSV.

During the process of model calibration, certain SEGIDs were allocated special signal-related data to validate the traffic volume and flow. This data is maintained in a separate file called "SPEC_SEGDATA.CSV." New data for signal segment parameters should be added to this file. Signal-specific data must be entered in the node and link layer as explained above.

The CV application estimates the free-flow speeds from posted speeds and signal information. This method works as follows:

- The highway network is stored as a TP+ (CV) network. It has two numeric fields of the link records: (1) Posted Speed (POSTSPD) and (2) SEGID. It also has two numeric fields of the node records: (1) SIGLOC and (2) Cycle Length (CYC_LEN). **Figure 2-2** displays the posted speed limits of 2000 SERPM6 network. The signal-controlled sections (SEGID>0) are illustrated in **Figure 2-3**. Followings are the ranges of SEGID that are coded for the 2000 SERPM6 network:

County	SEGID Range	Total Number of SEGID
Palm Beach	1-271	221
Broward	301-501, 839	278
Miami-Dade	601-887	205

- The modeler should populate the posted speed (POSTSPD) field for any new records. A value would be required for every link.
- The modeler should populate the SIGLOC field in the node records with a value of "1" for any new signal location, and where available, Cycle Length (CYC_LEN) data as well. The signal locations (SIGLOC=1) of 2000 SERPM6 network are illustrated in **Figure 2-4**.
- A segment id (SEGID) should be placed on every new links controlled by signals. Links with the same SEGID would use the same segment data.
- FFSPD are added by the CV application and then filled in with the free-flow speed (FREEFLOWSPEED) attribute.
- The CV application creates a segment file called SEGMENT.CSV to hold the signal data. This is a temporary file that requires no user input. The fields are:
  - SEGID - Segment number (matches link record)
  - NUMSIG - Number of signals in the signalized segment
  - Length - Length of the signalized segment (miles)
  - FT1 – One digit FSUTMS facility type
  - DF - Signalized delay function (see values described earlier)
  - CYCLE - Cycle length (seconds)
  - GC – Default Fraction green g/C (decimal fraction < 1.0).
- The model application script develops the free-flow speed values from the posted speed and traffic signal segment data.

The procedure described here is a complete procedure for calculating the free-flow speeds, as well as facilities for maintaining highway networks.

Figure 2-2: **Posted Speed Limits of Network Links**
Southeast Regional Planning Model VI

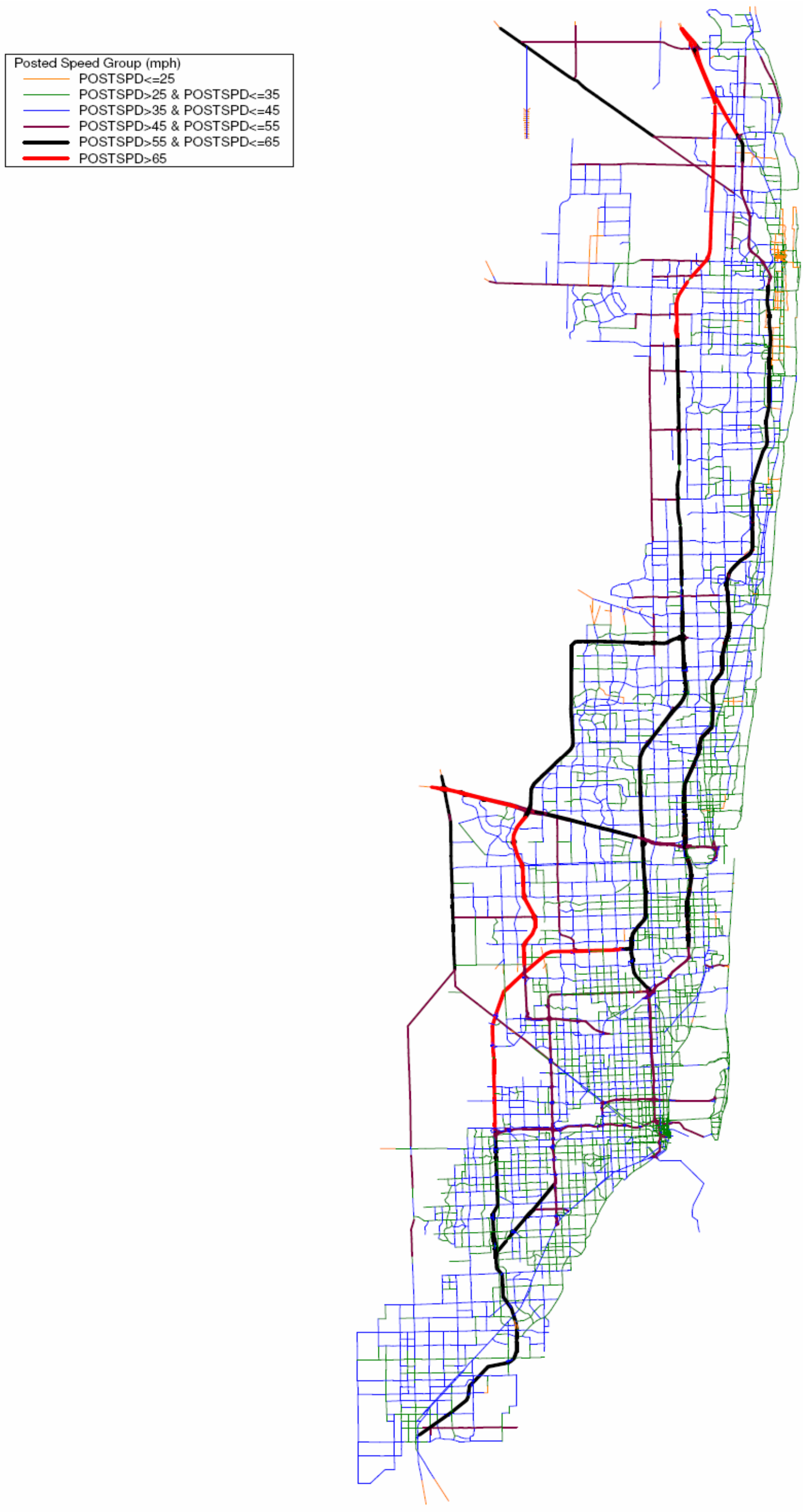


Figure 2-3: **Signal Controlled Section (SEGID) of Network Links**
Southeast Regional Planning Model VI

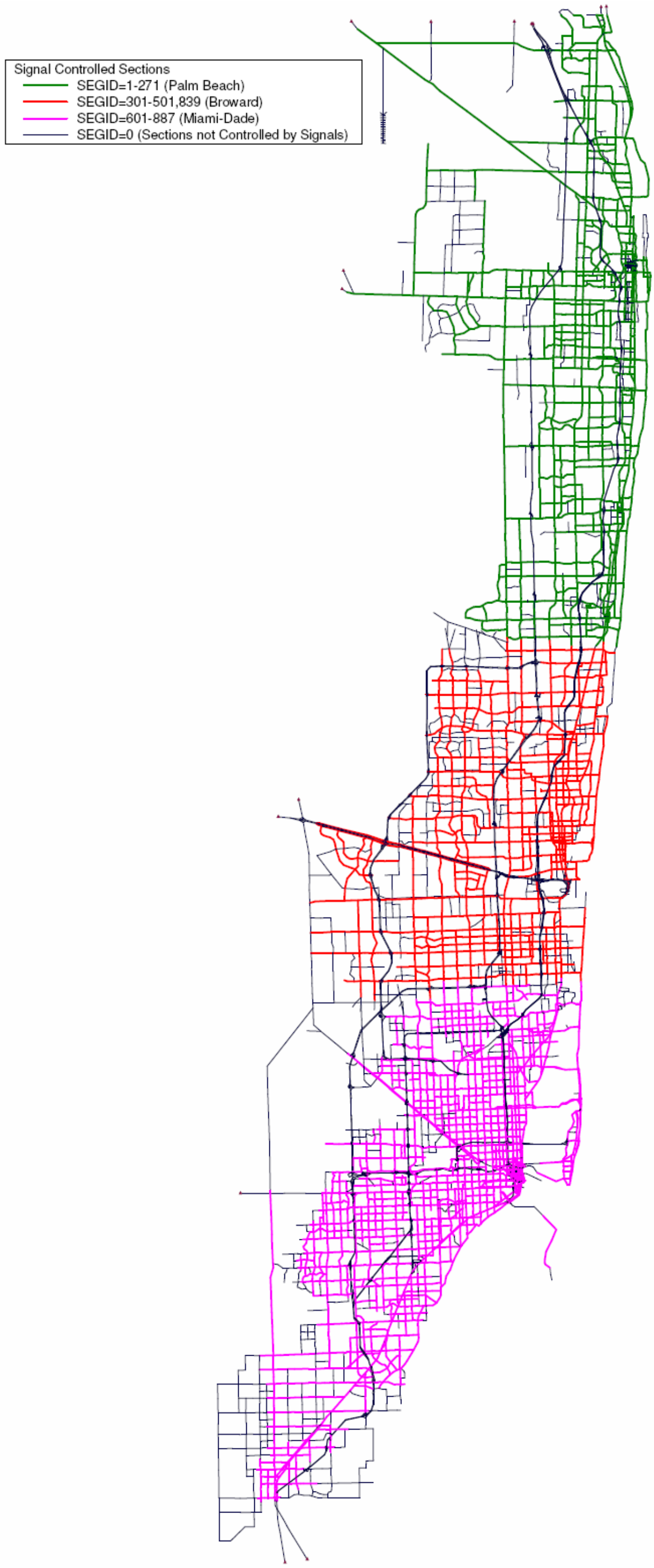
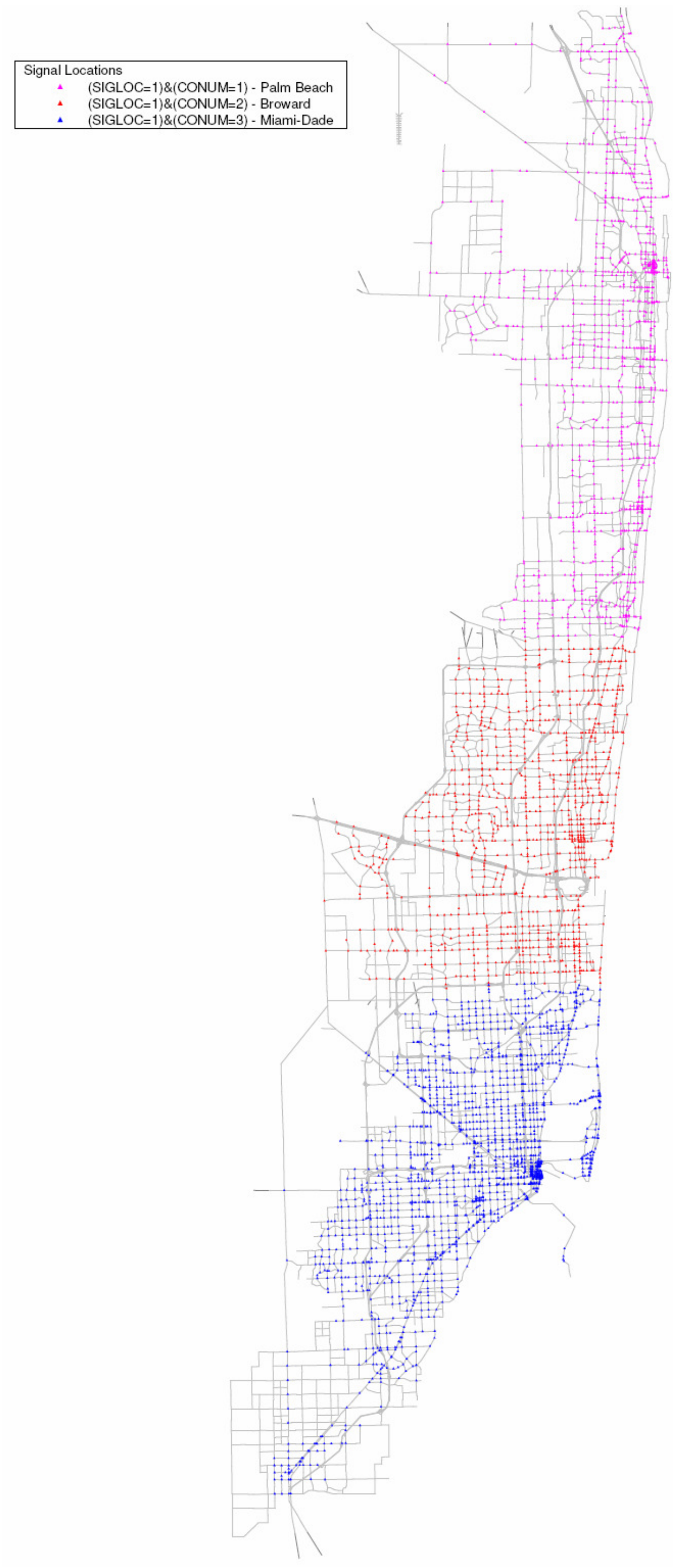


Figure 2-4: **Signal Locations**
Southeast Regional Planning Model VI



The capacities of the network are calculated based on the calculation and adjustment attributes as well as lookup tables. The values of these capacity lookup tables are primarily based on "Table 4-7 of the Florida LOS Handbook." The CAPCAL sub-module (see **Figure F-5 of TR3**) of CV application shows the steps of capacity calculation. **Table 2-5** summarizes the LOS-E capacities that are read as LOOKUP capacity tables. The attributes for the lookup capacity depend on facility type and those are number of lanes, interchange spacing, signal densities and area types.

2.4 Model Validation

The SERPM6 highway networks were reviewed and edited for the following link characteristics:

- Facility Type
- Number of Lanes
- Centroid Connections and Locations
- Added Network Detail
- Link Prohibitors
- Toll Facilities
- HOV Facilities

As part of model validation efforts, consistency of the TAZ structure and that of highway network was checked by overlaying the two layers in CUBE VIPER software. The TIGER street network was used to check the centroid connectors. In the regional model, the interfaces of Palm Beach, Broward and Miami-Dade Counties were examined in detail.

Based on an earlier review of the Miami portion of the regional network, a number of changes were made to the HOV codings to implement HOV modeling adopted in the SERPM. A number of HOV penalty cards were also developed for the Miami portion of the regional network.

Numerous plots were made to display key network attributes (facility and number of lanes) along with model volumes and counts and their ratios of SERPM6 networks. Problems with facility types and number of lanes were investigated through using VIPER and the color-coded plots. Numerous changes were made to the networks based on the review of these plots.

2.4.1 Traffic Counts

Traffic count data are important to validate the model. The counts (Average Annual Daily Traffic – AADT) were reviewed for reasonableness and edits were done where necessary. The count data are used by the HEVAL routine in validation mode to compare the model generated traffic volumes against the traffic counts. Care was taken to ensure that enough count data were available for model validation. **Table 2-6** presents a summary of the links by main facility and area types with traffic counts. Both 24-hour and period traffic counts that are available for model validation are summarized in this table.

For the whole SERPM region, 18.5 and 15.25 percent of links have traffic counts for 24-hours and for each periods of model. Table 2-6 also presents the number of links that has traffic counts as well as total number of links. The information in **Table 2-6** is valuable for judging the model statistics by facility and area types among the counties by the variation of the percentage of links with traffic counts.

Table 2-5: **Summary of LOS-E Capacities in Passenger-cars-per-hour-per-lane by Roadway Functional Type**
Southeast Regional Planning Model VI

FUNCTIONAL TYPES (for Capacity Lookup purposes)	**LOOKUP TABLE USED**	**LANES** per direction	**Interhchange Spacing >= 2 miles apart**	**Interhchange Spacing < 2 miles apart**		**(see Note)**
FREEWAYS (includes Parkways, Expressways, Toll and HOV freeway sections and, Freeway-to-Freeway ramps)	*FRWYPCE.DAT*	**1**	1,900	1,950		*1-lane section used for Freeway-to-Freeway ramps if needed.*
		2	1,990	2,050		
		3	2,090	2,110		
		4	2,140	2,110		
		5	2,170	2,160		
		6	2,180	2,170		

UNINTERRUPTED ROADWAYS (includes arterials with signal spacing > 1.5 and posted speed > 40 for Signalized, OR posted speed > 40 for Unsignalized)	**LOOKUP TABLE USED**	**LANES** per direction	**All**		**(see Note)**
	HWYPCE.DAT	**1**	1,310		
		2	1,850		
		3	1,850		

INTERRUPTED ROADWAYS, ARTERIALS (arterials with posted speed >= 35)	**LOOKUP TABLE USED**	**LANES** per direction	**Signal Density >0.00 to 1.99 per mile**	**Signal Density 2.00 to 4.50 per mile**	**Signal Density > 4.50 per mile AND NOT within CBD (and Major City/County Roadways)**	**Signal Density > 4.50 per mile AND WITHIN CBD**	**Other Signalized Roadways**	**(see Note)**
	ARTPCE.DAT	**1**	900	860	820	820	660	
		2	900	910	870	870	660	
		3	900	910	870	870	660	
		4	900	880	840	840	660	

LOW SPEED ROADWAYS, COLLECTORS (posted speed < 35)	**LOOKUP TABLE USED**	**LANES** per direction	**CBD & Non-CBD High-Density**	**Non-CBD Low-Density**	**Non-CBD Medium-Density**	**Non-CBD Very Low-Density**		**(see Note)**
	LOWPCE.DAT	**1**	630	750	630	760		
		2	650	750	650	760		
		3	650	750	650	760		
		4	650	750	650	760		

Table 2-5 (Continued)

FUNCTIONAL TYPES (for Capacity Lookup purposes)		**LOOKUP TABLE USED**	**LANES** per direction	**CBD**	**Non-CBD Low-Density**	**Non-CBD Medium-Density**	**Non-CBD High-Density**	**Non-CBD Very Low-Density**	**(see Note)**
RAMPS	**ON**	*ONPCE.DAT*	**1**	1,927	1,927	1,927	1,927	1,512	*Capacities for ramps are also not shown in Table 4-7. These capacities, which are already high, have been adopted from the previous lookup table.*
			2	1,927	1,927	1,927	1,927	1,512	
	LOOP ON	*LONPCE.DAT*	**1**	774	835	835	892	892	
			2	774	835	835	892	892	
	OFF	*OFFPCE.DAT*	**1**	1,927	1,927	1,927	1,927	1,512	
			2	1,927	1,927	1,927	1,927	1,512	
	LOOP OFF	*LOFFPCE.DAT*	**1**	892	892	835	892	892	
			2	892	892	835	892	892	
	TOLL ON	*TONPCE.DAT*	**1**	1,927	1,927	1,927	1,927	1,512	
			2	1,927	1,927	1,927	1,927	1,512	
	TOLL OFF	*TOFFPCE.DAT*	**1**	1,927	1,927	1,927	1,927	1,512	
			2	1,927	1,927	1,927	1,927	1,512	
	HOV PEAKS ONLY (slip ramps)	*n/a*	**1**	4,000	4,000	4,000	4,000	4,000	*These high capacities have been adopted from the previous model and are not part of the Capacity Calculator.*
	HOV ALL DAY (slip ramps)	*n/a*	**1**	4,000	4,000	4,000	4,000	4,000	
CENTROID CONNECTORS	**INTERNAL CENTROID CONNECTORS**	*n/a*	**1**	10,000	10,000	10,000	10,000	10,000	*Centroid connectors are given high capacities and are not part of the Capacity Calculator.*
	EXTERNAL CENTROID CONNECTORS	*n/a*	**1**	10,000	10,000	10,000	10,000	10,000	

Note: All capacities are LOS E in PCEs as adapted from Table 4-7 of the Florida LOS Handbook, unless otherwise noted. In cases where number of lanes in each driection are more than the maximum in the lookup table, the capacity from the maximum number of lanes is used, assuming CBD area type.

Table 2-6: **2000 Highway Network Total Links and Links with Traffic Counts by Facility and Area Types**
Southeast Regional Planning Model VI

0. ALL Counties - 24-Hour Traffic Counts

Facility Type	Total System Miles	No. of Links	Links % with Counts	No. of Links with Counts	Area Type	Total System Miles	No. of Links	Links % with Counts	No. of Links with Counts
1. Freeway (11)	362.3	991	24.32	241	1. CBD	76.9	901	8.21	74
2. Uninterrupted Roadways (21)	116.6	231	24.68	57	2. NonCBD HiDen	187.5	1,069	10.20	109
4. High Speed Arterials (41)	2,394.3	8,928	23.22	2,073	3. NonCBDMedDen	1,052.0	4,859	17.31	841
6. Low Speed Collectors (61)	838.0	3,585	10.32	370	4. NonCBDLowDen	2,422.4	8,247	21.60	1,781
7. Ramps (71-75, 93,94)	216.3	1,677	4.65	78	5. NonCBD VeryLowDen	572.4	1,112	17.27	192
8. HOV (81-84)	92.9	260	23.08	60					
9. Toll Facility (91-92)	290.8	516	22.87	118	**TOTAL**	**4,311.2**	**16,188**	**18.51**	**2,996**

0T. ALL Counties - TOD Traffic Counts

Facility Type	Total System Miles	No. of Links	Links % with Counts	No. of Links with Counts	Area Type	Total System Miles	No. of Links	Links % with Counts	No. of Links with Counts
1. Freeway (11)	362.3	991	17.56	174	1. CBD	76.9	901	6.05	55
2. Uninterrupted Roadways (21)	116.6	231	22.08	51	2. NonCBD HiDen	187.5	1,069	7.76	83
4. High Speed Arterials (41)	2,394.3	8,928	20.79	1,856	3. NonCBDMedDen	1,052.0	4,859	13.83	672
6. Low Speed Collectors (61)	838.0	3,585	8.84	317	4. NonCBDLowDen	2,422.4	8,247	18.50	1,526
7. Ramps (71-75, 93,94)	216.3	1,677	0.12	2	5. NonCBD VeryLowDen	572.4	1,112	12.05	134
8. HOV (81-84)	92.9	260	23.08	60					
9. Toll Facility (91-92)	290.8	516	1.74	9	**TOTAL**	**4,311.2**	**16,188**	**15.25**	**2,469**

Table 2-6 (Continued)

1. Palm Beach County -24-Hour Traffic Counts

Facility Type	Total System Miles	No. of Links	Links % with Counts	No. of Links with Counts	Area Type	Total System Miles	No. of Links	Links % with Counts	No. of Links with Counts
1. Freeway (11)	91.7	214	27.10	58	1. CBD	21.1	261	13.41	35
2. Uninterrupted Roadways (21)	82.6	132	22.73	30	2. NonCBD HiDen	12.3	101	16.83	17
4. High Speed Arterials (41)	746.6	2,773	27.23	755	3. NonCBDMedDen	115.5	552	25.54	141
6. Low Speed Collectors (61)	155.8	875	12.11	106	4. NonCBDLowDen	819.1	2,938	23.69	696
7. Ramps (71-75, 93,94)	44.4	193			5. NonCBD VeryLowDen	253.8	498	18.88	94
8. HOV (81-84)	15.6	40	25.00	10					
9. Toll Facility (91-92)	85.1	123	19.51	24	**TOTAL**	**1,221.7**	**4,350**	**22.60**	**983**

2. Broward County - 24-Hour Traffic Counts

Facility Type	Total System Miles	No. of Links	Links % with Counts	No. of Links with Counts	Area Type	Total System Miles	No. of Links	Links % with Counts	No. of Links with Counts
1. Freeway (11)	120.2	311	23.79	74	1. CBD	6.7	58	25.86	15
2. Uninterrupted Roadways (21)	32.4	88	28.41	25	2. NonCBD HiDen	6.6	38	34.21	13
4. High Speed Arterials (41)	705.9	2,257	37.00	835	3. NonCBDMedDen	267.7	1,037	31.82	330
6. Low Speed Collectors (61)	223.0	744	28.90	215	4. NonCBDLowDen	928.2	2,837	29.50	837
7. Ramps (71-75, 93,94)	60.6	415			5. NonCBD VeryLowDen	93.5	179	23.46	42
8. HOV (81-84)	50.9	130	29.23	38					
9. Toll Facility (91-92)	109.5	204	24.51	50	**TOTAL**	**1,302.7**	**4,149**	**29.81**	**1,237**

3. Miami-Dade County - 24-Hour Traffic Counts

Facility Type	Total System Miles	No. of Links	Links % with Counts	No. of Links with Counts	Area Type	Total System Miles	No. of Links	Links % with Counts	No. of Links with Counts
1. Freeway (11)	150.3	466	23.39	109	1. CBD	49.2	582	4.12	24
2. Uninterrupted Roadways (21)	1.7	11	18.18	2	2. NonCBD HiDen	168.5	930	8.49	79
4. High Speed Arterials (41)	941.7	3,898	12.39	483	3. NonCBDMedDen	669.1	3,272	11.31	370
6. Low Speed Collectors (61)	459.2	1,966	2.49	49	4. NonCBDLowDen	675.2	2,472	10.03	248
7. Ramps (71-75, 93,94)	111.6	1,071	7.28	78	5. NonCBD VeryLowDen	225.1	435	12.87	56
8. HOV (81-84)	26.4	90	13.33	12					
9. Toll Facility (91-92)	96.2	189	23.28	44	**TOTAL**	**1,787.1**	**7,691**	**10.10**	**777**

24-Hour Traffic Counts

Few ramp links have traffic counts, and they account for less than 1 percent of the TOD and 5 percent of the 24-hour counts. For other facility types, the percentage of links having traffic counts varies from 10.34% (low speed collectors) to 24.68% (uninterrupted roadways). For the area types, the percentage of links having traffic counts varies from 8.21% (CBD) to 21.60 (Low Density Non-CBD).

There are significant differences in the percentages between the counties (Palm Beach – 22.6%, Broward – 29.81% and Miami-Dade –10.1 %) of links with traffic counts. **Table 2-6** also presents the counts availability by the facility and area types for each three counties. **Figure 2-5** presents the locations of 24-hour traffic counts. This figure shows that Broward and Palm Beach have higher percentages of links with traffic counts compare to Miami-Dade.

In order to assess the extent of traffic counts that exists by the posted speeds and cycle lengths, several cross-tabulations of the network were made through CV scripts. The speed groupings are less than 25, 25-35, 35-45, 45-55, 55-65 and more than 65 mph. The cycle length groupings are less than 45, 45-60, 60-90, 90-120 and more than 120 seconds. **Table 2-7** presents the summary of links and lane-miles for the posted speed groups and facility type combination that have traffic counts. Of the total of 13,666 lane-miles, 3,803 lane-miles have traffic counts (27.8%). This is much higher than the 19.2% of directional link counts. Almost 40% of freeway lane-miles have traffic counts compare to 24.3% directional link counts. These summary tables are important for assessing the volume/count ratios by the speed groups and facility types.

Table 2-8 presents the summary of links and lane-miles for the cycle length groups and facility type combination that have traffic counts. Of the total of 9,470 lane-miles of signalized controlled facilities, 2,660 lane-miles have traffic counts (28.1%). This is much higher than the 21.8% of directional link counts. The uninterrupted roadways and high-speed arterials have higher percentages of links with traffic counts compare to low speed collectors. The summaries from this table are important for assessing the volume/count ratios by the cycle length groups and facility types.

TOD Traffic Counts

Beside toll facilities, the percentages of links with TOD traffic counts show trends similar to the 24-hours traffic counts (see **Table 2-6**). The toll facilities have only 1.74% of the links with TOD traffic counts. **Figure 2-6** presents the locations of TOD traffic counts. This figure shows that Broward and Palm Beach have higher percentages of links with traffic counts compared to Miami-Dade.

Table 2-7: **2000 Highway Network Directional Links and Lane-Miles with Traffic Counts by Posted Speed Group and Facility Type**
Southeast Regional Planning Model VI

A. Number of Directional Links

Facility Type	Posted Speed (in mph) Group						TOTAL
	<25	25-35	35-45	45-55	55-65	>65	
1. Freeway (11)		2		545	365	84	**996**
2. Uninterrupted Roadways (21)			151	190	57		**398**
4. High Speed Arterials (41)	11	6,654	10,215	515	47		**17,442**
6. Low Speed Collectors (61)	809	4,824	1,178	10			**6,821**
7. Ramps (71-75, 93,94)	16	40	1,015	584	55		**1,710**
8. HOV (81-82)				90	170		**260**
9. Toll Facility (91-92)		13	9	18	355	121	**516**
TOTAL	**836**	**11,533**	**12,568**	**1,952**	**1,049**	**205**	**28,143**

B. Number of Directional Links with Counts

Facility Type	Posted Speed (in mph) Group						TOTAL
	<25	25-35	35-45	45-55	55-65	>65	
1. Freeway (11)				128	84	30	**242**
2. Uninterrupted Roadways (21)			38	52	10		**100**
4. High Speed Arterials (41)		1,291	2,625	147	14		**4,077**
6. Low Speed Collectors (61)	82	599	38				**719**
7. Ramps (71-75, 93,94)			67	11			**78**
8. HOV (81-82)				12	48		**60**
9. Toll Facility (91-92)			1	6	80	31	**118**
TOTAL	**82**	**1,890**	**2,769**	**356**	**236**	**61**	**5,394**

C. Percentage of Directional Links with Counts

Facility Type	Posted Speed (in mph) Group						TOTAL
	<25	25-35	35-45	45-55	55-65	>65	
1. Freeway (11)				23.5%	23.0%	35.7%	**24.3%**
2. Uninterrupted Roadways (21)			25.2%	27.4%	17.5%		**25.1%**
4. High Speed Arterials (41)		19.4%	25.7%	28.5%	29.8%		**23.4%**
6. Low Speed Collectors (61)	10.1%	12.4%	3.2%				**10.5%**
7. Ramps (71-75, 93,94)			6.6%	1.9%			**4.6%**
8. HOV (81-82)				13.3%	28.2%		**23.1%**
9. Toll Facility (91-92)			11.1%	33.3%	22.5%	25.6%	**22.9%**
TOTAL	**9.8%**	**16.4%**	**22.0%**	**18.2%**	**22.5%**	**29.8%**	**19.2%**

D. Lane-Miles

Facility Type	Posted Speed (in mph) Group						TOTAL
	<25	25-35	35-45	45-55	55-65	>65	
1. Freeway (11)		2		589	442	192	**1,225**
2. Uninterrupted Roadways (21)			76	189	54		**319**
4. High Speed Arterials (41)	6	2,573	5,855	466	56		**8,956**
6. Low Speed Collectors (61)	156	1,451	483	7			**2,097**
7. Ramps (71-75, 93,94)	2	9	138	123	13		**285**
8. HOV (81-82)				26	67		**93**
9. Toll Facility (91-92)		2	3	15	500	172	**692**
TOTAL	**164**	**4,037**	**6,554**	**1,415**	**1,132**	**364**	**13,666**

E. Lane-Miles with Counts

Facility Type	Posted Speed (in mph) Group						TOTAL
	<25	25-35	35-45	45-55	55-65	>65	
1. Freeway (11)				228	179	81	**488**
2. Uninterrupted Roadways (21)			21	57	11		**89**
4. High Speed Arterials (41)		632	1,810	160	19		**2,621**
6. Low Speed Collectors (61)	25	233	19				**277**
7. Ramps (71-75, 93,94)			12	4			**16**
8. HOV (81-82)				7	28		**34**
9. Toll Facility (91-92)			1	6	208	62	**278**
TOTAL	**25**	**864**	**1,863**	**462**	**446**	**143**	**3,803**

F. Percentage of Lane-Miles with Counts

Facility Type	Posted Speed (in mph) Group						TOTAL
	<25	25-35	35-45	45-55	55-65	>65	
1. Freeway (11)				38.8%	40.5%	42.0%	**39.9%**
2. Uninterrupted Roadways (21)			28.0%	29.9%	20.5%		**27.9%**
4. High Speed Arterials (41)		24.5%	30.9%	34.4%	34.6%		**29.3%**
6. Low Speed Collectors (61)	15.9%	16.0%	4.0%				**13.2%**
7. Ramps (71-75, 93,94)			8.7%	3.4%			**5.7%**
8. HOV (81-82)				24.6%	41.5%		**36.7%**
9. Toll Facility (91-92)			28.3%	42.4%	41.7%	36.3%	**40.2%**
TOTAL	**15.2%**	**21.4%**	**28.4%**	**32.7%**	**39.4%**	**39.3%**	**27.8%**

Table 2-8: **2000 Highway Network Directional Links and Lane-Miles with Traffic Counts by Cycle Length Group and Facility Type**
Southeast Regional Planning Model VI

A. Number of Directional Links

	Signal Cycle Length (in secs) Group					
Facility Type	**<45**	**45-60**	**60-90**	**90-120**	**>120**	**TOTAL**
2. Uninterrupted Roadways (21)			83	276		**359**
4. High Speed Arterials (41)	18	1,575	13,542	326		**15,461**
6. Low Speed Collectors (61)	24	3,245	811	24		**4,104**
7. Ramps (71-75, 93,94)		7	46			**53**
9. Toll Facility (91-92)			4			**4**
TOTAL	**42**	**4,827**	**14,486**	**626**		**19,981**

B. Number of Directional Links with Counts

	Signal Cycle Length (in secs) Group					
Facility Type	**<45**	**45-60**	**60-90**	**90-120**	**>120**	**TOTAL**
2. Uninterrupted Roadways (21)			19	79		**98**
4. High Speed Arterials (41)	6	376	3,299	100		**3,781**
6. Low Speed Collectors (61)	8	329	122	10		**469**
7. Ramps (71-75, 93,94)						
9. Toll Facility (91-92)						
TOTAL	**14**	**705**	**3,440**	**189**		**4,348**

C. Percentage of Directional Links with Counts

	Signal Cycle Length (in secs) Group					
Facility Type	**<45**	**45-60**	**60-90**	**90-120**	**>120**	**TOTAL**
2. Uninterrupted Roadways (21)			22.9%	28.6%		**27.3%**
4. High Speed Arterials (41)	33.3%	23.9%	24.4%	30.7%		**24.5%**
6. Low Speed Collectors (61)	33.3%	10.1%	15.0%	41.7%		**11.4%**
7. Ramps (71-75, 93,94)						
9. Toll Facility (91-92)						
TOTAL	**33.3%**	**14.6%**	**23.7%**	**30.2%**		**21.8%**

D. Lane-Miles

	Signal Cycle Length (in secs) Group					
Facility Type	**<45**	**45-60**	**60-90**	**90-120**	**>120**	**TOTAL**
2. Uninterrupted Roadways (21)			90	211		**302**
4. High Speed Arterials (41)	12	671	7,082	233		**7,999**
6. Low Speed Collectors (61)	6	876	274	6		**1,162**
7. Ramps (71-75, 93,94)		1	6			**7**
9. Toll Facility (91-92)			1			**1**
TOTAL	**19**	**1,548**	**7,453**	**450**		**9,470**

E. Lane-Miles with Counts

	Signal Cycle Length (in secs) Group					
Facility Type	**<45**	**45-60**	**60-90**	**90-120**	**>120**	**TOTAL**
2. Uninterrupted Roadways (21)			21	65		**86**
4. High Speed Arterials (41)	5	184	2,140	90		**2,419**
6. Low Speed Collectors (61)	2	106	46	2		**156**
7. Ramps (71-75, 93,94)						
9. Toll Facility (91-92)						
TOTAL	**7**	**290**	**2,206**	**157**		**2,660**

F. Percentage of Lane-Miles with Counts

	Signal Cycle Length (in secs) Group					
Facility Type	**<45**	**45-60**	**60-90**	**90-120**	**>120**	**TOTAL**
2. Uninterrupted Roadways (21)			23.0%	30.8%		**28.5%**
4. High Speed Arterials (41)	38.9%	27.4%	30.2%	38.5%		**30.2%**
6. Low Speed Collectors (61)	29.3%	12.1%	16.6%	39.2%		**13.4%**
7. Ramps (71-75, 93,94)						
9. Toll Facility (91-92)						
TOTAL	**35.6%**	**18.7%**	**29.6%**	**34.9%**		**28.1%**

Figure 2-5: **24-Hour Traffic Count Locations**
Southeast Regional Planning Model VI

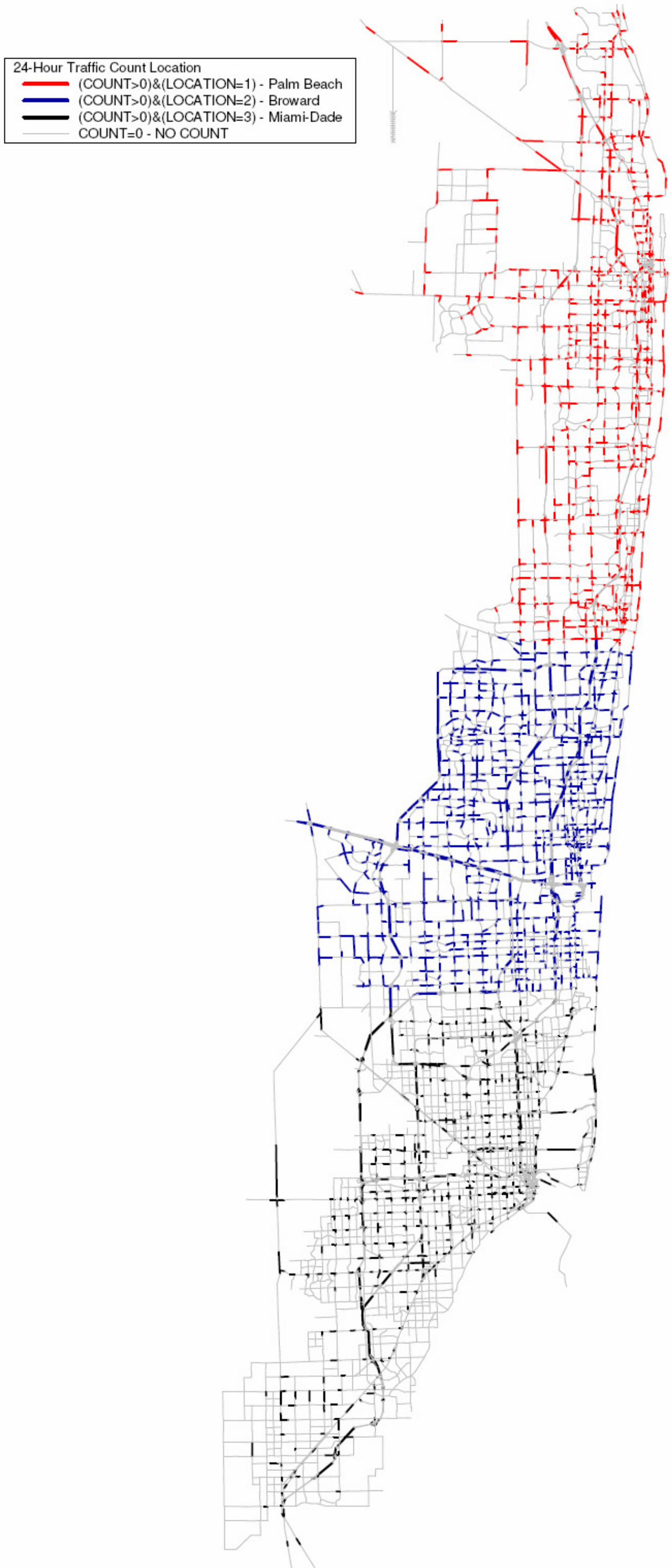
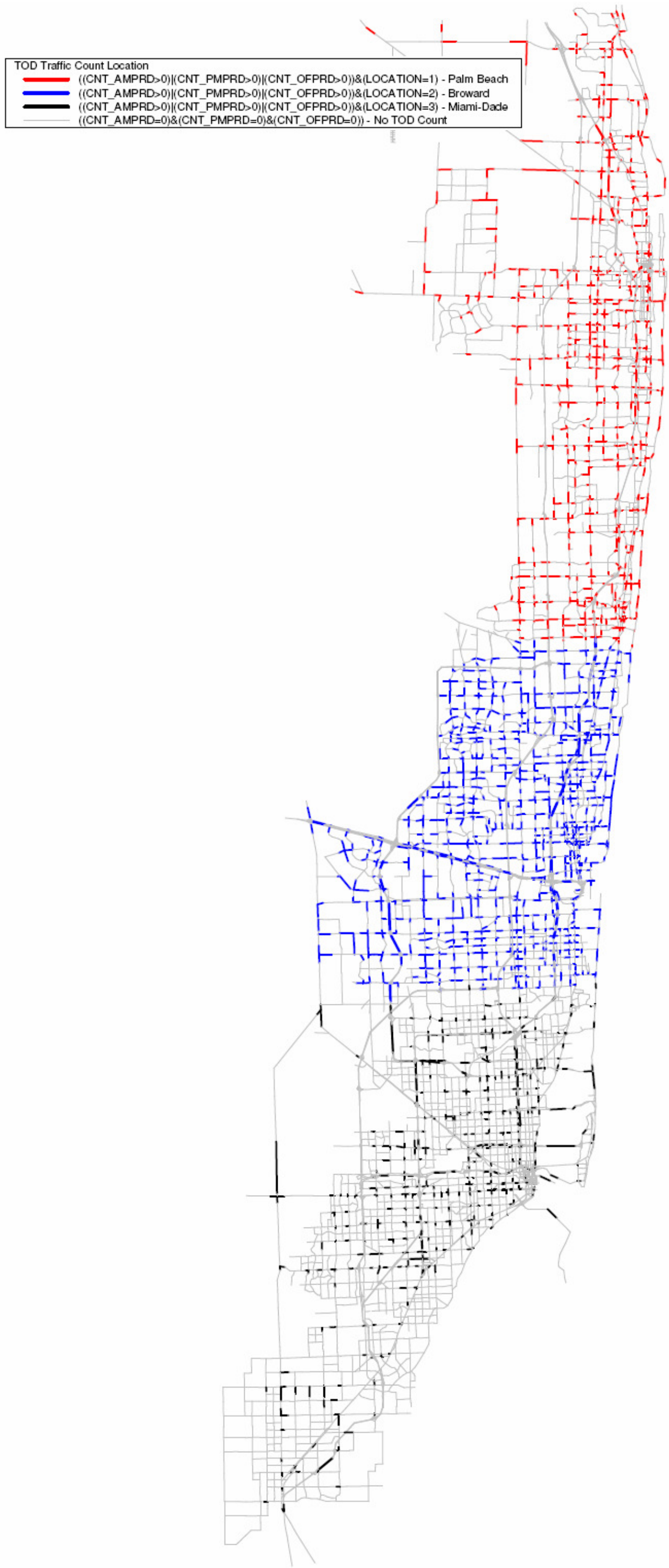


Figure 2-6: **Time-of-Day Traffic Count Locations**
Southeast Regional Planning Model VI



2.4.2 Speed Comparisons

SERPM6 uses a new process to develop the initial speeds for the network (see Section 2.3). The initial speed is one of the key model parameters adjusted during the validation process. This adjustment can make specific transportation facilities more or less attractive, thereby causing the model to produce estimates that are closer in magnitude to observed conditions. Several changes were made to the method for estimating initial speeds during the course of 2000 model validation process. The adjustments to the initial speeds were an iterative process designed to yield better estimates of traffic volumes that reflect observed traffic flows as well as to replicate observed speeds. More on the observed speeds are discussed in Chapter 10.

SERPM6 is a TOD model, where each period assignment has its own constrained speeds, depending on the level of congestion in that period. **Tables 2-9** presents a summary of the final validated unconstrained speeds and the period specific constrained speeds. The summary table shows the speed statistics by the main facility. This summary was made using period-specific HEVAL outputs. A feedback pre-assignment at the distribution module was made to generate the "stable" AM peak period constrained speeds for input to final peak period distribution and transit peak speeds. The statistics for the 24-hour congested speeds were developed by summing the VHT statistics for each assignment period. **Table 2-9** presents the pre-assigned and 24-hour constrained speeds. Both initial and constrained speeds are reported in miles per hour along with their differences and percent differences. This was made to check the reasonableness of the speeds. The original speeds were also compared to the model generated congested speeds.

Table 2-10 presents a summary of the model input and constrained speeds for the 2030 SERPM6 model. The statistics on original, congested speed, change in speed and percent change in speeds are reported for each cell of the main facility types. Once again, speeds of final pre-assignment, three period and 24-hour totals are summarized for the 2030 model run.

For the 2000 model, an overall decrease in 3.97 mph (11.3%) is shown between the original and congested speeds for the 24-hour period. By periods, the decreases in speeds are 3.77 mph (10.7%), 5.69 mph (16.2%) and 2.33 mph (6.6%) for the AM, PM and off-peak periods, respectively. The trends by period are expected as more travel occurs in PM peak periods. The percent change in speeds among the facility type in 2000 validation run ranges –5.9% (uninterrupted roadways) to –34.8% (ramps) for the 24-hour period. It should be mentioned that the ramp and freeways speeds include the merge delays that are simulated by the model. Once again, the trends of speed decrease due to congestion by facility types are reasonable.

For the 2030 model, an overall decrease in 7.4 mph (20.8%) is shown between the original and congested speeds for the 24-hour period. By periods, the decreases in speeds are 6.53 mph (18.4%), 9.55 mph (26.9%) and 5.16 mph (14.5%) for the AM, PM and off-peak periods, respectively. The trends by period are expected as more travel occurs in PM peak periods. The percent change in speeds among the facility type in 2030 run ranges –3.1% (uninterrupted roadways) to –44.1% (ramps) for the 24-hour period. The change is justifiable because of the increase in the number of trips in the 2030 model. **Tables 2-9** and **2-10** exhibit logical hierarchies of speed.

Speeds for each of three periods as well 24-hour totals are further summarized by both facility and area types and their combinations from corresponding period HEVAL outputs. The summaries are presented in **Tables 2-11 to 2-14**. These types of detailed summaries provided more insights in speeds in each period and assisted in model validation efforts.

By facility type, higher volume facilities are more congested, and overall off-peak period are less congested. By area type, less dense areas are less congested. None of these results are contrary to the observed travel characteristics in the SERPM region.

Table 2-9: **Year 2000 Highway Speed Summary by Facility and Time Period**
Southeast Regional Planning Model VI

1. Original Speeds in MPH

Facility Type	PreAsign AM Peak	AM Peak Period	PM Peak Period	OFF Peak Period	ALL (24H) Periods
1. Freeway (11)			52.90		
2. Uninterrupted Roadways (21)			41.68		
4. High Speed Arterials (41)			34.03		
6. Low Speed Collectors (61)			30.80		
7. Ramps (71-75, 93,94)			46.29		
8. HOV (81-82)			54.75		
9. Toll Facility (91-92)			66.10		
TOTAL			**35.11**		

2. Congested Speeds in MPH

Facility Type	PreAsign AM Peak	AM Peak Period	PM Peak Period	OFF Peak Period	ALL (24H) Periods
1. Freeway (11)	43.59	45.69	40.22	47.21	45.49
2. Uninterrupted Roadways (21)	39.19	39.17	37.89	41.31	39.24
4. High Speed Arterials (41)	29.76	30.51	28.63	32.06	30.36
6. Low Speed Collectors (61)	27.12	27.79	26.19	28.96	27.61
7. Ramps (71-75, 93,94)	29.85	31.50	27.41	31.97	30.19
8. HOV (81-82)	51.96	53.55	51.05	51.30	51.29
9. Toll Facility (91-92)	57.93	60.71	59.38	61.99	60.59
TOTAL	**30.53**	**31.34**	**29.42**	**32.78**	**31.14**

3. Change (Congested-Original) in Speeds in MPH

Facility Type	PreAsign AM Peak	AM Peak Period	PM Peak Period	OFF Peak Period	ALL (24H) Periods
1. Freeway (11)	-9.31	-7.21	-12.68	-5.69	-7.41
2. Uninterrupted Roadways (21)	-2.49	-2.51	-3.79	-0.37	-2.44
4. High Speed Arterials (41)	-4.27	-3.52	-5.40	-1.97	-3.67
6. Low Speed Collectors (61)	-3.68	-3.01	-4.61	-1.84	-3.19
7. Ramps (71-75, 93,94)	-16.44	-14.79	-18.88	-14.32	-16.10
8. HOV (81-82)	-2.79	-1.20	-3.70	-3.45	-3.46
9. Toll Facility (91-92)	-8.17	-5.39	-6.72	-4.11	-5.51
TOTAL	**-4.58**	**-3.77**	**-5.69**	**-2.33**	**-3.97**

4. Percent Change [(Congested-Original)/Original] in Speeds

Facility Type	PreAsign AM Peak	AM Peak Period	PM Peak Period	OFF Peak Period	ALL (24H) Periods
1. Freeway (11)	-17.6%	-13.6%	-24.0%	-10.8%	-14.0%
2. Uninterrupted Roadways (21)	-6.0%	-6.0%	-9.1%	-0.9%	-5.9%
4. High Speed Arterials (41)	-12.5%	-10.3%	-15.9%	-5.8%	-10.8%
6. Low Speed Collectors (61)	-11.9%	-9.8%	-15.0%	-6.0%	-10.4%
7. Ramps (71-75, 93,94)	-35.5%	-32.0%	-40.8%	-30.9%	-34.8%
8. HOV (81-82)	-5.1%	-2.2%	-6.8%	-6.3%	-6.3%
9. Toll Facility (91-92)	-12.4%	-8.2%	-10.2%	-6.2%	-8.3%
TOTAL	**-13.0%**	**-10.7%**	**-16.2%**	**-6.6%**	**-11.3%**

Table 2-10: **Year 2030 Highway Speed Summary by Facility and Time Period**
Southeast Regional Planning Model VI

1. Original Speeds in MPH

Facility Type	PreAsign AM Peak	AM Peak Period	PM Peak Period	OFF Peak Period	ALL (24H) Periods
1. Freeway (11)			52.69		
2. Uninterrupted Roadways (21)			41.46		
4. High Speed Arterials (41)			34.54		
6. Low Speed Collectors (61)			30.57		
7. Ramps (71-75, 93,94)			45.28		
8. HOV (81-82)			54.37		
9. Toll Facility (91-92)			64.06		
TOTAL			**35.50**		

2. Congested Speeds in MPH

Facility Type	PreAsign AM Peak	AM Peak Period	PM Peak Period	OFF Peak Period	ALL (24H) Periods
1. Freeway (11)	37.42	44.37	40.74	43.66	42.53
2. Uninterrupted Roadways (21)	40.39	40.46	39.74	40.78	40.18
4. High Speed Arterials (41)	24.86	28.31	25.40	29.98	27.62
6. Low Speed Collectors (61)	21.78	24.76	21.97	25.92	23.86
7. Ramps (71-75, 93,94)	24.03	27.78	23.36	26.95	25.33
8. HOV (81-82)	41.79	49.49	45.20	47.67	46.90
9. Toll Facility (91-92)	42.56	55.03	51.60	58.26	54.07
TOTAL	**25.38**	**28.97**	**25.95**	**30.34**	**28.10**

3. Change (Congested-Original) in Speeds in MPH

Facility Type	PreAsign AM Peak	AM Peak Period	PM Peak Period	OFF Peak Period	ALL (24H) Periods
1. Freeway (11)	-15.27	-8.32	-11.95	-9.03	-10.16
2. Uninterrupted Roadways (21)	-1.07	-1.00	-1.72	-0.68	-1.28
4. High Speed Arterials (41)	-9.68	-6.23	-9.14	-4.56	-6.92
6. Low Speed Collectors (61)	-8.79	-5.81	-8.60	-4.65	-6.71
7. Ramps (71-75, 93,94)	-21.25	-17.50	-21.92	-18.33	-19.95
8. HOV (81-82)	-12.58	-4.88	-9.17	-6.70	-7.47
9. Toll Facility (91-92)	-21.50	-9.03	-12.46	-5.80	-9.99
TOTAL	**-10.12**	**-6.53**	**-9.55**	**-5.16**	**-7.40**

4. Percent Change [(Congested-Original)/Original] in Speeds

Facility Type	PreAsign AM Peak	AM Peak Period	PM Peak Period	OFF Peak Period	ALL (24H) Periods
1. Freeway (11)	-29.0%	-15.8%	-22.7%	-17.1%	-19.3%
2. Uninterrupted Roadways (21)	-2.6%	-2.4%	-4.1%	-1.6%	-3.1%
4. High Speed Arterials (41)	-28.0%	-18.0%	-26.5%	-13.2%	-20.0%
6. Low Speed Collectors (61)	-28.8%	-19.0%	-28.1%	-15.2%	-21.9%
7. Ramps (71-75, 93,94)	-46.9%	-38.6%	-48.4%	-40.5%	-44.1%
8. HOV (81-82)	-23.1%	-9.0%	-16.9%	-12.3%	-13.7%
9. Toll Facility (91-92)	-33.6%	-14.1%	-19.5%	-9.1%	-15.6%
TOTAL	**-28.5%**	**-18.4%**	**-26.9%**	**-14.5%**	**-20.8%**

Table 2-11: **Year 2000 Highway Speed Summary by Facility and Area Type Combination – AM Peak Period**
Southeast Regional Planning Model VI

1. Original Speeds in MPH

	Area Type					
Facility Type	1. CBD	2. NonCBD HiDen	3. NonCBD MedDen	4. NonCBD LowDen	5. NonCBD VeryLowDen	**TOTAL**
1. Freeway (11)	46.90	48.98	51.36	53.66	70.14	**52.90**
2. Uninterrupted Roadways (21)			41.34	40.26	42.24	**41.68**
4. High Speed Arterials (41)	26.50	28.38	31.72	34.50	39.73	**34.03**
6. Low Speed Collectors (61)	25.61	25.70	30.27	31.86	33.19	**30.80**
7. Ramps (71-75, 93,94)	47.11	41.73	46.59	46.56	49.02	**46.29**
8. HOV (81-82)			53.84	55.42		**54.75**
9. Toll Facility (91-92)	30.86	45.28	59.88	65.44	72.78	**66.10**
TOTAL	**26.99**	**28.86**	**33.21**	**35.85**	**39.62**	**35.11**

2. Congested Speeds in MPH

	Area Type					
Facility Type	1. CBD	2. NonCBD HiDen	3. NonCBD MedDen	4. NonCBD LowDen	5. NonCBD VeryLowDen	**TOTAL**
1. Freeway (11)	45.51	39.10	43.21	47.33	69.57	**45.69**
2. Uninterrupted Roadways (21)			41.34	39.00	39.19	**39.17**
4. High Speed Arterials (41)	24.19	24.35	27.43	31.30	36.75	**30.51**
6. Low Speed Collectors (61)	24.05	22.36	26.27	28.90	32.56	**27.79**
7. Ramps (71-75, 93,94)	37.95	30.62	29.18	32.47	41.71	**31.50**
8. HOV (81-82)			52.55	54.31		**53.55**
9. Toll Facility (91-92)	15.65	28.92	53.86	60.65	66.16	**60.71**
TOTAL	**24.89**	**24.64**	**28.44**	**32.36**	**37.22**	**31.34**

3. Change (Congested-Original) in Speeds in MPH

	Area Type					
Facility Type	1. CBD	2. NonCBD HiDen	3. NonCBD MedDen	4. NonCBD LowDen	5. NonCBD VeryLowDen	**TOTAL**
1. Freeway (11)	-1.39	-9.88	-8.15	-6.33	-0.57	**-7.21**
2. Uninterrupted Roadways (21)			0.00	-1.26	-3.05	**-2.51**
4. High Speed Arterials (41)	-2.31	-4.03	-4.29	-3.20	-2.98	**-3.52**
6. Low Speed Collectors (61)	-1.56	-3.34	-4.00	-2.96	-0.63	**-3.01**
7. Ramps (71-75, 93,94)	-9.16	-11.11	-17.41	-14.09	-7.31	**-14.79**
8. HOV (81-82)			-1.29	-1.11		**-1.20**
9. Toll Facility (91-92)	-15.21	-16.36	-6.02	-4.79	-6.62	**-5.39**
TOTAL	**-2.10**	**-4.22**	**-4.77**	**-3.49**	**-2.40**	**-3.77**

4. Percent Change [(Congested-Original)/Original] in Speeds

	Area Type					
Facility Type	1. CBD	2. NonCBD HiDen	3. NonCBD MedDen	4. NonCBD LowDen	5. NonCBD VeryLowDen	**TOTAL**
1. Freeway (11)	-2.96%	-20.17%	-15.87%	-11.80%	-0.81%	**-13.63%**
2. Uninterrupted Roadways (21)			0.00%	-3.13%	-7.22%	**-6.02%**
4. High Speed Arterials (41)	-8.72%	-14.20%	-13.52%	-9.28%	-7.50%	**-10.34%**
6. Low Speed Collectors (61)	-6.09%	-13.00%	-13.21%	-9.29%	-1.90%	**-9.77%**
7. Ramps (71-75, 93,94)	-19.44%	-26.62%	-37.37%	-30.26%	-14.91%	**-31.95%**
8. HOV (81-82)			-2.40%	-2.00%		**-2.19%**
9. Toll Facility (91-92)	-49.29%	-36.13%	-10.05%	-7.32%	-9.10%	**-8.15%**
TOTAL	**-7.78%**	**-14.62%**	**-14.36%**	**-9.74%**	**-6.06%**	**-10.74%**

Table 2-12: **Year 2000 Highway Speed Summary by Facility and Area Type Combination – PM Peak Period**
Southeast Regional Planning Model VI

1. Original Speeds in MPH

	Area Type					
Facility Type	1. CBD	2. NonCBD HiDen	3. NonCBD MedDen	4. NonCBD LowDen	5. NonCBD VeryLowDen	**TOTAL**
1. Freeway (11)	46.90	48.98	51.36	53.66	70.14	**52.90**
2. Uninterrupted Roadways (21)			41.34	40.26	42.24	**41.68**
4. High Speed Arterials (41)	26.50	28.38	31.72	34.50	39.73	**34.03**
6. Low Speed Collectors (61)	25.61	25.70	30.27	31.86	33.19	**30.80**
7. Ramps (71-75, 93,94)	47.11	41.73	46.59	46.56	49.02	**46.29**
8. HOV (81-82)			53.84	55.42		**54.75**
9. Toll Facility (91-92)	30.86	45.28	59.88	65.44	72.78	**66.10**
TOTAL	**26.99**	**28.86**	**33.21**	**35.85**	**39.62**	**35.11**

2. Congested Speeds in MPH

	Area Type					
Facility Type	1. CBD	2. NonCBD HiDen	3. NonCBD MedDen	4. NonCBD LowDen	5. NonCBD VeryLowDen	**TOTAL**
1. Freeway (11)	40.22	36.69	39.36	44.96	68.25	**42.70**
2. Uninterrupted Roadways (21)			41.34	38.82	37.49	**37.89**
4. High Speed Arterials (41)	22.52	21.99	25.28	29.56	35.35	**28.63**
6. Low Speed Collectors (61)	22.93	20.54	24.15	27.48	32.18	**26.19**
7. Ramps (71-75, 93,94)	23.90	26.63	25.03	29.01	38.59	**27.41**
8. HOV (81-82)			50.69	51.31		**51.05**
9. Toll Facility (91-92)	15.65	28.92	51.74	59.33	65.41	**59.38**
TOTAL	**23.07**	**22.41**	**26.11**	**30.61**	**36.05**	**29.42**

3. Change (Congested-Original) in Speeds in MPH

	Area Type					
Facility Type	1. CBD	2. NonCBD HiDen	3. NonCBD MedDen	4. NonCBD LowDen	5. NonCBD VeryLowDen	**TOTAL**
1. Freeway (11)	-6.68	-12.29	-12.00	-8.70	-1.89	**-10.20**
2. Uninterrupted Roadways (21)			0.00	-1.44	-4.75	**-3.79**
4. High Speed Arterials (41)	-3.98	-6.39	-6.44	-4.94	-4.38	**-5.40**
6. Low Speed Collectors (61)	-2.68	-5.16	-6.12	-4.38	-1.01	**-4.61**
7. Ramps (71-75, 93,94)	-23.21	-15.10	-21.56	-17.55	-10.43	**-18.88**
8. HOV (81-82)			-3.15	-4.11		**-3.70**
9. Toll Facility (91-92)	-15.21	-16.36	-8.14	-6.11	-7.37	**-6.72**
TOTAL	**-3.92**	**-6.45**	**-7.10**	**-5.24**	**-3.57**	**-5.69**

4. Percent Change [(Congested-Original)/Original] in Speeds

	Area Type					
Facility Type	1. CBD	2. NonCBD HiDen	3. NonCBD MedDen	4. NonCBD LowDen	5. NonCBD VeryLowDen	**TOTAL**
1. Freeway (11)	-14.24%	-25.09%	-23.36%	-16.21%	-2.69%	**-19.28%**
2. Uninterrupted Roadways (21)			0.00%	-3.58%	-11.25%	**-9.09%**
4. High Speed Arterials (41)	-15.02%	-22.52%	-20.30%	-14.32%	-11.02%	**-15.87%**
6. Low Speed Collectors (61)	-10.46%	-20.08%	-20.22%	-13.75%	-3.04%	**-14.97%**
7. Ramps (71-75, 93,94)	-49.27%	-36.18%	-46.28%	-37.69%	-21.28%	**-40.79%**
8. HOV (81-82)			-5.85%	-7.42%		**-6.76%**
9. Toll Facility (91-92)	-49.29%	-36.13%	-13.59%	-9.34%	-10.13%	**-10.17%**
TOTAL	**-14.52%**	**-22.35%**	**-21.38%**	**-14.62%**	**-9.01%**	**-16.21%**

Table 2-13: **Year 2000 Highway Speed Summary by Facility and Area Type Combination – Off Peak Period**
Southeast Regional Planning Model VI

1. Original Speeds in MPH

	Area Type					
Facility Type	1. CBD	2. NonCBD HiDen	3. NonCBD MedDen	4. NonCBD LowDen	5. NonCBD VeryLowDen	**TOTAL**
1. Freeway (11)	46.90	48.98	51.36	53.66	70.14	**52.90**
2. Uninterrupted Roadways (21)			41.34	40.26	42.24	**41.68**
4. High Speed Arterials (41)	26.50	28.38	31.72	34.50	39.73	**34.03**
6. Low Speed Collectors (61)	25.61	25.70	30.27	31.86	33.19	**30.80**
7. Ramps (71-75, 93,94)	47.11	41.73	46.59	46.56	49.02	**46.29**
8. HOV (81-82)			53.84	55.42		**54.75**
9. Toll Facility (91-92)	30.86	45.28	59.88	65.44	72.78	**66.10**
TOTAL	**26.99**	**28.86**	**33.21**	**35.85**	**39.62**	**35.11**

2. Congested Speeds in MPH

	Area Type					
Facility Type	1. CBD	2. NonCBD HiDen	3. NonCBD MedDen	4. NonCBD LowDen	5. NonCBD VeryLowDen	**TOTAL**
1. Freeway (11)	44.75	41.69	44.38	48.98	70.08	**47.21**
2. Uninterrupted Roadways (21)			41.34	39.36	42.10	**41.31**
4. High Speed Arterials (41)	24.69	24.83	28.83	32.93	38.97	**32.06**
6. Low Speed Collectors (61)	24.36	22.90	27.60	30.38	33.01	**28.96**
7. Ramps (71-75, 93,94)	32.86	30.20	29.28	33.70	42.78	**31.97**
8. HOV (81-82)			50.64	51.79		**51.30**
9. Toll Facility (91-92)	15.65	29.27	56.92	61.89	66.36	**61.99**
TOTAL	**25.15**	**25.19**	**29.76**	**33.95**	**38.98**	**32.78**

3. Change (Congested-Original) in Speeds in MPH

	Area Type					
Facility Type	1. CBD	2. NonCBD HiDen	3. NonCBD MedDen	4. NonCBD LowDen	5. NonCBD VeryLowDen	**TOTAL**
1. Freeway (11)	-2.15	-7.29	-6.98	-4.68	-0.06	**-5.69**
2. Uninterrupted Roadways (21)			0.00	-0.90	-0.14	**-0.37**
4. High Speed Arterials (41)	-1.81	-3.55	-2.89	-1.57	-0.76	**-1.97**
6. Low Speed Collectors (61)	-1.25	-2.80	-2.67	-1.48	-0.18	**-1.84**
7. Ramps (71-75, 93,94)	-14.25	-11.53	-17.31	-12.86	-6.24	**-14.32**
8. HOV (81-82)			-3.20	-3.63		**-3.45**
9. Toll Facility (91-92)	-15.21	-16.01	-2.96	-3.55	-6.42	**-4.11**
TOTAL	**-1.84**	**-3.67**	**-3.45**	**-1.90**	**-0.64**	**-2.33**

4. Percent Change [(Congested-Original)/Original] in Speeds

	Area Type					
Facility Type	1. CBD	2. NonCBD HiDen	3. NonCBD MedDen	4. NonCBD LowDen	5. NonCBD VeryLowDen	**TOTAL**
1. Freeway (11)	-4.58%	-14.88%	-13.59%	-8.72%	-0.09%	**-10.76%**
2. Uninterrupted Roadways (21)			0.00%	-2.24%	-0.33%	**-0.89%**
4. High Speed Arterials (41)	-6.83%	-12.51%	-9.11%	-4.55%	-1.91%	**-5.79%**
6. Low Speed Collectors (61)	-4.88%	-10.89%	-8.82%	-4.65%	-0.54%	**-5.97%**
7. Ramps (71-75, 93,94)	-30.25%	-27.63%	-37.15%	-27.62%	-12.73%	**-30.94%**
8. HOV (81-82)			-5.94%	-6.55%		**-6.30%**
9. Toll Facility (91-92)	-49.29%	-35.36%	-4.94%	-5.42%	-8.82%	**-6.22%**
TOTAL	**-6.82%**	**-12.72%**	**-10.39%**	**-5.30%**	**-1.62%**	**-6.64%**

Table 2-14: **Year 2000 Highway Speed Summary by Facility and Area Type Combination – 24-Hour Total**
Southeast Regional Planning Model VI

1. Original Speeds in MPH

	Area Type					
Facility Type	1. CBD	2. NonCBD HiDen	3. NonCBD MedDen	4. NonCBD LowDen	5. NonCBD VeryLowDen	**TOTAL**
1. Freeway (11)	46.90	48.98	51.36	53.66	70.14	**52.90**
2. Uninterrupted Roadways (21)			41.34	40.26	42.24	**41.68**
4. High Speed Arterials (41)	26.50	28.38	31.72	34.50	39.73	**34.03**
6. Low Speed Collectors (61)	25.61	25.70	30.27	31.86	33.19	**30.80**
7. Ramps (71-75, 93,94)	47.11	41.73	46.59	46.56	49.02	**46.29**
8. HOV (81-82)			53.84	55.42		**54.75**
9. Toll Facility (91-92)	30.86	45.28	59.88	65.44	72.78	**66.10**
TOTAL	**26.99**	**28.86**	**33.21**	**35.85**	**39.62**	**35.11**

2. Congested Speeds in MPH

	Area Type					
Facility Type	1. CBD	2. NonCBD HiDen	3. NonCBD MedDen	4. NonCBD LowDen	5. NonCBD VeryLowDen	**TOTAL**
1. Freeway (11)	43.75	39.32	42.45	47.52	69.35	**45.49**
2. Uninterrupted Roadways (21)			41.34	39.09	39.26	**39.24**
4. High Speed Arterials (41)	23.73	23.63	27.09	31.26	36.87	**30.36**
6. Low Speed Collectors (61)	23.75	21.83	25.97	28.89	32.58	**27.61**
7. Ramps (71-75, 93,94)	30.31	28.89	27.60	31.80	40.86	**30.19**
8. HOV (81-82)			50.64	51.77		**51.29**
9. Toll Facility (91-92)	15.65	28.92	53.70	60.57	65.95	**60.59**
TOTAL	**24.31**	**23.98**	**28.03**	**32.31**	**37.39**	**31.14**

3. Change (Congested-Original) in Speeds in MPH

	Area Type					
Facility Type	1. CBD	2. NonCBD HiDen	3. NonCBD MedDen	4. NonCBD LowDen	5. NonCBD VeryLowDen	**TOTAL**
1. Freeway (11)	-3.15	-9.66	-8.91	-6.14	-0.79	**-7.41**
2. Uninterrupted Roadways (21)				-1.17	-2.98	**-2.44**
4. High Speed Arterials (41)	-2.77	-4.75	-4.63	-3.24	-2.86	**-3.67**
6. Low Speed Collectors (61)	-1.86	-3.87	-4.30	-2.97	-0.61	**-3.19**
7. Ramps (71-75, 93,94)	-16.80	-12.84	-18.99	-14.76	-8.16	**-16.10**
8. HOV (81-82)			-3.20	-3.65		**-3.46**
9. Toll Facility (91-92)	-15.21	-16.36	-6.18	-4.87	-6.83	**-5.51**
TOTAL	**-2.68**	**-4.88**	**-5.18**	**-3.54**	**-2.23**	**-3.97**

4. Percent Change [(Congested-Original)/Original] in Speeds

	Area Type					
Facility Type	1. CBD	2. NonCBD HiDen	3. NonCBD MedDen	4. NonCBD LowDen	5. NonCBD VeryLowDen	**TOTAL**
1. Freeway (11)	-6.72%	-19.72%	-17.35%	-11.44%	-1.13%	**-14.01%**
2. Uninterrupted Roadways (21)				-2.91%	-7.05%	**-5.85%**
4. High Speed Arterials (41)	-10.45%	-16.74%	-14.60%	-9.39%	-7.20%	**-10.78%**
6. Low Speed Collectors (61)	-7.26%	-15.06%	-14.21%	-9.32%	-1.84%	**-10.36%**
7. Ramps (71-75, 93,94)	-35.66%	-30.77%	-40.76%	-31.70%	-16.65%	**-34.78%**
8. HOV (81-82)			-5.94%	-6.59%		**-6.32%**
9. Toll Facility (91-92)	-49.29%	-36.13%	-10.32%	-7.44%	-9.38%	**-8.34%**
TOTAL	**-9.93%**	**-16.91%**	**-15.60%**	**-9.87%**	**-5.63%**	**-11.31%**

3. EXTERNAL TRIP MODEL

This chapter presents the validation of external trips. Highway external trips are divided into external-internal (IE and EI) person trip ends and through (EE) vehicle trip ends, and the external-internal trip ends are further divided by type of trip end (trip productions and trip attractions) and by trip purpose (the same 11 trip purposes used for the internal trip ends). Finally, the external-internal trip productions and attractions by trip purpose are distributed and assigned with the internal-internal trip ends.

Modeling EE trips is the second module in CV application (see **Figure 1-1**). The external trip module requires an EE trip table that contains EE vehicle trip between external stations.

The SERPM study area consists of mainly the urbanized portion of the Palm Beach, Broward and Miami-Dade Counties. External stations are intersections between the network and the study area boundary. These stations serve as ports of entry and exit from/to the study area. Each station was coded with a TAZ number (4051 to 4134). There are several dummy external stations not used to simulate external traffic. All of these external stations are also modeled as external stations in the MPO models. The MPO external stations between the county interfaces of Palm Beach, Broward and Miami-Dade were treated as "dummies" in the regional model. External stations are shown in **Figure 3-1**.

3.1 Model Enhancements

The enhancements to both IE and EE processes that were adopted in the previous model update studies (SEERPM4 and SERPM5) were also continued in the CV based SERPM6. The IE/EI trips simulation was also implemented in the 1996-2000 Palm Beach and Broward models. It has improved the modeling statistics at the peripheral areas.

The modified process eliminates IE/EI as a separate trip purpose. The IE/EI trips in the modified process were modeled as part of the internal trip purpose. The model allows station specific distribution the IE/EI trips. The modified IE process works as follows:

- Total productions and attractions and their percentages by internal trip purposes are entered in the ZDATA4B files. The initial estimates of total productions and attractions should be made from the traffic counts and an estimate of through trips.

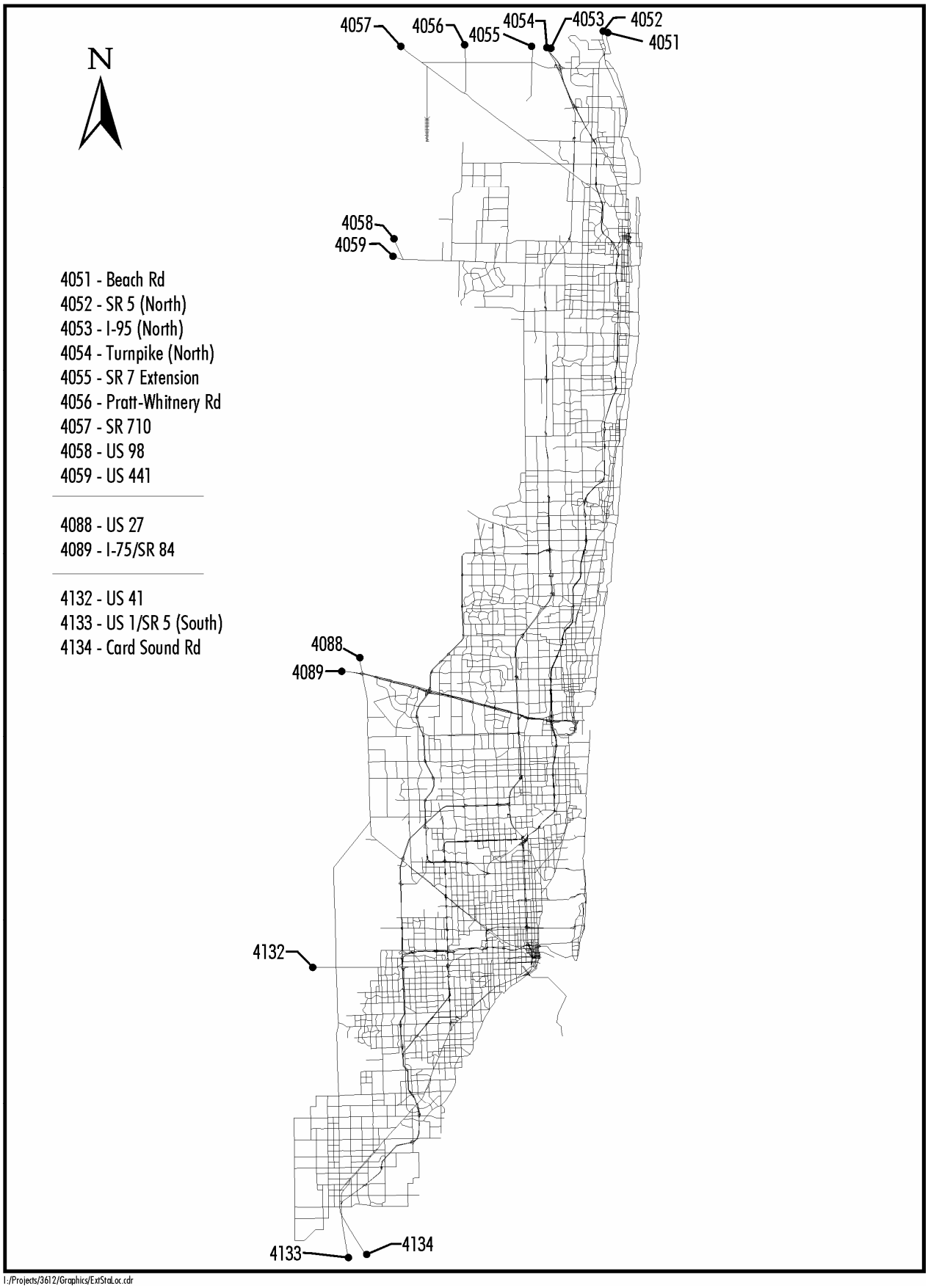
- The productions and attractions for each trip purpose are then obtained by multiplying the percentages for each purpose by total trips.

- In the CV script, travel times from all external zones to all external zones are set at zero. In addition, the FAIL[1] in the FF LOOKUP statement prevents IE trips from becoming EE. This has the same effect as specifying K factors of zero in earlier versions of SERPM.

For external-external (EE) trips, major enhancements adopted in earlier versions of SERPM (SERPM-IV and SERPM-V) are included in the SERPM6. Those are:

- Simulation of truck EE trips, and
- Breakdown of EE trips by auto occupancy level.

Figure 3-1: **External Station Locations**
Southeast Regional Planning Model VI



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EE truck trips were estimated using a Fratar model. Based on truck traffic information gathered from the Florida Traffic Information CDROM, PERTRKEXTZ.DBF (an input file to CV module 10) was developed which describes the percentage of volume at each external station that is truck traffic. These percentages are taken together with the EETAB (Binary output of through vehicle trip table) and input to the CV's FRATAR model function. The result is an estimate of EE truck traffic that was then summed with other internal truck trips to make a separate truck assignment. Truck trips are also converted into passenger-car-equivalents (PCE) to be in line with the capacity units.

Once EE truck trips were subtracted from the EE trip table, the remaining passenger car trips were factored into three different matrices using the CV's MATRIX function. Two CV's keys (see Table A-1 of Appendix A) parameters (EE1OCC and EE2OCC) are used to factor the auto trips into drive alone and 2-person shared-ride and 3-or-more persons shared ride modes. The percent of EE trips in each auto mode are assumed to be the following:

- Drive Alone - 73.26%
- 2 Person Carpool - 17.18%
- 3-or-more Person Carpool - 9.56%

The EE trips are also splits into the period specific trips using CV keys EE-PK, EE-AMPK and EE-PMPK. The distributions used in earlier SERPM model were used in SERPM6 and those are as follows:

- Peak Period - 40.29%
- AM peak period - 18.47%
- PM peak period - 21.82%

3.2 Model Validation

Validation of the EETRIPS file was based on extrapolation and professional judgment. The EETRIP file validation would generally rely upon recently collected roadside or cordon line surveys to determine the proportion of the vehicle traffic that passes through the study area. This study includes the 1999 EETRIP file and then adjusted slightly by comparing the 1999 and 2000 traffic counts at the external stations. The FDOT, MPO and Consultant staff reviewed the resultant through trip table to affirm the reasonableness of the data for model validation. The final EETRIPS file is summarized in **Table 3-1**.

A similar process was used to develop the 2030 EETRIP file. It used the growth factors that were derived from the model estimates from the 2000 and 2030 MPO models. **Table 3-2** presents the 2030 external OD trip table. **Tables 3-1** and **3-2** show the zonal interchanges of the external trips those data are balanced for use in model EETRIP file. Table 3-2 also presents the overall station specific growths in EE trips between 2000 and 2030. They are in the range of 29 to 53 percents.

Initial external station productions and attractions for IE person trips were developed from traffic counts. After the completion of a simulation run, the assigned volume at the external links may not sum to the counts. The validation of the external model adjusted the both IE person trips productions and attractions to match the assigned volumes with the traffic counts.

The distribution process determines the number of IE trips (they will be present in the internal trip tables). Some adjustments to productions and attractions were made so that the model produces the desired volumes at the external stations. The travel times on the external connectors represent the average time from the station to a typical destination outside the study area. The trips produced at an external station are assumed to be equal to the attractions (a very standard assumption), which is equal to half the daily volume on that link.

Table 3-1: **Year 2000 Daily Through Vehicle Trip Table**
Southeast Regional Planning Model VI

FROM STATION	TO STATION 4051	4052	4053	4054	4055	4056	4057	4058	4059	4088	4089	4132	4133	4134	Total Origin	Total Destination	Total Through Veh
4051		24	7	2			17			8		4	11		**73**	**73**	**146**
4052	24					1	75		3		15	5	14		**137**	**137**	**274**
4053	7									27	33	48	142	35	**292**	**293**	**585**
4054	2									8	22	12	35	10	**89**	**89**	**178**
4055																	
4056		1					30			7	1	1	1		**41**	**40**	**81**
4057	17	75				29			68	100	23	9	28	17	**366**	**366**	**732**
4058																	
4059		3					68			14	2		2		**89**	**90**	**179**
4088	8		27	8		7	100		15		72	99	295	102	**733**	**732**	**1,465**
4089		15	33	22		2	22		2	72		46	136		**350**	**350**	**700**
4132	4	5	48	12		1	9			99	46			187	**411**	**411**	**822**
4133	11	14	142	35			28		2	295	136			558	**1,221**	**1,222**	**2,443**
4134			36	10			17			102		187	558		**910**	**909**	**1,819**
Total Destination	**73**	**137**	**293**	**89**		**40**	**366**		**90**	**732**	**350**	**411**	**1,222**	**909**	**4,712**	**4,712**	**9,424**

Station	Road Name	Station	Road Name
4051	Beach Road @ MA CL	4058	Okeechobee Boulevard (US 98)
4052	SR 5 (North) @ MA CL	4059	SR 80/Us 441 @ Hendry CL
4053	I-95 (North) @ MA CL	4088	US 27 towards PB County
4054	Florida Turnpike (North) @ MA CL	4089	I-75/SR 84 towards Collier CL
4055	SR 7 Extension @ MA CL	4132	Tamiami Trail (US 41/SR 90)
4056	Pratt-Whitney Road @ MA CL	4133	US 1/SR 5 South @ Monroe CL
4057	Bee Line Hwy (SR 710) @ Okeechobee CL	4134	Card Sound Road @ Monroe CL

Symbol Used:
MA = Martin
BO = Broward
CL = County Line

Table 3-2: **Year 2030 Daily Through Vehicle Trip Table**
Southeast Regional Planning Model VI

FROM STATION	TO STATION 4051	4052	4053	4054	4055	4056	4057	4058	4059	4088	4089	4132	4133	4134	Total Origin	Total Destination	Total Through Veh	2000-2030 Growth Fac.
4051		33	9	3			25			10		7	18		**105**	**105**	**210**	**1.44**
4052	33					1	108		4		18	8	23		**195**	**195**	**390**	**1.42**
4053	9									30	38	74	219	46	**416**	**416**	**832**	**1.42**
4054	3									9	26	19	56	13	**126**	**126**	**252**	**1.42**
4055																		
4056		1					44			8	2	1	1		**57**	**58**	**115**	**1.42**
4057	25	108				44			100	126	29	16	48	24	**520**	**520**	**1,040**	**1.42**
4058																		
4059		4					100			18	2		3		**127**	**127**	**254**	**1.42**
4088	10		30	9		8	126		18		75	138	414	118	**946**	**946**	**1,892**	**1.29**
4089		18	38	26		2	29		2	75		66	195		**451**	**451**	**902**	**1.29**
4132	7	8	74	19		2	16			138	66			299	**629**	**628**	**1,257**	**1.53**
4133	18	23	219	56		1	48		3	414	195			892	**1,869**	**1,869**	**3,738**	**1.53**
4134			46	13			24			118		299	892		**1,392**	**1,392**	**2,784**	**1.53**
Total Destination	**105**	**195**	**416**	**126**		**58**	**520**		**127**	**946**	**451**	**628**	**1,869**	**1,392**	**6,833**	**6,833**	**13,666**	**1.45**

Station	Road Name	Station	Road Name
4051	Beach Road @ MA CL	4058	Okeechobee Boulevard (US 98)
4052	SR 5 (North) @ MA CL	4059	SR 80/Us 441 @ Hendry CL
4053	I-95 (North) @ MA CL	4088	US 27 towards PB County
4054	Florida Turnpike (North) @ MA CL	4089	I-75/SR 84 towards Collier CL
4055	SR 7 Extension @ MA CL	4132	Tamiami Trail (US 41/SR 90)
4056	Pratt-Whitney Road @ MA CL	4133	US 1/SR 5 South @ Monroe CL
4057	Bee Line Hwy (SR 710) @ Okeechobee CL	4134	Card Sound Road @ Monroe CL

Symbol Used:
MA = Martin
BO = Broward
CL = County Line

3.3 Results and Comparisons

The IE trip ends (entered in ZDATA4B files) were developed by subtracting the EE trip ends from the count. The IE trip ends were then divided by 2 to obtain the directional values and multiplied by an auto occupancy to obtain person trips. The external station traffic count, the splits of IE and EE trips are summarized in **Table 3-3**.

The external trips consist of both IE passenger trips and EE vehicle trips. The percentages of 11 trip purposes of the IE trips are primarily based on the numbers generated from the trip generation model. Adjustments were made at a few external stations. The actual IE trip ends at each external zone are determined by the trip distribution. The trip ends thus had to be adjusted so that post distribution trip ends matched traffic counts. Several runs were made to validate the external station volumes. The IE productions, attractions and extra-regional time for each external station were modified through the validation runs to replicate each of the external station volumes to traffic counts. The results of this validation are presented in **Table 3-3**. Table also lists the IE/EI vehicle and person trips for each station.

Results are summarized from the 24-hour HEVAL runs. The results exhibit very close agreement between the external station model volume and traffic counts. With the exception of a few low volume roads, all external station volumes match the traffic counts. The volume/count ratios for the validated model range among 0.99 to 1.03 for 14 external stations. The total ratio of the all stations is 1.00. The table also presents the volume/counts ratios for the four screenlines/cutlines (Nos. 7, 16, 29 and 71 – see Figures 10-3 and 10-4) that were used in external model validation. The volume/count ratios for three of these screenlines/cutlines are 1.0 and that for cutline 71 is 1.01.

Table 3-3: **Year 2000 External Station Traffic Counts, IE/EE Trips and Volume/Count Ratios**
Southeast Regional Planning Model VI

						Through Vehicle Trips					Model Stats (24-Hour)	
Regional External TAZ	MPO External TAZ	Road Name	Links of Traffic Counts	Screenline No	2000 Count	Origin	Destination	Total	IE & EI Vehicle Trips	IE person trips	Volume	Volume /Count
4051	1598	Beach Road @ MA CL	5096-6550	7	1,800	**73**	**73**	**146**	**1,654**	**1,069**	**1,780**	**0.99**
4052	1599	SR 5 (North) @ MA CL	5068-5092	7	25,000	**137**	**137**	**274**	**24,726**	**16,146**	**24,947**	**1.00**
4053	1600	I-95 (North) @ MA CL	10098->10102, 10100->10098	7	64,500	**292**	**293**	**585**	**63,915**	**41,752**	**64,503**	**1.00**
4054	1601	Florida Turnpike @ MA CL	9904->9908, 9906->9904	7	27,500	**89**	**89**	**178**	**27,322**	**18,800**	**27,331**	**0.99**
4055	1602	SR 7 Extension @ MA CL	5168-5260	7								
4056	1603	Pratt-Whitney Road (CR 711) @ MA CL	5144-6554	7	3,000	**41**	**40**	**81**	**2,919**	**2,052**	**3,089**	**1.03**
4057	1604	Bee Line Hwy (SR 710) @ Okeechobee CL	5120-6558	7	5,000	**366**	**366**	**732**	**4,268**	**2,824**	**4,958**	**0.99**
4058	1605	Okeechobee Boulevard (US 98)	6904-7610	16								
4059	1606	SR 80/US 441 @ Hendry CL	6912-7610	16	11,200	**89**	**90**	**179**	**11,021**	**7,071**	**11,189**	**1.00**
4088	918	US 27 towards PB County	18292-18293	29	8,300	**733**	**732**	**1,465**	**6,835**	**4,192**	**8,328**	**1.00**
4089	919	I-75/SR 84 towards Collier CL	19400->19402,19401->19400	29	19,100	**350**	**350**	**700**	**18,400**	**11,979**	**19,136**	**1.00**
4132	1519	Tamiami Trail (US 41/SR 90) towards Monroe/Collier CL	24811-27903	71	6,174	**411**	**411**	**822**	**5,352**	**3,606**	**6,166**	**1.00**
4133	1520	US 1/SR 5 South @ Monroe CL	22341-26322	71	17,326	**1,221**	**1,222**	**2,443**	**14,883**	**10,158**	**17,572**	**1.01**
4134	1521	Card Sound Road @ Monroe CL	22340-26325	71	6,040	**910**	**909**	**1,819**	**4,221**	**2,910**	**6,192**	**1.03**
		ALL External Stations:			194,940	**4,712**	**4,712**	**9,424**	**185,516**	**122,559**	**195,191**	**1.00**
				7-Total	126,800	998	998	1,996	124,804	82,643	**126,608**	**1.00**
				16-Total	11,200	89	90	179	11,021	7,071	**11,189**	**1.00**
				29-Total	27,400	1,083	1,082	2,165	25,235	16,171	**27,464**	**1.00**
				71-Total	29,540	2,542	2,542	5,084	24,456	16,674	**29,930**	**1.01**

Symbol Used: MA = Martin, PB = Palm Beach, BO = Broward, CL = County Line

4. TRIP GENERATION MODEL

The standard FSUTMS GEN model was replaced with the Lifestyle Trip Generation Model for all Southeast Florida models validated since 1996. SERPM4 model uses a regional trip generation program process that was built upon FSUTMS GEN model. One key enhancement of the SERPM5 was to develop a regional trip generation process to implement the lifestyle trip generation models. Chapter 8 of Technical Report 1 (Data Development and Model Update) of SERPM5 has a complete description of this process.

With the new special Census 2000 tabulation (STP60), a few minor changes were made to the urban version of lifestyle program (ULSTGENMX), primarily to implement the new Census data. A few others changes were made to incorporate density based area types that are dynamically generated by CV application.

This chapter lists few elements of the lifestyle trip generation model. It then summarizes the overall model process and the validated rates and results.

4.1 Lifestyle Trip Generation Elements

Trip generation is the process used to determine the number of person trips that originate or are produced in any specific zone and the number of trips that are destined or are attracted to that zone. The lifestyle trip generation process uses a cross-classification model for trip productions. Two separate structures were used for the work and non-work trips. The process also used revised trip attraction rates that vary by employment categories and area types. Special generators represent Land uses that exhibit extraordinary trip productions or trip attraction characteristics. The lifestyle trip generation model includes a modified process to handle special generator trips in the trip generation model. Trips that have one end in the study area and the other end out of the study area, known as internal-external trips, are modeled as internal-internal trips in the lifestyle trip generation process.

The lifestyle trip generation programs produce daily trips for the following eleven purposes:

1. Home-Based Work (HBW) person trips
2. Home-Based Shopping (HBShop/HBSHP) person trips
3. Home-Based Social-Recreation (HBSocRec/HBSCR) person trips
4. Home-based School (HBSchool/HBSCH) person trips [It includes only private schools and colleges and universities]
5. Home-based Other (HBO) person trips
6. Non-Home-Based Work (NHBW) person trips
7. Non-Home-Based Other (NHBO) person trips
8. Airport (AIRPORT) person trips
9. Truck – 4-Tired Commercial vehicle trips
10. Truck – Single Unit Commercial vehicle trips
11. Truck – Combinations Commercial vehicle trips

4.1.1 Trip Generation Model Structure

Cross-classification and regression-type models are used in the lifestyle trip generation model. Cross-classification analysis is used to group households with common socioeconomic characteristics (with or without children, household size, number of vehicles and number of workers) together to create relatively homogenous groups.

The modified lifestyle trip production models are cross-classification models that estimate trips per household based on the following classifying variables:

- Vehicles in households with and without children
- Workers in households with and without children (for HBW and NHBW purposes)
- Persons in households with and without children (for non-work purpose only)
- Hotel-motel type (optionally three hotel-motel types can be used)

Figure 4-1 presents the trip production model structures of the 2000 based lifestyle model of Southeast Florida. It differentiates the work and non-work structures. The simple rate based equations were used for the airport and the three truck purposes.

The revised trip attraction models use employment by type, school enrollment, households and area type as independent variables. The attractions rates were based on "disaggregate" analysis for work purposes (HBW and NHBW). An aggregate analysis was used for non-work trip purposes. Rates were developed based on the area type used in highway network. The *Trip Attraction Equation Refinement Study* report [Reference 27] has a detailed description of the development of the trip attraction rates. **Figure 4-2** presents the modified trip attraction model structure. The modified structure includes the new density based area type. Correlating these new area types with standard model area types provided the initial rates for this new structure.

4.1.2 School Trips

For the lifestyle trip generation process, school trips were divided in two broad categories—public and private. Public schools are further divided into elementary, middle, and high school. Because most public school students are assigned to a school from designated school boundaries within a school district, the trip table is fairly well established. The model takes this structure into account by using separate processes for public and private schools. Trip tables are directly built for the public school students using actual school board student enrollment information for each school and related school boundary. Private school and college students are distributed using the normal gravity model.

The initial set of school productions is calculated from the trip rates and socioeconomic data. Then the productions of the home zones are prorated in proportion to the attractions. These prorated values become the school productions for this school. This is done for the private as well as the public school trips. For private schools, the total productions are proportioned to the total attractions (enrollment x trips/enrollment).

To accommodate the change in the school trip rate method, three variables, representing grade school, middle school and high school trip generation rates were added to the "school" file. If the school rates in the "school" are blank, but the TAZ has a school, the model uses the trip attraction rate from the production/attraction rate file. Thus, the modeler has control over the trip attraction rate for each type of school, for each TAZ.

Figure 4-1: **Trip Production Model Structure**
Southeast Regional Planning Model VI

Cross-Classified Structure of Work Purposes

1. Home-Based Work (HBWork)
6. Non-Home-Based Work (NHBWork) Production/Attraction Controls

		Rates per Household		
		WORKER		
CHILDREN	VEHICLE	0 Worker	1 Worker	2+ Workers
Without Children	0 vehicle		x	x
	1 vehicle		x	x
	2 vehicles		x	x
	3+ vehicles		x	x
With Children	0 vehicle		x	x
	1 vehicle		x	x
	2 vehicles		x	x
	3+ vehicles		x	x

Hotel/Motel(H/M) Type(*)	Rate/Unit
Business	x
Leisure/Recreational	x
Mix	x
All Types	x

(*) Model uses either "Individual H/M Type rates" or "all H/M type rate"

Cross-Classified Structure of Non-Work Purposes:

2. Home-Based Shopping (HBShop)
3. Home-Based Social Recreation (HBSocRec)
4. Home-Based School (HBSchool) - No H/M Rates
5. Home-Based Other (HBOther)
7. Non-Home-Based Other (NHBOther) Origin/Destination Controls

		Rates per Household			
		PERSON			
CHILDREN	VEHICLE	1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	x	x	x	x
	1 vehicle	x	x	x	x
	2 vehicles	x	x	x	x
	3+ vehicles	x	x	x	x
With Children	0 vehicle		x	x	x
	1 vehicle		x	x	x
	2 vehicles		x	x	x
	3+ vehicles		x	x	x

Hotel/Motel(H/M) Type(*)	Rate/Unit
Business	x
Leisure/Recreational	x
Mix	x
All Types	x

(*) Model uses either "Individual H/M Type rates" or "all H/M type rate"

(8) Airport Trip Purpose (for major airport only)

Trips per Enplanement = x

(9-11) Three Truck (4-tired, SU & COMB) Purposes:

Truck production rates are same as their attraction rates.
Truck Attraction Structure is shown in Figure 4-2.

Figure 4-2: **Trip Attraction Model Structure**
Southeast Regional Planning Model VI

Trip Purpose		Area Type	Attraction Variables						
			Industrial Employment (SIC:1-39)	Commercial Employment (SIC:50-59)	Service Employment (SIC:40-49,60-99)	Total Employment	Households	Occupied H/M Units	School and College Enrollment
1. HB-Work		ALL	X	X	X				
2. HB-Shop		CBD		X	X				
		High Density Non-CBD		X	X				
		Medium Density Non-CBD		X	X				
		Low Density Non-CBD		X	X				
		Very Low Density Non-CBD		X	X				
3. HB-SocRec		CBD		X	X		X	X	
		High Density Non-CBD		X	X		X	X	
		Medium Density Non-CBD		X	X		X	X	
		Low Density Non-CBD		X	X		X	X	
		Very Low Density Non-CBD		X	X		X	X	
4. HB-School		ALL							X
5. HB-Other		CBD		X	X		X	X	
		High Density Non-CBD		X	X		X	X	
		Medium Density Non-CBD		X	X		X	X	
		Low Density Non-CBD		X	X		X	X	
		Very Low Density Non-CBD		X	X		X	X	
6. NHB-Work (*)	a. Production Allocation	ALL	X	X	X				
	b. Attraction Allocation	CBD	X	X	X		X	X	
		High Density Non-CBD	X	X	X		X	X	
		Medium Density Non-CBD	X	X	X		X	X	
		Low Density Non-CBD	X	X	X		X	X	
		Very Low Density Non-CBD	X	X	X		X	X	
7. NHB-Other (*)	a. Origin Allocation	CBD	X	X	X		X	X	
		High Density Non-CBD	X	X	X		X	X	
		Medium Density Non-CBD	X	X	X		X	X	
		Low Density Non-CBD	X	X	X		X	X	
		Very Low Density Non-CBD	X	X	X		X	X	
	b. Destination Allocation	CBD	X	X	X		X	X	
		High Density Non-CBD	X	X	X		X	X	
		Medium Density Non-CBD	X	X	X		X	X	
		Low Density Non-CBD	X	X	X		X	X	
		Very Low Density Non-CBD	X	X	X		X	X	
8. Airport		ALL				X	X	X	
Truck	9. Four-tired	ALL	X	X	X		X	X	
	10. Single Unit	ALL	X	X	X		X	X	
	11. Combinations	ALL	X	X	X		X	X	

(*) These trip allocations are based on trip production control totals.

4.1.3 Truck Trips

Truck traffic has different travel characteristics than passenger vehicles. Truck traffic is important for pavement design and capacity analysis. Truck trips also have different characteristics than auto trips such as travel pattern and vehicle operating characteristics. The modified lifestyle trip generation routine implements three truck purposes (4-tired, Single Unit and Combinations) treating trucks as separate mode from generation through assignment.

The structure of the truck model follows the one suggested in FHWA's Quick Response Freight Manual (QRFM). The truck model uses the same highway network and socio-economic data as the auto model. The truck QRFM rates were not directly applicable to the FSUTMS truck model since it uses employment categories that are not directly comparable. A mapping of the FSUTMS and QRFM employment categories by the Standard Industrial Classification (SIC) codes overcame this problem. The process developed truck rates for the each urban region separately. These rates were further adjusted as part of model validation.

The friction factors for the three truck purposes were developed using the negative exponential functions suggested in the QRFM. The assignment of the truck trips (SU and Combination trucks) uses equilibrium assignment technique using truck as one class. The 4-tired truck trips are added to drive-alone trips after distribution for assignment.

4.1.4 Airport Trips

Airport enplanement-related person trips generated at the major (international) airports (Palm Beach International Airport – PBIA, Ft. Lauderdale/Hollywood International Airport – FLL and Miami International Airport - MIA) are handled separately in the SERPM trip generation model. For modeling purposes, all trips are produced at the airport. The attraction trip ends are based on rates derived from a recent airport surveys at commercial, permanent-residential, and visitor-residential land uses.

4.1.5 Internal-External (IE) Trips

Most non-Southeast Florida FSUTMS models take a traditional approach to IE trips treating them separately and independently from internal trips. While this approach works well in isolated areas, it has problems in urban areas, which are part of a larger urban area. The problem is usually seen as an overestimation of traffic near a study area boundary. The reason for the overestimation is the surcharge of IE trips across the study area boundary.

This revised model includes a modified IE process that eliminates IE as a separate trip purpose. These trips are now handled as part of the internal trip purposes. The process works as follows:

- Total person trip productions and total person trip attractions at each external TAZ are entered in the ZDATA4B files. These are obtained from external station counts by adjusting the values so that the trip ends after distribution at each external TAZ match the counts.

- The file also contains the percentages of productions and attractions by internal purpose.

- The IE person trip P's and person trip A's by purpose at each external station are estimated by multiplying the two sets of data noted above.

- Travel times from all external zones to all external zones are set at zero inside CV scripts. In addition, the FAIL[1] in the FF LOOKUP statement of trip distribution prevents IE trips from becoming EE. These are same as specifying K factors of zero in earlier versions of SERPM.

- Distribute the IE trip ends as part of the internal trip distribution process.

The distribution process will determine the IE and EI trips (they will be present in the internal trip tables). Because the gravity model ensures the distribution of all productions, but not all attractions, the production ends of the IE trips will be fairly accurate while the attraction ends could be significantly different from the counts. Some adjustment of the total IE trips (productions and attractions) and/or travel time at external station connectors were made so that the desired volumes at the external stations are obtained.

4.1.6 Non-Home-Based Trips

A nationwide review [see Reference 27] of Non Home Based (NHB) trip modeling techniques showed a growing trend of using two separate NHB purposes – Non Home Based Work (NHBW) and Non Home Based Other (NHBO). Starting version 5 pf SERPM, these two NHB purposes were modeled. Calibration of trip rates of these two purposes used the 1999 Southeast Florida Travel Characteristics Surveys (SEFTCS). Results showed different trip generation and distribution characteristics for the NHBW and NHBO purposes. These surveys were also used data for model trip distribution parameters. Both production and attractions of NHBW and NHBO are new in the SERPM5 and SERPM6.

The control totals for the NHBW and NHBO trips are obtained using cross-classification trip production rates. Like other home-based trip purposes, NHBW and NHBO trips are generated for each travel zone. However, these values cannot be used for NHBW (or NHBO) productions and attractions because, by definition, NHBW (or NHBO) trips are not related to zonal household characteristics. The zonal level trips were summed to derive the control total values for the study area. The control total value is then allocated to zones in proportion to the modified NHBW and NHBO regression equation trip ends. Thus, the NHBW and NHBO regression equations are used to allocate the control total value. This process produces more accurate control totals for the NHB trips based on the travel survey data. Therefore, it is a worthy enhancement to the NHB trip process.

4.1.7 Household Stratification Curves

Stratification curves are needed to distribute the aggregate zonal level data to the discrete classes used in the trip production matrices. Data from a Census special tabulation were used to develop stratification models. Models were developed for the following categories:

- Zonal household vehicles of without-children households,
- Zonal household vehicles of with-children households,
- Zonal household workers of without-children households,
- Zonal household workers of with-children households,
- Zonal household persons of without-children households, and
- Zonal household persons of with-children households.

Polynomial regression analysis was performed for each data set. The deviation of the average of the class of the variable from its grand mean was used as the independent variable. The dependent variables are the frequencies of each class of the variable. The general form of this equation is

$$Y_i = \beta_o + \beta_1 x_i + \beta_2 x_i^2 + \ldots\ldots + \beta_j x_i^j + \ldots + \beta_n x_i^n$$

$$(\text{where, } x_i = X_i - \overline{X})$$

The specification of the independent variable as a deviation reduces the multicollinearity problem, as well as computational problems arising from higher order polynomials. **Tables C-1, C-2 and C-3 of Appendix C** present the stratification models for Palm Beach, Broward and Miami-Dade Counties, respectively.

4.1.8 Special Generator Process

Activity within some zones is significantly different from the regional averages. The differences in predicted trips would be large enough to change planning decisions on specific roadway or transit facilities. These facilities may include some airports (modeled as a separate purpose in SERPM5 and SERPM6), recreation and amusement areas, regional shopping centers, military and government complexes, hospitals, and colleges and universities. These facilities are often treated as special generators.

The lifestyle trip generation process includes a modified process to handle special generator trips in the trip generation model. One of the criticisms of the trip generation process used in Florida concerns the special generator process. Traditionally, trip generation models adjust the calculated number of trip attractions such for each trip purpose the sum of the adjusted attraction equals the sum of productions. Even if this adjustment were not made in the trip generation step, the adjustment would be made effectively in the gravity model. This is because the gravity model distributes as many trips as there are trip productions.

A problem occurs when there is an attraction special generator. The attractions for a zone set by the special generator model are adjusted up or down so that the attractions used by the model are different from those specified for the special generator. Sometimes these differences are large. If, for example, the sum of attractions is 120% of the sum of productions, then the attractions at every zone including the special generators will be only 83.3% of the input values. Conversely, if the sum of attractions if only 80% of the sum of productions, the model will use a value that is 125% of the input values. If the model is being applied to assess the impacts of a proposed development, the traffic forecast at the entrance to the development might be quite different from what is expected.

To overcome the above problem, a modified special generator process was implemented in the lifestyle trip generation routines. This modified process holds the special generators attractions constant, and then applies the adjustments only to the non-special generator zones so that the sum of adjusted attractions will be equal to the sum of productions. Thus, if a TAZ has “regular” attractions from the trip rate equations, and an addition of special generator trips, the regular trips will be subject to adjustment, while the additional trips will not be subject to adjustment.

While the adjustment method is the same for home-based and non-home based trips, the application is slightly different. For home-based trips productions never are adjusted. For non-home based trips, productions and attractions are the same by definition. Thus, both productions and attractions are adjusted. A benefit of this adjustment process is that special generators can be applied with a much higher degree of accuracy than under the conventional approach.

The adjustment procedure for each purpose adjusts the trips as follows:

- Productions are calculated for each TAZ, and totaled for the study area.
- Attractions are calculated for each TAZ, and totaled for the study area. However, during the process, separate totals are kept for regular attractions and special generator attractions.
- The sum of special generator attractions is subtracted from the sum the sum of productions. Let this difference be X. The adjustment factor for regular attractions for each TAZ is X divided by the sum of regular trip attractions. The program reports this factor as “Balance Factor”.
- The regular attractions are multiplied by the adjustment factor.

- The adjusted regular attractions are added to the unadjusted special generator attractions for each TAZ. The sum for each TAZ is passed to the trip distribution model.

The result is that the sums of productions and attractions are equal, and the special generator portions of a TAZ's trip attraction are not adjusted. The changes that were made to the lifestyle generation model's special generator procedure do not require changes to any input variable. However, the trip attraction balancing procedure has been modified. This adjustment methodology should give logical results unless the special generator trips are a very large fraction of the total number of trips or the sum of productions and attractions are grossly out of balance.

4.2 Modeling Process

The regional trip generation model uses the eleven purposes and includes all enhancements implemented in its urban counterpart. The regional model is a combination of five FORTRAN based programs that run in succession. They are:

1. RZDATA2 – Regional Employment Indexing Program
2. ULSTGENM3 - Urban Area Lifestyle Trip Generation Model
3. COMBLSM – Trip Generation Integration Program
4. RBALM2 – Regional Balancing and Special Generation Program
5. ZAP2 – Zero Auto Household Trip Production Program

The regional model allows use of each urban area's trip production and attraction rates as well as other parameters specified in GRATEBXX.SYN files (where, "xx" stands for two-digit urban code, PB = Palm Beach, BO = Broward and MI = Miami-Dade). The model also uses urban zonal data to produce the productions and attractions. The regional model uses two control files (S6GEN.CTL and COMBLS.CTL) to map the urban and regional TAZs and data.

The program execution assumes the existence of the following subdirectories from the working directory.

• {PATH1}	=> See the catalog key (Table A-1)for User Written Program Location
• {DATADIR}\MPOIN\PBIN	=> Subdirectory of Palm Beach Input files [Note: {DATADIR} is a catalog key for the main input folder]
• {DATADIR}\MPOIN\BOIN	=> Subdirectory of Broward Input files
• {DATADIR}\MPOIN\MIIN	=> Subdirectory of Miami-Dade Input files
• {OUTDIR}\MPOOUT\PBOUT	=> Subdirectory of Palm Beach Output files [Note: {OUTDIR} is a catalog key for the main output folder]
• {OUTDIR}\MPOOUT\BOOUT	=> Subdirectory of Broward Output files
• {OUTDIR}\MPOOUT\MIOUT	=> Subdirectory of Miami-Dade Output files
• RGENOUT	=> Subdirectory of Regional Output files

The input directory should contain the two control files (S6GEN.CTL and COMBLS.CTL) and PROFILE.MAS. Each of the three input subdirectories (PBIN, BOIN and MIIN) contains seven input files. Following is a list of the input files of the XXIN (where, XX=PB-Palm Beach, BO-Broward, and MI-Miami-Dade) folder.

- GRATESXX.SYN: Trip Production Rate, Attraction Rate and Household Stratification Curve File.
- STP60XX.SYN: Year 2000 Census Special Tabulation (STP60) File.
- SCHOOL.{YEAR}{ALT}: Year 20YY SCHOOL file.
- ZDATA1B.{YEAR}{ALT}: Year 20YY zonal production data file.
- ZDATA2.{YEAR}{ALT}: Year 20YY zonal attraction data file.
- ZDATA3B.{YEAR}{ALT}: Year 20YY airport and special generator file.
- ZDATA4B.{YEAR}{ALT}: Year 20YY internal-external production/attraction file.

The zone numbers used in the trip generation input files of these input folders are the MPO zone numbers. The ZDATA1B input data provides TAZ level household characteristic data. This input file is written from the TAZ database (SERPM6.DBF) file. So, the users are required to modify SERPM6.DBF file if any modification zonal production data is required. The density based area types for their use in trip attraction model are written from CV application.

The trip generation routine then estimates the households within each cell of the cross-classification matrices. The ULSTGENM3 routine reports the number of households in each of the cross-classification cells. The HBW and NHBW productions use the work classification structure (see **Figure 4-1**), which uses the stratification variables presence/absence of children, number of HH workers and number of HH autos. The other purposes (HBShop, HBSocRec, HBSchool-non-public, HBOther and NHBO) productions use the non-work structure (see **Figure 4-2**), which uses the stratification variables presence/absence of children, number of persons and number of HH autos. The other production and attraction models use a regression model. The production and attraction rates, as well as the stratification curves, are entered in GRATEBXX.SYN (XX=PB, BO and MI) files. The regional model implements county specific trip generation rates. Beside standard {ALT}{YEAR} output file extension, the trip generation module generates several output files with extensions of XX (PB, BO and MI), ERR, CHK, and UND. Users should consult Technical Report 3 (Model Application Guidelines) for complete description of the input and output files.

The trip generation module separates the peak and off-peak trips using the diurnal factors shown in **Table 4-1** (see part a).

4.3 Model Validation

The production and attraction rates were calibrated from the 1999 South Florida Travel Characteristics survey [Reference 25]. The trip generation (both productions and attractions) calibration processes are based mainly on statistical analyses. A report titled "*Development of Trip Rates and Friction Factors for Southeast Florida Demand Forecast Models*," [Reference 26] describes trip production calibration process. *Trip Attraction Equation Refinement Study* report [Reference 27] describes the trip attraction calibration process. In model validation, the calibrated rates were adjusted to produce reasonable results.

The special generators used in the MPO files were used in the regional model. A few changes were made to the Miami-Dade special generator files to delete the special generator records of the Miami International Airport (because of the addition of the airport purpose), and formatting changes due to the addition of trip purposes.

The validation of the trip generation model started with the validated 1999 Miami-Dade County rates from SERPM5 and the 2000 validated rates from Palm Beach and Broward counties. The rates were further modified so that model produces reasonable results both in the trip generation module and in the context of overall model stream. The rates were modified so that model generated volumes reasonably replicate the observed counts. Adequate comments are provided in the GRATEBXX.SYN files so that the data are easily understood. A summary of the validated production rates for Palm Beach, Broward and Miami-Dade counties are shown in **Tables 4-2, 4-3 and 4-4** respectively. The attraction rates were summarized in **Tables 4-5, 4-6 and 4-7** for these three counties.

Table 4-1: **Time-of-Day Model Diurnal Factors**
Southeast Regional Planning Model VI

A. Peak & Off-Peak Factors:

HBW-PK	0.5980	HBW-OP	0.4020
HBSHP-PK	0.3790	HBSHP-OP	0.6210
HBSCR-PK	0.3861	HBSCR-OP	0.6139
HBSCH-PK	0.5225	HBSCH-OP	0.4775
HBO-PK	0.3821	HBO-OP	0.6179
NHBW-PK	0.3915	NHBW-OP	0.6085
NHBO-PK	0.2991	NHBO-OP	0.7009
ARPRT-PK	0.3316	ARPRT-OP	0.6684
T4TRK-PK	0.3864	T4TRK-OP	0.6136
SUTRK-PK	0.4541	SUTRK-OP	0.5459
COMBTRK-PK	0.3594	COMBTRK-OP	0.6406

B. AM and PM Peak Splitting Factors:

AMPKSF-HBW	0.4834	PMPKSF-HBW	0.5166
AMPKSF-HBNW	0.4482	PMPKSF-HBNW	0.5518
AMPKSF-NHB	0.3983	PMPKSF-NHB	0.6017
AMPKSF-4TTRK	0.4755	PMPKSF-4TTRK	0.5245
AMPKSF-SUTRK	0.4830	PMPKSF-SUTRK	0.5170
AMPKSF-COMBTRK	0.4492	PMPKSF-COMBTRK	0.5508

C. AM and PM Peak PtoA (PA) & AtoP (AP) Factors:

AMPKPAF-HBW	0.9549	PMPKPAF-HBW	0.0963	OFPKPAF-HBW	0.4947
AMPKPAF-HBNW	0.7683	PMPKPAF-HBNW	0.3051	OFPKPAF-HBNW	0.4889
AMPKAPF-HBW	0.0451	PMPKAPF-HBW	0.9037	OFPKAPF-HBW	0.5053
AMPKAPF-HBNW	0.2317	PMPKAPF-HBNW	0.6949	OFPKAPF-HBNW	0.5111

The MPO's TAZ data includes only the total number of hotels and motels, not the number by type of hotel/motel. Thus, one hotel/motel rate by purpose was used in the 2000 model validation, although rates by type were developed. The attraction rates shown in Tables 4-5, 4-6 and 4-7 depend on area type, employment type, school enrollments, and occupied dwelling and hotel/motel units.

Table 4-2: **Validated Cross-Classified Trip Production Rates for Palm Beach County**
Southeast Regional Planning Model VI

(1) Home-Based Work (HBWork)

		WORKER		
CHILDREN	VEHICLE	0 Worker	1 Worker	2+ Workers
Without Children	0 vehicle		0.360	2.637
	1 vehicle		**0.617**	**2.895**
	2 vehicles		**1.392**	**3.748**
	3+ vehicles		3.204	**5.557**
With Children	0 vehicle		1.544	3.897
	1 vehicle		**1.799**	**4.153**
	2 vehicles		**2.650**	**5.006**
	3+ vehicles		4.461	**6.818**
All Hotel & Motel Types:		0.396		

(2) Home-Based Shopping (HBShop)

		PERSON			
CHILDREN	VEHICLE	1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	0.043	0.475	0.979	1.527
	1 vehicle	**0.136**	**0.571**	1.074	1.621
	2 vehicles	0.259	**0.827**	**1.331**	1.879
	3+ vehicles	0.979	**1.546**	**2.047**	**2.598**
With Children	0 vehicle		1.248	1.754	2.303
	1 vehicle		1.344	1.847	**2.396**
	2 vehicles		1.600	**2.105**	**2.651**
	3+ vehicles		2.319	2.822	**3.372**
All Hotel & Motel Types:		0.600			

(3) Home-Based Social-Recreation (HBSocRec)

		PERSON			
CHILDREN	VEHICLE	1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	0.051	0.086	0.192	0.784
	1 vehicle	**0.100**	**0.301**	0.476	1.068
	2 vehicles	0.217	**0.561**	**0.735**	1.324
	3+ vehicles	0.356	**0.697**	**0.875**	**1.463**
With Children	0 vehicle		0.672	0.844	1.439
	1 vehicle		0.958	1.131	**1.722**
	2 vehicles		1.214	**1.389**	**1.982**
	3+ vehicles		1.355	1.527	**2.118**
All Hotel & Motel Types:		4.915			

(4) Home-Based School (HBSchool)

		PERSON			
CHILDREN	VEHICLE	1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	0.056	0.074	0.107	1.086
	1 vehicle	**0.086**	**0.104**	0.510	1.458
	2 vehicles	0.337	**0.355**	**0.855**	1.805
	3+ vehicles	0.669	**0.687**	**1.219**	**2.169**
With Children	0 vehicle		0.481	0.991	2.144
	1 vehicle		0.750	1.324	**2.274**
	2 vehicles		1.098	**1.672**	**2.622**
	3+ vehicles		1.462	2.036	**2.986**

(5) Home-Based Other (HBOther)

		PERSON			
CHILDREN	VEHICLE	1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	0.099	0.530	2.010	3.142
	1 vehicle	**0.159**	**0.679**	2.162	3.293
	2 vehicles	0.199	**1.126**	**2.608**	3.740
	3+ vehicles	1.668	**2.614**	**4.096**	**5.227**
With Children	0 vehicle		2.605	4.086	5.221
	1 vehicle		2.758	4.237	**5.367**
	2 vehicles		3.202	**4.685**	**5.815**
	3+ vehicles		4.690	6.172	**7.304**
All Hotel & Motel Types:		0.391			

(6) Non-Home-Based-Work (NHBW) Origin/Destination Controls

		WORKER		
CHILDREN	VEHICLE	0 Worker	1 Worker	2+ Workers
Without Children	0 vehicle		0.242	0.966
	1 vehicle		**0.281**	**1.113**
	2 vehicles		**0.530**	**1.432**
	3+ vehicles		1.143	**2.045**
With Children	0 vehicle		0.709	1.609
	1 vehicle		**0.860**	**1.759**
	2 vehicles		**1.175**	**2.076**
	3+ vehicles		1.789	**2.690**
All Hotel & Motel Types:		0.237		

(7) Non-Home-Based-Other (NHBO) Origin/Destination Controls

		PERSON			
CHILDREN	VEHICLE	1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	0.260	0.482	1.056	1.668
	1 vehicle	**0.463**	**0.946**	1.527	2.137
	2 vehicles	0.625	**1.203**	**1.786**	2.394
	3+ vehicles	1.190	**1.770**	**2.346**	**2.957**
With Children	0 vehicle		1.498	2.078	2.687
	1 vehicle		1.967	2.546	**3.157**
	2 vehicles		2.224	**2.804**	**3.415**
	3+ vehicles		2.788	3.366	**3.978**
All Hotel & Motel Types:		1.600			

(8) Airport Trip Purpose

Trips per Enplanement = 3.316

(9-11) Three Truck (4-tired, SU & COMB) Purposes:

Truck production rates are same as their attraction rates.

Table 4-3: **Validated Cross-Classified Trip Production Rates for Broward County**
Southeast Regional Planning Model VI

(1) Home-Based Work (HBWork)

CHILDREN	VEHICLE	WORKER: 0 Worker	1 Worker	2+ Workers
Without Children	0 vehicle		0.605	2.172
	1 vehicle		**0.638**	**2.212**
	2 vehicles		**1.151**	**2.828**
	3+ vehicles		2.308	**3.982**
With Children	0 vehicle		1.392	3.070
	1 vehicle		**1.432**	**3.110**
	2 vehicles		**2.046**	**3.722**
	3+ vehicles		3.205	**4.880**
All Hotel & Motel Types:		0.396		

(2) Home-Based Shopping (HBShop)

CHILDREN	VEHICLE	PERSON: 1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	0.077	0.474	0.505	1.355
	1 vehicle	**0.118**	**0.512**	0.548	1.396
	2 vehicles	**0.212**	**0.723**	**0.755**	1.607
	3+ vehicles	0.845	**1.353**	**1.385**	**2.235**
With Children	0 vehicle		0.864	0.895	1.749
	1 vehicle		**0.908**	**0.936**	**1.789**
	2 vehicles		1.115	**1.148**	**1.996**
	3+ vehicles		1.744	1.774	**2.627**
All Hotel & Motel Types:		0.600			

(3) Home-Based Social-Recreation (HBSocRec)

CHILDREN	VEHICLE	PERSON: 1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	0.007	0.071	0.352	1.010
	1 vehicle	**0.029**	**0.095**	0.388	1.049
	2 vehicles	**0.198**	**0.454**	**0.751**	1.408
	3+ vehicles	0.403	**0.664**	**0.957**	**1.615**
With Children	0 vehicle		0.620	0.915	1.576
	1 vehicle		**0.655**	**0.949**	**1.611**
	2 vehicles		1.016	**1.310**	**1.970**
	3+ vehicles		1.225	1.518	**2.176**
All Hotel & Motel Types:		4.915			

(4) Home-Based School (HBSchool)

CHILDREN	VEHICLE	PERSON: 1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	0.062	0.084	0.145	1.430
	1 vehicle	**0.090**	**0.133**	0.224	1.536
	2 vehicles	**0.105**	**0.140**	**0.384**	1.841
	3+ vehicles	0.211	**0.345**	**0.940**	**2.397**
With Children	0 vehicle		0.719	1.334	2.791
	1 vehicle		**0.819**	**1.433**	**2.890**
	2 vehicles		1.123	**1.737**	**3.195**
	3+ vehicles		1.680	2.294	**3.751**

(5) Home-Based Other (HBOther)

CHILDREN	VEHICLE	PERSON: 1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	0.246	0.397	0.669	2.122
	1 vehicle	**0.302**	**0.853**	1.209	2.662
	2 vehicles	**0.380**	**1.435**	**1.792**	3.243
	3+ vehicles	0.897	**2.183**	**2.541**	**3.992**
With Children	0 vehicle		1.859	2.220	3.672
	1 vehicle		**2.401**	**2.759**	**4.209**
	2 vehicles		2.986	**3.339**	**4.794**
	3+ vehicles		3.733	4.089	**5.538**
All Hotel & Motel Types:		0.391			

(6) Non-Home-Based-Work (NHBW) Origin/Destination Controls

CHILDREN	VEHICLE	WORKER: 0 Worker	1 Worker	2+ Workers
Without Children	0 vehicle		0.224	0.792
	1 vehicle		**0.293**	**1.012**
	2 vehicles		**0.580**	**1.383**
	3+ vehicles		0.959	**1.765**
With Children	0 vehicle		0.522	1.328
	1 vehicle		**0.744**	**1.549**
	2 vehicles		**1.118**	**1.922**
	3+ vehicles		1.499	**2.304**
All Hotel & Motel Types:		0.237		

(7) Non-Home-Based-Other (NHBO) Origin/Destination Controls

CHILDREN	VEHICLE	PERSON: 1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	0.055	0.101	1.010	1.810
	1 vehicle	**0.143**	**0.447**	1.407	2.208
	2 vehicles	**0.267**	**0.754**	**1.713**	2.513
	3+ vehicles	1.021	**1.506**	**2.466**	**3.266**
With Children	0 vehicle		1.098	2.057	2.859
	1 vehicle		**1.496**	**2.455**	**3.255**
	2 vehicles		1.800	**2.759**	**3.558**
	3+ vehicles		2.555	3.514	**4.316**
All Hotel & Motel Types:		1.600			

(8) Airport Trip Purpose

Trips per Enplanement = 2.831

(9-11) Three Truck (4-tired, SU & COMB) Purposes:

Truck production rates are same as their attraction rates.

Table 4-4: **Validated Cross-Classified Trip Production Rates for Miami-Dade County**
Southeast Regional Planning Model VI

(1) Home-Based Work (HBWork)

CHILDREN	VEHICLE	WORKER: 0 Worker	1 Worker	2+ Workers
Without Children	0 vehicle		0.722	2.467
	1 vehicle		**0.738**	**2.499**
	2 vehicles		**1.390**	**3.238**
	3+ vehicles		2.840	**4.688**
With Children	0 vehicle		1.463	3.314
	1 vehicle		**1.491**	**3.343**
	2 vehicles		**2.227**	**4.076**
	3+ vehicles		3.677	**5.527**
All Hotel & Motel Types:		0.396		

(2) Home-Based Shopping (HBShop)

CHILDREN	VEHICLE	PERSON: 1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	0.092	0.216	0.443	0.969
	1 vehicle	**0.111**	**0.239**	0.452	0.992
	2 vehicles	**0.181**	**0.282**	**0.580**	1.118
	3+ vehicles	1.150	**1.315**	**1.681**	**2.222**
With Children	0 vehicle		0.574	0.946	1.473
	1 vehicle		**0.581**	**0.952**	**1.494**
	2 vehicles		0.713	**1.079**	**1.619**
	3+ vehicles		1.815	2.183	**2.723**
All Hotel & Motel Types:		0.600			

(3) Home-Based Social-Recreation (HBSocRec)

CHILDREN	VEHICLE	PERSON: 1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	0.092	0.113	0.123	0.413
	1 vehicle	**0.109**	**0.136**	0.148	0.433
	2 vehicles	**0.147**	**0.211**	**0.306**	0.587
	3+ vehicles	0.272	**0.363**	**0.530**	**0.810**
With Children	0 vehicle		0.228	0.401	0.699
	1 vehicle		**0.277**	**0.441**	**0.722**
	2 vehicles		0.430	**0.599**	**0.879**
	3+ vehicles		0.654	0.816	**1.098**
All Hotel & Motel Types:		4.915			

(4) Home-Based School (HBSchool)

CHILDREN	VEHICLE	PERSON: 1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	0.077	0.098	0.144	1.088
	1 vehicle	**0.086**	**0.105**	0.184	1.110
	2 vehicles	**0.130**	**0.149**	**0.602**	1.391
	3+ vehicles	0.479	**0.852**	**1.091**	**2.196**
With Children	0 vehicle		0.455	0.956	2.079
	1 vehicle		**0.487**	**1.002**	**2.106**
	2 vehicles		0.767	**1.280**	**2.385**
	3+ vehicles		1.573	2.088	**3.194**

(5) Home-Based Other (HBOther)

CHILDREN	VEHICLE	PERSON: 1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	0.203	0.476	0.926	2.215
	1 vehicle	**0.227**	**0.505**	0.951	2.264
	2 vehicles	**0.376**	**0.775**	**1.434**	2.749
	3+ vehicles	1.336	**1.863**	**2.522**	**3.842**
With Children	0 vehicle		1.451	2.098	3.413
	1 vehicle		**1.483**	**2.140**	**3.455**
	2 vehicles		1.966	**2.627**	**3.942**
	3+ vehicles		3.055	3.716	**5.029**
All Hotel & Motel Types:		0.391			

(6) Non-Home-Based-Work (NHBW) Origin/Destination Controls

CHILDREN	VEHICLE	WORKER: 0 Worker	1 Worker	2+ Workers
Without Children	0 vehicle		0.138	0.599
	1 vehicle		**0.148**	**0.637**
	2 vehicles		**0.355**	**0.976**
	3+ vehicles		1.095	**1.718**
With Children	0 vehicle		0.401	1.070
	1 vehicle		**0.465**	**1.088**
	2 vehicles		**0.799**	**1.423**
	3+ vehicles		1.543	**2.165**
All Hotel & Motel Types:		0.237		

(7) Non-Home-Based-Other (NHBO) Origin/Destination Controls

CHILDREN	VEHICLE	PERSON: 1 person	2 persons	3 persons	4+ persons
Without Children	0 vehicle	0.104	0.228	0.366	1.079
	1 vehicle	**0.146**	**0.261**	0.457	1.114
	2 vehicles	**0.299**	**0.496**	**0.853**	1.510
	3+ vehicles	1.088	**1.340**	**1.700**	**2.357**
With Children	0 vehicle		0.919	1.278	1.956
	1 vehicle		**0.998**	**1.355**	**2.017**
	2 vehicles		1.395	**1.752**	**2.412**
	3+ vehicles		2.243	2.061	**3.259**
All Hotel & Motel Types:		1.600			

(8) Airport Trip Purpose

Trips per Enplanement = 2.000

(9-11) Three Truck (4-tired, SU & COMB) Purposes:

Truck production rates are same as their attraction rates.

Table 4-5: **Validated Cross-Classified Trip Attraction Rates for Palm Beach County**
Southeast Regional Planning Model VI

		Socio-Economic Data Categories						
	Area	Employment				School	Occupied	Occupied
Purpose	Type	Industial	Commercial	Service	Total	Enrollment	Dwelling Units	H/M Units
1. HBWork	CBD	1.815	1.815	1.815				
	High Density Non-CBD	1.661	1.661	1.661				
	Medium Density Non-CBD	1.867	1.867	1.867				
	Low Density Non-CBD	1.888	1.888	1.888				
	Very Low Density Non-CBD	1.719	1.572	1.561				
2. HBShop	CBD		1.510	0.050				
	High Density Non-CBD		3.419	0.128				
	Medium Density Non-CBD		2.360	0.379				
	Low Density Non-CBD		4.072	0.481				
	Very Low Density Non-CBD		2.818	0.347				
3. HBSocRec	CBD		0.834	0.250			0.505	0.505
	High Density Non-CBD		1.702	0.824			0.536	0.536
	Medium Density Non-CBD		0.315	0.453			0.315	0.315
	Low Density Non-CBD		0.569	0.804			0.330	0.330
	Very Low Density Non-CBD		0.414	0.555			0.274	0.274
4. HBSchool	ALL					1.850		
5. HBOther	CBD		2.515	0.673			1.025	1.025
	High Density Non-CBD		1.228	3.096			0.282	0.282
	Medium Density Non-CBD		1.109	1.298			0.483	0.483
	Low Density Non-CBD		1.795	2.609			0.397	0.397
	Very Low Density Non-CBD		1.296	1.767			0.340	0.340
6a. NHBWork Origin/Production Allocation	CBD	0.582	0.777	0.841				
	High Density Non-CBD	0.454	0.607	0.656				
	Medium Density Non-CBD	0.570	0.763	0.825				
	Low Density Non-CBD	0.576	0.770	0.833				
	Very Low Density Non-CBD	0.426	0.570	0.617				
6b. NHBWork Destination/Attraction Allocation	CBD	0.139	1.157	0.532			0.325	0.325
	High Density Non-CBD	0.108	2.247	0.921			0.035	0.035
	Medium Density Non-CBD	0.123	0.833	0.452			0.166	0.166
	Low Density Non-CBD	0.158	1.012	0.669			0.109	0.109
	Very Low Density Non-CBD	0.102	0.721	0.450			0.086	0.086
7a. NHBOther Origin/Production Allocation	CBD	0.103	1.673	0.743			0.353	0.353
	High Density Non-CBD	0.141	2.982	1.205			0.507	0.507
	Medium Density Non-CBD	0.149	1.376	0.935			0.317	0.317
	Low Density Non-CBD	0.206	2.103	1.493			0.314	0.314
	Very Low Density Non-CBD	0.133	1.374	0.957			0.235	0.235
7b. NHBOther Destination/Attraction Allocation	CBD	0.185	1.870	0.659			0.493	0.493
	High Density Non-CBD	0.105	3.645	1.415			0.563	0.563
	Medium Density Non-CBD	0.074	1.860	0.759			0.329	0.329
	Low Density Non-CBD	0.168	2.713	1.215			0.293	0.293
	Very Low Density Non-CBD	0.099	1.790	0.789			0.224	0.224
8. Airport	CBD				0.025		0.031	0.618
	High Density Non-CBD				0.014		0.018	0.434
	Medium Density Non-CBD				0.018		0.023	0.546
	Low Density Non-CBD				0.016		0.022	0.515
	Very Low Density Non-CBD				0.011		0.015	0.350
9. Truck - 4-tired Commercial Vehicle	CBD	0.108	0.084	0.046			0.018	
	High Density Non-CBD	0.092	0.072	0.039			0.015	
	Medium Density Non-CBD	0.117	0.091	0.049			0.019	
	Low Density Non-CBD	0.117	0.092	0.049			0.020	
	Very Low Density Non-CBD	0.097	0.075	0.041			0.016	
10. Truck - Single-Unit	CBD	0.690	0.578	0.210			0.172	
	High Density Non-CBD	0.136	0.114	0.042			0.034	
	Medium Density Non-CBD	0.123	0.104	0.039			0.030	
	Low Density Non-CBD	0.256	0.215	0.079			0.063	
	Very Low Density Non-CBD	0.177	0.148	0.056			0.044	
11. Truck - Combinations	CBD	0.240	0.112	0.037			0.037	
	High Density Non-CBD	0.043	0.020	0.007			0.007	
	Medium Density Non-CBD	0.039	0.017	0.006			0.006	
	Low Density Non-CBD	0.133	0.060	0.021			0.019	
	Very Low Density Non-CBD	0.169	0.076	0.025			0.025	

Table 4-6: **Validated Cross-Classified Trip Attraction Rates for Broward County**
Southeast Regional Planning Model VI

		Socio-Economic Data						
	Area	Employment				School	Occupied	Occupied
Purpose	Type	Industial	Commercial	Service	Total	Enrollment	Dwelling Units	H/M Units
1. HBWork	CBD	1.907	1.907	1.907				
	High Density Non-CBD	1.729	1.721	1.729				
	Medium Density Non-CBD	1.914	1.893	1.903				
	Low Density Non-CBD	1.773	1.737	1.747				
	Very Low Density Non-CBD	1.799	1.731	1.796				
2. HBShop	CBD		2.134	0.072				
	High Density Non-CBD		2.209	0.082				
	Medium Density Non-CBD		2.096	0.337				
	Low Density Non-CBD		3.136	0.370				
	Very Low Density Non-CBD		2.725	0.335				
3. HBSocRec	CBD		1.708	0.511			1.035	1.035
	High Density Non-CBD		1.547	0.749			0.488	0.488
	Medium Density Non-CBD		0.393	0.564			0.393	0.393
	Low Density Non-CBD		0.617	0.870			0.359	0.359
	Very Low Density Non-CBD		0.549	0.738			0.363	0.363
4. HBSchool	ALL					1.850		
5. HBOther	CBD		4.209	1.127			1.717	1.717
	High Density Non-CBD		1.006	2.537			0.231	0.231
	Medium Density Non-CBD		1.250	1.461			0.544	0.544
	Low Density Non-CBD		1.753	2.549			0.388	0.388
	Very Low Density Non-CBD		1.521	2.074			0.398	0.398
6a. NHBWork Origin/Production Allocation	CBD	0.993	1.911	1.699				
	High Density Non-CBD	0.322	0.619	0.551				
	Medium Density Non-CBD	0.556	1.069	0.951				
	Low Density Non-CBD	0.486	0.936	0.832				
	Very Low Density Non-CBD	0.463	0.892	0.792				
6b. NHBWork Destination/Attraction Allocation	CBD	0.278	2.328	1.070			0.653	0.653
	High Density Non-CBD	0.098	2.034	0.833			0.031	0.031
	Medium Density Non-CBD	0.152	1.036	0.561			0.208	0.208
	Low Density Non-CBD	0.170	1.091	0.720			0.117	0.117
	Very Low Density Non-CBD	0.150	1.060	0.663			0.126	0.126
7a. NHBOther Origin/Production Allocation	CBD	0.185	2.986	1.329			0.544	0.544
	High Density Non-CBD	0.115	2.435	0.984			0.358	0.358
	Medium Density Non-CBD	0.166	1.545	1.049			0.307	0.307
	Low Density Non-CBD	0.201	2.046	1.453			0.263	0.263
	Very Low Density Non-CBD	0.183	1.899	1.323			0.280	0.280
7b. NHBOther Destination/Attraction Allocation	CBD	0.321	3.230	1.139			0.852	0.852
	High Density Non-CBD	0.084	2.871	1.115			0.444	0.444
	Medium Density Non-CBD	0.080	2.014	0.822			0.356	0.356
	Low Density Non-CBD	0.158	2.546	1.141			0.276	0.276
	Very Low Density Non-CBD	0.133	2.386	1.051			0.299	0.299
8. Airport	CBD				0.065		0.044	0.715
	High Density Non-CBD				0.039		0.024	0.463
	Medium Density Non-CBD				0.049		0.031	0.589
	Low Density Non-CBD				0.037		0.024	0.441
	Very Low Density Non-CBD				0.031		0.019	0.379
9. Truck - 4-tired Commercial Vehicle	CBD	0.125	0.097	0.052			0.021	
	High Density Non-CBD	0.099	0.077	0.042			0.016	
	Medium Density Non-CBD	0.126	0.098	0.053			0.021	
	Low Density Non-CBD	0.115	0.090	0.049			0.019	
	Very Low Density Non-CBD	0.116	0.091	0.050			0.019	
10. Truck - Single-Unit	CBD	0.988	0.828	0.301			0.247	
	High Density Non-CBD	0.532	0.450	0.164			0.134	
	Medium Density Non-CBD	0.126	0.105	0.039			0.033	
	Low Density Non-CBD	0.213	0.178	0.066			0.052	
	Very Low Density Non-CBD	0.523	0.439	0.162			0.131	
11. Truck - Combinations	CBD	0.344	0.160	0.054			0.054	
	High Density Non-CBD	0.171	0.077	0.024			0.024	
	Medium Density Non-CBD	0.039	0.017	0.005			0.005	
	Low Density Non-CBD	0.111	0.050	0.018			0.016	
	Very Low Density Non-CBD	0.497	0.225	0.076			0.073	

Table 4-7: **Validated Cross-Classified Trip Attraction Rates for Miami-Dade County**
Southeast Regional Planning Model VI

		Socio-Economic Data Categories						
	Area	Employment				School	Occupied	Occupied
Purpose	Type	Industial	Commercial	Service	Total	Enrollment	Dwelling Units	H/M Units
1. HBWork	CBD	1.920	1.885	1.884				
	High Density Non-CBD	1.832	1.786	1.785				
	Medium Density Non-CBD	1.902	1.840	1.839				
	Low Density Non-CBD	1.807	1.807	1.807				
	Very Low Density Non-CBD	1.756	1.756	1.756				
2. HBShop	CBD		0.984	0.033				
	High Density Non-CBD		2.909	0.109				
	Medium Density Non-CBD		1.868	0.301				
	Low Density Non-CBD		3.661	0.433				
	Very Low Density Non-CBD		3.718	0.457				
3. HBSocRec	CBD		0.438	0.131			0.266	0.266
	High Density Non-CBD		1.167	0.566			0.369	0.369
	Medium Density Non-CBD		0.201	0.289			0.201	0.201
	Low Density Non-CBD		0.415	0.582			0.239	0.239
	Very Low Density Non-CBD		0.441	0.592			0.292	0.292
4. HBSchool	ALL					1.750		
5. HBOther	CBD		1.643	0.439			0.670	0.670
	High Density Non-CBD		1.049	2.646			0.240	0.240
	Medium Density Non-CBD		0.883	1.032			0.385	0.385
	Low Density Non-CBD		1.620	2.357			0.360	0.360
	Very Low Density Non-CBD		1.716	2.339			0.449	0.449
6a. NHBWork Origin/Production Allocation	CBD	0.307	0.438	0.597				
	High Density Non-CBD	0.313	0.447	0.610				
	Medium Density Non-CBD	0.366	0.523	0.714				
	Low Density Non-CBD	0.420	0.600	0.818				
	Very Low Density Non-CBD	0.507	0.724	0.987				
6b. NHBWork Destination/Attraction Allocation	CBD	0.085	0.711	0.326			0.199	0.199
	High Density Non-CBD	0.086	1.805	0.740			0.029	0.029
	Medium Density Non-CBD	0.091	0.623	0.337			0.125	0.125
	Low Density Non-CBD	0.134	0.859	0.567			0.092	0.092
	Very Low Density Non-CBD	0.140	0.997	0.623			0.119	0.119
7a. NHBOther Origin/Production Allocation	CBD	0.058	0.953	0.424			0.173	0.173
	High Density Non-CBD	0.105	2.221	0.898			0.326	0.326
	Medium Density Non-CBD	0.103	0.954	0.647			0.190	0.190
	Low Density Non-CBD	0.163	1.655	1.174			0.213	0.213
	Very Low Density Non-CBD	0.169	1.763	1.228			0.261	0.261
7b. NHBOther Destination/Attraction Allocation	CBD	0.098	0.987	0.347			0.259	0.259
	High Density Non-CBD	0.072	2.515	0.977			0.388	0.388
	Medium Density Non-CBD	0.047	1.195	0.488			0.211	0.211
	Low Density Non-CBD	0.123	1.979	0.887			0.215	0.215
	Very Low Density Non-CBD	0.117	2.128	0.938			0.265	0.265
8. Airport	CBD				0.035		0.022	0.418
	High Density Non-CBD				0.037		0.023	0.447
	Medium Density Non-CBD				0.042		0.026	0.503
	Low Density Non-CBD				0.048		0.030	0.576
	Very Low Density Non-CBD				0.048		0.030	0.576
9. Truck - 4-tired Commercial Vehicle	CBD	0.120	0.103	0.058			0.020	
	High Density Non-CBD	0.123	0.106	0.059			0.021	
	Medium Density Non-CBD	0.144	0.123	0.069			0.025	
	Low Density Non-CBD	0.166	0.141	0.079			0.028	
	Very Low Density Non-CBD	0.200	0.171	0.095			0.034	
10. Truck - Single-Unit	CBD	0.102	0.094	0.044			0.029	
	High Density Non-CBD	0.226	0.208	0.099			0.063	
	Medium Density Non-CBD	0.195	0.179	0.084			0.055	
	Low Density Non-CBD	0.381	0.351	0.165			0.106	
	Very Low Density Non-CBD	1.191	1.100	0.518			0.333	
11. Truck - Combinations	CBD	0.059	0.029	0.014			0.010	
	High Density Non-CBD	0.130	0.063	0.031			0.024	
	Medium Density Non-CBD	0.110	0.055	0.026			0.020	
	Low Density Non-CBD	0.219	0.106	0.052			0.039	
	Very Low Density Non-CBD	0.682	0.333	0.163			0.123	

4.4 Results and Comparisons

The number of unadjusted and adjusted productions and attractions of the 2000 validated model is presented in **Table 4-8**. Results are summarized for each of the county and then for the whole study area. The trip generation programs report balance factors (columns 4 and 9 of Table 4-8). The balance factors do not consider the special generators. Except for the home-based shopping and social-recreation purposes, these factors are very close to 1. In the 2000 model, almost 17.5 million person trips are generated, out of which 12.18 million trips (69.6 percent) are home–based. The overall trips per household and employee are 9.22 and 8.31, respectively. The household trip rates are 9.39, 9.16 and 9.11 for the Palm Beach, Broward and Miami-Dade Counties, respectively. The zero auto household productions are shown for the HBW (2.93%), HB shopping (3.97%), HB SocRec (2.49%) and HB Other purposes (4.11%). These zero auto HH trips use separate distribution process. Table 4-8 also shows the percent distribution of trips among the purposes for each county and for the whole region. It also presents a summary of special generator trips by purpose.

Table 4-9 presents the trip generation summary for the 2030 SERPM6 model. In the 2030 model, almost 26.0 million person trips are generated, out of which 18.3 million trips (70.2 percent) are home–based. The overall trips per household and employee are 9.57 and 8.69, respectively. The household trip rates are 10.28, 9.18 and 9.42 for the Palm Beach, Broward and Miami-Dade Counties, respectively. A slight increase in trip rates is noticed in 2030 rates compared to the 1999 rates. **Table 4-10** presents the growth ratios of 2030 and 2000 trip productions and attractions by purpose and county. Overall, 50% growth in trip productions is shown in 2030 model. These production growths are 66%, 43% and 46% for the Palm Beach, Broward and Miami-Dade Counties, respectively.

Additional trip generation and distribution statistics are presented in **Tables 6-2** and **6-3** of see Chapter 6 for the 2000 and 2030 SERPM6 models. The comparisons made in section D of Tables 6-2 show that the trip generation statistics from SERPM6 are similar to those obtained from the survey (1999 Southeast Florida Travel Characteristics Survey - SEFRTCS) other studies (Year 2000 Palm Beach, Broward and Miami-Dade models) and other national studies reported in NCHRP 365. The following are some notable observations:

- The distribution of trips by purpose in the 2000 and 2030 SERPM6 models closely matches the ranges of the SEFRTCS.

- The sum of the percentages for the two NHB purposes equals 24.3 percent (Year 2000) and 24.2 (Year 2030), which is very comparable to the percentages shown in other models and reports.

- Airport trips are approximately 0.9 percent (Year 2000) and 1.1 percent (Year 2030) of the overall number of trips. The overall growth in airport trips between 2000 and 2030 is 83 percent. They are modeled separately because of their significance near the airports.

- The two truck purposes (SU and Combination) constitute approximately 6.6 and 5.5 percents of all vehicle trips of 2000 and 2030 (see Tables 6-4 and 6-5 of Chapter 6).

- The 2000 overall trip rate (person trips per household) is 9.45 (without trucks), which matches well with NCHRP 365 (based on recent travel surveys in the nation) rate of 9.0 for similarly sized study areas and that of 1999 SEFRTCS (9.46-9.97, see Tables 3-1, 3-2 and 3-3 of Reference 26). This overall 2030 rate (9.76 trips per household) is higher than the 2000 model, however within the range of 1999 SEFRTCS.

Table 4-8: **Year 2000 Trip Generation Summary**
Southeast Regional Planning Model VI

A. Palm Beach County	Year 2000 Production				Year 2000 Attraction			
Purpose	Adjusted	Unadjusted	Balance Factor	Percent	Adjusted	Unadjusted	Special Generations	Balance Factor
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1. HB Work	920,680			20.90%		921,632		
2. HB Shopping	547,846			12.43%		548,122		
3. HB SocRec	434,984			9.87%		435,107		
4a. HB School -Non Public	126,169	391,256		2.86%	126,183		-	
5. HB Other	1,041,651			23.64%		1,042,155		
6. Non Home Based Work	366,936	366,866	0.982	8.33%	368,997	369,429	2,051	0.999
7. Non Home Based Other	768,553	768,665	0.986	17.44%	770,592	771,103	2,051	0.999
8. Airport	26,644			0.60%		26,590		
9. Truck (4-tired)	43,491			0.99%		43,491		
10. Truck (Single Unit)	94,673			2.15%		94,673		
11. Truck (Combination)	34,065			0.77%		34,065		
Total:	**4,405,692**			100.00%				

Statistics	Result
Total HB Trips (Production)	3,071,330
Total Trips (Production)	4,405,692
Person Trips per Household	**9.39**
Person Trips per Employee	**9.16**

Table 4-8 (Continued)

B. Broward County

Purpose	Year 2000 Production				Year 2000 Attraction			
	Adjusted	Unadjusted	Balance Factor	Percent	Adjusted	Unadjusted	Special Generations	Balance Factor
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1. HB Work	1,169,778			19.51%		1,169,583		
2. HB Shopping	635,898			10.61%		635,855		
3. HB SocRec	634,807			10.59%		634,981		
4a. HB School -Non Public	315,534	702,871		5.26%	315,535		32,499	
5. HB Other	1,375,525			22.94%		1,375,690		
6. Non Home Based Work	568,575	568,781	0.998	9.48%	570,840	570,892	2,249	1.000
7. Non Home Based Other	1,037,948	1,037,974	0.999	17.31%	1,040,194	1,040,547	2,249	1.000
8. Airport	59,451			0.99%		59,473		
9. Truck (4-tired)	59,058			0.99%		59,058		
10. Truck (Single Unit)	105,431			1.76%		105,431		
11. Truck (Combination)	33,143			0.55%		33,143		
Total:	**5,995,148**			100.00%				

Statistics	Result
Total HB Trips (Production)	4,131,542
Total Trips (Production)	5,995,148
Person Trips per Household	**9.16**
Person Trips per Employee	**9.30**

Table 4-8 (Continued)

C. Miami-Dade County	Year 2000 Production				Year 2000 Attraction			
Purpose	Adjusted	Unadjusted	Balance Factor	Percent	Adjusted	Unadjusted	Special Generations	Balance Factor
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1. HB Work	1,798,634			25.49%		1,798,232		
2. HB Shopping	749,915			10.63%		750,021		
3. HB SocRec	546,514			7.75%		546,663		
4a. HB School -Non Public	335,086	806,094		4.75%	335,130		-	
5. HB Other	1,542,142			21.86%		1,542,339		
6. Non Home Based Work	598,791	598,972	0.998	8.49%	603,169	602,773	4,370	1.001
7. Non Home Based Other	1,001,706	1,001,679	0.998	14.20%	1,006,077	1,005,616	4,370	1.000
8. Airport	80,000			1.13%		80,018		
9. Truck (4-tired)	109,670			1.55%		109,670		
10. Truck (Single Unit)	213,754			3.03%		213,754		
11. Truck (Combination)	78,934			1.12%		78,934		
Total:	**7,055,146**			100.00%				

Statistics	Result
Total HB Trips (Production)	4,972,291
Total Trips (Production)	7,055,146
Person Trips per Household	**9.11**
Person Trips per Employee	**7.20**

Table 4-8 (Continued)

D. Southeast Region	Year 2000 Production		Year 2000 Attraction				0-auto HH Prods & Attrs		
Purpose	Adjusted	Percent	Adjusted	Unadjusted	Special Generations	Balance Factor	Prods Total	Attrs Total	Prods Percent
(1)	(2)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(10)/(2)*100
1. HB Work	3,889,092	22.23%	3,888,753	3,887,663	22,086	1.000	113,943	113,933	2.93%
2. HB Shopping	1,933,659	11.05%	1,933,641	2,057,476	123,501	0.936	76,686	76,685	3.97%
3. HB SocRec	1,616,305	9.24%	1,616,321	1,908,801	299,916	0.816	40,234	40,234	2.49%
4a. HB School -Non Public	776,789	4.44%	776,848						
5. HB Other	3,959,318	22.63%	3,959,556	3,962,173	1,955	0.999	162,676	162,686	4.11%
6. Non Home Based Work	1,534,302	8.77%	1,543,006						
7. Non Home Based Other	2,808,207	16.05%	2,816,863						
8. Airport	166,095	0.95%	166,063	166,063	-	1.000			
9. Truck (4-tired)	219,978	1.26%	219,978	219,978	7,764				
10. Truck (Single Unit)	435,689	2.49%	435,689	435,689	21,836				
11. Truck (Combination)	158,180	0.90%	158,180	158,180	12,043				
Total:	**17,497,614**	100.00%	**17,514,898**						

Statistics	Result
Total HB Trips (Production)	12,175,163
Total Trips (Production)	17,497,614
Person Trips per Household	**9.22**
Person Trips per Employee	**8.31**

Table 4-9: **Year 2030 Trip Generation Summary**
Southeast Regional Planning Model VI

A. Palm Beach County	Year 2030 Production				Year 2030 Attraction			
Purpose	Adjusted	Unadjusted	Balance Factor	Percent	Adjusted	Unadjusted	Special Generations	Balance Factor
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1. HB Work	1,514,313			20.96%		1,413,668		
2. HB Shopping	889,848			12.32%		739,059		
3. HB SocRec	678,128			9.39%		620,788		
4a. HB School -Non Public	328,150	644,979		4.54%	328,148		-	
5. HB Other	1,701,808			23.56%		1,451,406		
6. Non Home Based Work	601,040	560,551	1.056	8.32%	603,104	548,852	2,051	1.107
7. Non Home Based Other	1,221,718	1,086,787	1.110	16.91%	1,223,771	1,107,604	2,051	1.107
8. Airport	51,607			0.71%		39,266		
9. Truck (4-tired)	66,729			0.92%		66,729		
10. Truck (Single Unit)	127,027			1.76%		127,027		
11. Truck (Combination)	42,903			0.59%		42,903		
Total:	**7,223,271**			100.00%				

Statistics	Result
Total HB Trips (Production)	5,112,247
Total Trips (Production)	7,223,271
Person Trips per Household	**10.28**
Person Trips per Employee	**9.70**

Table 4-9 (Continued)

B. Broward County	Year 2030 Production				Year 2030 Attraction			
Purpose	Adjusted	Unadjusted	Balance Factor	Percent	Adjusted	Unadjusted	Special Generations	Balance Factor
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1. HB Work	1,644,663			19.24%		1,745,044		
2. HB Shopping	919,140			10.75%		831,396		
3. HB SocRec	883,283			10.33%		880,625		
4a. HB School -Non Public	457,010	1,023,737		5.35%	457,000		47,121	
5. HB Other	1,983,763			23.20%		1,860,758		
6. Non Home Based Work	799,949	854,620	0.935	9.36%	802,206	841,588	2,249	0.953
7. Non Home Based Other	1,493,181	1,422,962	1.047	17.46%	1,495,457	1,461,174	2,249	1.024
8. Airport	115,359			1.35%		88,746		
9. Truck (4-tired)	86,642			1.01%		86,642		
10. Truck (Single Unit)	134,500			1.57%		134,500		
11. Truck (Combination)	32,649			0.38%		32,649		
Total:	**8,550,139**			100.00%				

Statistics	Result
Total HB Trips (Production)	5,887,859
Total Trips (Production)	8,550,139
Person Trips per Household	**9.18**
Person Trips per Employee	**9.11**

Table 4-9 (Continued)

C. Miami-Dade County	Year 2030 Production				Year 2030 Attraction			
Purpose	Adjusted	Unadjusted	Balance Factor	Percent	Adjusted	Unadjusted	Special Generations	Balance Factor
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1. HB Work	2,624,513			25.68%		2,395,370		
2. HB Shopping	1,107,103			10.83%		1,117,307		
3. HB SocRec	775,848			7.59%		861,174		
4a. HB School -Non Public	480,590	1,208,493		4.70%	480,636		-	
5. HB Other	2,274,109			22.25%		2,207,730		
6. Non Home Based Work	878,998	772,556	1.136	8.60%	884,842	958,810	5,832	0.922
7. Non Home Based Other	1,432,195	1,491,270	0.958	14.01%	1,473,374	1,602,241	41,157	0.917
8. Airport	137,280			1.34%		105,920		
9. Truck (4-tired)	142,596			1.39%		142,596		
10. Truck (Single Unit)	271,564			2.66%		271,564		
11. Truck (Combination)	97,192			0.95%		97,192		
Total:	**10,221,988**			100.00%				

Statistics	Result
Total HB Trips (Production)	7,262,163
Total Trips (Production)	10,221,988
Person Trips per Household	**9.42**
Person Trips per Employee	**7.80**

Table 4-9 (Continued)

D. Southeast Region	Year 2030 Production		Year 2030 Attraction				0-auto HH Prods & Attrs		
Purpose	Adjusted	Percent	Adjusted	Unadjusted	Special Generations	Balance Factor	Prods Total	Attrs Total	Prods Percent
(1)	(2)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(10)/(2)*100
1. HB Work	5,783,489	22.23%	5,783,497	5,546,048	22,299	1.043	183,325	183,326	3.17%
2. HB Shopping	2,916,091	11.21%	2,916,077	2,811,243	123,501	1.039	128,073	128,072	4.39%
3. HB SocRec	2,337,259	8.99%	2,337,267	2,654,005	301,378	0.864	67,488	67,488	2.89%
4a. HB School -Non Public	1,265,750	4.87%	1,265,784						
5. HB Other	5,959,680	22.91%	5,959,700	5,557,207	37,320	1.073	273,548	273,549	4.59%
6. Non Home Based Work	2,279,987	8.77%	2,290,152						
7. Non Home Based Other	4,147,094	15.94%	4,192,602						
8. Airport	304,246	1.17%	304,343	233,941	-	1.301			
9. Truck (4-tired)	298,552	1.15%	298,552	298,552	2,589				
10. Truck (Single Unit)	540,856	2.08%	540,856	540,856	7,769				
11. Truck (Combination)	178,329	0.69%	178,329	178,329	5,589				
Total:	**26,011,333**	100.00%	**26,067,159**						

Statistics	Result
Total HB Trips (Production)	18,262,269
Total Trips (Production)	26,011,333
Person Trips per Household	**9.57**
Person Trips per Employee	**8.69**

Table 4-10: **Ratio of 2030 and 2000 Trip Productions and Attractions**
Southeast Regional Planning Model VI

A. Palm Beach County	2030/2000 Production Ratio		2030/2000 Attraction Ratio	
Purpose	**Adjusted**	**Unadjusted**	**Adjusted**	**Unadjusted**
1. HB Work	1.64			1.53
2. HB Shopping	1.62			1.35
3. HB SocRec	1.56			1.43
4a. HB School -Non Public	2.60	1.65	2.60	
5. HB Other	1.63			1.39
6. Non Home Based Work	1.64	1.53	1.63	1.49
7. Non Home Based Other	1.59	1.41	1.59	1.44
8. Airport	1.94			1.48
9. Truck (4-tired)	1.53			1.53
10. Truck (Single Unit)	1.34			1.34
11. Truck (Combination)	1.26			1.26
Total:	**1.64**			

Statistics	Y2030/2000 Ratio
Total HB Trips (Production)	**1.66**
Total Trips (Production)	**1.64**
Person Trips per Household	**1.09**
Person Trips per Employee	**1.06**

B. Broward County	2030/2000 Production Ratio		2030/2000 Attraction Ratio	
Purpose	**Adjusted**	**Unadjusted**	**Adjusted**	**Unadjusted**
1. HB Work	1.41			1.49
2. HB Shopping	1.45			1.31
3. HB SocRec	1.39			1.39
4a. HB School -Non Public	1.45	1.46	1.45	
5. HB Other	1.44			1.35
6. Non Home Based Work	1.41	1.50	1.41	1.47
7. Non Home Based Other	1.44	1.37	1.44	1.40
8. Airport	1.94			1.49
9. Truck (4-tired)	1.47			1.47
10. Truck (Single Unit)	1.28			1.28
11. Truck (Combination)	0.99			0.99
Total:	**1.43**			

Statistics	Y2030/2000 Ratio
Total HB Trips (Production)	**1.43**
Total Trips (Production)	**1.43**
Person Trips per Household	**1.00**
Person Trips per Employee	**0.98**

Table 4-10 (Continued)

C. Miami-Dade County	2030/2000 Production Ratio		2030/2000 Attraction Ratio	
Purpose	**Adjusted**	**Unadjusted**	**Adjusted**	**Unadjusted**
1. HB Work	1.46			1.33
2. HB Shopping	1.48			1.49
3. HB SocRec	1.42			1.58
4a. HB School -Non Public	1.43	1.50	1.43	
5. HB Other	1.47			1.43
6. Non Home Based Work	1.47	1.29	1.47	1.59
7. Non Home Based Other	1.43	1.49	1.46	1.59
8. Airport	1.72			1.32
9. Truck (4-tired)	1.30			1.30
10. Truck (Single Unit)	1.27			1.27
11. Truck (Combination)	1.23			1.23
Total:	**1.45**			

Statistics	Y2030/2000 Ratio
Total HB Trips (Production)	**1.46**
Total Trips (Production)	**1.45**
Person Trips per Household	**1.03**
Person Trips per Employee	**1.08**

D. Southeast Region	2030/2000 Production Ratio	2030/2000 Attraction Ratio		2030/2000 Zero-Auto HHs Ratio	
Purpose	**Adjusted**	**Adjusted**	**Unadjusted**	**Prods**	**Attrs**
1. HB Work	1.49	1.49	1.43	1.61	1.61
2. HB Shopping	1.51	1.51	1.37	1.67	1.67
3. HB SocRec	1.45	1.45	1.39	1.68	1.68
4a. HB School -Non Public	1.63	1.63			
5. HB Other	1.51	1.51	1.40	1.68	1.68
6. Non Home Based Work	1.49	1.48			
7. Non Home Based Other	1.48	1.49			
8. Airport	1.83	1.83	1.41		
9. Truck (4-tired)	1.36	1.36	1.36		
10. Truck (Single Unit)	1.24	1.24	1.24		
11. Truck (Combination)	1.13	1.13	1.13		
Total:	**1.49**	**1.49**			

Statistics	Y2030/2000 Ratio
Total HB Trips (Production)	**1.50**
Total Trips (Production)	**1.49**
Person Trips per Household	**1.04**
Person Trips per Employee	**1.05**

- Overall, there is 45% growth in 2025 vehicle trips (19.6 million) over 1999 vehicle trips (13.5 million).

The trip production and attraction rates for the 1999 lifestyle model were based on the survey data from the 1999 Southeast Florida Regional Travel Characteristics Survey. An improved trip attraction model was implemented first in the SERPM5 model and carried over to the SERPM6 model. The SERPM5 and SERPM6 models have more trip purposes than any of the predecessor models. Also, trip rates for hotel and motel populations were derived from the 1999 visitor survey. Three separate categories of hotel/motel rate can be applied.

The lifestyle model also has improved approaches to school trips, truck model, airport trips, IE trips, two NHB trips, household stratification models and special generator process. It should be noted that most of the other urban models in Florida use a seven-purpose trip generation model that combines truck and taxi trips. The SERPM6 model results generally compare favorably with modeling results from other areas in Florida and other states.

5. HIGHWAY PATHS AND SKIMS

Minimum travel time paths are calculated using time over the highway and HOV system. In building paths, a turning penalty file is used. Paths are not built through prohibited movements. Initial paths are built using the link free-flow speeds. Terminal times and intrazonal times are also added.

This chapter describes the enhancements of recent SERPM models and then presents the key modeling data that were used in model validation.

5.1 Model Enhancements

The SERPM highway path module uses standard Cube Voyager procedures to build time and distance skim matrices for Single Occupancy Vehicle (SOV) and High Occupancy Vehicle (HOV) paths. The SOV paths are defined as the shortest time path through the portion of the highway network available to single occupant vehicles. SOV paths do not include HOV facilities. HOV paths are defined as the shortest time path through the portion of the network available to passenger cars with two or more persons in the vehicle. Such paths consider both HOV and SOV facilities. Truck traffic was assigned to the SOV network as class of trip of multi-class equilibrium assignment.

The enhancement of SOV and HOV paths and skims is necessary for later use in mode choice analysis. To permit analysis of HOV lane impacts, the mode choice model reads two sets of highway impedances. One set represents the highway travel times available to travelers in mixed-flow traffic, while the other represents the reduced travel times available to travelers with occupancies that qualify for the HOV lanes. The model assigns the appropriate travel time to each occupancy alternative and then computes mode share that recognizes the impact of HOV time saving.

For SERPM6, a revised program (MKTURN2), originally developed for SERPM5, was used to deal uniformly the model turning issues. The revision to this program was made to handle the revised facility type of the SERPM6 model as well as CV network. The MKTURN2 program needs an ASCII node coordinates and facility type information of highway links. These data are written from the CV network. The standard FSUTMS models do not generally deal in detail with intersections and turning movements. The MKTURN2 program manages the traditional turn penalties and prohibitors and generates new generalized penalty cards on the basis of type of turns (right, through and left) and facility type. Chapter 9 of Technical Report 1 (Data Development and Model Update) of SERPM5 has a detailed description of this program.

For SERPM6, a new process was implemented to address the ramp and freeway merging penalties. A new program was written (MLEG) to identify those merging nodes. The SERPM6 highway path module performs the following functions:

- Writes network attributes for two custom written programs (MKTURN2 and MLEG)
- Identifies Freeway and Ramp merge approach links from merged nodes, identified through MLEG2 program
- Runs automated turning movement program (MKTURN2)
- Converts FSUTMS TCARDS data to voyager turn penalty format
- Extracts terminal time for external zones from ZDATA1B file
- Builds LOV and HOV free-flow skims
- Compiles skims for free-flow distribution and mode choice

5.2 Model Validation

To check the network for coding errors and to ensure reasonable paths were built through the network, the Cube-Base/VIPER (Visual Planning Environment) program was used to check the path building. This program was used to display the path between several selected pairs of centroid in various locations in the network. The routines trace the shortest path using the network impedance of time or distance with the summation of link impedances computed. Numerous paths were drawn on the computer screen to make sure that paths drawn were "reasonable".

In SERPM, three variables are considered as significant in determining the minimum paths between any given pair of zones. These variables are as follows:

1. In-Vehicle Travel (IVT) time: IVT time is the primary variable, which is a function of distance and input speed.

2. Prohibited and penalized movements: The MTURNDEF file contains a listing of all link penalties and prohibitors in the highway network. It also annotates the types of prohibitors and penalties.

Prohibitors are generally coded to identify those turning movements in the highway network that are not permitted. Another use of prohibitors is in the double-line coding of freeway facilities, toll plazas, and interchanges where they are used to route vehicles to the proper entrance and exit ramps, and to prevent U-turn or illogical movements from occurring. SERPM includes all such prohibitors used in the MPO models. They are included, for the most part, on freeways to prohibit illegal U-turns, left turns and illogical movements.

Time penalties are added to a highway network for several reasons. They can represent movements that are unusually difficult, such as left turns where no signal protection exists. Despite the capabilities of using generalized turning penalties through MKTURN2 program, no such penalties were used in the SERPM6 model.

The model also adds penalties to the HOV egress and ingress links. Following the methodologies adopted initially in SERPM4, SERPM6 incorporates a flexible method for handling HOV lanes not by restricting the modes allowed to use the HOV lanes, but by restricting the modes that can enter the HOV access ramps. The mainline HOV links (FTC2 81-82) are coded parallel to the respective freeway links. Other HOV codes that are available for HOV ramp codes are: 83 (AM and PM peak HOV ramp), 84 (AM peak only HOV ramp), 85 (PM peak only HOV ramp) and 86 (all day HOV ramp).

In SERPM6, HOV access links were coded with a special facility type (types 83 through 86) that is recognized by the highway assignment program for restricted assignment of a special trip purpose. Interested readers should consult EXCLUDEGROUP keyword of PATHLOD statement of the highway assignment scripts. The restriction to use (EXCLUDEGROUP) is defined through the ADDTOGROUP statement. The ADDTOGROUP in highway assignment script allows facility types excluded (EXCLUDEGROUP) to use HOV facilities during the "XX" time period.

In the HOV model, the HOV table is assigned along with other highway tables in a single run using the equilibrium assignment technique. The same initial speeds were used during the first iteration of equilibrium highway loading for both general purpose and HOV links. For subsequent iterations, the congestion on the mixed flow links will automatically make the HOV times more attractive. To represent the difficulty encountered in weaving in and out of the carpool lanes, turning penalty cards were coded on the access and egress links. The penalty also discourages short trips from using the HOV links. The model's time penalty was determined for these access links through iterative model runs.

For the 2000 SERPM6, approximately 135 records with egress and ingress penalties are used. The following ingress or egress penalties of I-95 HOV were used in the validated model:

- Palm Beach County: 0.57 minute (34 sec)
- Broward County: 1.42 minute (85 sec)
- Miami-Dade County: 1.51 minute (91 sec)

There are approximately 323 ingress or egress penalty cards for the 2030 SERPM6 HOV facilities. The following ingress or egress penalties were used in 2030 SERPM6:

- Palm Beach County (I-95): 0.57 minute (34 sec)
- Broward County (I-95): 1.42 minute (85 sec)
- Miami-Dade County (I-95): 1.51 minute (91 sec)
- Miami-Dade County (Turnpike): 0.70 minute (42 sec)
- Miami-Dade County (Palmetto Expy/SR826): 0.75 minute (45 sec)

These penalties also discourage short trips from using the HOV links, and represent the time to weave across traffic to the HOV lanes. These penalties are iteratively developed during the model validation. Some localized penalties that were initially to MPO models were adjusted to improve the performances of the model locally. In general, time penalties are minimized during model validation, as they are difficult to assign when developing future year highway network scenarios.

3. Toll Impedance: The toll related data (typically entered in TOLLLINK file of standard Tranplan-based FSUTMS model) are specified on the highway network links (see items 28-35 of Table B-1). The CV scripts automatically generate the deceleration and acceleration of the links that precede and follow toll plaza links.

Toll data are required in areas where toll facilities exist or are planned. The purpose of the toll data is to account for the costs and delays (i.e., stopping at a toll plaza to pay the toll) associated with using toll facilities in the computation of travel impedance. These costs and delays impact a potential user's decision of whether or not to travel on the toll facility.

Toll plaza links (FTC2=95) must contain the following data on the highway network:

- Toll class
- Toll Type
- Number of lanes
- Number of plaza lanes
- Toll amount
- Average service time
- Percent of heavy trucks (for reporting only)

For the 2000 validation, the toll data from the 2000 MPO models were checked to ensure that no plazas were missing and valid for the regional model.

In the 2000 model, toll plazas using the "ticket" system were modeled by both type 1 and type 2. Toll type 1 is used on entry and exit ramps to represent time lost through acceleration/deceleration and queuing at the tollbooths. However, no toll (money) is assessed at the type 1 locations; only service time, acceleration/deceleration, and queuing. Tolls are not assessed because the length of the toll road trip, and thus the dollar amount are not known by the model at either the entry or exit booth. Type 2 is used on the mainline to assess the toll amounts, but in reality no such "booths" exist. So, between every entry and exit nodes, an imaginary tollbooth location was used to assess the toll. The toll amount is equal to the toll rate per mile, times the distance between the entry and exit nodes. No extra travel time, including acceleration/deceleration, service time and queuing, is added at these imaginary locations. On the other

hand, the "coin" system type 1 will always be used, whether the tollbooths are on mainline or ramps. For these locations, there is always a time delay associated with the booths (acceleration/deceleration, service time, and queuing), and assessment of a toll.

Toll costs are converted to travel time and factored by a parameter called a CTOLL. In the SERPM6, the value of CTOLL is 0.085. Service times and monetary costs for the toll facility are converted to travel time, and this value is added to the regular travel time for toll links, based upon their speeds.

Using these variables, a single composite measure of impedance is obtained for use in the determination of the minimum path between all pair of zones. The calculations of impedance are based upon the combination of time and distance (on non-toll links) or time and toll (on toll links) are as follows:

For non-toll links,

$$IMPED = CTIME * TIME$$

For toll links,

$$IMPED = \{CTIME * (SERVT + TIME)\} + CTOLL * TOLL$$

Where,

CTIME = time coefficient,
TIME = travel time on the link, and
SERVT = service time on the toll booth

Highway path development is one of the critical components of the model stream. For all pairs of zones, minimum paths are determined based upon the least impedance criteria. They include IVT time, prohibited and penalized movements, and toll cost and service time.

6. TRIP DISTRIBUTION MODEL

Except for through vehicles, SERPM6 uses the Cube Voyager distribution program to distribute trips between production and attraction zones for all trips and purposes. The trip distribution module of SERPM6 performs the following functions:

- Creates the public school (school district-based) trip tables from the school file;
- Distributes off-peak trips with free flow skims;
- Performs a preliminary distribution of peak period trips with free flow skims;
- Performs a feedback process of peak period pre-assignments, congested skims (HOV and LOV) and redistribution of trips with congested skims; and
- Performs a final peak period distribution and creates pre-assignment evaluation summaries.

The results of these functions, in turn, become inputs for transit network development and mode choice estimation.

6.1 Model Enhancements

SERPM6 is a time-of-day model where separate distributions are run for peak and off-peak period trips. The off-peak distribution uses free-flow skims, whereas the peak period distribution uses congested skims. The peak period distribution also uses feedback loops for distribution, highway-only mode choice and pre-assignment steps. Two feedback loops were used in the peak period SERPM6 distribution. The loaded networks of these two feedback loops were combined for the calculation of transit paths and skims. A final congested distribution is also run using this merged loaded network.

Several enhancements made to the SERPM5 distribution model were carried in the SERPM6. Some of these enhancements are tied to the lifestyle trip generation process. These enhancements include the followings:

- Introduction of multiple school and truck purposes
- Elimination of Internal-External (IE) trips as a separate purpose
- Separate friction factors for the two distributions—first one using free-flow skims, the second one using congested skims.

Attention has been given to refining production and attraction data as well as trip purposes and to improving the measure of spatial separation to be sensitive to the impacts of future congestion. The following subsections describe the enhancements incorporated into the trip distribution process. Also, the distribution of zero-auto households using transit skims incorporated into the revised SERPM5 model was carried into SERPM6.

6.1.1 School and Truck Trip Distributions

Coincident with enhancements to the trip generation model, the trip distribution model incorporates expanded trip purposes. They include two NHB purposes, four school purposes, a new airport purpose and three truck purposes. This enhancement was continued from SERPM5. The gravity model handles eleven purposes.

The airport trip purpose is an addition to the model since SERPM5. The three truck purposes follow the process recommended in the Quick Response Freight Manual [Reference 30]. The school trip purpose handled by the gravity model includes only private schools, and colleges and universities. Three public school (elementary, middle and high) trip matrices are directly written by the trip generation program. The program uses information from the SCHOOL file to estimate these matrices. As public school children are allocated to the schools in their district, the model directly writes out the trip matrices. The

benefit of this approach is that it allows for a more accurate match of productions with attractions. The private school trips go through the normal distribution process.

The truck model uses three truck purposes (4-tired, single-unit and combination) as suggested in the USDOT publication Quick Response Freight Manual (QRFM). The QRFM model has gained popularity in the modeling communities for improving the truck model component. To simulate the truck distribution for the three truck purposes, the friction factors recommended by the QRFM were used during the early part of model validation. These friction factors are calculated with negative exponential functions. The functions are:

Four-tire Commercial Vehicles: $F_{ij} = EXP(-0.08 * t_{ij})$

Single Unit Trucks (6+ tires): $F_{ij} = EXP(-0.10 * t_{ij})$

Combination Trucks: $F_{ij} = EXP(-0.03 * t_{ij})$

where, F_{ij} and t_{ij} are friction factors and travel time between zones "i" and "j". EXP is the exponential function.

The exponential parameters were later adjusted in the SERPM6 model validation to produce reasonable trip lengths in comparison to the other trip purposes.

6.1.2 Internal External Trip Distribution

Internal External (IE) trips are no longer treated as a separate trip purpose. They are instead included in the internal trip productions and attractions. Thus, the external TAZs (4051-4134) have productions and attractions associated with them. The trip distribution model determines the number of IE trips. Trips are prevented from becoming EE by setting travel times from all external zones to all external zones at zero inside CV scripts. In addition, the FAIL[1] in the friction factor LOOKUP statement of trip distribution prevents IE trips from becoming EE. These are same as specifying K factors of zero in earlier versions of SERPM.

The changes in IE, school and truck trips are part of the changes introduced by the lifestyle trip generation model. The trip distribution model had changed accordingly. One of those changes is to rewrite the terminal time computation. The SERPM5 model used some variants of the TTPREP, a standard FSUTMS program that writes terminal times. The SERPM6 model does not need any of these programs (TTPREBX, and TTBTX of SERPM5). The functions of those programs were scripted in the SERPM6.

Treating external-to-internal and internal-to-external trips as internal trips is one of the key enhancements to the SERPM5 and SERPM6 models. Benefits realized of this enhancement include the following:

- Permits trips generated inside of study area to be attracted to locations outside.
- Routine external-internal trip productions can now compete with internal-internal trips for attractions.
- Routine internal-external trip attractions can now satisfy some internal trip productions.
- Trip length distributions from external stations will vary based upon the types of trips made at those points.
- The total number of trips generated by a household is no longer influenced by its location in the study area.

6.1.3 Distribution Using Congested Time and Feedback Loops

Congestion on the roadway network has an impact on trip distribution and should be accounted for in the model. This is particularly true if future congestion levels are significantly different than those witnessed in 2000. Using the standard approach of distributing trips based strictly on free-flow highway travel time, there would be minimal impact on overall distribution by the addition of capacity to existing facilities.

Many models now use congested time or a combination of uncongested and congested time to distribute trips. The SERPM4 model used composite impedance of highway and transit modes for its final trip distribution. Although the process is more appealing in concept, it is hard to understand the impedance units used in trip distribution. For the distribution of 0-auto household trips, the original SERPM5 continues to use the composite impedance as used in SERPM4 for all the trips. In the revised SERPM5, the zero-auto household trips are mainly impacted through using transit skim time.

For the SERPM6 model, the zero auto distribution follows transit skimming and is performed in the mode choice module. Following the process of using free-flow skims for off-peak period and the congested skims for peak period of distribution of trips of the households with autos, the zero-auto household trip distributions use free-flow and transit skims for the off-peak and peak distribution, respectively.

The SERPM6 peak period distribution goes through a feedback loop of 2 iterations to stabilize the congested skims for use in final peak distribution as well as their use in peak period transit paths and skimming. The peak period distribution uses feedback loops and performs following steps:

- Distribute an initial peak period distribution trip using uncongested times
- Run a highway-only mode choice analysis using default values for transit shares
- Run AM peak multi-class equilibrium highway assignment
- Get congested times
- Redistribute trips using congested time
- Run two feedbacks of distribution, highway-only mode choice and assignment
- Combine the loaded networks of the two feedback iterations
- Develop the final congested skims of the combined loaded network
- Perform a final congested peak period distribution using the congested times.

The SERPM6 trip distribution model differs from the conventional FSUTMS distribution models in that it considers the both free-flow and congested time rather than simply the free-flow highway travel time between origin and destination zones to distribute the off-peak and peak trips. The reason for this approach is to properly account for influence of congestion in peak period distribution. The use of both times in the distribution process is a more appropriate simulation of the trip distribution phenomenon.

6.1.4 Zero-Vehicle Household Trip Distribution

SERPM6 maintains the practice of distributing zero-car household trips using transit impedances. This process was used in the revised version of SERPM5. Previous versions of SERPM and other FSUTMS models distributed all home based person trips using a single distribution function and (usually) highway skims as the primary or only measure of impedance. The trip tables are divided into household auto ownership categories by applying factors at the production end based on the socio-economic characteristics of the zone. Thus, the proportion of trips by auto ownership category will be the same for every interchange.

In the past, FTA has responded negatively to this modeling approach, as it frequently produces trip tables with trips from too many zero-car households on interchanges lacking transit service and, conversely, too few households on interchanges with transit service. The latter frequently leads to the introduction of very

high modal bias constants for zero car households, as the model struggles to find enough transit trips on interchanges with transit service. As a way of addressing this, SERPM was modified so that the zero-car households were distributed separately.

With this approach, each of the trip tables by auto ownership category was computed separately within the trips distribution step and read into the mode choice model as full zone-to-zone tables, rather than a single table to split within the model as was done in the previous process. This approach results in the mode choice model reading in a total of seven separate tables, three each for home based work and home based other, and a seventh for non-home based.

The zero-auto distribution process requires a set of transit skims for the gravity model to use. The SERPM6 model develops eight sets of walk access skims, with names as follows:

- Peak walk to Bus
- Peak walk to New Mode
- Peak walk to Metrorail
- Peak walk to Tri-rail
- Off peak walk to Bus
- Off peak walk to New Mode
- Off peak walk to Metrorail
- Off peak walk to Tri-rail

The model chooses the minimum values of the four peak skims for peak period zero-car distribution and the minimum values of the four off-peak skims for off-peak period distribution. The module uses 200 minutes to place in the output table for unconnected zones. This value is needed to represent the unconnected zones. Before these values are used in the gravity model, the matrix is updated with intrazonal and terminal times.

The zero-car household trip distribution uses a standard gravity model and "deterrence" functions for four home based trip purposes (Work, Shopping, Social-Recreation and Others). A CV step of mode choice module uses the proportion of zero-car HBO for each zone to separate out the zero-car household school trips from the total school trips. This is done separately for peak and off-peak periods.

6.2 Model Validation

Although the gravity model formulation includes both friction factors (representing travel impedance between zones) and K-factors (often referred as socioeconomic adjustment factors), calibration of the gravity model centers on the adjustment of the friction factor component of the equation. For SERPM6, K-factors were not considered because the gravity model with friction factors alone performed well.

As the two sets of distribution use different skims, it was decided to use separate sets of friction factors - one for free-flow and another for congested distribution. Calibration was performed for both sets. The goal of the calibration was the average trip length should reasonably match target values.

The trip distribution validation procedure is an iterative process, where a set of travel time factors is developed for each trip purpose. The friction factors used in earlier part of the validation used the ones developed for the SERPM5. They were chosen because they were proven effective with same eleven trip purposes used in the regional model. The validated SERPM5 friction factors were fitted to a "Gamma" function through a non-linear curve. That analysis provided the starting parameters to start the SERPM6 model validation.

The process of validation uses an iterative adjustment to the friction factors through use a "Gamma" function (a function most commonly used for synthesized friction factors). The gamma function is defined in the following form:

$$F(I)_p = a_p * (I ** b_p) * EXP(c_p * I)$$

where

a_p, b_p, and c_p	=	calibration coefficients for trip purpose "p",
$F(I)_p$	=	friction factor for impedance value "I" and trip purpose "p",
I	=	impedance value, and
EXP	=	exponential function (the base of natural logarithm).

The gamma function usually does a very good job for trip distribution. The parameter "a" (known as scale factor) can be varied without changing the distribution and is usually not subject to change in model validation. The coefficients b and c, known as shape factors, are usually varied iteratively to match against the target trip lengths and trip length distribution. The values of b and c are negative when estimating friction factors.

Table 6-1 presents the parameters of the gamma function that was used in SERPM6 for all eleven purposes in both off-peak and peak period trip distribution using free-flow and congested skims. The validated friction factors files (FF.CSV and FF2.CSV) are shown in **Tables C-4** and **C-5** of Appendix C. The FF.CSV file is used in the distribution with free-flow skims and FF2.CSV file is used for the distribution with congested skims.

The zero-car household trip distribution uses a standard gravity model and "deterrence" functions for four home based trip purposes (Work, Shopping, Social-Recreation and Others). This is done separately for peak and off-peak periods. The validated deterrence coefficients (DC) of zero-car household trips of four home-based purposes are:

- Home-Based Work: 0.077265
- Home-Based Shopping: 0.115906
- Home-Based Social-Recreation: 0.106250
- Home-Based-Other: 0.110874

The DC for the work purpose is different from the other purposes. The friction factors (FF_{ij}) of the IJ zone pair are calculated using following exponential function:

$$FF_{ij} = EXP(-DC_p * I_{ij})$$

where, DC_p is purpose specific deterrence coefficient,
I_{ij} is impedance (transit travel time) between IJ zone pair,
EXP is the exponential function.

6.3 Results and Comparisons

Beside interzonal (zone to zone) travel time, the gravity model requires two additional measures of time – intrazonal travel time and out-of-vehicle travel (terminal time). Intrazonal travel time is the time needed for a trip between two sites within the same zone. This time is usually smaller than the interzonal time. In CV scripts, the intrazonal time are estimated based on the Nearest Neighbor Theory. The theory states that intrazonal travel time is proportional to the amount of time it takes to get to the nearest adjacent zone or zones. The half of the nearest zone IVT is taken as measure of intrazonal time. In the SERPM6, 2 adjacent zones are used to compute the intrazonal travel time during the trip distributions.

Table 6-1: **Validated Gamma Function Parameters of Friction Factors**
Southeast Regional Planning Model VI

	Parameters for Peak Distribution			Parameters for Off-Peak Distribution		
Purpose	a_p	b_p	c_p	a_p	b_p	c_p
1. HB Work	1,000,000	-0.040	-0.104	1,000,000	-0.040	-0.104
2. HB Shopping	1,000,000	-1.451	-0.120	1,000,000	-1.451	-0.120
3. HB SocRec	1,000,000	-1.451	-0.080	1,000,000	-1.451	-0.080
4a. HB School -Non Public	1,000,000	-1.451	-0.124	1,000,000	-1.451	-0.124
5. HB Other	1,000,000	-1.726	-0.093	1,000,000	-1.726	-0.093
6. Non Home Based Work	1,000,000	-1.201	-0.070	1,000,000	**-1.251**	**-0.085**
7. Non Home Based Other	1,000,000	-1.201	-0.076	1,000,000	**-1.251**	**-0.092**
8. Airport	100,000	-0.020	-0.180	100,000	-0.020	-0.180
9. Trucks - 4-tired	100,000		-0.110	100,000		**-0.120**
10. Trucks - Single Unit	100,000		-0.091	100,000		**-0.101**
11. Trucks - Combinations	100,000		-0.073	100,000		**-0.083**

Gamma Function:

$$F(I)_p = a_p * (I ** b_p) * EXP(c_p * I)$$

where,

a_p, b_p and c_p = calibration coefficients,

$F(I)_p$ = friction factor for ompedance value "I" and trip purpose "p",

I = impedance value, and

EXP = exponential function.

Intrazonal trips are trips that begin and end in the same zone. They are never loaded onto the network and are effectively omitted from total trips during assignment. They play a significant role in estimating the local VMT for air pollution analysis. Calibration of intrazonal trips is not easy unless a good sample size of shorter trips exist in the observed database. These trips, in general, are under reported in most household surveys. The percentage of intrazonal trips estimated by the SERPM6 gravity models is in line with other models.

Terminal times are the average times required to either get in a vehicle and go from the driveway to the street at the origin (production) end of the trip, or the average time required to park the vehicle and reach the final destination point at the destination (attraction) end of the trips. In SERPM6, terminal times vary according to the area type of a zone and are input through CV keys (see **Table A-1**). The values applied for terminal times in the SERPM6 are shown in the following table.

Area Type (*)	Terminal Time (minute)
1. Central Business District - CBD (CV Key TERM1)	*4.50*
2. High Density Non-CBD (CV Key TERM2)	*3.25*
3. Medium Density Non-CBD (CV Key TERM3)	*2.50*
4. Low Density Non-CBD (CV Key TERM4)	*0.75*
5.Very Low Density Non-CBD (CV Key TERM5)	*0.50*

*(*) **See Table 2-3** for Definition of these density based area type.*

Terminal times are added to the in-vehicle travel time for both ends of a trip, resulting in total travel time between pair of zones. The resulting travel times are ready for input into the gravity model.

The SERPM6 distribution model uses separate processes for peak and off-peak trip distributions. The off-peak period trips of household with autos are distributed based on free-flow travel time. The friction factor file, FF.CSV (see **Table C-4** of Appendix C), is used in the off-peak distribution. The first feedback distribution of the peak period trips also uses the FF.CSV file and free-flow skims. The peak-period trips of households with autos are distributed uses congested skims in the second feedback distribution as well as in the final peak period distribution. The congested skim distribution uses the same gravity model distribution process; however, a second set of friction factors, FF2.CSV (see **Table C-5** of Appendix C), is required. The zero-car household uses the transit skims of off-peak and peak period for the distribution of the respective time periods.

Trip length statistics (average and standard deviation) as well as intrazonal trip percentages are summarized for both peak and off-peak trip distributions. **Table 6-2** presents these summary statistics for the 2000 validation run. Trip length statistics are summarized both in travel time (minutes) and distance (miles). The peak and off-peak trip distribution statistics are combined and are shown in section C of Table 6-2. This was done since all other comparable model results are based on 24-hour trip distributions. The model generated average trip lengths were compared to the trips length for recent SERPM5 and other MPO models (see section E of Table 6-2). Notable findings include:

- The modeled trip length (**Table 6-2**) closely matches the trip lengths of SERPM5. For the first seven purposes together, the weighted modeled trip length is 18.57 minutes for 1+ car household trips. The weighted zero-car household trip length is 43.03 minutes (generally transit trips). The weighted trip lengths of the SERPM5 (original) validated model are 17.23 and 18.31 for the distributions using free-flow and congested skims, respectively. The MPO model trip lengths are generally lower than the regional models.

Table 6-2: **Year 2000 Trip Distribution, Trip Length and Intrazonal Trip Summary**
Southeast Regional Planning Model VI

(A) Peak Period Final Distribution of Zero and 1+ Auto Household Trips with Congested Skims	2000 Model - CF Skims - 40 Iters										
	1+ Auto HH Trips [*]	Zero Auto HH Trips	Total Trips	Percent Trips	1+ Auto HH Trip Length (min)	1+ Auto HH Trip Length (mile)	Zero Auto HH Trip Length (min)	1+ Auto HH Intrazonal Trips	Zero Auto HH Intrazonal Trips	Total Intrazonal	Percent Intrazonal
Purpose	**I. Person Trips**										
1. HB Work	2,257,613	68,144	2,325,757	30.0%	**25.51**	**9.39**	**52.61**	10,638	1,248	11,886	0.5%
2. HB Shopping	703,755	29,064	732,819	9.5%	**16.12**	**5.48**	**39.06**	21,835	1,157	22,992	3.1%
3. HB SocRec	608,490	15,535	624,025	8.1%	**18.33**	**6.60**	**39.36**	21,045	820	21,865	3.5%
4a. HB School -Non Public	405,870		405,870	5.2%	**21.17**	**7.31**		5,776		5,776	1.4%
4b. HB School - Public	650,372		650,372	8.4%				94,157		94,157	14.5%
4. HB School	1,056,242		1,056,242	13.6%				99,933		99,933	9.5%
5. HB Other	1,450,620	62,157	1,512,777	19.5%	**18.55**	**6.23**	**39.62**	60,637	3,153	63,790	4.2%
6. Non Home Based Work	600,618		600,618	7.8%	**18.48**	**6.83**		22,895		22,895	3.8%
7. Non Home Based Other	839,879		839,879	10.8%	**17.52**	**6.52**		33,559		33,559	4.0%
8. Airport	55,080		55,080	0.7%	**26.02**	**11.62**					
Tot Prsn Trips & P1-7 Wt. T/L):			**7,747,197**	**100%**	**20.59**	**7.38**	**44.56**	**270,542**	**6,378**	**276,920**	**3.6%**
Person Trips per HH:			**4.08**	(includes IE)							
	II. Vehicle Trips										
9. Trucks - 4-tired (II & IE)	84,995		84,995		**20.76**	**7.84**		1,846		1,846	2.2%
10. Trucks - SU (II & IE)	197,855		197,855		**23.00**	**9.25**		4,116		4,116	2.1%
11. Trucks - COMB (II & IE)	56,853		56,853		**28.19**	**11.54**		1,231		1,231	2.2%
Through Trips	1,898		1,898								
Total Vehicle Trips:	**341,601**		**341,601**					**7,193**		**7,193**	**2.1%**

[*] Purposes 1 (HBW), 2 (HBSHP), 3 (HBSR), and 5 (HBO) are for 1+ Auto trips; other purposes represent ALL HH trips.

Table 6-2 (Continued)

(B) Off-Peak Period Distribution of Zero and 1+ Auto Household Trips with Free-Flow Skims	2000 Model - FF Skims - 40 Iters										
	1+ Auto HH Trips [*]	Zero Auto HH Trips	Total Trips	Percent Trips	1+ Auto HH Trip Length (min)	1+ Auto HH Trip Length (mile)	Zero Auto HH Trip Length (min)	1+ Auto HH Intrazonal Trips	Zero Auto HH Intrazonal Trips	Total Intrazonal	Percent Intrazonal
Purpose	**I. Person Trips**										
1. HB Work	1,517,533	45,806	1,563,339	15.4%	**22.02**	**11.20**	**51.29**	6,201	770	6,971	0.4%
2. HB Shopping	1,153,216	47,626	1,200,842	11.8%	**14.87**	**6.44**	**38.81**	36,081	1,781	37,862	3.2%
3. HB SocRec	967,580	24,700	992,280	9.7%	**17.38**	**7.90**	**38.36**	32,939	1,220	34,159	3.4%
4a. HB School -Non Public	370,921		370,921	3.6%	**17.57**	**8.17**		5,316		5,316	1.4%
4b. HB School - Public	594,360		594,360	5.8%				86,047		86,047	14.5%
4. HB School	965,281		965,281	9.5%				91,363		91,363	9.5%
5. HB Other	2,346,019	100,525	2,446,544	24.0%	**15.94**	**7.11**	**39.36**	102,171	4,784	106,955	4.4%
6. Non Home Based Work	933,684		933,684	9.2%	**16.71**	**7.44**		38,887		38,887	4.2%
7. Non Home Based Other	1,968,328		1,968,328	19.3%	**15.84**	**7.05**		90,306		90,306	4.6%
8. Airport	111,015		111,015	1.1%	**22.24**	**11.84**					
Tot Prsn Trips & P1-7 Wt. T/L):			**10,181,313**	**100%**	**17.08**	**7.84**	**41.63**	**397,948**	**8,555**	**406,503**	**4.0%**
Person Trips per HH:			**5.36**	(includes IE)							
	II. Vehicle Trips										
9. Trucks - 4-tired (II & IE)	134,983		134,983		**19.24**	**9.17**		2,523		2,523	1.9%
10. Trucks - SU (II & IE)	237,834		237,834		**21.05**	**10.65**		4,304		4,304	1.8%
11. Trucks - COMB (II & IE)	101,327		101,327		**25.35**	**12.86**		2,046		2,046	2.0%
Through Trips	2,814		2,814								
Total Vehicle Trips:	**476,958**		**476,958**					**8,873**		**8,873**	**1.9%**

[*] Purposes 1 (HBW), 2 (HBSHP), 3 (HBSR), and 5 (HBO) are for 1+ Auto trips; other purposes represent ALL HH trips.

Table 6-2 (Continued)

(C) = A (peak) + B(off-peak)	Year 2000 Model										
	1+ Auto HH Trips [*]	Zero Auto HH Trips	Total Trips	Percent Trips	1+ Auto HH Trip Length (min) [**]	1+ Auto HH Trip Length (mile) [**]	Zero Auto HH Trip Length (min) [**]	1+ Auto HH Intrazonal Trips	Zero Auto HH Intrazonal Trips	Total Intrazonal	Percent Intrazonal
Purpose	**I. Person Trips**										
1. HB Work	3,775,146	113,950	3,889,096	21.7%	**24.11**	**10.12**	**52.08**	16,839	2,018	18,857	0.5%
2. HB Shopping	1,856,971	76,690	1,933,661	10.8%	**15.34**	**6.08**	**38.90**	57,916	2,938	60,854	3.1%
3. HB SocRec	1,576,070	40,235	1,616,305	9.0%	**17.75**	**7.40**	**38.75**	53,984	2,040	56,024	3.5%
4a. HB School -Non Public	776,791		776,791	4.3%	**19.45**	**7.72**		11,092		11,092	1.4%
4b. HB School - Public	1,244,732		1,244,732	6.9%				180,204		180,204	14.5%
4. HB School	2,021,523		2,021,523	11.3%				191,296		191,296	9.5%
5. HB Other	3,796,639	162,682	3,959,321	22.1%	**16.94**	**6.77**	**39.46**	162,808	7,937	170,745	4.3%
6. Non Home Based Work	1,534,302		1,534,302	8.6%	**17.40**	**7.20**		61,782		61,782	4.0%
7. Non Home Based Other	2,808,207		2,808,207	15.7%	**16.34**	**6.89**		123,865		123,865	4.4%
8. Airport	166,095		166,095	0.9%	**23.49**	**11.77**					
Tot Prsn Trips & P1-7 Wt. T/L):			**17,928,510**	**100%**	**18.57**	**7.64**	**42.93**	**668,490**	**14,933**	**683,423**	**3.8%**
Person Trips per HH:			**9.45**	(includes IE)							
	II. Vehicle Trips										
9. Trucks - 4-tired (II & IE)	219,978		219,978		**19.83**	**8.66**		4,369		4,369	2.0%
10. Trucks - SU (II & IE)	435,689		435,689		**21.94**	**10.01**		8,420		8,420	1.9%
11. Trucks - COMB (II & IE)	158,180		158,180		**26.37**	**12.39**		3,277		3,277	2.1%
Through Trips	4,712		4,712								
Total Vehicle Trips:	**818,559**		**818,559**					**16,066**		**16,066**	**2.0%**

[*] Purposes 1 (HBW), 2 (HBSHP), 3 (HBSR), and 5 (HBO) are for 1+ Auto trips; other purposes represent ALL HH trips.

Table 6-2 (Continued)

Purpose	D. Percent Distribution from Survey and Other Sources						
	SEFRTCS 1999	**SERPM5 1999 Model**	**Palm Beach 2000 Model**	**Broward 2000 Model**	**Miami-Dade 2000 Model**	**NCHRP 187 (Tab 2)**	**NCHRP 365 (Tab 6)**
1. HB Work	24.17 - 27.46	21.26	20.95	19.54	24	20	21
2. HB Shopping	9.38 - 10.02	11.29	12.23	10.26	13		
3. HB SocRec	7.16 - 9.46	9.06	9.97	10.18	13		
4a. HB School -Non Public		2.82	2.88	4.87		55	56
4b. HB School - Public		8.26	5.04	5.78			
4. HB School	6.98 - 9.60	11.08	7.92	10.65	12		
5. HB Other	22.01 - 23.18	21.27	23.06	22.25	12		
6. Non Home Based Work	8.65 - 9.55	8.52	8.18	9.23	26	25 (a)	23 (a)
7. Non Home Based Other	15.72 - 17.13	15.67	17.08	16.92			
8. Airport		1.85	0.61	0.97			
Total:	100	100	100	100	100	100	100
Person Trips per HH:		7.92	9.80	10.74	10.04	11.8	9.0

(a) Non Home Based

Purpose	E. Model Estimated Trip Length (minutes)					
	SERPM5 1999 Model - FF Distrib (1+Auto HH Trips)	**SERPM5 1999 Model - Wt. Cong. Distrib (1+ Auto HH Trips)**	Palm Beach 2000 Model - FF Distrib	**Palm Beach 2000 Model - Cong. Distrib**	Broward 2000 Model - FF Distrib	**Broward 2000 Model - Cong. Distrib**
1. HB Work	22.08	**24.45**	18.75	**19.63**	18.32	**20.24**
2. HB Shopping	14.97	**15.22**	13.16	**13.34**	13.63	**14.71**
3. HB SocRec	16.25	**16.40**	14.05	**14.48**	14.33	**15.02**
4a. HB School -Non Public	17.25	**18.95**	18.71	**19.53**	16.51	**17.84**
5. HB Other	15.66	**16.69**	13.48	**14.64**	14.06	**14.97**
6. Non Home Based Work	16.55	**17.41**	13.04	**13.33**	14.14	**15.61**
7. Non Home Based Other	15.60	**15.97**	12.71	**12.93**	14.09	**15.58**
8. Airport	23.47	**27.33**	20.58	**24.38**	19.74	**21.57**
9. Trucks - Four-tired	17.90	**18.25**	20.56	**20.93**	20.70	**21.78**
10. Trucks - Single Unit	20.17	**20.76**	22.03	**22.31**	26.03	**27.09**
11. Trucks - Combination	27.78	**29.23**	38.86	**42.25**	36.25	**38.87**
Purp 1-7 (Weighted by Trips):	17.23	**18.31**	14.65	**15.29**	15.07	**16.38**

- The differences in average trip lengths of each trip purpose are nearly the same for between SERPM6 and SERPM5. The HBW work trip of SERPM6 model is 24.11 minutes (10.13 mile) for households with cars. For the SERPM5, the HBW trip lengths with households with cars are 22.08 and 24.45 minutes for the distributions using free-flow and congested skims (see Table 6-2).

- Among the first seven trip purposes, HBW and Airport trips are longer, with a model trip length of 25.51 (HBW peak), 22.02 (HBW off-peak), 26.00 (airport peak) and 22.24 (airport off-peak) minutes. Truck trips, in general, showed longer trip lengths of 20.75-28.18 minutes (peak period) and 19.24-25.35 minutes (off-peak period).

- The overall intrazonal trip percentage is 3.8 percent. By purpose, the intrazonal percentages vary from 0.5% (work trips) to 9.5% (school trips). The intrazonal percentages of peak and off-peak periods are very similar. In addition to the sizes of TAZs, intrazonal percentages depend on other factors, including mixed/balanced land uses (homogeneous/heterogeneous nature of the TAZ with respect to dwelling units and employment), extent of local roads, and extent of non-motorized travel. The probability of the shorter trips becoming intrazonal goes up if there is a better balance of households (trip productions) and employment (attractions). Also, large percentages of non-motorized trips are intrazonal trips. No national target values for these percentages are available since urban development patterns and transportation infrastructure are unique to each urban area. However, the values shown in **Table 6-2** are very reasonable. For example, the home-based work purpose has the lowest intrazonal percentages of trips, less than 1 percent. The truck (SU and COMB) traffic intrazonal percentage is lower (1.9%) compared to other trips.

- The trip lengths for 0-auto households are significantly longer than for households with autos. For example, the HBW trip lengths for 0-auto households are 52.74 and 51.47 minutes for the peak and off-peak periods. For the households with autos, the HBW trip lengths are 25.41 and 22.02 minutes for peak and off-peak periods. The same pattern appears for other home-based purposes with 0-auto households. It should be mentioned that 0-auto trips use impedances of transit modes in their distribution. These results are reasonable because zero auto trips are most likely slower and have more access time (walking and waiting).

Few adjustments were needed to make the calibrated friction factors (see Reference 26) match the validated trip lengths from the recent SERPM5 model. A few adjustments were made to the shape parameters of friction factor curves, particularly for the 1-10 minutes range of friction factors, to produce the reasonable intrazonal trip percentages by purpose. Based on the close match between the model trip lengths of SERPM6 and that of SERPM5 as well as reasonable intrazonal trip percentages, calibrated friction factors were not adjusted further in the model validation phase.

The trip length statistics from the 2030 full model run are summarized in **Table 6-3**. 2030 trip lengths are similar to those of the 2000 model, but the congestion in future years caused somewhat longer trips. For the first seven purposes, weighted trip lengths are (a) 20.59 minutes (7.39 miles) and 26.13 minutes (7.47 miles) for the peak period, (b) 17.08 minutes (7.84 miles) and 18.61 minutes (8.58 miles) for the off-peak period, and (c) 18.57 minutes (7.65 miles) and 21.82 minutes (8.11 miles) for all periods for the 2000 and 2030 models, respectively. The trip lengths increased for all trip purposes. Nearly the same levels of intrazonal trips are found in both 2000 and 2030 models.

Table 6-3: **Year 2030 Trip Distribution, Trip Length and Intrazonal Trip Summary**
Southeast Regional Planning Model VI

(A) Peak Period Final Distribution of Zero and 1+ Auto Household Trips with Congested Skims	2030 Model - CF Skims - 40 Iters										
	1+ Auto HH Trips [*]	Zero Auto HH Trips	Total Trips	Percent Trips	1+ Auto HH Trip Length (min)	1+ Auto HH Trip Length (mile)	Zero Auto HH Trip Length (min)	1+ Auto HH Intrazonal Trips	Zero Auto HH Intrazonal Trips	Total Intrazonal	Percent Intrazonal
Purpose	**I. Person Trips**										
1. HB Work	3,349,014	109,632	3,458,646	30.2%	**33.74**	**9.35**	**63.14**	21,686	1,592	23,278	0.7%
2. HB Shopping	1,056,605	48,538	1,105,143	9.7%	**20.55**	**5.98**	**41.69**	36,519	2,012	38,531	3.5%
3. HB SocRec	876,313	26,058	902,371	7.9%	**22.97**	**7.13**	**43.50**	32,650	1,273	33,923	3.8%
4a. HB School -Non Public	661,344		661,344	5.8%	**24.37**	**6.44**		13,016		13,016	2.0%
4b. HB School - Public	807,984		807,984	7.1%				128,504		128,504	15.9%
4. HB School	1,469,328		1,469,328	12.8%				141,520		141,520	9.6%
5. HB Other	2,172,558	104,517	2,277,075	19.9%	**25.08**	**6.81**	**44.86**	86,877	4,764	91,641	4.0%
6. Non Home Based Work	892,524		892,524	7.8%	**20.25**	**6.41**		41,976		41,976	4.7%
7. Non Home Based Other	1,240,313		1,240,313	10.8%	**19.10**	**6.12**		61,700		61,700	5.0%
8. Airport	100,894		100,894	0.9%	**30.27**	**12.17**					
Tot Prsn Trips & P1-7 Wt. T/L):			**11,446,294**	**100%**	**26.07**	**7.44**	**51.15**	**422,928**	**9,641**	**432,569**	**3.8%**
Person Trips per HH:			**4.21**	(includes IE)							
	II. Vehicle Trips										
9. Trucks - 4-tired (II & IE)	115,354		115,354		**21.53**	**7.02**		2,753		2,753	2.4%
10. Trucks - SU (II & IE)	245,613		245,613		**23.99**	**8.25**		4,514		4,514	1.8%
11. Trucks - COMB (II & IE)	64,095		64,095		**28.04**	**10.12**		883		883	1.4%
Through Trips	2,753		2,753								
Total Vehicle Trips:	**427,815**		**427,815**					**8,150**		**8,150**	**1.9%**

[*] Purposes 1 (HBW), 2 (HBSHP), 3 (HBSR), and 5 (HBO) are for 1+ Auto trips; other purposes represent ALL HH trips.

Table 6-3 (Continued)

(B) Off-Peak Period Distribution of Zero and 1+ Auto Household Trips with Free-Flow Skims	2030 Model - FF Skims - 40 Iters										
	1+ Auto HH Trips [*]	Zero Auto HH Trips	Total Trips	Percent Trips	1+ Auto HH Trip Length (min)	1+ Auto HH Trip Length (mile)	Zero Auto HH Trip Length (min)	1+ Auto HH Intrazonal Trips	Zero Auto HH Intrazonal Trips	Total Intrazonal	Percent Intrazonal
Purpose	**I. Person Trips**										
1. HB Work	2,251,157	73,694	2,324,851	15.4%	**23.03**	**11.75**	**59.49**	9,878	897	10,775	0.5%
2. HB Shopping	1,731,420	79,536	1,810,956	12.0%	**16.81**	**7.44**	**39.84**	49,273	2,870	52,143	2.9%
3. HB SocRec	1,393,459	41,434	1,434,893	9.5%	**19.24**	**9.01**	**41.73**	39,640	1,671	41,311	2.9%
4a. HB School -Non Public	604,393		604,393	4.0%	**17.57**	**7.61**		10,206		10,206	1.7%
4b. HB School - Public	738,397		738,397	4.9%				117,436		117,436	15.9%
4. HB School	1,342,790		1,342,790	8.9%				127,642		127,642	9.5%
5. HB Other	3,513,576	169,033	3,682,609	24.4%	**18.09**	**8.27**	**43.07**	125,400	6,371	131,771	3.6%
6. Non Home Based Work	1,387,463		1,387,463	9.2%	**17.91**	**7.91**		48,976		48,976	3.5%
7. Non Home Based Other	2,906,781		2,906,781	19.3%	**17.14**	**7.51**		116,286		116,286	4.0%
8. Airport	203,352		203,352	1.3%	**23.41**	**12.46**					
Tot Prsn Trips & P1-7 Wt. T/L):			**15,093,695**	**100%**	**18.61**	**8.58**	**45.54**	**517,095**	**11,809**	**528,904**	**3.5%**
Person Trips per HH:			**5.55**	(includes IE)							
	II. Vehicle Trips										
9. Trucks - 4-tired (II & IE)	183,198		183,198		**19.99**	**9.43**		2,688		2,688	1.5%
10. Trucks - SU (II & IE)	295,243		295,243		**21.78**	**10.90**		3,337		3,337	1.1%
11. Trucks - COMB (II & IE)	114,233		114,233		**24.55**	**12.79**		1,071		1,071	0.9%
Through Trips	4,080		4,080								
Total Vehicle Trips:	**596,754**		**596,754**					**7,096**		**7,096**	**1.2%**

[*] Purposes 1 (HBW), 2 (HBSHP), 3 (HBSR), and 5 (HBO) are for 1+ Auto trips; other purposes represent ALL HH trips.

Table 6-3 (Continued)

(C) = A (peak) + B(off-peak)	Year 2030 Model										
	1+ Auto HH Trips [*]	Zero Auto HH Trips	Total Trips	Percent Trips	1+ Auto HH Trip Length (min) [**]	1+ Auto HH Trip Length (mile) [**]	Zero Auto HH Trip Length (min) [**]	1+ Auto HH Intrazonal Trips	Zero Auto HH Intrazonal Trips	Total Intrazonal	Percent Intrazonal
Purpose	**I. Person Trips**										
1. HB Work	5,600,171	183,326	5,783,497	21.8%	**29.43**	**10.31**	**61.67**	31,564	2,489	34,053	0.6%
2. HB Shopping	2,788,025	128,074	2,916,099	11.0%	**18.23**	**6.89**	**40.54**	85,792	4,882	90,674	3.1%
3. HB SocRec	2,269,772	67,492	2,337,264	8.8%	**20.68**	**8.28**	**42.41**	72,290	2,944	75,234	3.2%
4a. HB School -Non Public	1,265,737		1,265,737	4.8%	**21.12**	**7.00**		23,222		23,222	1.8%
4b. HB School - Public	1,546,381		1,546,381	5.8%				245,940		245,940	15.9%
4. HB School	2,812,118		2,812,118	10.6%				269,162		269,162	9.6%
5. HB Other	5,686,134	273,550	5,959,684	22.5%	**20.76**	**7.71**	**43.75**	212,277	11,135	223,412	3.7%
6. Non Home Based Work	2,279,987		2,279,987	8.6%	**18.83**	**7.32**		90,952		90,952	4.0%
7. Non Home Based Other	4,147,094		4,147,094	15.6%	**17.73**	**7.09**		177,986		177,986	4.3%
8. Airport	304,246		304,246	1.1%	**25.68**	**12.36**					
Tot Prsn Trips & P1-7 Wt. T/L):			**26,539,989**	**100%**	**21.79**	**8.10**	**48.02**	**940,023**	**21,450**	**961,473**	**3.6%**
Person Trips per HH:			**9.76**	(includes IE)							
	II. Vehicle Trips										
9. Trucks - 4-tired (II & IE)	298,552		298,552		**20.59**	**8.50**		5,441		5,441	1.8%
10. Trucks - SU (II & IE)	540,856		540,856		**22.78**	**9.70**		7,851		7,851	1.5%
11. Trucks - COMB (II & IE)	178,328		178,328		**25.80**	**11.83**		1,954		1,954	1.1%
Through Trips	6,833		6,833								
Total Vehicle Trips:	**1,024,569**		**1,024,569**					**15,246**		**15,246**	**1.5%**

[*] Purposes 1 (HBW), 2 (HBSHP), 3 (HBSR), and 5 (HBO) are for 1+ Auto trips; other purposes represent ALL HH trips.

In addition to person trips, the vehicle trip statistics from different period highway assignments are summarized for both 2000 and 2030 model runs (see **Tables 6-4** and **6-5**). The following statistics are summarized for these vehicle trips by their modes and modeling periods (AM peak, PM peak and off-peak) of assignments:

(1) Total Trips and their distribution by mode
(2) Intrazonal and Percent Intrazonal trips
(3) Assigned Trips and their distribution by mode
(4) Overall distribution of trips among the modeling periods

These statistics were also summarized for the two feedback AM period pre assignments. Notable findings include:

- For the 2000 model, the overall percentages of vehicular trips are 20.38, 24.59 and 55.03 for the AM, PM and off-peak periods, respectively. Distribution statistics for the 2030 model are very similar.
- For the 2000 model, there are 69.9, 23,5 and 6.6 percent of trips for the drive-alone, shared ride and truck trips, respectively. The results of 2030 model run are very similar.
- The overall percentage of intrazonal vehicle trip 2.2 for the both 2000 and 2030 models. Truck trips have fewer intrazonal trips (2.0% in 2000 and 1.4% in 2030).
- The percentage of drive-alone trips is slightly higher in peak periods than in off-peak periods.

Within the framework of the gravity model trip distribution, the SERPM6 model includes sophisticated enhancements by incorporating separate distribution of the peak and off-peak periods. It also use separate distribution for the trips of households with and without autos. The trip length statistics are in close agreement with the recent model. The distributions of the vehicle trips by periods and by modes as well as percent intrazonal trips are also very reasonable.

Table 6-4: **Year 2000 Vehicle Trips, Their Distribution and Intrazonal Trips by Mode of Travel and Time Periods**
Southeast Regional Planning Model VI

		Vehicle Trip Statistics						
Period Assignment	**Mode**	**Total Trips**	**Within Period Trip Percent**	**Period Trip Distribution**	**Intrazonal Trips**	**Percent Intrazonal**	**Assigned Trips**	**Within Period Assigned Trip Percent**
A1. AM Peak Period Pre-Assignment (Feedback Iter 1)	Drive Alone (Includes Trucks)	2,143,552	78.1%		42,177	2.0%	2,101,375	78.3%
	Shared Ride (2+)	599,593	21.9%		16,138	2.7%	583,454	21.7%
	All Vehicles	**2,743,145**	100%	**20.34%**	58,315	**2.1%**	**2,684,829**	100%
A2. AM Peak Period Pre-Assignment (Feedback Iter 2)	Drive Alone (Includes Trucks)	2,156,892	78.4%		42,652	2.0%	2,114,240	78.6%
	Shared Ride (2+)	592,844	21.6%		16,092	2.7%	576,752	21.4%
	All Vehicles	**2,749,736**	100%	**20.39%**	58,744	**2.1%**	**2,690,992**	100%
B. AM Peak Period Assignment	Drive Alone	1,977,738	71.9%		37,184	1.9%	1,940,554	72.1%
	Shared Ride (2+)	589,715	21.5%		15,905	2.7%	573,810	21.3%
	Trucks (SU & COMB)	181,784	6.6%		3,807	2.1%	177,977	6.6%
	All Vehicles	**2,749,237**	100%	**20.38%**	56,895	**2.1%**	**2,692,342**	100%
C. PM Peak Period Assignment	Drive Alone	2,370,079	71.5%		48,437	2.0%	2,321,641	71.6%
	Shared Ride (2+)	745,363	22.5%		20,378	2.7%	724,985	22.4%
	Trucks (SU & COMB)	200,562	6.0%		4,204	2.1%	196,359	6.1%
	All Vehicles	**3,316,004**	100%	**24.59%**	73,019	**2.2%**	**3,242,985**	100%
D. Off Peak Period Assignment	Drive Alone	5,073,306	68.4%		116,816	2.3%	4,956,490	68.3%
	Shared Ride (2+)	1,839,925	24.8%		42,504	2.3%	1,797,421	24.8%
	Trucks (SU & COMB)	509,161	6.9%		9,525	1.9%	499,637	6.9%
	All Vehicles	**7,422,392**	100%	**55.03%**	168,844	**2.3%**	**7,253,547**	100%
E. Total 24-Hour Trips (B+C+D)	Drive Alone	9,421,123	69.9%		202,437	2.1%	9,218,686	69.9%
	Shared Ride (2+)	3,175,003	23.5%		78,787	2.5%	3,096,216	23.5%
	Trucks (SU & COMB)	891,507	6.6%		17,535	2.0%	873,972	6.6%
	All Vehicles	**13,487,633**	100%	**100%**	298,759	**2.2%**	**13,188,874**	100%

Table 6-5: **Year 2030 Vehicle Trips, Their Distribution and Intrazonal Trips by Mode of Travel and Time Periods**
Southeast Regional Planning Model VI

		Vehicle Trip Statistics						
Period Assignment	**Mode**	**Total Trips**	**Within Period Trip Percent**	**Period Trip Distribution**	**Intrazonal Trips**	**Percent Intrazonal**	**Assigned Trips**	**Within Period Assigned Trip Percent**
A1. AM Peak Period Pre-Assignment (Feedback Iter 1)	Drive Alone (Includes Trucks)	3,077,955	77.6%		55,546	1.8%	3,022,409	77.7%
	Shared Ride (2+)	891,034	22.4%		22,382	2.5%	868,652	22.3%
	All Vehicles	**3,968,989**	100%	**20.24%**	77,927	**2.0%**	**3,891,062**	100%
A2. AM Peak Period Pre-Assignment (Feedback Iter 2)	Drive Alone (Includes Trucks)	3,101,109	78.1%		72,127	2.3%	3,028,982	78.2%
	Shared Ride (2+)	870,233	21.9%		27,520	3.2%	842,713	21.8%
	All Vehicles	**3,971,343**	100%	**20.26%**	99,647	**2.5%**	**3,871,696**	100%
B. AM Peak Period Assignment	Drive Alone	2,873,478	72.5%		61,852	2.2%	2,811,626	72.6%
	Shared Ride (2+)	868,782	21.9%		25,636	3.0%	843,146	21.8%
	Trucks (SU & COMB)	221,319	5.6%		3,859	1.7%	217,460	5.6%
	All Vehicles	**3,963,579**	100%	**20.22%**	91,347	**2.3%**	**3,872,232**	100%
C. PM Peak Period Assignment	Drive Alone	3,448,322	72.0%		81,054	2.4%	3,367,268	72.1%
	Shared Ride (2+)	1,097,975	22.9%		33,084	3.0%	1,064,891	22.8%
	Trucks (SU & COMB)	243,647	5.1%		4,223	1.7%	239,424	5.1%
	All Vehicles	**4,789,944**	100%	**24.43%**	118,361	**2.5%**	**4,671,583**	100%
D. Off Peak Period Assignment	Drive Alone	7,454,739	68.7%		156,228	2.1%	7,298,511	68.7%
	Shared Ride (2+)	2,782,354	25.6%		57,817	2.1%	2,724,537	25.6%
	Trucks (SU & COMB)	614,811	5.7%		6,612	1.1%	608,199	5.7%
	All Vehicles	**10,851,904**	100%	**55.35%**	220,657	**2.0%**	10,631,247	100%
E. Total 24-Hour Trips (B+C+D)	Drive Alone	13,776,538	70.3%		299,134	2.2%	13,477,404	70.3%
	Shared Ride (2+)	4,749,111	24.2%		116,537	2.5%	4,632,574	24.2%
	Trucks (SU & COMB)	1,079,777	5.5%		14,694	1.4%	1,065,083	5.6%
	All Vehicles	**19,605,427**	100%	**100%**	430,365	**2.2%**	19,175,062	100%

7. TRANSIT NETWORK, PATH, SKIM AND FARE

Similar to highway networks, regional transit networks were developed from the urban model transit networks. The model development team decided to convert the new model to the FSUTMS-Voyager software and utilize its advanced features in the model development process. For transit, the team proposed to use Voyager's PUBLIC TRANSPORT (henceforth called PT in the document) module. PT was designed as a multi-path path-builder, meaning that it can internally evaluate different path and sub-modal trade-offs. The initial regional transit networks (one for peak and another for off-peak) were developed in PT format. Later, these two networks were combined into one regional transit network with separate headways for peak and off-peak periods.

At a New Starts workshop in June 2006, the FTA proposed requiring "best" walk and drive path results (i.e., walk and drive to best transit) sent to a standardized incremental logit model as a quality assurance practice. The paths would necessitate a single-path path-builder or a multi-path path-builder with its ability to evaluate multiple paths sharply curtailed. This was an obstacle to using PT for New/Small Starts projects during model development (note: this has since been resolved with the development of the "best-path" option).

Consequently, the development team decided that the paths, skims and the transit assignment should be built in TP+'s TRNBUILD software (also available in FSUTMS-Voyager). PT is used to maintain the transit networks and generate walk-access and transfer connectors. A process within the model stream converts the PT-formatted network and access connectors to TRNBUILD format; the user should not have to convert any information.

In addition, the team reviewed other key features in the transit model, especially the network speeds, zero car household distribution, and the mode choice model. In the new model, one transit route file is maintained in PT format, which allows multiple headways per route. Several changes were made to the original networks.

The new model has different mode definitions than SERPM5. Transit paths, skims and fare matrices were derived from the transit networks using a set of path-building parameters. This chapter describes the changes to the transit networks, paths and fares used in model validation.

7.1 Transit Network Enhancements

The transit network is coded over the roadway links for those modes and lines that share the right-of-way with automobiles. Additional links (FTC2 and FTC1 of 69) are added for modes operating on an exclusive right-of-way. In addition, special transit only links were added for station micro-coding. These links have FTC1 and FTC2 code of 59. All these transit only links were coded in the highway network. Minimum impedance travel paths are calculated using time and cost over the transit system. The transit modes included in the regional network are local bus, express bus, Tri-Rail, Metrorail and Metromover. Transit paths, skims and fare matrices were derived from the transit networks using a set of path-building parameters.

Several enhancements were implemented in the transit network, path and fare building steps. Some are new to SERPM6 and others were carried into SERPM6 from the SERPM5 revised version. The list below summarizes the different approaches that were followed in SERPM6 transit network development. Some of the features are new to the model.

- Transit Network – Mode and operator (similar to Company in TRANPLAN) codes have been revised and a new set of modes were introduced to handle the complex fare structure in southeast Florida
- Transit Network – A single transit route file is maintained in PT format
- Transit Network – Several changes were made to transit network, especially the fixed guideways, which were micro-coded to separate the rail platform from the street layer
- Transit Network – Walk-access and transfer connectors are generated using PT's GENERATE function
- Transit Network – A special FORTRAN program REWALK adjusts the percent walk file and the coded walk file
- Transit Network – Changes were made to the AUTOCON program for generating the auto-access links
- Transit Network – Transit-only links were coded in the highway network, so was the station data file
- Transit Network – The transit speed curves were modified with the time-of-day speeds
- Transit Network – The transit route file and the non-transit connectors are converted to TRNBUILD format within the model stream using a FORTRAN program
- Transit Network – Many FORTRAN programs used in pervious versions of SERPM were either eliminated or converted to Voyager scripts (e.g., WALKCON, SIDECON, SIDEXTD, FLAGLINE, SCALEA, FLAGLINE)
- Transit Path – TRNBUILD is used for generating transit paths
- Transit Path – The need for the station-to-station matrix was eliminated
- Transit Skim – TRNBUILD is used for generating transit skims
- Transit Fare – A stand-along script calculates fare

Descriptions of important transit network enhancements follow here.

7.1.1 Transit Modes

Two sets of mode numbers are used in the model stream, one for PT and another for TRNBUILD. The PT mode numbers generally reflect previous SERPM models. Three new modes were added to assist analysis for New/Small Starts studies. Modes 10 and 11 are reserved for a "new mode" (i.e., a new transit mode that is built between the base and horizon years) and a "project mode" (i.e., the mode under analysis, perhaps for a "new start" project), respectively. Limited-stop buses were assigned to Mode 13. Tri-Rail shuttle buses were coded as a separate mode so they could be treated differently than the other transit buses with reference to their fares.

A second set of mode numbers was developed for TRNBUILD. While PT (like Tranplan) can use the OPERATOR feature to differentiate transit fares, TRNBUILD relies on the mode numbers themselves. Consequently, the TRNBUILD mode system has a separate mode for each county and transit mode combination. Mode definitions between the two systems were kept identical to the extent possible. Both sets are detailed in **Table 7-1**.

Table 7-1: **Transit Mode Listing**
Southeast Regional Planning Model VI

#	PT Mode (applicable county)	TRNBUILD Mode (applicable county)
1	Walk Access	Walk Access
2	Drive Access	Drive Access
3	Sidewalk/Transfer connector	Sidewalk/Transfer connector
4	Bus (Palm Beach & Broward)	Bus (Palm Beach)
5	Bus (Miami-Dade)	Bus (Dade)
6	Express Bus (all)	Express Bus (Broward)
7	Metrorail	Metrorail
8	Tri-Rail	Tri-Rail
9	Metromover	Metromover
10	New Mode (all)	New Mode (Broward)
11	Project Mode (all)	Project Mode (all)
12	Tri-Rail Shuttle (all)	Tri-Rail Shuttle (all)
13	Limited Stop Bus (all)	Limited Stop Bus (Miami-Dade)
14	n/a	Bus (Broward)
15	n/a	Express Bus (Miami-Dade)
16	n/a	Express Bus (Palm Beach)
17	n/a	New Mode (Miami-Dade)
18	n/a	Limited Stop Bus (Broward)
19	n/a	Limited Stop Bus (Palm Beach)
20	n/a	New Mode (Palm Beach)

The transit network coding is done using the PT mode number definitions. The mode numbers for each line are converted to the TRNBUILD set by the PT2TRNB program during the model run. All path building, skimming and assignment reports follow the TRNBUILD mode set.

PT2TRNB reads in the walk, drive and sidewalk connector files as well as the bus line file from the list in the CONTROL.MAS file. It outputs new files using the TRNBUILD mode set.

7.1.2 Transit Operators

Operators, the equivalent of companies in FSUTMS-Tranplan, provide and maintain the transit service. Each operator is given a specific identifier, which is used in the route file to identify the operator of each line. During early development, it was decided to assign an operator number for each operator and service type to assist in fare computations. This became unnecessary when TRNBUILD was introduced. The operator codes used in the SERPM6 are listed in **Table 7-2**.

Table 7-2: **Transit Operator Listing**
Southeast Regional Planning Model VI

Operator Number	Operator & Type of Service
1	PalmTran local bus
2	Tri-Rail Shuttle buses
3	BCT local bus
4	MDT local bus
5	BCT express bus
6	MDT express bus
7	New mode
8	Metrorail
9	Metromover
10	Tri-Rail

7.1.3 Transit Line Attributes

The INET transit line files from the Palm Beach, Broward and Miami-Dade models were converted to PT format. Many of the PT data fields are similar to the INET data fields in the MPO models. A table describing the field names is shown in **Table 7-3**.

Table 7-3: **Transit Line Field Description**
Southeast Regional Planning Model VI

Field Name	Field Description
MODE	PT mode number
NAME	10-12 character identifier, follows MxLyyyzz format where x=MPO mode number, yyy = line number from MPO transit line file (TRANPLAN) and zz=MPO code and inbound/outbound indicator
ONEWAY	If true, route operates in coded direction only. If false, route operates in both directions.
LONGNAME	40-character identifier, generally follows ID field from MPO transit line file
XYSPEED	Default speed if link does not appear in the highway network
USERA1	MPO's Tranplan Based Model Route Group Number (Not used by CV model)
USERA2	MPO's Tranplan Based Model Network Mode Number (Not used by the CV model)
USERA3	MPO's Tranplan Based Model Line Number (not used by the CV model)
USERA4	SERPM5 Special Company Code (not used by the CV model)
HEADWAY[x]	Service frequency, where 1=AM peak, 2=midday, 3=PM peak
OPERATOR	Transit service operator for the route
N	Node string; stops are positive, non-stops are negative

Only one transit route file is necessary in PT because headways for up to five time periods can be coded. The PM peak frequencies have been coded in period 3, but are not used in SERPM6.

Several efforts were undertaken during model development to clean up transit coding. The largest effort was removing the two-way coding of buses in Miami-Dade County. These buses operate differently in inbound and outbound directions on one-way streets, but were coded such that the outbound direction traversed an inbound one-way street. This technique was used in the past to avoid the FSUTMS-Tranplan limit on the number of transit lines. These routes now have separate lines coded for inbound and outbound directions.

7.2 Modifications to Highway Network

Some transit-related highway coding guidelines are necessary so that generalized scripting procedures can be developed. Several transit network elements are now coded in the highway network (making it essentially a 'transportation' network). Two noticeable elements are station data, now coded into the highway node layer rather instead of a STATDATA file, and fixed-guideway links. Please note that STATDATA is now an output file, not an input file. These new procedures take advantage of the extended network attributes available in FSUTMS-Voyager and should provide better data-checking and maintenance capability to the user.

7.2.1 Micro-Coding Stations

In recent months, FTA has strongly encouraged detailed coding of fixed-guideway stations. Street nodes served as rail station nodes in FSUTMS-Tranplan, implying zero transfer time between bus and rail platforms. Micro-coding means separating the rail platform from the street layer by a connector to represent the time needed to access or egress the rail platform and transfer to other transit modes. The connectors are coded in such a way that only the fixed-guideway system is able to access the rail platform. All Metrorail, Tri-Rail and Metromover platforms have been micro-coded. The amount of travel time on the connector links (coded with facility type 59) vary, but is typically between 30 seconds and one minute.

7.2.2 Station Information

The transit station file inputs are coded directly on the nodes of the highway network and converted to an ASCII file via scripting for use during the model run. In SERPM5, these fields were coded into the STATDATA.{Year}{Alt}file. Information is coded on both the rail platform (if applicable) and the bus platform/street node. **Table 7-4** shows the fields that are coded on the street nodes (see node attributes 3-13 of **Table B-1** of Appendix B).

Table 7-4: **Highway Node Fields for Coding Transit Stations**
Southeast Regional Planning Model VI

Parameter	Type	Description
STATIONNUMBER	Numeric	From MPO's STATDATA files. Must be greater than 0 to be used in SERPM6
STATIONZONE	Numeric	Nearest centroid to station. This field is filled during model execution.
SERVICEMILES	Numeric	Maximum roadway distance allowed for auto-access connector (miles)
PARKINGSPACES	Numeric	Number of parking spaces
PARKINGCOSTAM	Numeric	Parking cost in peak period in cents
PARKINGCOSTMD	Numeric	Parking cost in off-peak period in cents
TERMTIMEPNR	Numeric	Terminal time for park-and-ride trips (in minutes)
TERMTIMEKNR	Numeric	Terminal time for kiss-and-ride trips (in minutes)
ACTIVEFLAG	Numeric	Used in model execution if greater than zero
STATIONDESC	Character	Station name & description
FAREZONE	Numeric	Fare zone (zone-based fares only). Not used for SERPM6

The station data on the node layer, especially the ACTIVEFLAG field, determines which nodes have park-and-ride access. The corresponding street node should also have station data coded if a park-and-ride to bus opportunity exists. This is an important practice since the drive-access connector cost includes parking costs and terminal times. Different terminal times, for example, may be justified at certain

stations. This procedure is likely to remain for future versions of SERPM when PT replaces the current TRNBUILD functionality.

7.2.3 Transit-Only Links

Transit-only links for bus and fixed-guideway transit are coded directly into the highway network. These links are coded with facility type 69. A set of three (distance, time and speed) is specifically for bus transit or other forms of transit subject to mixed-flow conditions. Another set of four fields (see **Table 7-5**) is designed for fixed-guideway transit, with a mode field added to the distance, time and speed fields. The bus-related fields do not have a mode since it is assumed that the speeds will apply to all transit operating within auto traffic. In all cases, time or speed should be coded, not both.

Table 7-5: **Headway Link Fields for Coding Transit-Only Links**
Southeast Regional Planning Model VI

Parameter	Type	Description
TMODE	Numeric	Transit mode number
TDIST	Numeric	Distance for bus transit (miles)
TSPEED	Numeric	Average speed for bus transit (mph)
TTIME	Numeric	Travel time for bus transit (minutes)

7.3 Transit Network Connectors and Speeds

The transit network component generally consists of highway network links on which buses operate. The transit network differs from the highway network when exclusive transit links (for example, Tri-Rail lines) are present. Transit networks also require walk access and park-n-ride access links that are not found in the highway networks.

The peak period transit network uses the constrained highway network, and the off-peak network uses the unconstrained network to derive estimates of transit vehicle speed (relative to highway network speeds) for modes of transportation that operate on roadways. Tri-Rail and Metrorail operating speeds were taken from the schedules.

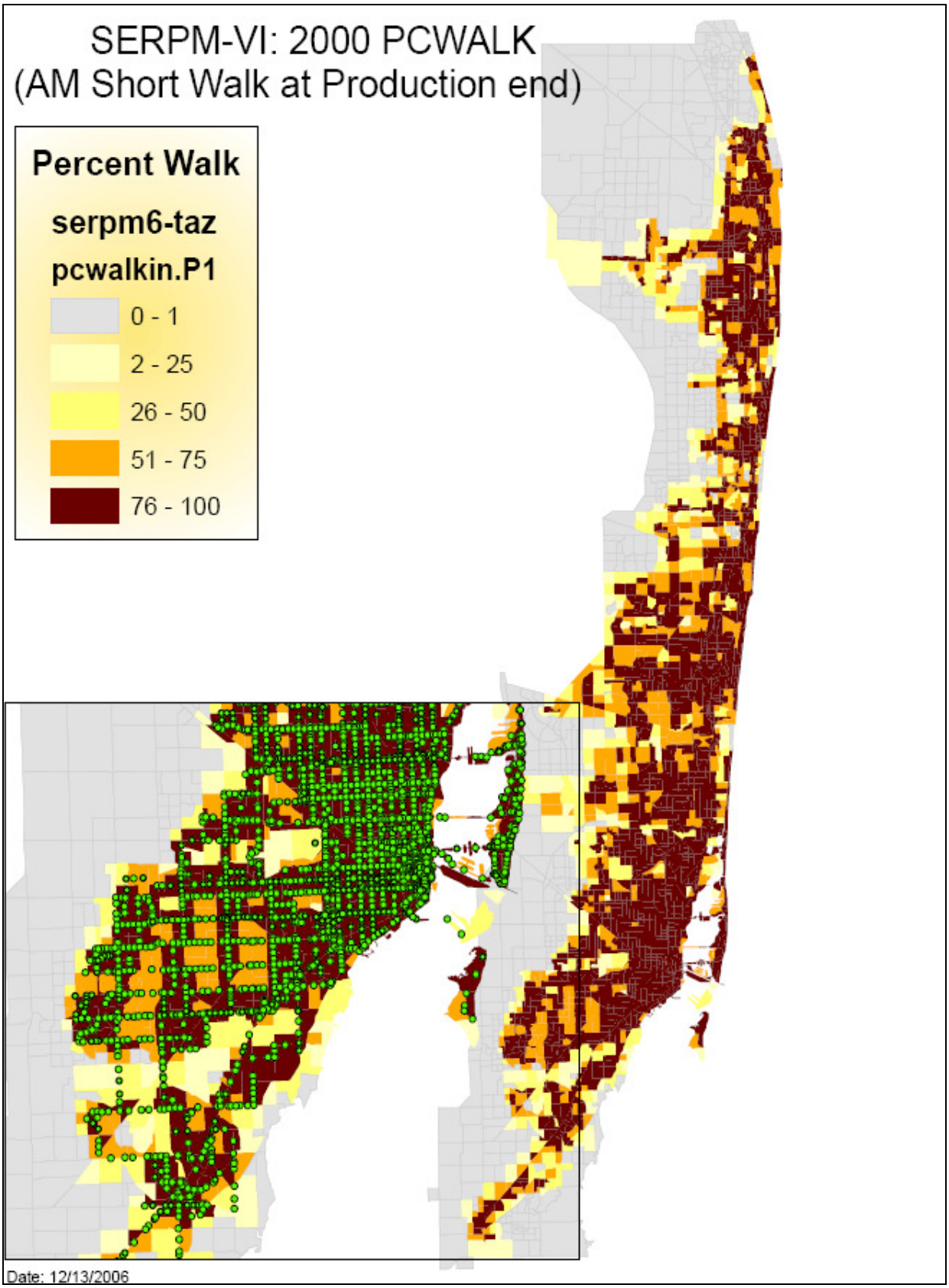
7.3.1 Access to Transit

The transit network files are the basic inputs to the transit demand estimation process. Transit access links are created using the automated processes. There are four elements to correctly determine transit accessibility: zonal access, walk-access connectors (mode 1), drive-access connectors (mode 2), and non-centroid to non-centroid connectors (mode 3).

Percent Walks

Percent walk represents the proportion of zone that is accessible to the transit stops. Proportions are determined using buffers around the stops. Percent of zone within 0.33 mile of the stops is called short-walk percent and that within 1 mile is long-walk percent. The percent walk file is not generated within the model stream and is an input file required by the transit model. **Appendix E of Technical Report 3** describes an ARCVIEW based process to develop this percent walk file. This process also employs a user written program (CVLIN2AV) that parses Cube Voyager transit route lines for ARCVIEW import. As an illustration, the short-walk percentages for peak period used in the 2000 model are presented in **Figure 7-1**.

Figure 7-1: **An Example of Zonal Walk Accessibility**
Southeast Regional Planning Model VI



The PCWALK file is used in REWALK program to revise the automated walk connectors generated in PT process (see below). The mode choice program also uses the PCWALK file. In mode choice, the short versus long walk for a zone is one of the variables that helps to determine the probability that a trip will use transit.

Walk Connectors

Walk connectors are created using PT's GENERATE command. Two sets of connectors will need to be produced: walk-access/egress to transit stops and walk-access/egress to stations. The walk speed is assumed to be 2.5 mph in the model. The non-transit links (called support links in TRNBUILD) are built as a part of building the transit network. SERPM6 uses PT's GENERATE statement to create initial set of non-transit connectors. It is a built-in process that automatically generates access support links. The connectors build by PT uses the highway links as the path for movement.

The maximum walk time is set to 1.1 miles for walk-stop connectors, reflecting a one-mile maximum plus some extra to account for variance in network topology, and three miles for walk-station connectors. This builds connectors from all the zones to the non-centroid nodes.

Longer connectors to fixed-guideway stations are required to minimize the potential of path disconnections between alternatives. The maximum distance is set to three miles. Walk-station connectors are built from all the Metrorail station and Tri-Rail stations to all zone centroids.

During development of the SERPM6 model, it was determined that PT's process generated more realistic connections (the most realistic scenario was no access for some zones) than the WALKCON program used in earlier versions of SERPM. An additional procedure was developed to coordinate the percent walk and walk connector data. This coordination is important, as there are conflicting assumptions in how they are generated. Percent walks are generated via a GIS-based program (see Appendix E of Technical Report 3) and assume ubiquitous access within the zone. PT's GENERATE creates walk access connectors by spidering along the highway network, assuming that the centroid connectors are not only the best but the *only* connection between the zone and the street grid, an assumption that is inconsistent with the percent walk calculations.

The REWALK program reads in the walk connectors file generated using PT, and the PCWALK file. It parses the walk connector file to find the following for each zone: the number of connectors, the shortest connector and whether any connectors go directly to transit stops.

A coded walk time is determined for each zone depending on the short walk percentage, long walk percentage and whether there is a transit stop at the centroid connector. In some situations, the walk time on a zone's walk-access connectors may be modified to better coordinate with the percent walk information. If a transit stop doesn't exist at the centroid connector, all percent walk values are set to zero, as a viable transit connector is unlikely. If there are no connectors from a zone, the short and long walk percentages are set to zero. REWALK also adjusts the length of the connectors under some circumstances. If not already, the length of the shortest connector is reset to at most 0.5 mile for zones with good transit coverage (i.e., 100% short walk). Connectors from zones with some transit coverage have their length altered to the average long walk distance.

Drive Access Connectors

Drive-access connectors are developed using a modified version of the AUTOCON program. The key input would be the highway network and a transit station data file created from the node layer. The

connector cost includes driving time, terminal times, station parking cost and auto operating cost, all weighted to their IVT time equivalents.

Peak period uses the congested skims and the off-peak period uses the free flow skims. Auto-connectors are generated only for the nodes that are in the station data file. It reads in the transit line file. Distances and speeds for the auto connectors were automatically extracted from the congested highway skims for the peak period.

If the usage flag is set and parking spaces are available, the AUTOCON program will generate auto connectors to a station. The AUTOCON program builds auto connectors (minimum drive paths) from each zone to one or more stations or park-and-ride lots flagged appropriately for the station data. In this program, auto connectors are created if the total distance, derived from the highway skims from a zone to the nearest the station, are within a specified maximum distance. Generally, this maximum distance has been set at 10 miles for end-of-line fixed guideway stations, and 5 miles for other fixed guideway and most PNR lots, and shorter distances for small neighborhood lots. The program generally creates the shortest and second shortest connectors to any given transit facility. The program uses network topology to eliminate the second if it does not provide reasonably different transit service. The program will eliminate auto connectors that involve extensive "backtracking" relative to the CBD, the primary destination for most PNR trips. Backtracking is when automobiles travel away from a final destination (such as the CBD) to get to a PNR lot.

In SERPM6, the revised AUTOCON program reads CONTROL.MAS for the input and output files. The program reads "AM" or "MD" as command-line parameters to indicate the period for which the program is run. The program outputs the access connectors in a form that can be read in PT. The weighted cost on the auto access connector is in IVT minutes. The costs on the access connectors take into account the station parking cost. The auto in-vehicle time is converted to weighted-IVT minutes by multiplying by a factor of 1.5. The terminal time in the cost includes a 2-minute terminal time at home-end and the terminal time at the parking node.

Transfer Connectors

Transfer connectors are needed to let people walk from one transit stop to another stop in order to transfer to another bus route. There are four sets of transfer connectors generated in SERPM6: (1) between rail and bus platforms, (2) between stations and nearby bus stops, (3) between all transit stops in CBDs and (4) between Metromover stations to nearby stops. All transfer connectors are built as mode number 3 in the model.

(1) Connection between rail and bus platforms
This set addresses the new station micro-coding technique introduced in SERPM6. The connection is between the bus stop at the street-level and the rail platform using a highway link coded as facility type 59.

(2)Connection between stations and nearby bus stops
This set of connectors mimics the SIDECON procedures used in SERPM5. The list of station nodes, from and to where the connectors are built, is obtained by reading the station data on the transportation network nodes.

(3) Connection between all transit stops in CBD
The third set replaces the coding of downtown sidewalks. It also eliminates the need of SIDETXD program used in SERPM5. The CBD nodes are identified using the area type field on the links.

7.3.2 Transit Speed Curves

While speeds for modes that have exclusive right-of-way are "hard-coded" into the transit links as attributes, speeds for modes that share right-of-way with vehicular traffic are estimated based on the relationship to highway speed, which may vary with congestion. The transit model assumes the time for a transit vehicle to traverse a highway link is a linear (usually, segmented/piecewise linear) function of the highway travel time. A series of speed curves, based on the auto speed, define this relationship. Exclusive right-of-way transit lines (Tri-Rail and Metrorail) running times were based on their schedule times. Peak and off-peak files are maintained separately.

Table 7-6 shows the curve used in the calculating the peak and off-peak period transit run times. Different sets of curves were developed for the off-peak period. Table 7-6 presents the speed conversion factors. Depending on area type and facility type of each link, a different curve is applied to get the transit speed from the auto speeds. The curve number to be used for each area type and facility type combinations is shown in **Table 7-7**.

Table 7-6: **Auto-Transit Speed Relationship Curves**
Southeast Regional Planning Model VI

Peak period

Curve Number	X1	X2	Y1	Y2
1	30	70	2.5	2.5
2	30	70	30	70
3	25	45	25	30
4	27	50	27	40
5	35	55	35	48
6	18	32	10	16
7	20	35	12	19
8	20	35	10	14
9	16	36	11	21
10	17	36	14	20
11	20	34	9	13.5
12	24	48	16	25
13	20	28	10	14
14	16	37	12	15
15	21	38	12	18

Off-peak period

Curve Number	X1	X2	Y1	Y2
1	30	70	2.5	2.5
2	30	70	30	70
3	25	45	25	30
4	27	50	27	40
5	35	55	35	48
6	17	31	11.5	17.5
7	19	34	13.5	20.5
8	19	34	11.5	15.5
9	15	35	12.5	22.5
10	18	35	13.5	20.5
11	19	33	10.5	15
12	23	47	17.5	26.5
13	19	27	11.5	15.5
14	21	36	10.5	13.5
15	20	37	11.5	17.5

Note: (0, 0), (X1, Y1) and (X2, Y2) are the three curve points on the piecewise continuous auto-transit speed relationship

Table 7-7: **Auto-Transit Curves Used by Area and Facility Type Combinations**
Southeast Regional Planning Model VI

Curves for mode 4 (Broward and Palm Beach County Buses)

FT AT	10-19	20-29	40-49	50-59	60-69	70-99
1-1	3	6	6	4	13	3
2-2	4	6	6	5	6	4
3-3	4		10	7	10	4
4-4	4		8	6	8	4
5-5	5		12	2	12	5

Curves for mode 5 (Metrobus)

FT AT	10-19	20-29	40-49	50-59	60-69	70-99
1-1	3	11	11	4	13	3
2-2	4	11	11	5	11	4
3-3	4		15	7	15	4
4-4	4		14	11	14	4
5-5	5		12	2	12	5

7.4 Transit Network Summary

A user-written program (TRANSTAT) was used in transit assignment module to summarize transit network characteristics (Distance in miles, VMT and VHT) for the peak and off-peak periods. **Table 7-9** summarizes the transit network by mode, period and company/county for 2000 validated model. Few notable statistics of the 2000 transit networks are:

- There are 6,012 directional route-miles for the 2000 transit network. Of these, 42 and 145 miles are for Metrorail and Tri-Rail, respectively.
- Overall, vehicle-miles-of-travel (VMT) in the peak and off-peak hours are 71,737 and 86,331, respectively.
- The peak period express bus directional route miles are 133 and 179 in Broward and Miami-Dade counties. The peak period VMT for express bus is 4764 and that for off-peak period is 684. This represents strong peak service provided by the bus companies, particularly by the MDTA.
- The vehicle-hours-of-travel (VHT) in the peak and off-peak hours are 5,161 and 5,557, respectively.
- The systemwide transit running speeds are 13.90 and 15.54 mph during peak and off-peak hours, respectively. The Metrorail and Tri-Rail running speeds are 28 and 40 mph, respectively.

The speeds by mode and period of the 2000 transit networks were judged to be reasonable.

A summary of the 2030 SERPM6 transit network is presented in **Table 7-10**. The 2030 transit network is more extensive with expanded bus and rail systems in all three counties. Some of the notable features of 2030 transit networks are as follows:

- The total directional route miles are 7,709 compared to 6,012 in the year 2000 network, which represents a 28% increase. Express bus directional route miles are 721, which represents an increase in 409 miles or 131%.
- There are 4 Tri-Rail lines, which represent extensions to Jupiter and Scripps in Palm Beach County and a new Dixie corridor line in Broward County.

- The rail mode (mode 7) has expanded to 212 miles compare to 42 miles 2000, a growth of approximately 400 percents. The VMT for the rail mode in 2030 are 23,842 compare to 4,607 in 2000, a growth of 418 percents.
- For 2030 model, the systemwide transit running speeds are 12.77 and 17.13 mph during peak and off-peak hours, respectively. The rail and Tri-Rail running speeds are 29 and 37 mph, respectively.

Table 7-8: **Year 2000 Transit Speed Summary by Mode and County**
Southeast Regional Planning Model VI

			Model Estimated Transit VMT, VHT & Speeds (*)					
Description	*PT Mode*	**TrnBuild Mode**	**Peak VMT**	**Peak VHT**	**Peak Speed (mph)**	**Off-Peak VMT**	**Off-Peak VHT**	**Off-Peak Speed (mph)**
Palm Beach Local Bus	4	**4**	8,896	651	**13.67**	12,100	768	**15.75**
Tri-Rail Shuttle (PB)	12	**12**	174	13	**13.78**			
Palm Beach Subtotal:			**9,071**	**663**	**13.67**	**12,100**	**768**	**15.75**
Broward Local Bus	4	**14**	15,170	1,099	**13.81**	24,379	1,506	**16.19**
Tri-Rail Shuttle (BO)	12	**12**	399	28	**14.06**	665	40	**16.60**
Broward Express Bus	6	**6**	1,063	55	**19.17**	365	15	**24.72**
Broward Subtotal:			**16,632**	**1,183**	**14.06**	**25,408**	**1,561**	**16.28**
Miami-Dade Local Bus	5	**5**	33,100	2,638	**12.55**	40,488	2,854	**14.18**
Miami-Dade Express Bus	6	**15**	3,701	228	**16.22**	319	20	**16.22**
Limited Stop Buses (MD)	13	**13**	3,299	192	**17.18**	355	17	**21.20**
Metro-Mover	9	**9**	1,676	120	**13.94**	2,658	190	**13.98**
Metro-Rail	7	**7**	**2,513**	90	**28.00**	**2,094**	75	**28.00**
Miami-Dade Subtotal:			**44,289**	**3,268**	**13.55**	**45,914**	**3,156**	**14.55**
Tri-Rail	8	**8**	**872**	**22**	**40.28**	**1,454**	**36**	**40.28**
ALL MODES/COUNTIES:			**70,864**	**5,136**	**13.80**	**84,876**	**5,521**	**15.37**

(*) Assumption: Peak Hours= 6 & Off-Peak Hours=10.

Table 7-9: **Year 2030 Transit Speed Summary by Mode and County**
Southeast Regional Planning Model VI

			2030 Model Estimated Transit VMT, VHT & Speeds (*)					
Description	*PT Mode*	**TrnBuild Mode**	**Peak VMT**	**Peak VHT**	**Peak Speed (mph)**	**Off-Peak VMT**	**Off-Peak VHT**	**Off-Peak Speed (mph)**
Palm Beach Local Bus	4	4	16,300	1,110	14.68	25,804	1,493	17.28
Tri-Rail Shuttle (PB) [NA]	12	12						
Palm Beach Express Bus	6	16	1,027	58	17.78	1,712	78	21.82
Limited Stop Buses (PB) [NA]	13	19						
NEW Mode (PB) [NA]	10	20						
Palm Beach Bus Subtotal:			**17,327**	**1,168**	**14.84**	**27,516**	**1,572**	**17.51**
Broward Local Bus	4	14	26,533	1,834	14.46	41,576	2,396	17.35
Tri-Rail Shuttle (BO)	12	12	397	29	13.88	661	40	16.61
Broward Express Bus	6	6	3,625	152	23.78	365	13	27.70
Limited Stop Buses (BO)	13	18	7,461	373	19.98	5,460	223	24.50
NEW Mode (BO)	10	10	1,930	64	30.00	1,609	54	30.00
Broward Bus Subtotal:			**39,945**	**2,453**	**16.28**	**49,670**	**2,726**	**18.22**
Miami-Dade Local Bus	5	5	62,261	6,389	9.75	65,026	4,494	14.47
Miami-Dade Express Bus	6	15	7,836	764	10.26	4,703	217	21.70
Limited Stop Buses (MD)	13	13	3,065	264	11.63	2,130	110	19.37
NEW Mode (MD)	10	17	1,659	110	15.03	1,382	92	15.03
Miami-Dade Subtotal:			**74,820**	**7,526**	**9.94**	**73,242**	**4,912**	**14.91**
Mover	9	9	1,260	112	11.26	1,993	177	11.23
Project Mode [NA]	11	11						
Rail	7	7	**11,953**	410	**29.18**	**11,758**	403	**29.18**
Tri-Rail	8	8	**4,891**	**135**	**36.14**	**4,401**	**116**	**37.80**
ALL MODES/COUNTIES:			**150,197**	**11,804**	**12.72**	**168,579**	**9,907**	**17.02**
Tri-Rail (Main)	8	8	2,614	65	40.23	2,905	72	40.23
Tri-Rail (FEC)	8	8	1,778	59	30.00	988	33	29.99
Tri-Rail (Jupiter)	8	8	387	9	45.01	323	7	45.06
Tri-Rail (scripps)	8	8	111	2	44.85	185	4	45.00

(*) Assumption: Peak Hours= 6 & Off-Peak Hours=10.

7.5 Transit Path

Transit paths are used to obtain travel times and costs by types of transit service based on access mode. The transit module first identifies the minimum paths between all pairs of zones by all available transit modes. After paths are created and travel time skims are constructed, the transit cost for each preferred path is calculated based on boarding and transfer fares. Multiple paths are built both for peak and off-peak periods.

A transit network must be formed and transit paths must be developed for the each zone pair for processing. The paths are the bases for extracting the impedance data for use in the mode choice models and for assigning trips to the network. Path development is considerably more complex than the highway processing, as consideration has to be given to mode transfers, mode weighting and line combining.

A path set is developed for an origin zone, and the individual zone-to-zone paths are extracted from the path set. Transit path building has considerably more variables to deal with than traditional highway path building. TRNBUILD develops the single best path between two zones, and the flexibility of TRNBUILD allows many factors that can be invoked at various points in the process.

Transit paths are built for both peak and off-peak periods. The peak period transit paths use congested highway skims as the basis for auto access and bus travel times. The off-peak transit paths use free-flow highway skims. The revised nested logit model requires eight sets of transit paths for each peak and off-peak period. The following paths are built:

1. Walk Access – Bus,
2. Walk Access – New Mode,
3. Walk Access – Metrorail,
4. Walk Access – Tri-Rail,
5. Auto Access – Bus,
6. Auto Access – New Mode,
7. Auto Access – Metrorail, and
8. Auto Access – Tri-Rail.

For walk to transit paths, auto access connectors are ignored; similarly for auto access to transit paths all walk access connectors are ignored. In a similar fashion, modes are either ignored or required to exist on the path to be evaluated by the mode choice model. For example, all rail modes and project modes are not taken into account in bus paths (both walk- and auto-access), but buses must exist for it to be sent to the mode choice model. The modes (mode numbers used in TRNBUILD set of modes, see **Table 7-1**) used in each path are shown in the **Table 7-10**. The table also indicates which modes are necessary for the paths ('☼') to be evaluated by the mode choice model.

Table 7-10: **Transit Modes Included in Path Development Process**
Southeast Regional Planning Model VI

Path \ Mode	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Bus	☼	☼	☼			☼			☼	☼	☼	☼	☼		☼	☼	
New/Project	☺	☺	☺			☺	☼	☼		☺	☺	☺	☺	☼	☺	☺	☼
MetroRail	☺	☺	☺	☼		☺	☺	☺		☺	☺	☺	☺	☺	☺	☺	☺
Tri-Rail	☺	☺	☺	☺	☼	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺

☺ included in the path
☼ path exists only if time on at least one of these modes is greater than 0.

7.5.1 Path Time Factors

Perceived time factors by mode, boarding/transfer and wait time are applied as the transit paths are built. Each time a path segment (i.e., a support link or as a contiguous portion of a transit line) is to be chosen, the actual time is converted to perceived time according to the action being considered. As the path moves from one segment to another, the modes used in the from- and to- segments determine how the path will be processed. In most situations, there is some perceived time associated with segment connections. Accessing a transit segment is considered as a boarding, and if it is not the initial boarding in the path, it is considered as a transfer.

Different transit run-time factors are applied for different modes. **Table 7-11** shows the factors that are applied on the travel time on different modes for different paths. FTA does not recommend large favoring ratios and prefers the ratios in the 10-20% range. In the SERPM6, a factor of 1.00 was used for the favored mode and 1.20 was used for all the disfavored modes.

Table 7-11: **Transit Perceived-to-Actual Travel Time Factors**
Southeast Regional Planning Model VI

Mode	TRNBUILD Mode Numbers	Weight Values			
		Bus Paths	New/Project Mode Paths	Metrorail Path	Tri-Rail Path
Walk	1	2.25	2.25	2.25	2.25
Auto	2	1.50	1.50	1.50	1.50
Sidewalks	3	2.25	2.25	2.25	2.25
Bus & Metromover	4,5,6,9,13-16,18,19	1.00	1.20	1.20	1.20
New/Project mode	10,11,17,20	n/a	1.00	1.20	1.20
Metrorail	7	n/a	n/a	1.00	1.20
Tri-Rail & Shuttles	8,12	n/a	n/a	n/a	1.00

7.5.2 Wait Time

The wait time for a line is usually calculated to be one-half of its headway. However, a limit on the maximum initial wait time is used to take into account the fact the travelers are knowledgeable about the bus schedules and have rearranged their schedules to limit their wait to a more reasonable amount of time. Also, if the person is transferring to the line, most likely there is some synchronization in the transit system. In TRNBUILD, the minimum and maximum initial wait times are specified by IWAITMIN and IWAITMAX variables, respectively. IWAITFAC is used to convert the actual values to perceived values.

7.5.3 Transfer and Boarding Penalties

A transit user has more control over the initial wait time than he does over subsequent wait times. So, the boarding penalties can be stratified according to initial or transfer conditions differently. The XWAITMIN and XWAITMAX values are actual values, and to convert them to perceived values the XWAITFAC factors are used.

Additional boardings incur an additional time penalty since they typically add uncertainty about path travel time and require an additional fare. Boarding penalties are specified by the BOARDPEN variable, with separate penalties specified for the each boarding on the path.

7.5.4 Service Combination

A segment can be combined with another segment between the same two nodes during path building using the COMBINE variable. If a destination is accessible on more than one line, it is possible that some travelers would use one line and others would use the other lines. In line choice situations the program

determines which line provides the best path and saves that as the "best". Then every other line is compared to the best line to determine if it should be considered in combination with the best line. In SERPM6, lines in peak period are combined if the difference in total times (the line vs. best line) is less than 5 minutes. Similarly, in the off-peak period, the lines are combined if the difference between the lines is less than 10 minutes. Line combining process combines only lines with the same mode.

After the program obtains a list of the lines to be combined, it determines how the trips will be distributed amongst the lines. A revised perceived wait time for each line is computed as the difference between the line's perceived time and the best path run time. Each line is given a weight based upon its revised wait time relative to the other lines' revised wait times.

Paths are developed using parameters intended to isolate a mode, or a submode, such as walk or auto access. People tend to perceive the time they spend walking to transit, waiting to board, and waiting for transfers, as greater than it actually is. The model multiplies these times by a weighting factor to better reflect how people perceive them in choosing transit paths. Also, because travelers usually do not like to make transfers, a penalty time is added for each transfer. Transit path selection criteria for each mode depends then on the following parameters: time weighting coefficients, minimum and maximum wait times, transfer penalty, and mode deletion. **Table 7-12** show all of the values of the different path building parameters used in SERPM6.

Table 7-12: **Description of TRNBUILD Path Building Parameters**
Southeast Regional Planning Model VI

Keyword	Description	Value
MODEFAC	Travel time factor by TRNBUILD mode	See Travel time factor (**Table 7-11**)
IWAITFAC	Initial wait time weight factor	2.25 (all transit modes)
IWAITMAX	Maximum initial wait time allowed in minutes	60 (all transit modes)
XWAITFAC	Transfer wait time weight	2.25 (all transit modes)
XWAITMIN	Minimum transit wait time allowed in minutes	0 (all transit modes)
BOARDPEN	Boarding penalties by order [1st boarding, 2nd boarding (i.e., first transfer), etc.]	Walk access 2.25 for first three boardings, 6.75 for 4th boarding, 13.5 for next 6 boardings Drive access 2.25 for first two boardings, 6.75 for 3rd boarding, 13.5 for next 7 boardings
COMBINE	Determines maximum difference in travel time allowed for headway combination of two or more lines (minutes)	5 (peak period) 10 (off-peak period)

7.6 Transit Skim

Zone-to-zone values such as times, distance, first and last transit nodes, access and first transit modes, number-of-boardings, and fares can be obtained for I-J paths. These skims are used by the mode choice model in evaluating transit paths versus the auto paths. Most of elements can be extracted by mode, or combinations of modes. They can be combined via user expressions. The transit running times and distances may be not exact for the transit legs where the path is split amongst several lines. In those segments, the extracted element is the weighted sum of for all lines in the segment.

Peak and off-peak skims are obtained using the peak and off-peak paths. One skim matrix corresponds to each path developed. Each of the skim matrix files contains the following 14 tables:

1. Walk access/egress time (in minutes)
2. Drive access time (in minutes)
3. Transfer and sidewalk time (in minutes)

4. Local bus IVT time (in minutes)
5. Express bus IVT time (in minutes)
6. New mode IVT time (in minutes)
7. Project mode IVT time (in minutes)
8. Metrorail IVT time (in minutes)
9. Tri-Rail IVT time (in minutes)
10. Number of transfers
11. Initial wait time (in minutes)
12. Transfer wait time (in minutes)
13. Total transit IVT time (in minutes)
14. Fare (in cents)

7.7 Transit Fare

After minimum transit travel time paths have been identified, total fares for each transit path are also calculated. Total transit fares are a function of boarding and transfer costs. Transit fare information was assembled from the MPO model's fare input files and transit operators of Southeast Florida.

Transit fares for all operators are coded in 2000 dollars for the base year and 2006 dollars for the future year. The future year fares are scaled to 2000$ in the mode choice model via the INFL1 factor in PROFILE.MAS (see Appendix A). The boarding fares for PalmTran, Broward County Transit (BCT) and Miami-Dade Transit/Metrobus (MDT) operators are shown in the **Table 7-13**.

Both PalmTran and BCT employ different fare system between 2000 and 2006. In 2000, a "boarding plus transfer" system was used; a boarding fare is charged on the first boarding and a reduced fare is charged for each transfer. PalmTran and BCT also had a reduced fare when transferred between the two systems. By 2006, both systems had eliminated reduced transfer fares. It is likely that customers that transfer regularly utilize one of the unlimited ride passes available. The SERPM6 fare logic assumes that single ride trips receive the general boarding fare while trips that require a transfer receive half of the cost of a daily pass.

MDT's "boarding plus transfer" fare system remains the same between the two years except for some modest fare increases. The Metromover fare was eliminated between 2000 and 2006.

Tri-Rail charges a fare relative to the rail distance traveled. Tri-Rail bus shuttles are free. The rail service is divided into distinct fare zones. Traveling within a zone is considered to have traveled one zone. There were six such zones in 2000. Five additional zones were developed for 2030 to reflect three planned expansions. Refer to **Table 7-13** for the listing of Tri-Rail zones. The Jupiter line, running between West Palm Beach and Jupiter, and the Scripps line, running between the original Howard Scripps development and Mangonia Park, were assigned unique zones (Zones 7 and 8, respectively). The Florida East Coast (FEC) line was assigned three zones due to its length (Zones 9-11). Its zonal boundaries correspond to the existing boundaries on the main line. Tri-Rail fare based on number of fare zones traveled is also shown in **Table 7-13**.

SERPM6 uses a scripted, rule-based process to determine transit fares because it was felt that TRNBUILD's fare capabilities were inadequate to capture the complex fare interactions among the different modes and operators. On interchanges using many modes and operators, a best-guess assumption of the most common fare is used. The different fare policies between 2000 and 2006 also make it challenging. This process, while not perfect, should produce the correct fare in most interchanges. The 11 notes transfer fare section of **Table 7-13** describe fare logics that been implemented in SERPM6. The skim and fare matrices are used by the mode choice program.

Tri-Rail feeder buses provide free service. The Tri-Rail "fare-zone policy" as implemented in earlier versions of SERPM was implemented on to SERPM6. The TR_FARE (a new custom written program in place of STATFARE in SERPM5 model) program automatically calculates the station-to-station fares using zonal fares information from the FAREZONE file and station data information written from node layer.

Together with the highway skims, the transit skims and fares play an important role in mode choice analysis.

Table 7-13: **Transit Boarding and Transfer Fares**
Southeast Regional Planning Model VI

Boarding Fares (see Notes):

Agency/FareType	Fare in Cents (a) 2000 Model	2030 Model
PalmTran	80	125
PalmTran_Pass ©		300
BCT	80	100
BCT_Pass ©		250
Metrobus	125	150
MetroExpress	150	185
MetroRail	125	150
MetroMover	25	0
Tri-Rail	(b)	(b)

Tri-Rail Zone Based Fares (b):

Fare Zones Traveled	Fare in Cents (a) 2000 Model	2030 Model
1	167	200
2	250	300
3	333	400
4	375	450
5	417	500
6	458	550
7	500	600
8	500	600

(a) Fares for 2000 Model are in 2000$ and for 2030 Model in 2006$.
Model application uses an inflation factor of "0.85" to convert 2030's 2006$ to 2000$.
(b) Tri-Rail implements "fare-zone" based fares
© For 2030, BCT and PalmTran do not offer reduced transfer fares as they did in 2000. One would get full fare if a transfer is made.
The model assigns the average value of a 1-way trip based on the pass fare.

Transfer Fares (see Notes):

Agency/Transfer	Fare in Cents (a) 2000 Model	2030 Model
PalmTran_Xfer	25	
BCT_Xfer	25	
Metro_to_BCT	80	15
Metro_Xfer	25	50
Metro_to_Express	50	85

Notes:

The Cube-Voyager script computes fare based on paths. Following logics are implemented to calculate this path based fares:
(1) No transfer fare to Tri-Rail Shuttle, if a ride takes place between Tri-Rail and Tri-Rail Shuttle.
(2) If a ride takes place in Tri-Rail mode, the Tri-Rail zonal fare governs assuming that the Tri-Rail is the dominate mode.
(3) For 2000 PalmTran only ride with transfer, "PalmTran_Xfer" is applied for any transfer in addition to PalmTran boarding fare.
(4a) For 2030 PalmTran only ride with transfer, the average cost of trip based on "PalmTran_pass" governs.
(4b) For 2030 PalmTran only ride without any transfer, the PalmTran boarding fare is applied.
(5) For 2000 BCT only ride with transfer, "BCT_Xfer" is applied for any transfer in addition BCT boarding fare.
(6a) For 2030 BCT only ride with transfer, the average cost of trip based on "BCT_pass" governs.
(6b) For 2030 BCT only ride without any transfer, the BCT boarding fare is applied.
(7) For Metrobus only ride with or without any transfer, "Metro_Xfer" is applied for any transfer in addition to Metrobus boarding fare.
(8) For MetroExpress only ride with or without any transfer, "Metro_Xfer" is applied for any transfer in addition to MetroExpress boarding fare.
(9) For Metrorail only ride, MetroRail boarding fare is used.
(10) For Metromover only ride, MetroMover boarding fare is used.
(11a) For 2000, a ride in PalmTran and BCT with no other transfers, the BCT and PalmTran boarding fares are added.
(11b) For 2000, a ride in PalmTran and BCT with additional transfers, the "BCT_Xfer" is applied to each added transfer in addition to total boarding fares of BCT and PalmTran.

Table 7-13 (Continued)

Notes (continued):

(12) For 2030, a ride in PalmTran and BCT, the average cost of trip based on "PalmTran_pass" governs.

(13) For a ride in BCT and Metrobus only, fare is sum of Metrobus (boarding), "Metro_to_BCT" transfer, and additional transfers using "Metro_Xfer".

(14) For a ride in BCT and Metro Express bus only, fare is sum of MetroExpress (boarding), "Metro_to_BCT" transfer, and additional transfers using "Metro_Xfer".

(15) For a ride in Metrobus and Metro Express bus only, fare is sum of MetroExpress (boarding) and additional transfers using "Metro_Xfer".

(16) For a ride in Metrobus and MetroRail only, fare is sum of MetroRail (boarding) and additional transfers using "Metro_Xfer".

(17) For a ride in Metro Express bus and MetroRail only, fare is sum of MetroExpress (boarding) and additional transfers using "Metro_Xfer".

(18) For riding various flavors of Metro not pointed above (notes 1,2,7-10,13-17), fare is calculated as sum of Metrobus (boarding) and additional transfers using "Metro_Xfer".

Tri-Rail Station Farezones:

2000 Tri-Rail Fare Zones			2030 Tri-Rail Fare Zones		
Node	Station	FareZone	Node	Station	FareZone
30500	Mangonia Park	1	30500	Mangonia Park	1
30501	West Palm Beach	1	30501	West Palm Beach	1
30503	Lake Worth	1	30502	Australian	1
30504	Boynton Beach	2	30503	Lake Worth	1
30505	Delray Beach	2	30504	Boynton Beach	2
30506	Boca Raton	3	30505	Delray Beach	2
30509	Deerfield Beach	3	30506	Boca Raton	3
30510	Pompano Beach	3	30509	Deerfield Beach	3
30511	Cypress Creek	4	30510	Pompano Beach	3
30512	Fort Lauderdale	4	30511	Cypress Creek	4
30513	FLL Airport	5	30512	Fort Lauderdale	4
30514	Sheridan	5	30513	FLL Airport	5
30515	Hollywood	5	30514	Sheridan	5
30518	Golden Glades	6	30515	Hollywood	5
30519	Opa Locka	6	30518	Golden Glades	6
30520	Tri-Rail	6	30519	Opa Locka	6
30521	Hialeah Market	6	30520	Tri-Rail	6
30522	Miami Airport	6	30521	Hialeah Market	6
			30522	Miami Airport	6
			30530	Jupiter	7
			30533	Frederick	7
			30534	PGA Blvd	7
			30537	Blue Heron	7
			30539	WPB-Jupiter	7
			30550	Old Scripps	8
			30552	Mangonia-Scripps	8
			30560	Aventura	11
			30562	Hollywood-FEC	11
			30563	FLL Airport-FEC	11
			30564	Fort Lauderdale-FEC	10
			30565	Sunrise	10
			30566	Oakland Park	10
			30567	Cypress Creek-FEC	10
			30568	Atlantic	9
			30569	Deerfield Beach-FEC	9
			30570	Boca Raton-FEC	9

Table 7-13 (Continued)

Number of Tri-Rail Farezone Traveled:

2000 Model		
From/To Farezone		Farezones Traveled
1	1	**1**
1	2	**2**
1	3	**3**
1	4	**4**
1	5	**5**
1	6	**6**
2	2	**1**
2	3	**2**
2	4	**3**
2	5	**4**
2	6	**5**
3	3	**1**
3	4	**2**
3	5	**3**
3	6	**4**
4	4	**1**
4	5	**2**
4	6	**3**
5	5	**1**
5	6	**2**
6	6	**1**

2030 Model		
From/To Farezone		Farezones Traveled
1	1	**1**
1	2	**2**
1	3	**3**
1	4	**4**
1	5	**5**
1	6	**6**
1	7	**2**
1	8	**2**
1	9	**4**
1	10	**5**
1	11	**6**
2	2	**1**
2	3	**2**
2	4	**3**
2	5	**4**
2	6	**5**
2	7	**3**
2	8	**3**
2	9	**3**
2	10	**4**
2	11	**5**

2030 Model		
From/To Farezone		Farezones Traveled
3	3	**1**
3	4	**2**
3	5	**3**
3	6	**4**
3	7	**4**
3	8	**4**
3	9	**2**
3	10	**3**
3	11	**4**
4	4	**1**
4	5	**2**
4	6	**3**
4	7	**5**
4	8	**5**
4	9	**3**
4	10	**2**
4	11	**3**
5	5	**1**
5	6	**2**
5	7	**6**
5	8	**6**
5	9	**4**
5	10	**3**
5	11	**2**
6	6	**1**
6	7	**7**
6	8	**7**
6	9	**5**
6	10	**4**
6	11	**3**
7	7	**1**
7	8	**2**
7	9	**5**
7	10	**6**
7	11	**7**
8	8	**1**
8	9	**5**
8	10	**6**
8	11	**7**
9	9	**1**
9	10	**2**
9	11	**3**
10	10	**1**
10	11	**2**
11	11	**1**

8. MODE CHOICE MODEL

The mode choice model determines the amount of travel that will take place on each available mode of transportation. The SERPM6 mode choice model, NLOGITK, is similar to SERPM5 model. The improvements made to the revised transit model of SERPM5 were primarily centered on the mode choice model. Separate models are used for the three main trip purposes (HBW, HBNW and NHB). This is because people have a different propensity for using transit for different types of trips. For example, people are usually more willing to use transit for work trips than for other trips. The purposes were further separated by household auto categories for the home-based purposes.

The time of day features in SERPM6 necessitated some changes. The model executes for seven purposes and two times of the day concurrently. It is structured as if it were running for 14 trip purposes with the first seven using peak skims and the last seven using off-peak skims. The seven purposes are:

1. Zero-car household HBW trips,
2. 1-car household HBW trips,
3. 2+ cars household HBW trips,
4. Zero-car household HBNW trips,
5. 1-car household HBNW trips,
6. 2+ cars household HBNW trips, and
7. NHB trips.

The mode choice model zeros out the drive alone and park-ride sub-modes as possibilities for zero-car households. The reason for this is to reduce the size of the bias constants on the sub-modes during calibration. It is an option that is triggered with the parameter ZAPZERO in PROFILE.MAS (see Appendix A). It is highly recommended that users should not change this parameter value of 1 (YES). However, a value of 0 (NO) would allow one to return to a previous version with drive alone trips for the zero car households.

Like SERPM5, NLOGITK is a seven-purpose mode-choice program. The MODECHOICE module consists of three basic elements: distribute trips made by zero-car households, compute the number of non-motorized trips and execute the NLOGITK mode choice model. This chapter compares the original and revised model structures. It then presents several key enhancements and the model validation results.

8.1 Model Structure

FTA has stated that some models are “over specified,” and prefers a model that reacts logically, rather than one that is calibrated to detailed access/modes and market segments. During the process of revision of SERPM5, the consultant devised a system of “grouping” constants and targets, in line with the discussions that were held between consultant and Department staff.

The original SERPM5 transit model was revised to allow restructuring of the modes as well as reducing the number of logit constants. **Figures 8-1** and **8-2** present the nested logit structures of original and the revised model. The model structure with transit modes is referred as the “full” model structure.

The SERPM nested logit model was originally borrowed from the Dade County Transit Corridor Transitional Analysis. The original SERPM5 nested logit structure (see **Figure 8-1**) incorporated in the other previous versions of SERPM (SERPM3 and SERPM4) has many characteristics of the Miami and Minneapolis St. Paul models.

Figure 8-1: **Nested Logit Mode Choice Structure of Original SERPM5 Full Model**
Southeast Regional Planning Model VI

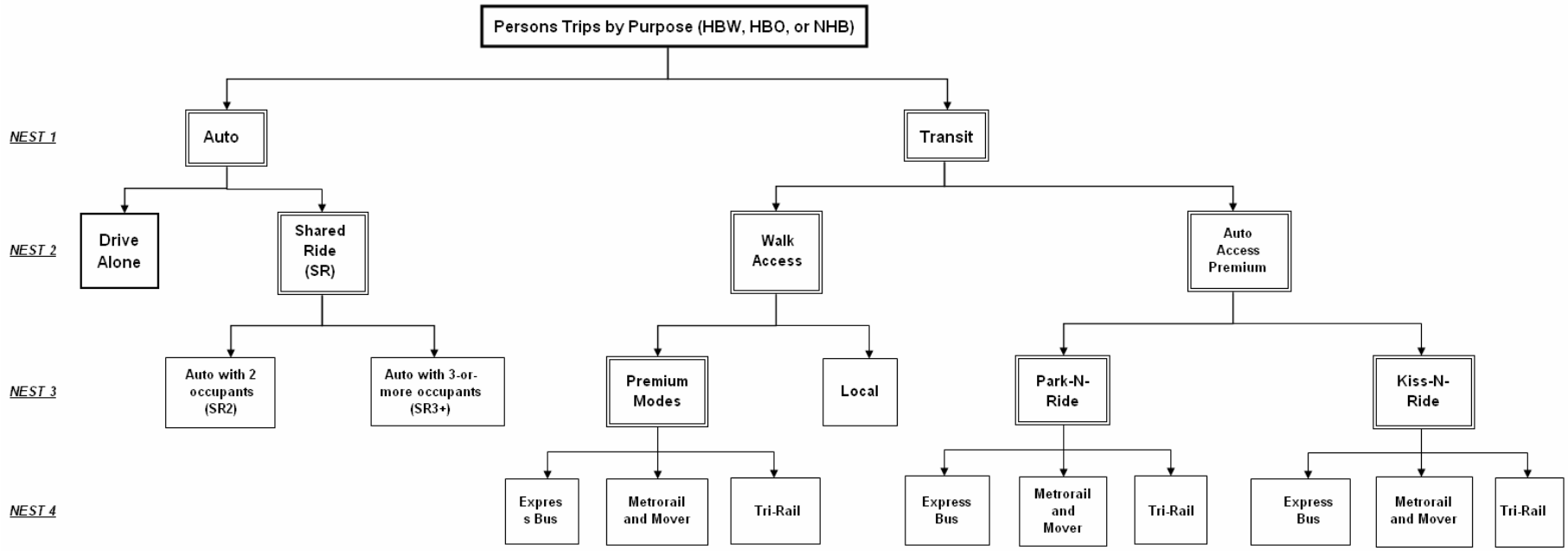
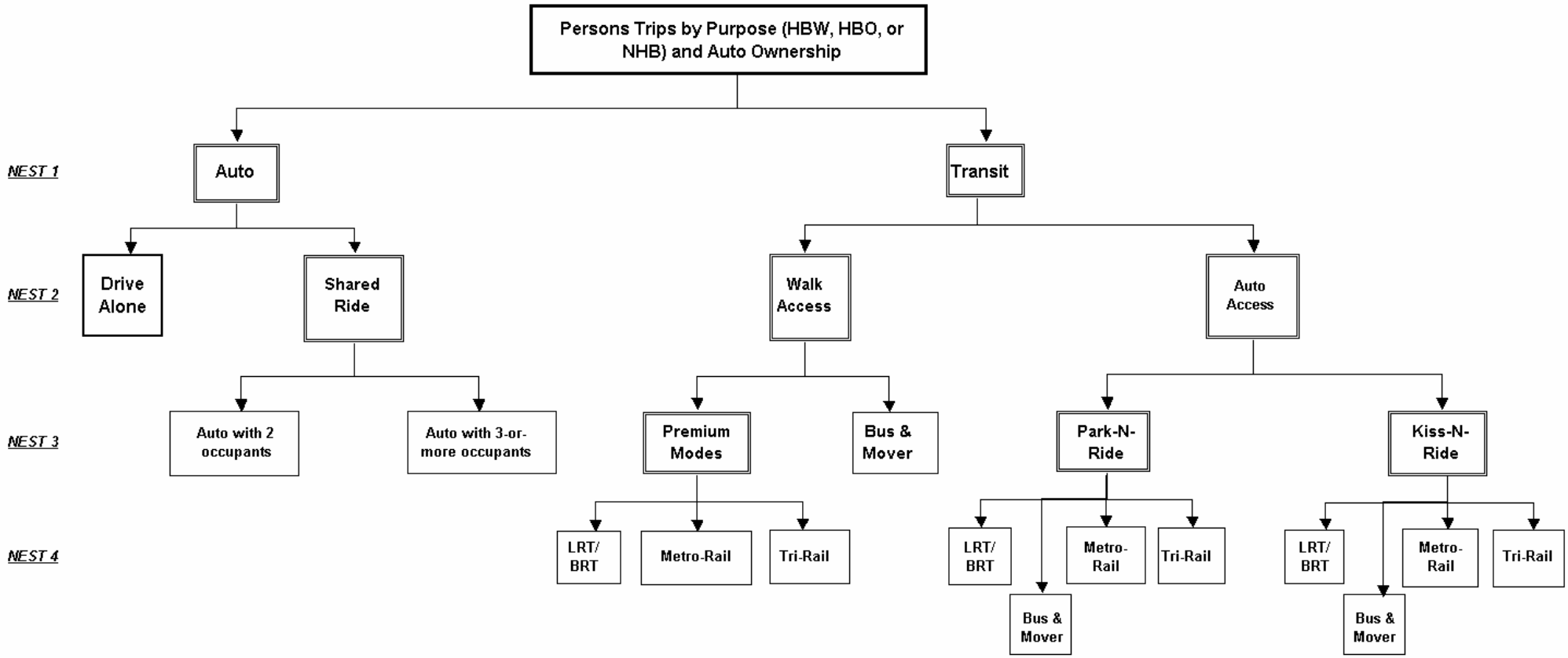


Figure 8-2: **Nested Logit Mode Choice Structure of SERPM6 Full Model**
Southeast Regional Planning Model VI



The most salient features of the nested logit structures of both original and revised model (**Figures 8-1** and **8-2**) are:

- Separation of auto submodes by vehicle occupancy; i.e., drive alone and shared ride. The shared ride category is further subdivided into auto with two occupants and auto with three-or-more occupants.
- Separation of auto access transit trips by park-and-ride and kiss-and-ride to reflect the growing passenger drop-off market within the study area and the need to estimate mode-of-arrival at transit stations.
- Allowances for competition among premium transit submodes (i.e., LRT/BRT in SERPM6 only and, Metrorail and Tri-Rail)

In the primary nest of the 4-level nested structure, total person trips are divided into "Auto" and "Transit" trips. In the secondary nest, the auto trips are split into "Drive Alone and "Shared Ride" trips, and the transit trips are split into "Walk Access" and "auto Access (Premium)" trips. In the third nest, shared ride trips are further divided into "One Passenger (SR2)" and "2+ Passengers (SR3+)".

For the original SERPM model structure (see **Figure 8-1**), on the transit side in the third nest, the walk access trips are divided into "Local Bus" and "Premium Modes" trips, and the auto access trips are divided into "Park-N-Ride" and "Kiss-N-Ride" trips. In the fourth nest, premium transit trips are further divided into Express Bus, Metrorail and Tri-Rail.

For the revised model structure (see **Figure 8-2**) , on the transit side in the third nest, the walk access trips are divided into "Bus & Mover" and "Premium Modes" trips, and the auto access trips are divided into "Park-N-Ride" and "Kiss-N-Ride" trips. In the fourth nest, premium transit trips are further divided into BRT/LRT, Bus & Mover, Metrorail and Tri-Rail.

Highlights of the changes in the mode structure of revised SERPM5 and that of SERPM6 follow:

- All buses are grouped as buses with added company codes to distinguish premium and limited stop routes.
- The mover mode is separated from the Metrorail and added to the bus mode.
- A new mode (BRT/LRT) was added and took the place of original express bus.
- Both Park-N-Ride and Kiss-N-Ride nests allow bus and mover modes.
- The original structure CBD constant has replaced by the generalized district-to-district constants.

It should be noted that the literature does not present a consensus on the values of the nesting coefficient for each nest. The degree of sensitivity of each nest is measured by the magnitude of its nesting coefficient. The nesting coefficient varies between zero and one. If the nesting coefficient is one then the nested logit model structure becomes identical to multinomial logit model form. The closer a nesting coefficient is to zero the more elastic that particular nest would become.

According to FTA guidance, the original SERPM5 model structure (see **Figure 8-1**) was viewed as "over-specified". The model estimates the number of trips for a long list of access and mode combinations, for households of three auto ownership levels. Additionally, there are constants that cause the model to estimate the observed number of local bus trip for each of the three counties, and there is a constant that allows for the adjustment of the utility of CBD-oriented trips.

Drive-alone is the base or reference mode, and the constants for this mode are zero. The original SERPM5 structure model allows 49 constants to be specified for each trip purpose. During model validation, model results are compared to observed target values for each of these constants, and then the constants are adjusted until there is a reasonable level of agreement between the model results and the target.

The observed target values were developed from several sources, including the 1999 Southeast Florida household and transit on-board surveys [Reference 25] and other information obtained from the transit operators. Because of the "thinness" of the data, development of the modal targets is usually a difficult task requiring numerous adjustments and assumptions. There are several difficulties with this structure and method of calibration:

- Because of the thinness of the data, the modal targets are based on very small samples. The large number of market segments for each trip purpose (48) makes it even more difficult to estimate the market share for each segment. Trying to match targets based on the small sample may lead to illogical constants.

- The practice of allowing unique values for each of the market segments does not impose any requirements for consistency between the constants. Thus, for example, the effect of auto availability may not be consistent among the premium modes (Premium bus, Metrorail, Metromover and Tri-Rail). Thus, small changes in the assumptions for future year zonal data (e.g., auto ownership) may cause illogical changes in the mode shares.

FTA has suggested simplification of the constant terms in the utility expression and the validation to target mode shares. The consultant revised the model at several steps and the final structure grouped/incremental structure is shown in **Figure 8-2**.

This form of the model requires only 18 unique constants for each trip purpose. There are three additional constants that are location specific. With the revised model, there are many fewer "degrees of freedom." So, the model was validated in a much more aggregate fashion. For each of the three main trip purposes (HBW, HBNW, and NHB), utility constants were updated to match trips targets for the following markets:

1. Drive alone
2. 2-occupant carpools for 0 car households
3. 2-occupant carpools for 1 car households
4. 2-occupant carpools for 2+ car households
5. Carpools (sum of 2 and 3+ carpools) from 0 car households.
6. Carpools (sum of 2 and 3+ carpools) from 1-car households.
7. Carpools (sum of 2 and 3+ carpools) from 2+ car households.
8. Walk to Total transit trips 0 car households
9. Walk to Total transit trips 1 car households
10. Walk to Total transit trips 2+ car households
11. BRT and LRT mode transit (new mode)
12. Metrorail trips
13. Tri-Rail trips
14. Walk to premium transit trips
15. Park-and-ride trips
16. Kiss-and-ride trips
17. Total transit trips to the CBD
18. Local bus trips by county

Thus, the revised model would be concerned with only 18 targets for each trip purpose. For example, while the model will attempt to match the number of premium bus trips, and the total number of transit trips from

zero-car households, it will not try to match the number of premium bus trips from zero-car households. Under the original structure, constants were adjusted to match 49 targets for each purpose. This is a significant simplification, and much more in line with available data. The revised structure also had allowed better evaluation as to whether the constants make sense and would produce a reasonable forecast.

It should be noted that the household-type constants separately for each of the "main" modes: auto, walk to transit, park-and-ride to transit, and kiss-and-ride to transit are very logical. Clearly, the ability to drive to transit is a function of auto availability and should not be treated the same as walk to transit.

Figure 8-3 presents the mapping of the grouped/incremental constants to its original mode and access forms. The symbolic names as well as the numbers are used to display this mapping. The revised mode choice (NLOGITK) model subroutine (SETCOEFF) implements this mapping before they are applied in the utility equation. The premium constant should be set for MPO planning and other uses because "there's something about a train that's magic". For the new mode (mode 6), twelve minutes of preferential treatment ("silver bullet") was applied for the basic set of assumptions. This is included in the NLOGITJ.SYN file. The NLOGITK program also applies the premium surcharge, if present in the NLOGIT.SYN file. In the SERPM6, the premium surcharge constants are zero.

The model with only highway modes is referred as the "highway-only" model structure. NLOGITK can be run four different ways depending on the type of study. It has separate procedures for the "full" mode structure and the "highway-only" model structure. The model structure with transit modes is referred as the "full" model structure and is executed using the TRSTD argument. The model with only highway modes is referred as the "highway-only" model structure. This is executed using the HWONLY argument. Both use versions of the nested logit model, but the highway-only model allocates trips only to levels of auto occupancy but not to transit trip tables. The highway-only model does not require transit network inputs.

Figure 8-4 present the nested logit structures of the "highway-only" models. NLOGITJ.SYN is the only transit file that is used by the highway-only model. NLOGITK also has different options for user benefit analysis; TRUB executes a build user benefit run and TRUBBAS runs the user benefit run for the baseline.

The nesting structure assumes that the elasticity or sensitivity to travel characteristics will be greater at the lower levels of the nest. The sensitivity of each mode is estimated using a nesting coefficient in the range of zero to one. It is inversely proportional to the sequential product of all nesting coefficients of the upper level nests including the current level. Thus, a choice between premium and local transit, for example, at a lower level of the nest, would be quite sensitive to the competition between these submodes. The impact of a change in one submode would be diminished at a higher level of decision (one main mode choice between transit and auto, for example).

Figure 8-3: **Utility Constants of New "Incremental" Model and Mapping of Constants to Original Model**
Southeast Regional Planning Model VI

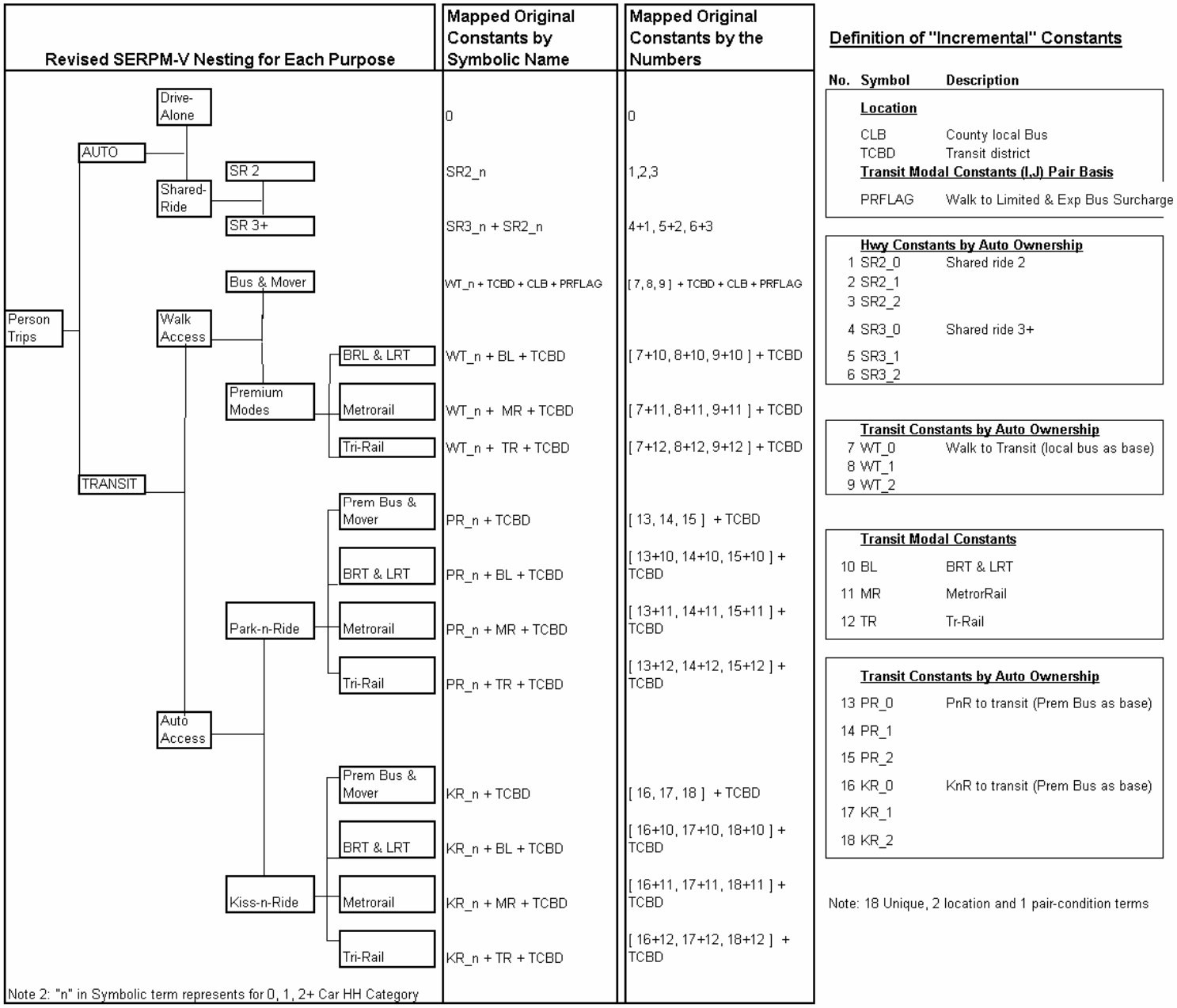
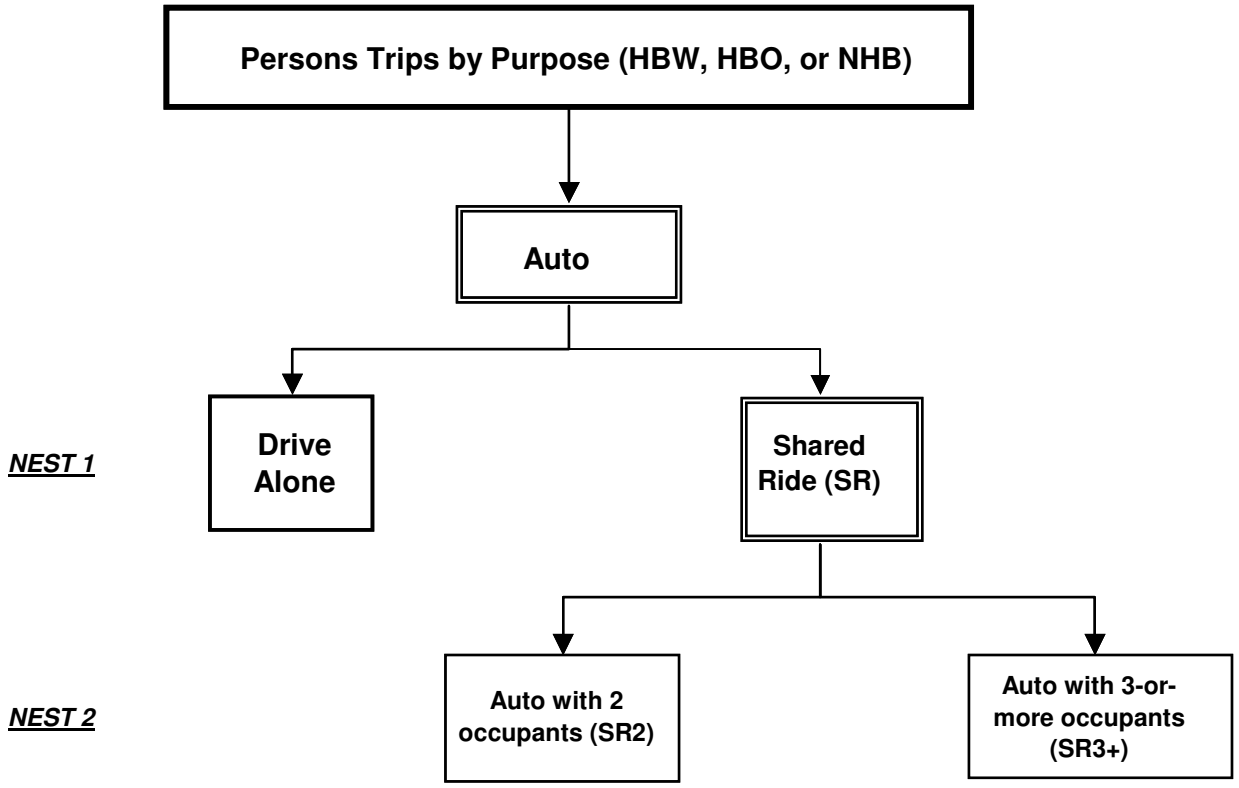


Figure 8-4: **Nested Logit Mode Choice Structure of Highway-Only Model**
Southeast Regional Planning Model VI



8.2 Other Model Enhancements

Although SERPM6 uses the same mode-choice model as was used revised SERPM5, the mode choice module incorporates a few other enhancements. Those are:

- Use of transit skim for zero auto trip distribution
- Transit district-to-district constants
- Local bus bias constants
- Transit path cliffs
- Separation of non-motorized trips

Section 6.1.4 has description of zero auto trip distribution process. A brief description of other enhancements follows in this section.

8.2.1 Transit District-to-District Constants

The SERPM6 mode choice program reads in DISTS_SYN.TXT to add extra constants on a district-to-district basis. This is explained by TCBD variable in **Figure 8-3**. The process allows for reading in production or attraction districts with their own constants. The transit districts are coded in ZDATA1B file. The current model has a mode control with added flexibility of a maximum of 99 transit districts. The transit district constants are read and applied as origin-destination (IJ) pair basis.

The DISTS_SYN.TXT is semi-free format file, and allows up to 99 transit districts. The constants are used in the utility expression of the model for each IJ zone pair and the purpose. In order to preserve flexibility, a simple structure based on a range of "i-values" and a range of "j-values" was implemented. The first two ranges are for the (origin districts), the second two ranges are for the destination districts and the third two ranges are the trip purposes. The constants for transit and the shared modes are input last two columns. This format will allow for simple constants to be input but will allow for a more general structure if needed without the need to revise the code every time. This allowed for something fairly sophisticated by simply identifying and grouping districts cleverly.

The SERPM6 model identified six transit districts each with zero values before calibration: Miami CBD, Fort Lauderdale CBD, Outlying CBD's (Palm Beach Area), Metro-Dade Other, Broward Other and West Palm Other. The model calibration and validation efforts did not require any adjustments and the values of these constants are zeros.

8.2.2 Local Bus Bias Constants

This enhancement was originally made in previous version of SERPM and carried over to SERPM6. The model contains bias constants for walk- and auto-access for each county. The addition of these constants added an extra flexibility in the model validation at the county and at the regional level. The mode-choice program uses separate constants for the transit services of Palm Beach, Broward and Miami-Dade Counties. This is added to the utility equations and has improved the model validation statistics for the local buses not only for the whole region but also for each individual county. The bias constants are entered in PROFILE.MAS (see **Appendix A**). The portion of the PROFILE.MAS file that includes these bias constants is shown here.

```
&BWABSPB       Walk-Access Bus Bias - Palm Beach
1.35
&BWABSBO       Walk-Access Bus Bias - Broward
0.55
&BWABSMD       Walk-Access Bus Bias - Miami-Dade
0.00
&BAABSPB       Auto-Access Bus Bias - Palm Beach
1.35
&BAABSBO       Auto-Access Bus Bias - Broward
1.35
&BAABSMD       Auto-Access Bus Bias - Miami-Dade
1.15
&WKBRTF        Walk Access BRT/LRT Bias Factor as frac of Walk-Access Bus Biases
0.00
&PKBRTF        Auto Access BRT/LRT Bias Factor as frac of Walk-Access Bus Biases
0.00
```

8.2.3 Transit Path Cliffs

This enhancement was made in revised SERPM5 and was carried over to SERPM6. The trip time "threshold" MINRUN variables (cliffs) were changed to represent variable highway distances instead of transit travel times. The values of the MINRUN variables are set in PROFILE.MAS as they were in original version. The CV path module scripts eliminate other path-building "cliffs" as appropriate (for example, increased boarding penalties for higher number of transfers).

The previous "cliff" on transit travel time has been replaced by one based on off-peak highway distance. In the original SERPM5, a value of 3 minutes was used for all of the walk access paths and 6 minutes for drive paths. Since most local buses run in the 8-12 mph range, this would mean a distance of around 0.4 to 0.6 miles. For the drive paths, for an assumption of 12 mph speed (or 5 minutes per mile), the 6 minutes cliff would imply a 1.2 miles trip. The values are still input through PROFILE.MAS (see MINRUN1-4 parameters of Figures **A-1** and **A-2** of Appendix A) but are now expressed in miles. 0.6

miles was used as the limit for the walk paths and 1.2 miles for the auto paths.

Cliffs presented a problem when applying Summit to evaluate transit alternatives. When transit service changes resulted in a travel time change for a short trip, especially in the CBD or other areas with sidewalk links, quite often the transit path would change from the use of a bus path to a direct walk from the origin to destination station. Within Summit, the dropping (or adding) of a transit path is taken to mean a deliberate change in the availability of transit on an interchange and Summit would compute a very large loss (or gain) in user benefits, even though the actual travel time that caused the shift from bus to walk might have a fraction of a minute. By changing the criteria from being transit service-dependent to a depending solely on off-peak auto time, a measure is used which almost never changes between one alternative and another and thus virtually eliminates these minute changes produced huge changes in Summit. This approach still preserves the original intent of the MINRUN factor, which was to eliminate unreasonably short trips from showing up as "transit" when the "real" mode was probably simply to walk, a short distance, regardless of the transit service being offered.

8.2.4 Non-Motorized Mode Choice

This process was first implemented in the SERPM5 and later revised in revised SERPM5. In this transit model, the person trip tables were broken down by auto ownership categories for HBW and HBO trips. The process was undertaken with a view of altering the logit model as little as possible and making as few changes as possible in the rest of the model application package. A revised version of the motorized trip splitting program has been prepared as NMOTOR7. The revisions were made by applying the same factors to each of the sub-purposes, although it could be argued that zero-car households are more likely to make non-motorized trips.

The SERPM6 mode choice program uses only motorized trips. A logit-based program (NMOTOR7, originally developed for SERPM5) was modified for SERPM6 to separate motorized and non-motorized trips from total trips for the seven trip purposes (HBW0Car, HBW1Car, HBW2+Car, HBO0Car, HBO1Car, HBO2+Car and NHB). The model estimates the percentage of non-motorized trips by trip purposes between each pair of TAZs. This percentage is determined by a logit equation, and the utilities contain the following measures:

- Spatial separation (highway network distance between the two TAZs).
- A non-motorized friendliness index of the origin and destination TAZs. The values are calculated for each TAZ, and the values for the origin and destination are averaged and used in the utility.

The non-motorized trips should decrease as distance increases. Thus, a logit trip elasticity curve was used that decreases the potential non-motorized trips as the highway distance skim increases. The following variables were used to devise the non-motorized friendliness (NMF) index:

- Percentage of streets with sidewalks
- Percentage of streets that are easy to cross by pedestrians
- Area type

A composite rating (index) for a TAZ was the sum of the NMF for the three variables. The logit model constants and parameters are entered in the NMOTOR.SYN file. **Table 8-1** presents the validated parameters of the logit utility equation along with NMF ratings.

Table 8-1: **Validated Non-motorized Logit Model Constants and Coefficients**
Southeast Regional Planning Model VI

	HBW	HBNW	NHB
Coefficient (COEF)	3.00	2.50	2.00
Bias Constants (BIAS)	-0.679779495	0.423668830	1.324100570
Index Coefficient (INDCOEF)	0.25		

Utility Equation:

Utility (i,j,p) = COEF(p) * [Distance(i,j) - 0.5 * INDCOEF * {-index(i)-index(j)}] + BIAS(p)

where,
p = purpose (HBW, HBNW and NHB)
i = Origin Zone
j = Destination Zone
index = Walk Index from file WALK.XX (XX=PB, BO and MI)

The non-motorized friendliness Index (index) is defined as follows:

	Non-motorized Friendliness Index (index)			
Variable	0	1	2	3
Sidewalk Availability	No sidewalks	<10% have sidewalks	10-90% have sidewalks	>90% have sidewalks
Ease of Crossing	No crossings	<10% have crossings	10-90% have crossings	>90% have crossings
Area Type	5 (Very Low Density Non-CBD)	4 (Low Density Non-CBD)	2 & 3 (High & Medium Density Non-CBD)	1 (CBD)

Logit Equation:

Non-Motorized Share (i,j,p) = 1 / [1 + EXP {Utility(i,j,p)}]

Summaries of the motorized and non-motorized trips by purpose are shown in **Tables 8-2** and **8-3** for the 2000 and 2030 model runs. Overall, there are 3.10% and 2.31% of non-motorized trips for the peak and off-peak periods of the 2000 validation run. The HBW purpose has the lowest percentage of non-motorized trips (1.21% in peak period and 0.91% in off-peak period).

Tables 8-2 and **8-3** also present intrazonal trips and their percentages separately for the motorized and non-motorized trips as well as total trips.

For the 2000 all person trips, the intrazonal percentages are 3.6 and 3.3 for the peak and off-peak periods, respectively. The motorized intrazonal trip percentages are 2.2 percents for the both periods. Once again, HBW has the lowest percentages of intrazonal trips. Although there are no strict guidelines on these percentages, the values in the ranges of 2-4 percents are very reasonable figures. Moreover, a expected pattern of lower percentages of the HBW intrazonal trips is exhibited in the SERPM6 model.

For the 2000 non-motorized trips, the overall intrazonal trip percentages are 46.2 and 50.2 in the peak and off-peak periods, respectively. The HBW trip non-motorized intrazonal trips are 28.5 and 34.2 percents for the peak and off-peak periods, respectively. The higher percentages on non-motorized trips are very reasonable.

The percentages of non-motorized trips for the 2030 model run are very similar. These percentages of non-motorized trips are almost similar among the household auto categories. The motorized trips are assigned to the network.

Table 8-2: **Year 2000 Motorized and Non-Motorized Trips and Their Distribution**
Southeast Regional Planning Model VI

B1. Year 2000 Model: Peak Period

Purpose	Number of Person Trips			Percent Non-Motorized	Intrazonal Person Trips			Percent Intrazonal Trips		
	Total Person Trips	Non-Motorized Person Trips	Motorized Person Trips		All Trips	Non-Motorized Trips	Motorized Trips	All Trips	Non-Motorized Trips	Motorized Trips
a. HB Work (0,1,2+ Auto HHs)	2,324,927	28,122	2,296,805	1.21%	11,854	8,028	3,826	0.5%	28.5%	0.2%
b. HB Non-Work (0,1,2+ Auto HHs)	3,924,612	186,470	3,738,142	4.75%	208,606	90,056	118,550	5.3%	48.3%	3.2%
c. Non Home Based (ALL HHs)	1,495,606	25,436	1,470,170	1.70%	56,440	12,913	43,527	3.8%	50.8%	3.0%
Total Person Trips:	**7,745,145**	**240,028**	**7,505,117**	**3.10%**	**276,900**	**110,997**	**165,903**	**3.6%**	**46.2%**	**2.2%**
a0. HB Work (0 Auto HHs)	67,316	1,339	65,977	1.99%	1,259	922	337	1.9%	68.9%	0.5%
a1. HB Work (1 Auto HHs)	347,847	5,217	342,630	1.50%	1,795	1,353	442	0.5%	25.9%	0.1%
a2. HB Work (2+ Autos HHs)	1,909,764	21,566	1,888,198	1.13%	8,800	5,753	3,047	0.5%	26.7%	0.2%
b0. HB Non-Work (0 Auto HHs)	148,464	7,642	140,822	5.15%	10,281	4,728	5,553	6.9%	61.9%	3.9%
b1. HB Non-Work (1 Auto HHs)	797,689	39,816	757,873	4.99%	41,170	18,697	22,473	5.2%	47.0%	3.0%
b2. HB Non-Work (2+ Autos HHs)	2,978,459	139,012	2,839,447	4.67%	157,155	66,631	90,524	5.3%	47.9%	3.2%
c. Non Home Based (ALL HHs)	1,495,606	25,436	1,470,170	1.70%	56,440	12,913	43,527	3.8%	50.8%	3.0%
Total Person Trips:	**7,745,145**	**240,028**	**7,505,117**	**3.10%**	**276,900**	**110,997**	**165,903**	**3.6%**	**46.2%**	**2.2%**

B2. Year 2000 Model: Off-Peak Period

Purpose	Number of Person Trips			Percent Non-Motorized	Intrazonal Person Trips			Percent Intrazonal Trips		
	Total Person Trips	Non-Motorized Person Trips	Motorized Person Trips		All Trips	Non-Motorized Trips	Motorized Trips	All Trips	Non-Motorized Trips	Motorized Trips
a. HB Work (0,1,2+ Auto HHs)	1,559,156	14,174	1,544,982	0.91%	6,971	4,843	2,128	0.4%	34.2%	0.1%
b. HB Non-Work (0,1,2+ Auto HHs)	5,006,032	150,410	4,855,622	3.00%	184,339	76,383	107,956	3.7%	50.8%	2.2%
c. Non Home Based (ALL HHs)	3,009,287	56,374	2,952,913	1.87%	129,187	29,761	99,426	4.3%	52.8%	3.4%
Total Person Trips:	**9,574,475**	**220,958**	**9,353,517**	**2.31%**	**320,497**	**110,987**	**209,510**	**3.3%**	**50.2%**	**2.2%**
a0. HB Work (0 Auto HHs)	44,935	821	44,114	1.83%	786	608	178	1.7%	74.1%	0.4%
a1. HB Work (1 Auto HHs)	232,017	2,578	229,439	1.11%	1,042	821	221	0.4%	31.8%	0.1%
a2. HB Work (2+ Autos HHs)	1,282,204	10,775	1,271,429	0.84%	5,143	3,414	1,729	0.4%	31.7%	0.1%
b0. HB Non-Work (0 Auto HHs)	185,375	4,291	181,084	2.31%	8,005	3,414	4,591	4.3%	79.6%	2.5%
b1. HB Non-Work (1 Auto HHs)	1,038,501	35,782	1,002,719	3.45%	39,459	17,460	21,999	3.8%	48.8%	2.2%
b2. HB Non-Work (2+ Autos HHs)	3,782,156	110,337	3,671,819	2.92%	136,875	55,509	81,366	3.6%	50.3%	2.2%
c. Non Home Based (ALL HHs)	3,009,287	56,374	2,952,913	1.87%	129,187	29,761	99,426	4.3%	52.8%	3.4%
Total Person Trips:	**9,574,475**	**220,958**	**9,353,517**	**2.31%**	**320,497**	**110,987**	**209,510**	**3.3%**	**50.2%**	**2.2%**

Table 8-3: **Year 2030 Motorized and Non-Motorized Trips and Their Distribution**
Southeast Regional Planning Model VI

F1. Year 2030 Model: Peak Period

Purpose	Number of Person Trips			Percent Non-Motorized	Intrazonal Person Trips			Percent Intrazonal Trips		
	Total Person Trips	Non-Motorized Person Trips	Motorized Person Trips		All Trips	Non-Motorized Trips	Motorized Trips	All Trips	Non-Motorized Trips	Motorized Trips
a. HB Work (0,1,2+ Auto HHs)	3,457,637	51,909	3,405,728	1.50%	23,237	14,637	8,600	0.7%	28.2%	0.3%
b. HB Non-Work (0,1,2+ Auto HHs)	5,752,100	249,795	5,502,305	4.34%	305,005	122,647	182,358	5.3%	49.1%	3.3%
c. Non Home Based (ALL HHs)	2,233,744	43,434	2,190,310	1.94%	103,736	21,523	82,213	4.6%	49.6%	3.8%
Total Person Trips:	**11,443,481**	**345,138**	**11,098,343**	**3.02%**	**431,978**	**158,807**	**273,171**	**3.8%**	**46.0%**	**2.5%**
a0. HB Work (0 Auto HHs)	108,576	1,570	107,006	1.45%	1,571	1,087	484	1.4%	69.2%	0.5%
a1. HB Work (1 Auto HHs)	480,756	9,442	471,314	1.96%	3,489	2,430	1,059	0.7%	25.7%	0.2%
a2. HB Work (2+ Autos HHs)	2,868,305	40,897	2,827,408	1.43%	18,177	11,120	7,057	0.6%	27.2%	0.2%
b0. HB Non-Work (0 Auto HHs)	244,716	10,555	234,161	4.31%	15,386	6,578	8,808	6.3%	62.3%	3.8%
b1. HB Non-Work (1 Auto HHs)	1,095,013	51,073	1,043,940	4.66%	55,506	23,528	31,978	5.1%	46.1%	3.1%
b2. HB Non-Work (2+ Autos HHs)	4,412,371	188,167	4,224,204	4.26%	234,113	92,541	141,572	5.3%	49.2%	3.4%
c. Non Home Based (ALL HHs)	2,233,744	43,434	2,190,310	1.94%	103,736	21,523	82,213	4.6%	49.6%	3.8%
Total Person Trips:	**11,443,481**	**345,138**	**11,098,343**	**3.02%**	**431,978**	**158,807**	**273,171**	**3.8%**	**46.0%**	**2.5%**

F2. Year 2030 Model: Off-Peak Period

Purpose	Number of Person Trips			Percent Non-Motorized	Intrazonal Person Trips			Percent Intrazonal Trips		
	Total Person Trips	Non-Motorized Person Trips	Motorized Person Trips		All Trips	Non-Motorized Trips	Motorized Trips	All Trips	Non-Motorized Trips	Motorized Trips
a. HB Work (0,1,2+ Auto HHs)	2,320,212	20,123	2,300,089	0.87%	10,817	6,792	4,025	0.5%	33.8%	0.2%
b. HB Non-Work (0,1,2+ Auto HHs)	7,527,728	174,067	7,353,661	2.31%	235,416	87,290	148,126	3.1%	50.1%	2.0%
c. Non Home Based (ALL HHs)	4,493,910	66,954	4,426,956	1.49%	165,258	33,942	131,316	3.7%	50.7%	3.0%
Total Person Trips:	**14,341,850**	**261,144**	**14,080,706**	**1.82%**	**411,491**	**128,024**	**283,467**	**2.9%**	**49.0%**	**2.0%**
a0. HB Work (0 Auto HHs)	72,441	871	71,570	1.20%	896	635	261	1.2%	72.9%	0.4%
a1. HB Work (1 Auto HHs)	320,926	3,367	317,559	1.05%	1,518	1,063	455	0.5%	31.6%	0.1%
a2. HB Work (2+ Autos HHs)	1,926,845	15,885	1,910,960	0.82%	8,403	5,094	3,309	0.4%	32.1%	0.2%
b0. HB Non-Work (0 Auto HHs)	313,730	5,852	307,878	1.87%	11,247	4,515	6,732	3.6%	77.2%	2.2%
b1. HB Non-Work (1 Auto HHs)	1,454,715	37,717	1,416,998	2.59%	43,896	17,383	26,513	3.0%	46.1%	1.9%
b2. HB Non-Work (2+ Autos HHs)	5,759,283	130,498	5,628,785	2.27%	180,273	65,392	114,881	3.1%	50.1%	2.0%
c. Non Home Based (ALL HHs)	4,493,910	66,954	4,426,956	1.49%	165,258	33,942	131,316	3.7%	50.7%	3.0%
Total Person Trips:	**14,341,850**	**261,144**	**14,080,706**	**1.82%**	**411,491**	**128,024**	**283,467**	**2.9%**	**49.0%**	**2.0%**

8.3 Mode Choice Parameters

The mode split calculation takes into account the time and cost of travel. Travel time is divided into two general groups: (1) time spent in the vehicle, and (2) time spent outside the vehicle (walking, waiting, transferring, and parking the vehicle). Times are separated in the model because travelers dislike out-of-vehicle travel much more than riding time. Both wait and transfer times in the SERPM6 are weighted by 2.25 times the in-vehicle time (see **Table 7-13**).

Starting with SERPM3, a nested logit model structure was implemented in SERPM. This specification eliminated a problem with the multinomial logit form, independence of irrelevant alternatives (effectively a restriction on the cross elasticities). The appeal of the nested logit model is its ability to accommodate differential degrees of interdependence between subsets of alternatives. Section 8.1 provides the description of the nested logit structure. The logit parameters (constants and coefficients) are presented in this section.

The same nesting coefficients are used for the three purposes and both peak and off-peak time periods. The values of the nesting coefficients are shown in **Table 8-4**.

Table 8-4: **Mode Choice Structure Nesting Coefficients**
Southeast Regional Planning Model VI

Nest	Value
Auto	0.80
Auto/Shared-ride	0.20
Transit	**0.50**
Transit/Walk Access	**0.30**
Transit/Park-ride Access	**0.30**
Transit/Kiss-ride Access	**0.30**

The utility of a mode is assumed to be a function of attributes that describe the level of service (LOS) provided by the mode (called coefficients), and a mode specific constant. The mode specific constant, also known as mode bias coefficient, is an adjustment parameter that compensates the unknown effects of the variables not included in the utility computation. The incremental constants and coefficients are entered in NLOJITJ.SYN file. The NLOGITK program reads this file as well as several parameters from the PROFILE.MAS file. The parameters that are read from PROFILE.MAS file are described in **Table 8-5**.

Other purpose specific coefficients are shown in **Tables 8-6.** They are same for both peak and off-peak periods. For work trips, the model uses twice the model coefficients for the first seven minutes of weight (-.045 vs. -.023). Beside time related variables, transit fare, parking costs, and auto operating costs also are factored into the mode split analysis. Other factors considered in the mode choice model include a HOV time difference.

The constants of the validated SERPM6 model are shown in **Table 8-7,** respectively. Drive alone is the base or reference mode, and the constants for this mode are zero. They are expressed for each mode, stratified by trip purpose and auto ownership categories and by periods. The mode choice model derives the detailed structure constants for use in the utility expressions. **Figure 8-3** shows the relationship of mapping.

Other factors considered in the mode choice model include transit district-to-district constants, which reflect the effect of items beyond time and cost that impact the decision to use alternative modes to a

particular district (for example, transit attractions to CBD district). Those location specific constants are shown in **Table 8-8**.

Table 8-5: **Description of PROFILE.MAS Attributes Used by Mode-Choice Program**
Southeast Regional Planning Model VI

Parameter	Variable	Value
Auto operating cost	&AOC	9.50 cents/mile
3+ auto occupancy by purpose	&OC3	3.20 persons for all purposes
Park-ride auto occupancy by purpose	&OCTA	1.20 persons for all purposes
Average auto access speed (peak)	&TASPD	26.00 mph
Average auto access speed (off-peak)	&TASPD	26.00 mph
Minimum distance		
Walk to local transit	&MINRUN1	0.60 mile
Walk to premium transit	&MINRUN2	0.60 mile
Auto access local transit	&MINRUN3	1.20 mile
Auto access premium transit	&MINRUN4	1.20 mile
Inflation		
Transit fare	&INFL1	1.00
Auto operating cost	&INFL2	1.00
Parking cost	&INFL3	1.00
Minimum mode split by purpose	&MSMIN	0.00 for all purposes
HOV flag	&HOVUSE	2, so 2 or 3+ carpools can use HOV lanes
Minimum HOV qualifying time	&HOVMIN	3.00
Station walk-access impedance flag	&RAILAC	0
Validation summary flag	&VAL	0
Kiss-ride additional impedance factor	&KRFAC	1.50
Default regional mode splits by purpose	&DEFMS	0.0334 (HBW peak) 0.0117 (HBNW peak) 0.0134 (NHB peak) 0.0314 (HBW off-peak) 0.0126 (HBNW off-peak) 0.0069 (NHB off-peak)
Default zonal mode split update flag	&DEFUPD	2 (1= yes, 2= no)
Zero-out drive-along as a sub-mode for 0-car households	&ZAPZERO	1 (1= yes, anything else= no)
Integer bucket rounding method	&IBUCK	1 (0= none, 1=modified)

Table 8-6: **Mode Choice Utility Coefficients of LOS Attributes**
Southeast Regional Planning Model VI

Purposes			Description		
PK-HBW or OP-HBW	PK-HBNW or OP-HBNW	PK-NHB or OP-NHB			
-0.0450	-0.0350	-0.0450	TRANSIT WALK TIME, HIGHWAY TERMINAL TIME	WALKC ATRMC	1
-0.0200	-0.0150	-0.0180	TRANSIT AUTO ACCESS TIME	AUTOC	2
-0.0200	-0.0150	-0.0180	TRANSIT RUN TIME, HIGHWAY RUN TIME	TRUNC ARUNC	3
-0.0450	-0.0350	-0.0450	TRANSIT FIRST WAIT < 7 MIN	WTTAC	4
-0.0230	-0.0350	-0.0450	TRANSIT FIRST WAIT > 7 MIN	WTTBC	5
-0.0450	-0.0350	-0.0450	TRANSIT TRANSFER TIME	XFTC	6
-0.0450	-0.0350	-0.0450	TRANSIT NUMBER OF TRANSFERS	NXFC	7
-0.0032	-0.0048	-0.0048	TRANSIT FARE	FAREC	8
-0.0025	-0.0048	-0.0048	HIGHWAY AUTO OPERATING COSTS	ACSTC	9
-0.0032	-0.0048	-0.0048	HIGHWAY PARKING COSTS	APRKC	10
-0.0180	-0.0150	-0.0180	HOV TIME DIFFERENCE	HOVDIFFC	11

Table 8-7: **Validated Mode Choice Utility Constants**
Southeast Regional Planning Model VI

Purposes						Description		
PK-HBW	PK-HBNW	PK-NHB	OP-HBW	OP-HBNW	OP-NHB			
0.0000	0.0000	-0.5253	0.0000	0.0000	-0.5077	SHARED RIDE 2 CONSTANT - ZERO CAR HOUSEHOLDS	NEWCOEF(1,I)	12
-1.3312	-0.0015	-0.5253	-1.3351	-0.0197	-0.5077	SHARED RIDE 2 CONSTANT - ONE CAR HOUSEHOLDS	NEWCOEF(2,I)	13
-1.9331	-0.0005	-0.5253	-1.9370	-0.0265	-0.5077	SHARED RIDE 2 CONSTANT - TWO+ CAR HOUSEHOLDS	NEWCOEF(3,I)	14
-0.3119	-0.1743	-0.2082	-0.3061	-0.1791	-0.1935	SHARED RIDE 3+ CONSTANT - ZERO CAR HOUSEHOLDS	NEWCOEF(4,I)	15
-0.3165	-0.1932	-0.2082	-0.3162	-0.1990	-0.1935	SHARED RIDE 3+ CONSTANT - ONE CAR HOUSEHOLDS	NEWCOEF(5,I)	16
-0.3411	-0.1080	-0.2082	-0.3401	-0.1179	-0.1935	SHARED RIDE 3+ CONSTANT - TWO+ CAR HOUSEHOLDS	NEWCOEF(6,I)	17
1.8895	-0.1130	-1.7029	2.0545	0.1289	-2.1136	WALK TO TRANSIT - ZERO CAR HOUSEHOLDS	NEWCOEF(7,I)	18
-0.0057	-1.0782	-1.7029	0.2647	-0.8632	-2.1136	WALK TO TRANSIT - ONE CAR HOUSEHOLDS	NEWCOEF(8,I)	19
-2.2311	-2.6903	-1.7029	-1.9136	-2.4061	-2.1136	WALK TO TRANSIT - TWO+ CAR HOUSEHOLDS	NEWCOEF(9,I)	20
0.2400	0.1800	0.2160	0.2400	0.1800	0.2160	BRT/LRT TRANSIT	NEWCOEF(10,I)	21
0.1709	0.3062	0.2692	0.5118	0.6625	0.5383	METRORAIL TRANSIT	NEWCOEF(11,I)	22
0.2697	**0.6123**	**0.8920**	**-0.3834**	**0.2640**	**0.6509**	TRIRAIL TRANSIT	NEWCOEF(12,I)	23
-5.4685 (a)	-5.0765 (a)	-1.9851	-5.3801 (a)	-5.0441 (a)	-2.3588	PARK AND RIDE TO TRANSIT - ZERO CAR HOUSEHOLDS	NEWCOEF(13,I)	24
-0.0030	-1.4217	-1.9851	0.2459	-1.2049	-2.3588	PARK AND RIDE TO TRANSIT - ONE CAR HOUSEHOLDS	NEWCOEF(14,I)	25
-1.9781	-2.7758	-1.9851	-1.6974	-2.5726	-2.3588	PARK AND RIDE TO TRANSIT - TWO+ CAR HOUSEHOLDS	NEWCOEF(15,I)	26
-5.4685 (a)	-5.0765 (a)	-1.7603	-5.3801 (a)	-5.0441 (a)	-2.0986	KISS AND RIDE TO TRANSIT - ZERO CAR HOUSEHOLDS	NEWCOEF(16,I)	27
0.1635	-1.2240	-1.7603	0.4441	-0.9561	-2.0986	KISS AND RIDE TO TRANSIT - ONE CAR HOUSEHOLDS	NEWCOEF(17,I)	28
-1.8650	-2.5928	-1.7603	-1.5517	-2.3211	-2.0986	KISS AND RIDE TO TRANSIT - TWO+ CAR HOUSEHOLDS	NEWCOEF(18,I)	29
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	WALK TO PREMIUM BUS SURCHARGE	PREMFLAG(I)	30

(a) Not Applicable for Zero-Car Households

Table 8-8: **Mode Choice Utility Transit District Constants**
Southeast Regional Planning Model VI

District Coefficients	Origin District Range		Destination District Range		Purpose Range		Transit Coefficients	Shared Ride Auto Coefficients
Description	I1	I2	J1	J2	P1	P2		
From All Dists To Miami CBD - HBW	1	6	1	1	1	1	0.00	0.00
From All Dists To Miami CBD - HBNW	1	6	1	1	2	2	0.00	0.00
From All Dists To Miami CBD - NHB	1	6	1	1	3	3	0.00	0.00
From All Dists To Broward CBD - HBW	1	6	2	2	1	1	0.00	0.00
From All Dists To Broward CBD - HBNW	1	6	2	2	2	2	0.00	0.00
From All Dists To Broward CBD - NHB	1	6	2	2	2	2	0.00	0.00
From All Dists To Palm Beach CBD - HBW	1	6	3	3	1	1	0.00	0.00
From All Dists To Palm Beach CBD - HBNW	1	6	3	3	2	2	0.00	0.00
From All Dists To Palm Beach CBD - NHB	1	6	3	3	3	3	0.00	0.00

Constants represent the unknown and goal of the validation should be lower values of these constants. A higher vale of the constants causes the model to be insensitive to changes in the level of service and costs associated with a particular mode. Most of the values of the constants are small (see **Table 8-7**).

All the constants are echoed back as input and also expressed in minutes of IVT. They are then added together following the mapping logic in Figure 8-3 and echoed back in the detailed format of the original program. Disutility functions are used to convert travel time and cost for each of the various modes into a generalized cost. They have the following form:

DU of transit	=	f (walk time, in-vehicle time, wait time, transfer time, number of transfers, transit fare, etc.) + constants
DU of highway	=	f (terminal time, run time, operating cost, parking cost, HOV time difference, etc.) + constants

These utility values are then used to compute the probability of using a mode as follows:

$$P(m) = EXP(-DU(m)) / \sum_{k=1}^{n}(EXP(-DU(k))$$

where:

P(m)	=	Probability of using mode "m"
EXP	=	Exponential function
DU(m)	=	Disutility of using mode "m"
DU(k)	=	Disutility of using mode "k"
n	=	Number of possible modes
m	=	Mode

8.4 Model Validation

Transit network simulation requires a number of input files for each period (peak and off-peak). After reasonableness checks of transit network and path building parameters, the mode specific constants are validated through a series of iterative model runs.

The primary validation check of the transit assignment process is a comparison of observed versus modeled boardings. This was checked for the region, by the mode and sub-mode. The first step of the validation of a transit assignment occurs during the mode choice model validation. In the mode choice step, the mode-specific constants for the region were derived so that the mode-choice model produces the appropriate share of transit trips for the region and different market segments.

The model validation efforts were concentrated to match the model-estimated shares to the observed shares for the 21 segments of the incremental structure (see Figure 8-3 and Section 8.1) of the following three main purposes (HBW, HBNW and NHB) of both peak and off-peak periods.

The mode choice model was validated to ensure that the model replicated observed shares. The validation was done in the following manner:

- Adjusting the modal bias coefficients (constants of the utility equation) to replicate the transit ridership data, and

- Examining the validation results to identify any additional adjustments to coefficients or other parameters, which were appropriate.

The "incremental" mode choice model requires 18 unique constants (see **Figure 8-3**) for each trip purpose compare to 49 possible constants of the original model. All modal constants are normalized with respect to the drive alone mode, which has a constant value of zero.

An iterative process was used to calibrate the modal constants. The initial constants SERPM6 model used those validated for the revised SERPM5. The formula used for calibration of the modal constants is as follows:

$$C_{i,m} = C_{i-1,m} + DF_m * \ln [(OS_m * ESDA) / ((ES_m * OSDA)]_{i-1}$$

where:

$C_{i,m}$	=	Constant for iteration "i" and mode m,
$C_{i-1,m}$	=	Constant for iteration "i-1 (previous)" and mode m,
DF_m	=	Dampening Factor of mode m,
OSDA	=	Observed Share of Drive Alone (DA) mode,
OS_m	=	Observed Share of mode m,
ESDA	=	Estimated Share of Drive Alone (DA) mode, and
ES_m	=	Estimated Share of mode m.

The process is an iterative procedure. The dampening factor (DF) usually ranges among 0.10 to 0.75. In the automated calibration process in CV, a factor of 0.25 was used. The input requirements for application of this process are:

- Base year observed target shares for each of the 21 markets of six purposes (3purposes X 2 periods). The 1999 SEFTCS was primarily used to develop these target shares.
- Initial or previous run modal constants.

The process is repeated until the differences between the observed and estimated trips for all 21 segments (18 grouped/incremental terms plus 3 drive alone terms by car ownership) become negligible.

The process used the observed shares and then compares the estimated trips against the observed trips. The adjusted constants are then used to make the next model run. The validated constants are shown in **Table 8-7**. Other factors considered in the revised mode choice model include location specific CBD related constants by the origin-destination pairs and purpose and county specific local bus constants, which reflects the effect of items beyond time and cost that impact the decision to use alternative modes.

The listing of the incremental and the derived detailed mode and access constants from MODEFINAL.OUT are presented in **Figure C-1** of Appendix C. Constants represent the included attributes of travel, those cannot or are not being represented in the model, and the goal of the validation should be lower values of these constants. A higher value of the constants causes the model to be more insensitive to changes in the level of service and costs associated with a particular mode. Most of the values of the constants are small. The auto access constants for zero-car households are the result of the auto-calibration procedure. The auto-calibration routine modifies them even though they are not used in the utility equations (the ZAPZERO flag is set to a value of one). The signs of the constants are also reasonable among the auto ownership categories and by mode and purpose.

8.5 Results and Comparisons

The mode choice model provides estimates of linked trips by mode. The section presents and discusses the revised mode choice model trip summary and compares the results with the observed data.

8.5.1 Year 2000 Linked Trips

The results of the 2000 validated model are shown in **Tables 8-9** and **8-10** for the peak and off-peak periods, respectively. Tables D-1 through D-5 of Appendix D exhibit a few other mode choice validation results for 2000 validation run. Those are:

- (Table D-1) Year 2000 summary of model transfers and comparison with survey transfer rates
- (Table D-2) Year 2000 linked auto person trip summary of full model run
- (Table D-3) Year 2000 linked auto person trip summary of highway-only model run
- (Table D-4) Year 2000 peak period linked trip summary
- (Table D-5) Year 2000 off-peak period linked trip summary

Tables 8-9 and **8-10** summarize the transit trips of the "incremental" structure for which model validation was primarily concentrated. Comparison of observed and target trips were made in these two tables. The targets trips are based on 1999 Southeast Florida Surveys and the observed ridership data. **Tables D-2** and **D-3** present the detailed summary of the highway trips. **Tables D-4** and **D-5** present the estimated linked trips of both highway and transit trips together and the estimated shares.

The auto person trips are shown by purpose, mode (drive alone, 2 persons shared ride and 2+ persons shared ride) and household type (0, 1 and 2+ cars). Some notable statistics of the 2000 peak period full model are (see **Table D-2**):

- All the cells match the corresponding targets of auto occupancies.
- Driving alone makes up about 84, 41 and 57 percent of the HBW, HBNW and NHB person trips. In total, drive-alone makes up 57.8 percent of all the highway person trips.
- Of the total person trips, 98.23 percent of trips are made by automobile and 1.77 percent by transit. Of HBW trips, the transit share is 3.18 percent.
- Zero-car households have higher percentages of transit trips (33.93 percent for HBW and 9.37 percent for HBNW).

For the 2000 off-peak period full model, the notable auto person trip statistics are (see **Table D-2**):

- All the cells match the corresponding targets of auto occupancies.
- Driving alone makes up about 87, 41 and 57 percent of the HBW, HBNW and NHB person trips. In total, drive-alone makes up 53.4 percent of all the highway person trips.
- Of the total person trips, 98.69 percent of trips are made by automobile and 1.31 percent by transit. Of HBW trips, the transit share is 3.01 percent.
- Zero-car households have higher percentages of transit trips (33.02 percent for HBW and 10.17 percent for HBNW).

The highway-only mode choice run in peak period discounts an overall transit trip percentage for each purpose irrespective of their auto ownership category. Notable statistics of the 2000 peak period highway-only model are (see **Table D-3**):

- Driving alone makes up about 86, 41 and 58 percents of the HBW, HBNW and NHB person trips.
- In total, drive-alone makes up 57.9 percent of all the highway person trips.

Table 8-9: **Comparison of 2000 Peak Period Model Linked Transit Trips**
Southeast Regional Planning Model VI

A. Peak Period Model Target Trips

			Peak Transit Target Linked Trips (1)				Peak Transit Target Shares			
			HBW-Pk	HBNW-PK	NHB-Pk	Pk-TOTAL	HBW-Pk	HBNW-Pk	NHB-Pk	Pk-TOTAL
7	Walk to Transit - Zero Car Households	WT_0	22,380	13,182			100.0%	100.0%		
8	Walk to Transit - One Car Households	WT_1	22,424	13,944			78.8%	88.6%		
9	Walk to Transit - Two+ Car Households	WT_2	14,472	9,325			19.8%	23.1%		
	Total:		**59,276**	**36,451**	**16,510**	**112,237**	81.2%	90.2%	86.4%	84.7%
10	BRT/LRT Transit	BL	-	-	-	-				
11	MetroRail Transit	MR	16,984	5,733	3,679	**26,396**	23.3%	14.2%	19.3%	19.9%
12	TriRail Transit	TR	3,582	895	657	**5,134**	4.9%	2.2%	3.4%	3.9%
13	PNR to transit - Zero Car Households	PR_0	-	-						
14	PNR to transit - One Car Households	PR_1	4,081	951			14.3%	6.0%		
15	PNR to transit - Two+ Car Households	PR_2	5,815	1,259			26.2%	10.9%		
	Total:		**9,896**	**2,210**	**1478**	**13,584**	13.6%	5.5%	7.7%	10.3%
16	KNR to transit - Zero Car Households	KR_0	-	-						
17	KNR to transit - One Car Households	KR_1	1965	839			6.9%	5.3%		
18	KNR to transit - Two+ Car Households	KR_2	1869	916			8.4%	8.0%		
	Total:		**3,834**	**1,755**	**1,115**	**6,704**	5.3%	4.3%	5.8%	5.1%
	Total Peak Transit Person Trips - Auto Access		13,730	3,965	2,593	20,288	18.8%	9.8%	13.6%	15.3%
	Total Peak Transit Person Trips - Walk Access		59,276	36,451	16,510	112,237	81.2%	90.2%	86.4%	84.7%
	Total Peak Transit person Trips		73,006	40,416	19,103	132,525	100.0%	100.0%	100.0%	100.0%
		0 CAR	22,380	13,182			30.7%	32.6%		
		1 CAR	28,470	15,734			39.0%	38.9%		
		2+CAR	22,156	11,500			30.3%	28.5%		
		Total-Pk	73,006	40,416	19,103	132,525	100.0%	100.0%	100.0%	100.0%

Table 8-9 (Continued)

B. Peak Period Model Estimated Trips

			Peak Transit Model Est Linked Trips (2)				Peak Model/Target Ratio (2/1)			
			HBW-Pk	HBNW-PK	NHB-Pk	Pk–TOTAL	HBW-Pk	HBNW-Pk	NHB-Pk	Pk-TOTAL
7	Walk to Transit - Zero Car Households	WT_0	22,395	13,186			1.00	1.00		
8	Walk to Transit - One Car Households	WT_1	22,424	13,953			1.00	1.00		
9	Walk to Transit - Two+ Car Households	WT_2	14,487	9,328			1.00	1.00		
	Total:		**59,306**	**36,467**	**16,528**	**112,301**	**1.00**	**1.00**	**1.00**	**1.00**
10	BRT/LRT Transit	BL	-	-	-	-	-	-	-	-
11	MetroRail Transit	MR	16,876	5,722	3,659	**26,257**	0.99	1.00	0.99	**0.99**
12	TriRail Transit	TR	3,590	893	655	**5,138**	1.00	1.00	1.00	**1.00**
13	PNR to transit - Zero Car Households	PR_0	-	-			-	-		
14	PNR to transit - One Car Households	PR_1	4,081	948			1.00	1.00		
15	PNR to transit - Two+ Car Households	PR_2	5,795	1,257			1.00	1.00		
	Total:		**9,876**	**2,205**	**1471**	**13,552**	**1.00**	**1.00**	**1.00**	**1.00**
16	KNR to transit - Zero Car Households	KR_0	-	-			-	-		
17	KNR to transit - One Car Households	KR_1	1965	840			1.00	1.00		
18	KNR to transit - Two+ Car Households	KR_2	1857	917			0.99	1.00		
	Total:		**3,822**	**1,757**	**1,114**	**6,693**	**1.00**	**1.00**	**1.00**	**1.00**
	Total Peak Transit Person Trips - Auto Access		13,698	3,962	2,585	20,245	1.00	1.00	1.00	1.00
	Total Peak Transit Person Trips - Walk Access		59,306	36,467	16,528	112,301	1.00	1.00	1.00	1.00
	Total Peak Transit person Trips		73,004	40,429	19,113	132,546	1.00	1.00	1.00	1.00
		0 CAR	22,395	13,186			1.00	1.00		
		1 CAR	28,470	15,741			1.00	1.00		
		2+CAR	22,139	11,502			1.00	1.00		
		Total-Pk	73,004	40,429	19,113	132,546	1.00	1.00	1.00	1.00

Table 8-10: **Comparison of 2000 Off-Peak Period Model Linked Transit Trips**
Southeast Regional Planning Model VI

A. Off-Peak Period Model Target Trips

			Off-Peak Transit Linked Trips (1)				Off-Peak Transit Shares			
			HBW-Op	HBNW-Op	NHB-Op	Op-TOTAL	HBW-Op	HBNW-Op	NHB-Op	Op-TOTAL
7	Walk to Transit - Zero Car Households	WT_0	14,536	18,404			100.0%	100.0%		
8	Walk to Transit - One Car Households	WT_1	15,191	19,952			84.3%	89.9%		
9	Walk to Transit - Two+ Car Households	WT_2	9,917	13,570			21.5%	23.8%		
	Total:		**39,644**	**51,926**	**16,848**	**108,418**	85.9%	91.2%	88.6%	88.8%
10	BRT/LRT Transit	BL	-	-	-	-				
11	MetroRail Transit	MR	10,104	9,043	3,709	**22,856**	21.9%	15.9%	19.5%	18.7%
12	TriRail Transit	TR	1,194	1,094	537	**2,825**	2.6%	1.9%	2.8%	2.3%
13	PNR to transit - Zero Car Households	PR_0	-	-						
14	PNR to transit - One Car Households	PR_1	1,957	1,198			10.9%	5.4%		
15	PNR to transit - Two+ Car Households	PR_2	2,874	1,591			21.1%	9.7%		
	Total:		**4,831**	**2,789**	**1280**	**8,900**	10.5%	4.9%	6.7%	7.3%
16	KNR to transit - Zero Car Households	KR_0	-	-						
17	KNR to transit - One Car Households	KR_1	862	1,040			4.8%	4.7%		
18	KNR to transit - Two+ Car Households	KR_2	823	1,164			6.0%	7.1%		
	Total:		**1,685**	**2,204**	**889**	**4,778**	3.7%	3.9%	4.7%	3.9%
	Total Off-Peak Transit Person Trips - Auto Access		6,516	4,993	2,169	13,678	14.1%	8.8%	11.4%	11.2%
	Total Off-Peak Transit Person Trips - Walk Access		39,644	51,926	16,848	108,418	85.9%	91.2%	88.6%	88.8%
	Total Off-Peak Transit person Trips		46,160	56,919	19,017	122,096	100.0%	100.0%	100.0%	100.0%
		0 CAR	14,536	18,404			31.5%	32.3%		
		1 CAR	18,010	22,190			39.0%	39.0%		
		2+CAR	13,614	16,325			29.5%	28.7%		
		Total-Op	46,160	56,919	19,017	122,096	100.0%	100.0%	100.0%	100.0%

Table 8-10 (Continued)

D. Off-Peak Period Model Estimated Trips

			Off-Peak Transit Model Est Linked Trips (2)				Off-Peak Model/Target Ratio (2/1)			
			HBW-Op	HBNW-Op	NHB-Op	Op–TOTAL	HBW-Op	HBNW-Op	NHB-Op	Op-TOTAL
7	Walk to Transit - Zero Car Households	WT_0	14,552	18,410			1.00	1.00		
8	Walk to Transit - One Car Households	WT_1	15,184	19,907			1.00	1.00		
9	Walk to Transit - Two+ Car Households	WT_2	9,907	13,545			1.00	1.00		
	Total:		**39,643**	**51,862**	**16,823**	**108,328**	**1.00**	**1.00**	**1.00**	**1.00**
10	BRT/LRT Transit	BL	-	-	-	-	-	-	-	-
11	MetroRail Transit	MR	10,097	9,024	3,704	**22,825**	1.00	1.00	1.00	**1.00**
12	TriRail Transit	TR	1,193	1,091	535	**2,819**	1.00	1.00	1.00	**1.00**
13	PNR to transit - Zero Car Households	PR_0	-	-			-	-		
14	PNR to transit - One Car Households	PR_1	1,958	1,193			1.00	1.00		
15	PNR to transit - Two+ Car Households	PR_2	2,871	1,589			1.00	1.00		
	Total:		**4,829**	**2,782**	**1279**	**8,890**	1.00	**1.00**	**1.00**	**1.00**
16	KNR to transit - Zero Car Households	KR_0	-	-			-	-		
17	KNR to transit - One Car Households	KR_1	862	1,038			1.00	1.00		
18	KNR to transit - Two+ Car Households	KR_2	823	1,161			1.00	1.00		
	Total:		**1,685**	**2,199**	**887**	**4,771**	1.00	1.00	**1.00**	**1.00**
	Total Off-Peak Transit Person Trips - Auto Access		6,514	4,981	2,166	13,661	1.00	1.00	1.00	1.00
	Total Off-Peak Transit Person Trips - Walk Access		39,643	51,862	16,823	108,328	1.00	1.00	1.00	1.00
	Total Off-Peak Transit person Trips		46,157	56,843	18,989	121,989	1.00	1.00	1.00	1.00
		0 CAR	14,552	18,410			1.00	1.00		
		1 CAR	18,004	22,138			1.00	1.00		
		2+CAR	13,601	16,295			1.00	1.00		
		Total-Op	46,157	56,843	18,989	121,989	1.00	1.00	1.00	1.00

- Results of the highway-only model run very close to the full model run.

The transit trips are shown by purpose and mode and access. **Tables 8-9** and **8-10** compare modeled versus target linked transit trips by line haul (BRT/LRT – New Mode, Metrorail and Tri-Rail) and bus modes for the three trip purposes and transit access modes (walk, park-and-ride and kiss-and-ride). A few notable observations on the linked transit trips in the 2000 peak SERPM6 validated model (see **Tables 8-9** and **D-4**) include:

- Bus is the predominant transit mode serving 76 percent of the linked transit trips in the region. The share of bus for HBW trips is 72 percent. The share of bus is higher for the HBNW (84%) and NHB (77%) trip purposes. About 55 percent of the total regional transit trips are of the HBW purpose.
- At the regional level, 20 percent are Metrorail and 4 percent are Tri-Rail trips.
- Overall, the ratios of model estimated to targets trips are 1.00 for both walk access and auto access trips, respectively.
- The ratio of total transit linked trips between the model runs and the target is 1.00. These ratios are for walk-to transit, PNR to transit and KNR to transit are 1.00, 1.00 and 0.99, respectively. The ratios for Metrorail and Tri-Rail modes are 1.00.
- The ratios of any cell shown in part B of **Table 8-9** varies from 0.99 to 1.00 by purpose, access and mode. This indicates close agreement.
- Of all HBW trips (highway and transit), 0-car, 1-car and 2+ cars households make about 3.1, 13.8 and 83 percents of trips, respectively. In case of all HBW transit trips, 0-car, 1-car and 2+ cars households make about 30.7, 39.0 and 30.3 percents of trips, respectively.
- Of all HBNW trips (highway and transit), 0-car, 1-car and 2+ cars households make about 4.3, 19.0 and 76.8 percents of trips, respectively. In case of all HBNW transit trips, 0-car, 1-car and 2+ cars households make about 32.6, 38.9 and 28.5 percents of trips, respectively.
- Overall share of walk and auto access transit trips are 85 and 15 percents. The auto share is slightly higher for the HBW trips (19 percent).

A few notable observations on the linked transit trips in the 2000 off-peak SERPM6 validated model (see **Tables 8-10** and **D-5**) includes:

- Bus is the predominant transit mode serving 79 percent of the linked transit trips in the region. The share of bus for HBW trips is 76 percent. The share of bus is higher in the HBNW (82%) and NHB (78%) trip purposes. About 38 percent of the total regional transit trips are of the HBW purpose.
- At the regional level, 19 percent are Metrorail and 2.3 percent are Tri-Rail trips.
- Overall, the ratios of model estimated to targets trips are 1.00 for both walk access and auto access trips, respectively.
- The ratio of total transit linked trips between the model runs and the target is 1.00. These ratios are for walk-to transit, PNR to transit and KNR to transit are 1.00. The ratios for Metrorail and Tri-Rail modes are 1.00 and 0.98, respectively.
- The ratios of any cell shown in part B of Table **8-10** varies from 0.97 to 1.01 by purpose, access and mode. Again, this indicates close agreement.
- Of all HBW trips (highway and transit), 0-car, 1-car and 2+ cars households make up about 2.9, 14.9 and 82.3 percent of trips, respectively. In case of all HBW transit trips, 0-car, 1-car and 2+ cars households make up about 31.5, 39.0 and 29.5 percent of trips, respectively.
- Of all HBNW trips (highway and transit), 0-car, 1-car and 2+ cars households make up about 3.7, 2.07 and 75.6 percent of trips, respectively. In case of all HBNW transit trips, 0-car, 1-car and 2+ cars households make up about 32.3, 39.0 and 28.7 percent of trips, respectively.

- Overall shares of walk and auto access transit trips are 89 and 11 percent, respectively. The auto share is slightly higher for the HBW trips (14 percent).

It was concluded from these results that the SERPM6 mode choice model was successfully calibrated.

8.5.2 Auto-Occupancy Rates

The auto occupancy rates resulting from the validated model are shown in **Tables D-2** and **D-3**. The auto occupancy rate for HBW trips is 1.07 and for all trips the rate is 1.33 (weighted average). The model-generated rates match the targets, which are based on 1999 SEFTCS. The SERPM target rates are generally smaller than the national rates presented in NCHRP 365.

The updated NCHRP rates [Reference 28: Tables 37 & 39, NCHRP 365), which are based on 1990 Nationwide Person Transportation Survey (NPTS), are shown in **Table 8-11**.

Table 8-11: **NCHRP 365 Auto Occupancy Rates by Urbanized Population, Income and Purpose**
Southeast Regional Planning Model VI

	Trip Purpose					
(NCHRP Table 37)	HBW	HBShop	HBSocRec	HBOther	NHB	ALL
Urban Area Size	**Updated NCHRP 365 Parameters**					
50,000 to 199,999	1.11	1.44	1.66	1.67	1.66	1.49
200,000 to 499,999	1.12	1.48	1.72	1.65	1.68	1.51
500,000 to 999,999	1.13	1.45	1.66	1.65	1.66	1.48
1,000,000+	1.11	1.48	1.69	1.66	1.64	1.49

Source: NPTS, 1990

(NCHRP Table 37)	HBW	HBShop	HBSocRec	HBOther	HBNW	NHB	ALL
Urban Area Size	**Parameters from NCHRP 187**						
50,000 to 199,999	1.38	1.57	2.31	1.52	1.82	1.43	1.5
200,000 to 499,999	1.37	1.57	2.31	1.52	1.81	1.43	1.5
500,000 to 999,999	1.35	1.57	2.3	1.52	1.77	1.43	1.5
1,000,000+	1.33	1.58	2.29	1.51	1.74	1.43	1.51

(NCHRP Table 39)	Trip Purpose				
Urban Area Size	HBW	HBShop	HBSocRec	HBOther	NHB
Low	1.19	1.49	1.77	1.66	1.69
Medium	1.12	1.47	1.67	1.65	1.57
High	1.11	1.43	1.56	1.58	1.5
ALL	1.12	1.44	1.63	1.62	1.56

Source: NPTS, 1990

The NCHRP 187 auto-occupancy rates for some purposes (for example HBW and HBNW) are quite different from those presented in NCHRP 365.

However, auto occupancy rates from 1999 SEFTCS are used as a gauge of how well the target mode shares are being matched. The SEFTCS auto-occupancy rates are very comparable to the 2000 validated model runs.

8.5.3 Transfer Rates

The model estimated number of transit trip transfers and their percentages were summarized in Table D-1 of Appendix D. These summaries were made by access and mode for HBW, HBNW and NHB purposes

of both peak and off-peak periods (see sections a-f of Table D-1). In general, HBW has smaller percentages of zero transfer trips than other purposes. Overall, percentages of no transfers for walk access trips are higher than the auto access trips for each trip purposes. To gauge the model estimated transfer percentages to the survey results, the purpose and period specific transfers were summed and are presented in section g of Table D-1. A few notable observations on the transfer percentages in the 2000 SERPM6 validated model (see sections g and h of **Table D-1**) include:

- For all purposes, there are 47 percents of model-estimated trips of no transfer versus 51 percents of survey trips.
- For all purposes, there are 39 percents of model-estimated trips of one transfer versus 35 percents of survey trips.
- For all purposes, there are 14.1 percents of model-estimated trips of two-or-more transfers versus 14.6 percents of survey trips.

The above statistics varies slightly for the individual trip purposes. However, the model overall trends of transfers are very close to the survey results.

8.5.4 Transit Trip Attractions by Districts

To evaluate the distribution of transit trips to its major attractions (mainly CBD), this study incorporated several location specific constants (see Section 8.2.1, Transit District-to-District Constants). The initial validation efforts use very small constants for few selected pairs of origin and destination districts for Miami-Dade CBD for the work purposes mainly. In the later part of validation efforts, it was found that no location specific constants were necessary. The final validated DISTS.SYN that incorporated the district-to-district constants does not contain location specific constants (see **Table 8-8**). However, the county specific overall local bus bias constants (see Section 8.2.2 and PROFILE.MAS file in Appendix A) are used in this study.

The model generated transit trip tables are further analyzed through a spatial analysis to show the effectiveness of the model trip attractions. The model trips attractions were then compared to the 1999 Southeast Florida transit survey data. The surveys data were pre-processed to account the weighting factors to represent the daily transit trips. The survey trips are further factored to the 2000 mode-choice targets. **Table 8-12** compares the 2000 model trips to survey trips by the six transit districts and by three trip purposes. Overall model generated transit trip percentages closely match survey trip percentages. Model and survey trip patterns are very similar. A few notable results are:

- For the HBW purpose, model estimates that 15.12 percent of the transit trips are destined to Miami-Dade CBD 13.33 percent observed in the survey.
- For all trips, the model estimates that 12.72% of transit trips are attracted to the Miami CBD, versus 10.62% reported by the survey.

8.5.5 Transit Work Trip Flow

The work trips for the Miami-Dade area, which account for the majority of the transit trips, were compared to the 2000 CTPP estimates. The Miami-Dade TAZs were grouped in to 13 districts. In addition, Palm Beach and Broward are considered as two more separate districts. The results of these 15 districts of the total motorized trips, total linked trips and their shares are generated and are shown in **Table 8-13**. It shows that Miami-CBD district attracts 16.8% work trips that are generated by the 2000 model versus 15.5% reported by the 2000 CTPP. Once again, the overall patterns of model work trips match the CTPP.

Table 8-12: **Comparison of Transit Trip Attractions of Survey and 2000 Model Estimated Trips by District and Purpose**
Southeast Regional Planning Model VI

					Survey Trips			2000 Model Trips		
Purpose	**Districts**	**No of TAZs**	**Gross Area (Sq. Mi)**	**Net Area (Sq. Mi)**	**Survey Trips (*)**	**Survey Trips / Net Sq. Mile**	**Survey Trip Percentages**	**Model Trips**	**Model Trips / Net Sq. Mile**	**Model Trip Percentages**
1. Home Based Work	1. Miami CBD	68	2.41	1.43	15,890	11,112	13.33%	18,079	12,642	15.12%
	2. Ft Lauderdale CBD	24	1.82	1.24	2,182	1,759	1.83%	2,463	1,986	2.06%
	3. Outlying CBD's (PB)	81	2.45	1.52	733	482	0.61%	1,197	788	1.00%
	4. Metro-Dade Other	1,398	631.50	508.72	67,339	132	56.51%	66,287	130	55.44%
	5. Broward Other	878	422.09	335.30	27,973	83	23.47%	23,295	69	19.48%
	6. West Palm Other	1,485	723.13	590.41	5,049	9	4.24%	8,246	14	6.90%
	Total:	3,934	1,783.40	1,438.62	119,166	83	100.00%	119,567	83	100.00%
2. Home Based Non-Work	1. Miami CBD	68	2.41	1.43	8,231	5,756	8.46%	6,261	4,378	6.43%
	2. Ft Lauderdale CBD	24	1.82	1.24	1,393	1,123	1.43%	2,426	1,957	2.49%
	3. Outlying CBD's (PB)	81	2.45	1.52	345	227	0.35%	512	337	0.53%
	4. Metro-Dade Other	1,398	631.50	508.72	58,272	115	59.87%	56,053	110	57.53%
	5. Broward Other	878	422.09	335.30	23,785	71	24.44%	25,208	75	25.87%
	6. West Palm Other	1,485	723.13	590.41	5,309	9	5.45%	6,969	12	7.15%
	Total:	3,934	1,783.40	1,438.62	97,335	68	100.00%	97,429	68	100.00%
3. Non Home Based	1. Miami CBD	68	2.41	1.43	2,911	2,036	7.64%	4,858	3,397	12.72%
	2. Ft Lauderdale CBD	24	1.82	1.24	539	434	1.41%	1,311	1,057	3.43%
	3. Outlying CBD's (PB)	81	2.45	1.52	63	42	0.17%	407	267	1.06%
	4. Metro-Dade Other	1,398	631.50	508.72	24,614	48	64.57%	19,873	39	52.01%
	5. Broward Other	878	422.09	335.30	8,440	25	22.14%	9,405	28	24.62%
	6. West Palm Other	1,485	723.13	590.41	1,553	3	4.07%	2,353	4	6.16%
	Total:	3,934	1,783.40	1,438.62	38,120	26	100.00%	38,207	27	100.00%
ALL Purposes	1. Miami CBD	68	2.41	1.43	27,031	18,903	10.62%	29,198	20,418	11.44%
	2. Ft Lauderdale CBD	24	1.82	1.24	4,113	3,317	1.62%	6,200	5,000	2.43%
	3. Outlying CBD's (PB)	81	2.45	1.52	1,141	751	0.45%	2,116	1,392	0.83%
	4. Metro-Dade Other	1,398	631.50	508.72	150,225	295	59.00%	142,212	280	55.73%
	5. Broward Other	878	422.09	335.30	60,199	180	23.64%	57,909	173	22.69%
	6. West Palm Other	1,485	723.13	590.41	11,912	20	4.68%	17,568	30	6.88%
	Total:	3,934	1,783.40	1,438.62	254,621	177	100.00%	255,203	177	100.00%

(*) Earlier Compiled Survey Trips (Ref. Table H-10, SERPM5-Revised Transit Model and Validation Technical Report) were factored to match 2000 mode-choice targets.

Table 8-13: **Comparison of Miami-Dade CTPP and 2000 Model Estimated HBW Trips**

Southeast Regional Planning Model VI

A1. CTPP - Total Motorized Trips

	Miami CBD	Civic Center	Airport	Little Havana	Coral Gables	Miami Beach	North Miami	Hialeah	Aventura	Miami Lakes	Doral	SE Dade	Homestead	Broward	Palm Beach	Total
Miami CBD	1,305	200	234	295	754	315	384	144	260	96	371	358	35			4,751
Civic Center	1,362	2,178	1,112	1,247	1,167	806	1,711	846	257	467	1,255	1,102	247			13,757
Airport	756	451	1,827	407	525	215	556	769	155	352	1,170	762	100			8,045
Little Havana	5,469	3,046	3,309	6,383	4,883	1,926	3,143	2,164	654	850	3,688	4,470	719			40,704
Coral Gables	7,289	2,756	2,158	2,565	10,348	1,325	1,724	1,129	547	751	2,242	4,660	573			38,067
Miami Beach	5,023	1,909	1,807	1,066	2,723	11,925	3,154	1,054	2,411	921	1,925	1,845	379			36,142
North Miami	8,792	6,523	4,397	2,190	3,875	6,316	14,593	3,677	5,753	3,947	4,172	3,960	1,188			69,383
Hialeah	3,981	3,299	6,141	2,666	2,329	1,786	6,793	22,835	2,066	6,275	8,401	4,983	1,021			72,576
Aventura	5,764	2,769	2,331	1,057	1,910	4,789	6,461	1,984	12,989	3,399	2,285	2,223	609			48,570
Miami Lakes	7,731	4,636	4,775	1,589	2,907	2,372	7,986	7,752	5,191	13,361	6,467	4,012	1,195			69,974
Doral	4,265	2,007	5,070	2,751	3,072	1,100	2,143	1,710	635	1,113	11,213	6,756	766			42,601
SE Dade	24,429	10,277	16,122	10,241	24,155	4,838	9,122	7,182	2,914	4,764	24,304	69,674	9,593			217,615
Homestead	7,815	3,048	4,386	1,834	5,848	1,583	2,819	1,751	1,129	1,534	5,693	18,481	28,730			84,651
Broward	11,946	6,289	10,750	2,768	5,067	5,006	11,875	7,431	14,736	13,450	11,090	9,494	2,013			111,915
Palm Beach	689	280	703	202	345	276	587	417	416	540	653	627	560			6,295
Total	96,616	49,668	65,122	37,261	69,908	44,578	73,051	60,845	50,113	51,820	84,929	133,407	47,728			865,046

A2. CTPP - (Bus or Trolley) or (Rail/Ferry)

	Miami CBD	Civic Center	Airport	Little Havana	Coral Gables	Miami Beach	North Miami	Hialeah	Aventura	Miami Lakes	Doral	SE Dade	Homestead	Broward	Palm Beach	Total
Miami CBD	162	24	22	101	111	92	79	14	48	29	24	32	-			738
Civic Center	257	181	67	152	110	93	220	42	28	30	97	96	28			1,401
Airport	32	30	50	55	22	4	15	-	4	-	51	4	-			267
Little Havana	1,106	282	292	601	489	434	378	113	73	53	193	456	39			4,509
Coral Gables	395	231	68	115	323	133	205	14	44	4	47	247	24			1,850
Miami Beach	638	175	117	48	235	2,175	303	82	347	24	68	60	4			4,276
North Miami	1,342	1,129	516	322	444	1,138	2,042	342	834	345	350	442	106			9,352
Hialeah	417	159	112	50	50	146	213	556	55	105	83	141	35			2,122
Aventura	403	182	125	68	76	474	622	116	886	156	54	99	10			3,271
Miami Lakes	547	338	56	96	91	170	402	100	248	409	102	96	36			2,691
Doral	212	45	30	122	123	44	48	25	14	-	161	166	-			990
SE Dade	2,453	1,284	118	228	388	265	240	97	82	53	196	1,169	60			6,633
Homestead	556	353	50	38	86	67	120	24	14	58	63	460	671			2,560
Broward	354	267	123	40	68	90	105	56	285	94	28	147	4			1,661
Palm Beach	38	44	22	10	10	-	14	-	4	34	-	10	4			190
Total	8,912	4,724	1,768	2,046	2,626	5,325	5,006	1,581	2,966	1,394	1,517	3,625	1,021			42,511

A3. Shares-CTPP - [(Bus or Trolley) or (Rail/Ferry)] as a percentage of Total Motorized Trips

	Miami CBD	Civic Center	Airport	Little Havana	Coral Gables	Miami Beach	North Miami	Hialeah	Aventura	Miami Lakes	Doral	SE Dade	Homestead	Broward	Palm Beach	Total
Miami CBD	12.4%	12.0%	9.4%	34.2%	14.7%	29.2%	20.6%	9.7%	18.5%	30.2%	6.5%	8.9%				15.5%
Civic Center	18.9%	8.3%	6.0%	12.2%	9.4%	11.5%	12.9%	5.0%	10.9%	6.4%	7.7%	8.7%	11.3%			10.2%
Airport	4.2%	6.7%	2.7%	13.5%	4.2%	1.9%	2.7%		2.6%		4.4%	0.5%				3.3%
Little Havana	20.2%	9.3%	8.8%	9.4%	10.0%	22.5%	12.0%	5.2%	11.2%	6.2%	5.2%	10.2%	5.4%			11.1%
Coral Gables	5.4%	8.4%	3.2%	4.5%	3.1%	10.0%	11.9%	1.2%	8.0%	0.5%	2.1%	5.3%	4.2%			4.9%
Miami Beach	12.7%	9.2%	6.5%	4.5%	8.6%	18.2%	9.6%	7.8%	14.4%	2.6%	3.5%	3.3%	1.1%			11.8%
North Miami	15.3%	17.3%	11.7%	14.7%	11.5%	18.0%	14.0%	9.3%	14.5%	8.7%	8.4%	11.2%	8.9%			13.5%
Hialeah	10.5%	4.8%	1.8%	1.9%	2.1%	8.2%	3.1%	2.4%	2.7%	1.7%	1.0%	2.8%	3.4%			2.9%
Aventura	7.0%	6.6%	5.4%	6.4%	4.0%	9.9%	9.6%	5.8%	6.8%	4.6%	2.4%	4.5%	1.6%			6.7%
Miami Lakes	7.1%	7.3%	1.2%	6.0%	3.1%	7.2%	5.0%	1.3%	4.8%	3.1%	1.6%	2.4%	3.0%			3.8%
Doral	5.0%	2.2%	0.6%	4.4%	4.0%	4.0%	2.2%	1.5%	2.2%		1.4%	2.5%				2.3%
SE Dade	10.0%	12.5%	0.7%	2.2%	1.6%	5.5%	2.6%	1.4%	2.8%	1.1%	0.8%	1.7%	0.6%			3.0%
Homestead	7.1%	11.6%	1.1%	2.1%	1.5%	4.2%	4.3%	1.4%	1.2%	3.8%	1.1%	2.5%	2.3%			3.0%
Broward	3.0%	4.2%	1.1%	1.4%	1.3%	1.8%	0.9%	0.8%	1.9%	0.7%	0.3%	1.5%	0.2%			1.5%
Palm Beach	5.5%	15.7%	3.1%	5.0%	2.9%		2.4%		1.0%	6.3%		1.6%	0.7%			3.0%
Total	9.2%	9.5%	2.7%	5.5%	3.8%	11.9%	6.9%	2.6%	5.9%	2.7%	1.8%	2.7%	2.1%			4.9%

Table 8-13 (Continued)

B1. Model Total Motorized HBW Trips

	Miami CBD	Civic Center	Airport	Little Havana	Coral Gables	Miami Beach	North Miami	Hialeah	Aventura	Miami Lakes	Doral	SE Dade	Homestead	Broward	Palm Beach	Total
Miami CBD	3,886	1,426	666	591	1,285	1,026	1,379	323	274	183	432	318	11			11,800
Civic Center	6,454	4,718	3,444	1,937	3,040	1,941	4,313	1,680	618	645	2,008	930	46			31,774
Airport	2,093	1,877	3,897	1,074	1,849	720	2,213	2,157	275	681	3,417	1,210	57			21,520
Little Havana	22,069	10,611	10,252	6,884	14,781	4,174	7,910	3,616	1,230	1,359	6,254	4,585	194			93,919
Coral Gables	18,974	6,825	6,125	5,356	18,446	3,485	5,742	2,225	1,002	927	3,815	5,691	307			78,920
Miami Beach	12,215	4,932	3,036	1,816	3,444	22,767	9,852	2,188	4,670	1,557	2,052	1,039	51			69,619
North Miami	24,223	13,204	9,081	4,323	7,628	11,449	30,976	10,019	11,942	7,454	6,364	2,262	101			139,026
Hialeah	9,316	8,733	19,918	3,737	6,408	4,107	20,607	31,877	5,700	15,989	26,367	5,214	279			158,252
Aventura	8,929	4,167	2,740	1,480	2,683	7,631	16,329	4,668	26,234	9,323	2,716	813	33			87,746
Miami Lakes	9,219	5,114	8,810	2,035	3,670	4,380	16,960	18,171	14,203	26,960	14,378	2,805	152			126,856
Doral	5,464	3,722	12,396	3,071	5,878	1,575	3,733	5,344	711	2,141	26,465	11,826	510			82,836
SE Dade	30,691	14,733	44,332	15,215	59,260	6,854	14,086	16,800	2,493	6,864	79,922	173,543	17,906			482,700
Homestead	7,426	3,199	9,857	3,244	15,197	1,598	3,241	4,005	593	1,461	16,547	64,425	74,018			204,810
Broward	13,078	6,994	10,421	2,746	4,981	7,125	22,122	20,083	31,643	31,154	19,341	3,925	231			173,843
Palm Beach	295	155	110	35	86	165	416	181	818	363	143	14	-			2,781
Total	174,333	90,409	145,085	53,544	148,635	78,997	159,879	123,337	102,406	107,061	210,220	278,599	93,895			1,766,401

B2. Model Total Transit (LINKED) HBW Trips

	Miami CBD	Civic Center	Airport	Little Havana	Coral Gables	Miami Beach	North Miami	Hialeah	Aventura	Miami Lakes	Doral	SE Dade	Homestead	Broward	Palm Beach	Total
Miami CBD	762	277	86	86	184	150	236	53	38	19	45	49	1			1,988
Civic Center	854	475	274	167	254	132	415	148	41	49	134	66	2			3,010
Airport	129	93	153	48	62	23	66	41	5	8	81	33	1			744
Little Havana	3,318	1,147	878	784	1,239	292	649	252	74	74	312	392	8			9,418
Coral Gables	1,680	477	265	266	982	142	265	88	27	26	81	285	9			4,594
Miami Beach	1,892	593	279	177	330	3,477	1,139	198	669	103	133	103	3			9,096
North Miami	2,984	1,440	654	335	571	822	2,843	769	885	442	366	143	5			12,260
Hialeah	687	460	619	111	213	131	690	1,347	92	451	508	93	4			5,405
Aventura	592	189	80	45	106	438	751	100	1,803	347	32	27	1			4,511
Miami Lakes	445	203	125	43	101	93	429	231	384	1,024	68	38	2			3,186
Doral	285	122	359	122	149	41	77	75	8	20	1,035	394	5			2,693
SE Dade	2,512	885	1,058	551	2,693	266	509	321	49	77	1,200	5,365	292			15,777
Homestead	1,245	441	422	251	1,568	127	275	170	24	32	258	2,617	2,420			9,848
Broward	304	130	69	26	65	96	233	80	540	229	28	18	1			1,818
Palm Beach	4	2	1	0	0	1	2	1	4	2	0	0	-			17
Total	17,694	6,935	5,322	3,011	8,517	6,232	8,580	3,872	4,643	2,903	4,280	9,625	2,752			84,366

B3. Model Transit Trips as a percentage of Total Motorized Trips

	Miami CBD	Civic Center	Airport	Little Havana	Coral Gables	Miami Beach	North Miami	Hialeah	Aventura	Miami Lakes	Doral	SE Dade	Homestead	Broward	Palm Beach	Total
Miami CBD	19.6%	19.4%	12.9%	14.6%	14.4%	14.7%	17.1%	16.6%	13.8%	10.6%	10.3%	15.4%	11.8%			16.8%
Civic Center	13.2%	10.1%	7.9%	8.6%	8.3%	6.8%	9.6%	8.8%	6.7%	7.6%	6.7%	7.1%	3.3%			9.5%
Airport	6.2%	4.9%	3.9%	4.4%	3.3%	3.2%	3.0%	1.9%	1.9%	1.2%	2.4%	2.7%	2.1%			3.5%
Little Havana	15.0%	10.8%	8.6%	11.4%	8.4%	7.0%	8.2%	7.0%	6.0%	5.4%	5.0%	8.5%	3.9%			10.0%
Coral Gables	8.9%	7.0%	4.3%	5.0%	5.3%	4.1%	4.6%	3.9%	2.7%	2.9%	2.1%	5.0%	3.0%			5.8%
Miami Beach	15.5%	12.0%	9.2%	9.7%	9.6%	15.3%	11.6%	9.0%	14.3%	6.6%	6.5%	9.9%	5.0%			13.1%
North Miami	12.3%	10.9%	7.2%	7.7%	7.5%	7.2%	9.2%	7.7%	7.4%	5.9%	5.8%	6.3%	4.6%			8.8%
Hialeah	7.4%	5.3%	3.1%	3.0%	3.3%	3.2%	3.3%	4.2%	1.6%	2.8%	1.9%	1.8%	1.4%			3.4%
Aventura	6.6%	4.5%	2.9%	3.0%	3.9%	5.7%	4.6%	2.1%	6.9%	3.7%	1.2%	3.3%	2.6%			5.1%
Miami Lakes	4.8%	4.0%	1.4%	2.1%	2.7%	2.1%	2.5%	1.3%	2.7%	3.8%	0.5%	1.4%	1.0%			2.5%
Doral	5.2%	3.3%	2.9%	4.0%	2.5%	2.6%	2.1%	1.4%	1.2%	0.9%	3.9%	3.3%	0.9%			3.3%
SE Dade	8.2%	6.0%	2.4%	3.6%	4.5%	3.9%	3.6%	1.9%	2.0%	1.1%	1.5%	3.1%	1.6%			3.3%
Homestead	16.8%	13.8%	4.3%	7.7%	10.3%	7.9%	8.5%	4.2%	4.0%	2.2%	1.6%	4.1%	3.3%			4.8%
Broward	2.3%	1.9%	0.7%	0.9%	1.3%	1.3%	1.1%	0.4%	1.7%	0.7%	0.1%	0.5%	0.5%			1.0%
Palm Beach	1.4%	1.0%	0.9%	0.5%	0.4%	0.5%	0.6%	0.4%	0.5%	0.5%	0.1%	0.4%				0.6%
Total	10.1%	7.7%	3.7%	5.6%	5.7%	7.9%	5.4%	3.1%	4.5%	2.7%	2.0%	3.5%	2.9%			4.8%

Table 8-13 (Continued)

C. Ratio of Model Transit Shares vs. CTPP Shares [B3/A3]

	Miami CBD	Civic Center	Airport	Little Havana	Coral Gables	Miami Beach	North Miami	Hialeah	Aventura	Miami Lakes	Doral	SE Dade	Homestead	Broward	Palm Beach	Total
Miami CBD	1.58	1.62	1.37	0.43	0.98	0.50	0.83	1.70	0.75	0.35	1.59	1.73				1.08
Civic Center	0.70	1.21	1.32	0.71	0.89	0.59	0.75	1.77	0.61	1.18	0.86	0.82	0.29			0.93
Airport	1.46	0.74	1.44	0.33	0.80	1.71	1.11		0.73		0.54	5.21				1.04
Little Havana	0.74	1.17	0.97	1.21	0.84	0.31	0.68	1.33	0.54	0.87	0.95	0.84	0.72			0.91
Coral Gables	1.63	0.83	1.37	1.11	1.71	0.41	0.39	3.19	0.33	5.36	1.01	0.95	0.71			1.20
Miami Beach	1.22	1.31	1.42	2.16	1.11	0.84	1.20	1.16	0.99	2.54	1.83	3.05	4.72			1.10
North Miami	0.81	0.63	0.61	0.53	0.65	0.40	0.66	0.83	0.51	0.68	0.69	0.57	0.51			0.65
Hialeah	0.70	1.09	1.70	1.58	1.55	0.39	1.07	1.73	0.61	1.69	1.95	0.63	0.40			1.17
Aventura	0.95	0.69	0.55	0.47	0.99	0.58	0.48	0.37	1.01	0.81	0.50	0.74	1.59			0.76
Miami Lakes	0.68	0.54	1.21	0.35	0.88	0.30	0.50	0.98	0.57	1.24	0.30	0.57	0.35			0.65
Doral	1.05	1.46	4.90	0.90	0.63	0.66	0.92	0.96	0.54		2.72	1.36				1.40
SE Dade	0.82	0.48	3.26	1.63	2.83	0.71	1.37	1.41	0.70	1.00	1.86	1.84	2.60			1.07
Homestead	2.36	1.19	3.75	3.74	7.01	1.87	1.99	3.09	3.20	0.58	1.41	1.63	1.40			1.59
Broward	0.78	0.44	0.58	0.65	0.97	0.75	1.19	0.53	0.88	1.05	0.57	0.30	2.31			0.70
Palm Beach	0.26	0.07	0.28	0.10	0.15		0.25		0.50	0.08		0.22				0.21
Total	1.10	0.81	1.35	1.02	1.53	0.66	0.78	1.21	0.77	1.01	1.14	1.27	1.37			0.97

8.5.6 Year 2030 Linked Trips

The results of the 2030 SERPM6 linked trips are summarized in **Tables 8-14** and **8-15** for the peak and off-peak periods, respectively. Tables D-6 through D-9 of Appendix D include additional summaries for the 2030 model run. Those are:

- (Table D-6) Year 2030 linked auto person trip summary for the full model run
- (Table D-7) Year 2030 linked auto person trip summary for the highway-only model run
- (Table D-8) Year 2030 peak period linked trip summary
- (Table D-9) Year 2030 off-peak period linked trip summary

Tables 8-14 and **8-15** summarize the transit trips of the "incremental" structure. Comparison of observed and target trips were made in these two tables. The ratios of 2030 estimated linked trips compared to the 2000 model are also shown in these tables. Please note that the 2030 statistics represent a greatly expanded transit system. For the peak period (see **Tables 8-14, D-2** and **D-6**), a few highlights of these comparisons include:

- The growth in all 2030 highway trips with respect to 2000 trips is 46.4 percent. Growth percentages by purpose are: 45% (HBW), 46% (HBNW) and 48% (NHB).
- The growth in all 2030 transit trips with respect to 2000 trips is 127 percent. Growth percentages by purposes are: 139% (HBW), 112% (HBNW) and 114% (NHB).
- By mode of access, walk and auto access trips show growths of 59% and 508%, respectively. For auto access, the park-n-ride trips (547%) are expected to grow more than the kiss-n-ride trips (430%).
- The growth in Tri-rail and other rail trips with respect to 2000 trips are 130 and 435 percent, respectively.

For the off-peak period (see **Tables 8-15, D-2** and **D-6**), highlights of these comparisons include:

- The growth in all 2030 highway trips with respect to 2000 trips is 49.6 percent. Growth percentages by purposes are: 46% (HBW), 51% (HBNW) and 49% (NHB).
- The growth in all 2030 transit trips with respect to 2000 trips is 124 percent. Growth percentages by purpose are: 119% (HBW), 123% (HBNW) and 136% (NHB).
- By mode of access, walk and auto access trips show growths of 66% and 586%, respectively. For auto access, the park-n-ride trips (618%) are expected to grow more than the kiss-n-ride trips (526%).
- The growth in Tri-rail and other rail trips with respect to 2000 trips are 85 and 410 percents, respectively.

A direct comparison cannot be made because the networks in the two model years are different. However, the growth trends are very reasonable for all modes and mode of accesses considering the fact of socioeconomic data growths as well as increases in transit supplies (see Table 7-9: peak transit VMT grows from 71,737 in 2000 to 150,791 in 2030). The exponential growth in auto access trips is due to greatly increased fixed guideway transit VMT (Tri-Rail, rail and mover VMT together grows from 5,934 in 2000 to 18,714 in 2030) and the number of stations.

In general, the 2000 SERPM6 transit model was well validated based on the guidelines recommended for FSUTMS, and provides a good estimate of trips by mode. The ratios between the estimates and the targets are 1.00 for most of the purposes, car ownerships and drive categories (DA, SR2, SR3+). Transit trip estimates were good, given their market share. The geographic distribution of the model estimated trips exhibits patters that are similar to the survey and 2000 CTPP data. This model should prove useful for long range planning purposes, as well as for corridor level analysis, but additional validation may be required for corridor level major transit investment studies.

Table 8-14: **Comparison of 2030 and 2000 Peak Period Model Linked Transit Trips**
Southeast Regional Planning Model VI

			2000 Peak Transit Linked Trips (1)				2030 Peak Transit Linked Trips (2)				Peak Growth (2/1)			
			HBW-Pk	HBNW-PK	NHB-Pk	Pk-TOTAL	HBW-Pk	HBNW-PK	NHB-Pk	Pk-TOTAL	HBW-Pk	HBNW-Pk	NHB-Pk	Pk-TOTAL
7	Walk to Transit - Zero Car Households	WT_0	22,395	13,186			40,802	28,080			1.82	2.13		
8	Walk to Transit - One Car Households	WT_1	22,424	13,953			34,256	21,811			1.53	1.56		
9	Walk to Transit - Two+ Car Households	WT_2	14,487	9,328			25,589	16,027			1.77	1.72		
	Total:		**59,306**	**36,467**	**16,528**	**112,301**	**100,647**	**65,918**	**29,415**	**195,980**	**1.70**	**1.81**	**1.78**	**1.75**
10	BRT/LRT Transit	BL	-	-	-	-	5,583	3,167	2,274	**11,024**				
11	MetroRail Transit	MR	16,876	5,722	3,659	**26,257**	79,864	26,053	9,564	**115,481**	4.73	4.55	2.61	**4.40**
12	TriRail Transit	TR	3,590	893	655	**5,138**	19,861	9,112	7,623	**36,596**	5.53	10.20	11.64	**7.12**
13	PNR to transit - Zero Car Households	PR_0	-	-			-	-			-	-		
14	PNR to transit - One Car Households	PR_1	4,081	948			16,904	4,223			4.14	4.45		
15	PNR to transit - Two+ Car Households	PR_2	5,795	1,257			30,519	6,045			5.27	4.81		
	Total:		**9,876**	**2,205**	**1471**	**13,552**	**47,423**	**10,268**	**6204**	**63,895**	4.80	**4.66**	**4.22**	**4.71**
16	KNR to transit - Zero Car Households	KR_0	-	-			-	-			-	-		
17	KNR to transit - One Car Households	KR_1	1965	840			8879	4,201			4.52	5.00		
18	KNR to transit - Two+ Car Households	KR_2	1857	917			11340	5,278			6.11	5.76		
	Total:		**3,822**	**1,757**	**1,105**	**6,684**	**20,219**	**9,479**	**6,318**	**36,016**	5.29	5.39	**5.72**	**5.39**
	Total Peak Transit Person Trips - Auto Access		13,698	3,962	2,576	20,236	67,642	19,747	12,522	99,911	4.94	4.98	4.86	4.94
	Total Peak Transit Person Trips - Walk Access		59,306	36,467	16,528	112,301	100,647	65,918	29,415	195,980	1.70	1.81	1.78	1.75
	Total Peak Transit person Trips		73,004	40,429	19,104	132,537	168,289	85,665	41,937	295,891	2.31	2.12	2.20	2.23
		0 CAR	22,395	13,186			40,802	28,080			1.82	2.13		
		1 CAR	28,470	15,741			60,039	30,235			2.11	1.92		
		2+CAR	22,139	11,502			67,448	27,350			3.05	2.38		
		Total-Pk	73,004	40,429	19,104	132,537	168,289	85,665	41,937	295,891	2.31	2.12	2.20	2.23

Table 8-15: **Comparison of 2030 and 2000 Off-Peak Period Model Linked Transit Trips**
Southeast Regional Planning Model VI

			2000 Off-Peak Transit Linked Trips [1]				2030 Off-Peak Transit Linked Trips (2)				Off-Peak Growth (2/1)			
			HBW-Op	HBNW-Op	NHB-Op	Op-TOTAL	HBW-Op	HBNW-Op	NHB-Op	Op-TOTAL	HBW-Op	HBNW-Op	NHB-Op	Op-TOTAL
7	Walk to Transit - Zero Car Households	WT_0	14,552	18,410			24,011	36,894			1.65	2.00		
8	Walk to Transit - One Car Households	WT_1	15,184	19,907			23,310	32,000			1.54	1.61		
9	Walk to Transit - Two+ Car Households	WT_2	9,907	13,545			17,132	24,991			1.73	1.85		
	Total:		**39,643**	**51,862**	**16,823**	**108,328**	**64,453**	**93,885**	**31,410**	**189,748**	**1.63**	**1.81**	**1.87**	**1.75**
10	BRT/LRT Transit	BL	-	-	-	-	2,037	2,548	1,757	**6,342**				
11	MetroRail Transit	MR	10,097	9,024	3,704	**22,825**	38,942	38,969	13,350	**91,261**	3.86	4.32	3.60	**4.00**
12	TriRail Transit	TR	1,193	1,091	535	**2,819**	3,566	5,460	3,167	**12,193**	2.99	5.00	5.92	**4.33**
13	PNR to transit - Zero Car Households	PR_0	-	-			-	-			-	-		
14	PNR to transit - One Car Households	PR_1	1,958	1,193			7,416	4,736			3.79	3.97		
15	PNR to transit - Two+ Car Households	PR_2	2,871	1,589			12,473	6,745			4.34	4.24		
	Total:		**4,829**	**2,782**	**1279**	**8,890**	**19,889**	**11,481**	**5616**	**36,986**	4.12	**4.13**	**4.39**	**4.16**
16	KNR to transit - Zero Car Households	KR_0	-	-			-	-			-	-		
17	KNR to transit - One Car Households	KR_1	862	1,038			4290	5,858			4.98	5.64		
18	KNR to transit - Two+ Car Households	KR_2	823	1,161			5167	8,412			6.28	7.25		
	Total:		**1,685**	**2,199**	**887**	**4,771**	**9,457**	**14,270**	**5,829**	**29,556**	5.61	6.49	**6.57**	**6.19**
	Total Off-Peak Transit Person Trips - Auto Access		6,514	4,981	2,166	13,661	29,346	25,751	11,445	66,542	4.51	5.17	5.28	4.87
	Total Off-Peak Transit Person Trips - Walk Access		39,643	51,862	16,823	108,328	64,453	93,885	31,410	189,748	1.63	1.81	1.87	1.75
	Total Off-Peak Transit person Trips		46,157	56,843	18,989	121,989	93,799	119,636	42,855	256,290	2.03	2.10	2.26	2.10
		0 CAR	14,552	18,410			24,011	36,894			1.65	2.00		
		1 CAR	18,004	22,138			35,016	42,594			1.94	1.92		
		2+CAR	13,601	16,295			34,772	40,148			2.56	2.46		
		Total-Op	46,157	56,843	18,989	121,989	93,799	119,636	42,855	256,290	2.03	2.10	2.26	2.10

9. TRANSIT ASSIGNMENT MODEL

The last transit-modeling step is assigning the transit trip tables produced by the mode choice model to the transit networks and paths. The transit trips are assigned to the minimum time path by an all-or-nothing method for each combination of mode and access. Unlike trips estimated during the mode choice step, assigned transit trips can be identified on all modes that they use to get to a destination. In other words, transit trips are measured by route and represent unlinked trips by mode.

For the 24-hour transit model, a common modeling practice is to assign all work trips to the peak network and all non-work trips to the off-peak network. The SERPM6 multi-period (often known as TOD) transit model on the other hand assigns all purposes (HBW, HBNW and NHB) in the P-to-A direction.

Because if this directionality, the results of the P-to-A transit assignments must be post-processed to derive mode of access data for any transit station and center. This post-processing is also desirable to show the actual loading direction in the transit analysis. In the absence of A-to-P assignments (not done because of model running times), users must use post-processing to estimate station activity and direction-specific transit loadings.

9.1 Model Process

The transit trips are allocated independently of highway trips. The resulting loads are reported by line and mode using the TRANSTAT program (a new program). This program produces route- and stop-level reports. It should be noted that trips are assigned in production-attraction (P-A) format, as is normal practice for transit analyses, rather than origin-destination (O-D) formats more commonly used in highway assignments.

SERPM6 transit model is a two periods (peak and off-peak) time-of-day model. Transit trips assignments are conducted in the same “2 x 2 x 4” loop as used for path building, with two loops for peak/off-peak periods, another two for walk/drive access, and a loop for each of the four paths.

9.2 Model Validation

The primary validation check of the transit assignment process is a comparison of observed versus modeled boardings. This was checked for the region, by the mode and submode. The first step of the validation of a transit assignment occurs during the mode choice model validation. In that step, the mode-specific constants for the region were derived so that the mode-choice model produces the appropriate share of transit trips for the region and different market segments.

As a first step in the validation of transit assignment results, an evaluation of the operating data and transit attributes generated by the TRANSTAT program was performed. Speeds along with other statistics (directional distance, peak/off-peak VMT and peak/off-peak VHT -- see Tables 7-9 and 7-10) give an indication that models are replicating the existing transit operating characteristics.

As part of transit model validation effort, year 2000 transit service characteristics and ridership information for all fixed transit services in Southeast Florida region were assembled by the MPOs and their consultants for use in 2000 MPO model validation. Tables D-10 to D-13 of Appendix D include a summary of these data. Ridership information, along with 1999 Southeast Florida Regional Travel Characteristics Survey data, was used to develop transit targets (see Tables in Chapters 8 and 9). These targets are used mainly to check the reasonableness of key modeling assumptions and model ridership estimates.

9.3 Results and Comparisons

This section presents summary results of the transit assignment process for the SERPM6 multi-period (often known as TOD) transit models. Summaries are made from both 2000 and 2030 model runs. The SERPM6 TOD transit model assigns all purposes (HBW, HBNW and NHB) in the P-to-A direction for each time periods (peak and off-peak). This is a conventional approach for the transit trip assignment process.

9.3.1 Year 2000 Transit Trips

Transit ridership from the 2000 validation model run is summarized from the reports of TRANSTAT program then compared with the targets in **Table 9-1**. This table tabulates the peak and off-peak model estimated passenger trips by transit modes (Bus, Tri-Rail feeder bus, Express Buses, Limited Stop Buses, Tri-Rail, Metrorail and Mover).

- Overall model estimated transit ridership are 5% overestimated (427,378 estimated vs. 406,867 observed).
- The bus modes (TRNBUILD modes 4, 5, 6, 12, 13 and 14) account for approximately 82 percent of total transit unlinked trips. These modes are about 7 % overestimated.
- The premium buses (Express and limited stops – TRNBUILD modes 6, 13 and 15) carry very few (10417, approx. 2.56%) unlinked transit trips. They are 65 percent overestimated.
- The Metrorail (observed ridership 49,622) and mover (observed ridership 15,619) carry 16% of the unlinked transit trips. The ratios of estimates-to-observed trips are 1.01 and 0.66 for the Metrorail and mover, respectively.
- The distribution among the counties of the local buses transit trips is 6%, 29% and 65% percent for Palm Beach, Broward and Miami-Dade Counties, respectively. The local buses trips are overestimated only by 11%, less than 1% and 8% for the Palm Beach, Broward and Miami-Dade Counties, respectively. The local bias constants (see Chapter 8) have improved these county specific model results.
- Tri-Rail accounts only 2% of overall transit trips and model estimates are 1 percent underestimated. Estimated trips for Tri-Rail feeder (TRNBUILD mode 12) are almost 49 percent underestimated. However, the number of trips for the Tri-Rail feeder mode is very small (901) compared to total bus trips (333,667).
- The distribution among the counties of the total transit trips is 4.75%, 23.66% and 71.59% percent for Palm Beach, Broward and Miami-Dade Counties, respectively. The Palm Beach, Broward and Miami-Dade all transit trips (Tri-rail trips not counted) are 11%, 1% and 6% overestimated, respectively.
- The Tri-Rail boarding summary by station is compared to the observed volume (see **Table 9-2**). By stations, the ratios of estimated boardings to target boardings vary significantly (0.01, 0.40 to 1.85). The total Tri-Rail station volumes are 1% underestimated. The ratios are 1.05, 1.17 and 0.65 for the stations in Palm Beach, Broward and Miami-Dade, respectively. Tri-Rail displays a larger deviation, because of the very low number of trips compared to local bus trips.
- **Table 9-3** presents station volume summary for the Metrorail stations. By station, the ratios of estimated boardings to target boardings vary from 0.63 to 1.95. The total Metrorail station volumes are 1% overestimated. The estimated/observed ratios of five segments of Metrorail (see **Table 9-3**) are 1.08, 1.16, 0.95, 1.54 and 0.84. This signifies that no systematic patterns of under and over estimation exist among the stations.

Summaries of route-level riderships were made and are presented in **Tables D-10** to **D-13** of Appendix D for the PalmTran, BCT and Miami-Dade (Metrobus, Mover and Metrorail), respectively.

Table 9-1: **Year 2000 Transit Ridership Comparison by Mode and County**
Southeast Regional Planning Model VI

Description	PT Mode	TrnBuild Mode	OBS 2000 Ridership (A)	Total 2000 OBS Ridership (A)	Model Estimated Passengers			Ratio of Est/Obs Ridership (B/A)
					Peak Period	Off-Peak Period	Total (B)	
Palm Beach Local Bus	4	4	18,802		10,878	9,827	20,705	1.10
Tri-Rail Shuttle (PB)	12	12	149		331		331	2.22
Palm Beach Subtotal:				**18,951**			**21,036**	**1.11**
Broward Local Bus	4	14	93,426		44,788	51,253	96,041	1.03
Tri-Rail Shuttle (BO)	12	12	752		39	49	88	0.12
Broward Express Bus	6	6	186		297	63	360	1.94
Broward Subtotal:				**94,364**			**96,489**	**1.02**
Miami-Dade Local Bus	5	5	210,121		113,730	106,254	219,984	1.05
Miami-Dade Express Bus	6	15	4,246		6,550	407	6,957	1.64
Limited Stop Buses (MD)	13	13	5,985		8,095	472	8,567	1.43
Metro-Mover	9	9	15,619		5,550	5,224	10,774	0.69
Metro-Rail	7	7	**49,622**		27,011	23,227	**50,238**	**1.01**
Miami-Dade Subtotal:				**285,593**			**296,520**	**1.04**
Tri-Rail	8	8	**7,959**	**7,959**	**5,136**	**2,821**	**7,957**	**1.00**
ALL MODES/COUNTIES:				**406,867**	**222,405**	**199,597**	**422,002**	**1.04**

Table 9-2: **Year 2000 Comparison of Tri-Rail Station Volumes**
Southeast Regional Planning Model VI

STATION	Year 2000 Observed Boardings	Peak Period ON (A)	Peak Period OFF (C)	Off-Peak Period ON (B)	Off-Peak Period OFF (D)	Estimated Boardings (E) = [(A+B)+(C+D)]/2	Ratio of Boardings (EST/ OBS)
Mangonia Park Station	519	61	169	87	67	192	0.37
West Palm Beach Station	784	107	885	75	407	737	0.94
Palm Beach Airport Station							
Lake Worth Station	412	847	140	380	82	725	1.76
Boynton Beach Station	460	453	112	258	59	441	0.96
Delray Beach Station	343	250	495	148	286	590	1.72
Boca Raton Station	547	220	269	136	165	395	0.72
Subtotal (Palm Beach):	**3,065**	**1,938**	**2,070**	**1,084**	**1,066**	**3,079**	**1.00**
Deerfield Beach Station	384	383	404	250	255	646	1.68
Pompano Beach Station	403	249	355	179	125	454	1.13
Cypress Creek Station	482	225	392	140	211	484	1.00
Ft. Lauderdale Station	648	437	682	224	363	853	1.32
Airport/Griffin Road Station	269	128	239	64	148	290	1.08
Sheridan Station	244	199	170	93	118	290	1.19
Hollywood Station	396	454	140	216	100	455	1.15
Subtotal (Broward):	**2,826**	**2,075**	**2,382**	**1,166**	**1,320**	**3,472**	**1.23**
Golden Glades Station	302	370	284	150	119	462	1.53
Opo Locka Station	117	119	36	68	24	124	1.06
Metrorail Station	1,156	521	284	250	210	633	0.55
Hialeah Market Station	87	34		16		25	0.29
MIC/Miami Airport Station	409	80	80	86	82	164	0.40
Subtotal (Miami-Dade):	**2,071**	**1,124**	**684**	**570**	**435**	**1,407**	**0.68**
TOTAL	**7,962**	**5,137**	**5,136**	**2,820**	**2,821**	**7,957**	**1.00**

(E) The sum was divided by 2 to estimate the boardings only, not boardings and alightings.

Table 9-3: **Year 2000 Comparison of Metro-Rail Station Volumes**
Southeast Regional Planning Model VI

STATION	Peak Period ON (A)	Peak Period OFF (C)	Off-Peak Period ON (B)	Off-Peak Period OFF (D)	Estimated Boardings (E) = [(A+B)+(C+D)]/2	2000 Observed Boardings (F)	Ratio (E)/(F)
Ockeechobee	1,828	2,143	1,596	1,291	3,429	1,937	1.77
Hialeah	1,196	338	904	408	1,423	1,421	1.00
Trirail	352	780	320	485	969	971	1.00
Northside	988	649	714	423	1,387	1,462	0.95
Subtotal	**4,364**	**3,910**	**3,534**	**2,607**	**7,208**	**5,791**	**1.24**
Martin Luther King	976	473	1,008	489	1,473	1,048	1.41
Brownsville	1,048	298	727	233	1,153	686	1.68
Earlington Heights	621	347	464	229	831	1,071	0.78
Allapattah	1,470	989	955	601	2,008	1,492	1.35
Subtotal	**4,115**	**2,107**	**3,154**	**1,552**	**5,464**	**4,297**	**1.27**
Santa Clara	389	337	264	361	676	440	1.54
Civic Center	714	3,955	790	3,958	4,709	4,660	1.01
Culmer	498	675	751	463	1,194	764	1.56
Overtown	519	521	509	514	1,032	920	1.12
Government Center	1,591	5,904	2,245	4,537	7,139	9,177	0.78
Brickell	1,015	1,658	1,428	1,331	2,716	2,297	1.18
Subtotal	**4,726**	**13,050**	**5,987**	**11,164**	**17,464**	**18,258**	**0.96**
Vizcaya	590	979	507	370	1,223	1,021	1.20
Coconut Grove	810	795	940	816	1,681	1,353	1.24
Douglas Road	1,775	2,890	2,138	3,061	4,932	2,642	1.87
Subtotal	**3,175**	**4,664**	**3,585**	**4,247**	**7,836**	**5,016**	**1.56**
University	354	904	471	863	1,296	1,736	0.75
South Miami	1,136	808	1,287	898	2,065	2,842	0.73
Dadeland North	3,570	922	1,323	741	3,278	5,977	0.55
Dadeland South	5,558	646	3,889	1,155	5,624	5,705	0.99
Subtotal	**10,618**	**3,280**	**6,970**	**3,657**	**12,263**	**16,260**	**0.75**
TOTAL	**26,998**	**27,011**	**23,230**	**23,227**	**50,233**	**49,622**	**1.01**

(E) The sum was divided by 2 to estimate the boardings only, not boardings and alightings.

The estimated ridership statistics were compared to the observed ridership for each transit route. Some of the routes show more variability in the ratios of the estimated trips to the observed trips. These are primarily due to the very low number of trips. Graphs (scatter-plots) of the route-level estimated versus observed ridership are presented in **Figures 9-1** to **9-4.** The statistical accuracy statistics (for example, RMSE and correlation) were also computed and presented in these figures. The systemwide statistics (total and average volume per route and differences) are also depicted. **Figures 9-5** and **9-6** present the scatter-plots and accuracy statistics of the Tri-Rail and Metrorail station observed and model estimated volumes. The scatter-plots exhibit a good linear trend (a high degree of correlation - 89 percent or higher) without any significant outliers.

Analyses of regression results are shown in each of these figures. The overall R-SQUARE of the fitted lines are in the range of 79-93 percent and "F-statistics" are also very high. The key accuracy statistics along with systemwide volumes, presented in **Figures 9-1 to 9-6**, are further summarized in **Table 9-4**.

Table 9-4
Year 2000 Systemwide Transit Volume and Accuracy Statistics
Southeast Regional Planning Model VI

			Total Volume			Per Station/Route Vol			
Transit Agency or County or Fixed Guideways	see	No of Routes or Stations	Observed	Model	Overall error (%)	Observed	Model	Correlation (%)	RMSE
ALL Transit Routes	Figure 9-1	166	406,755	423,838	4.20	2,450	2,553	96.19	52.44
Palm Tran	Figure 9-2	33	18,951	20,733	9.40	574	628	88.87	59.49
Broward Co Transit	Figure 9-3	60	94,252	94,979	0.77	1,571	1,583	93.91	47.38
Miami-Dade Transit	Figure 9-4	72	285,593	300,248	5.13	3,967	4,170	95.93	45.96
Tri-Rail Stations	Figure 9-5	18	7,962	7,884	-0.99	442	438	90.32	50.84
Metro-Rail Stations	Figure 9-6	21	49,622	49,974	0.71	2,363	2,380	94.95	43.64

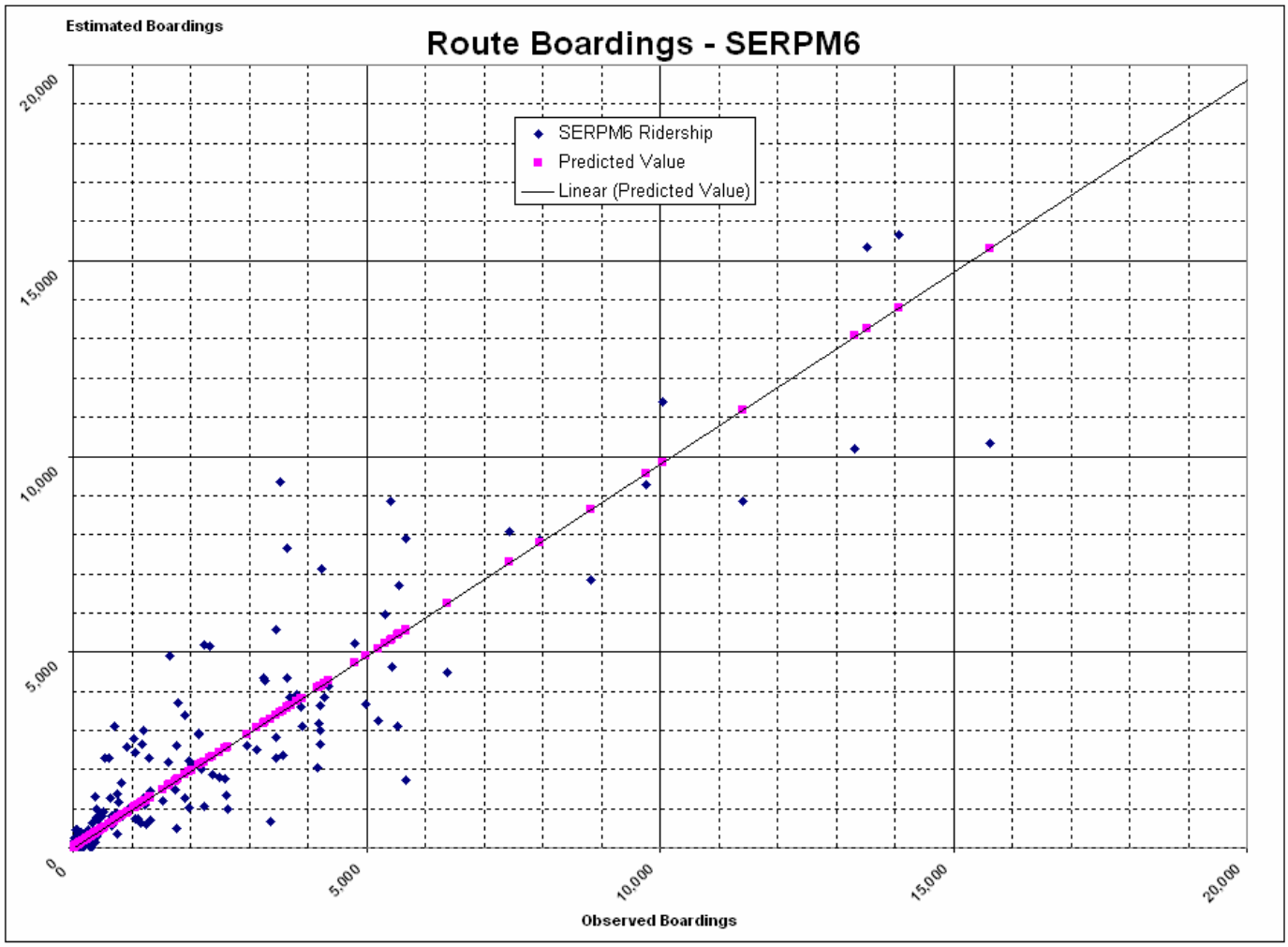
Outside of very highly traveled transit cities, one would naturally expect a high level of observed versus modeled variations at an individual bus route or rail station level. Considering the level of transit ridership in the Southeast Florida region (1.77% in peak period and 1.31% in off-peak period – see **Tables D-4** and **D-5**), the accuracy statistics of **Table 9-4** appear to be very good.

These results show that the SERPM6 transit assignment model is validated well. The mode choice model estimated linked trips match the target trips very well (see **Tables 8-9** and **8-10**) for the "grouped/incremental" structure. The ratios of the model estimation to the target linked trips are with few percentage points for most of the market segments with trips of significant numbers. The mode choice model accurately estimates mode shares. The transit assignment process results in accurate estimates of weekday travel using transit modes. With the number of trips of significant in numbers, the estimated unlinked trips closely match the observed ridership. However, the estimates of individual modes and routes may vary from the observed ridership.

9.3.2 Year 2030 Transit Trips

A transit ridership summary of the 2030 SERPM6 model is made in **Table 9-5**. Passenger trips by mode, county and selected lines were summarized. The 2030 trips were also compared against the 2000 model estimated trips. A few notable comparisons follow:

Figure 9-1: **Scatterplot and Accuracy Statistics of All Region Transit Route Boardings**
Southeast Regional Planning Model VI



RMSE:	52.44%

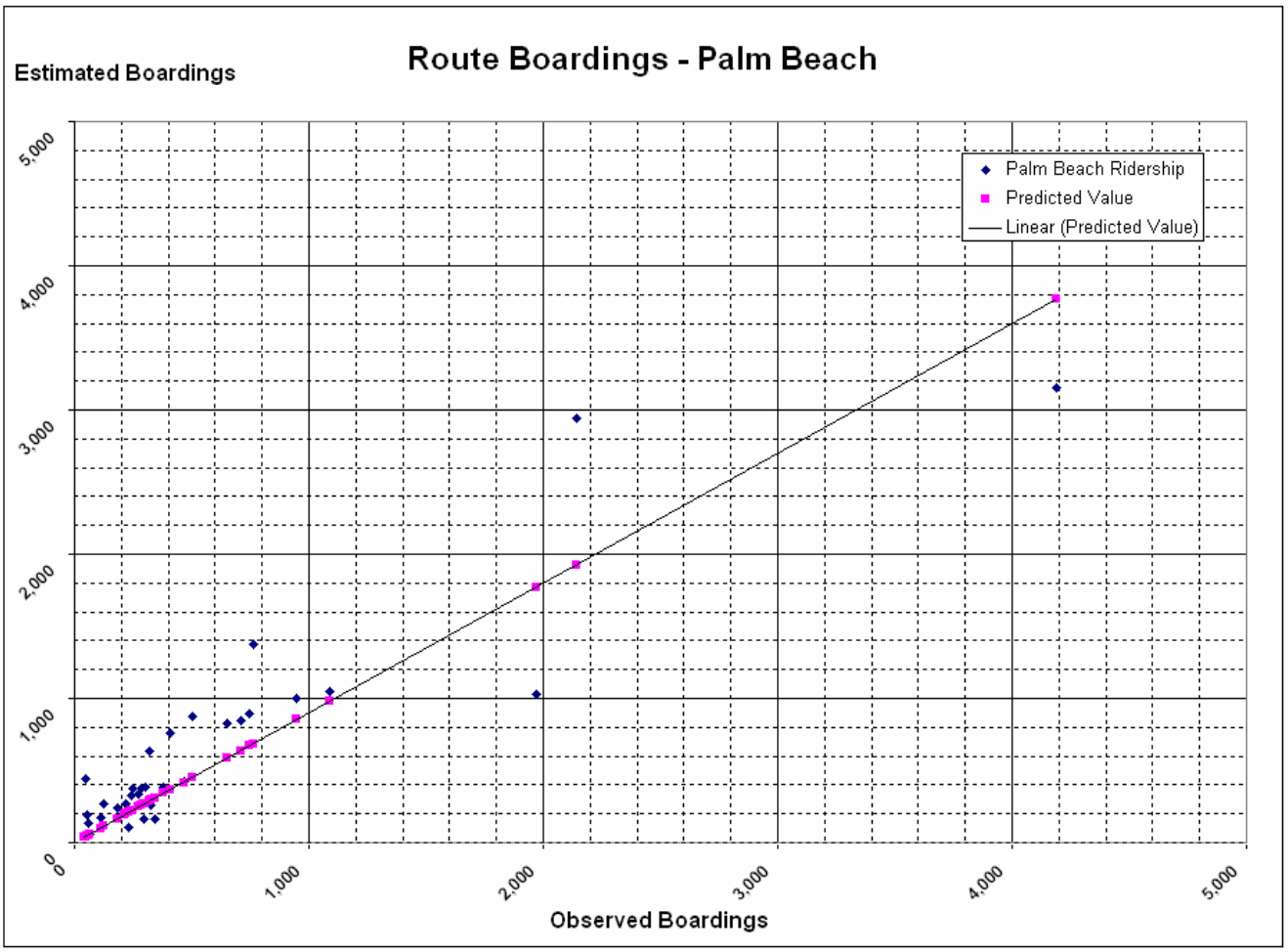
Systemwide Statistics:	Observed	Model	Model-OBS	Error(%)
Total Volume	406,755	423,838	17,083	4.20%
Ave Volume per Route	2,450	2,553	103	

Regression Statistics	
Multiple R	**96.19%**
R Square	**92.53%**
Adjusted R Square	**91.92%**
Standard Error	1280.91
Observations	166

ANOVA Statistics:

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	3.35E+09	3.35E+09	**2043.39**	**1.70E-94**
Residual	165	2.71E+08	1.64E+06		
Total	166	3.62E+09			

Figure 9-2: **Scatterplot and Accuracy Statistics of Palm Beach Transit Route Boardings**
Southeast Regional Planning Model VI



RMSE:	59.49%

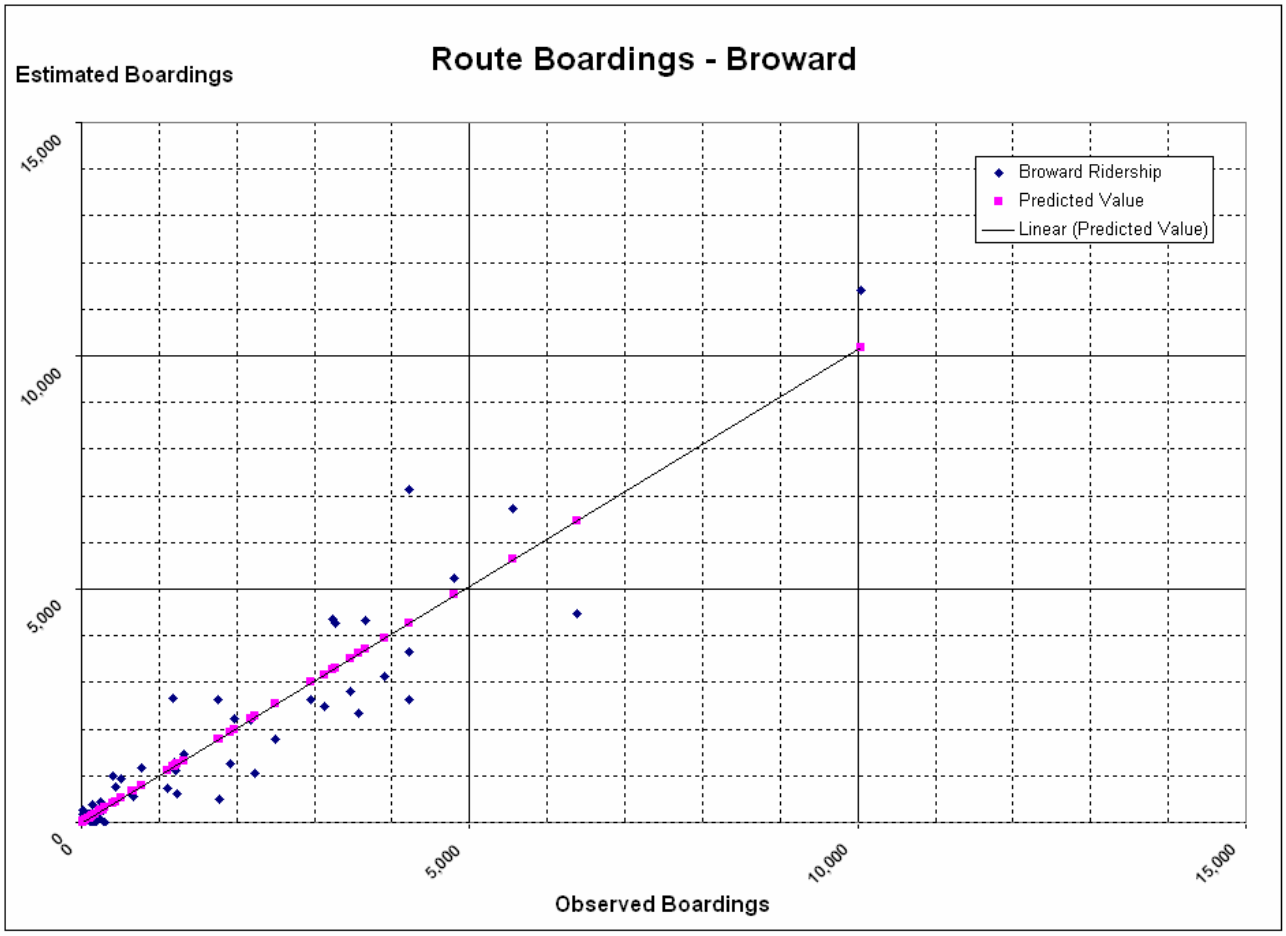
Systemwide Statistics:	Observed	Model	Model-OBS	Error(%)
Total Volume	18,951	20,733	1,782	9.40%
Ave Volume per Route	574	628	54	

Regression Statistics	
Multiple R	**88.87%**
R Square	**78.98%**
Adjusted R Square	**75.85%**
Standard Error	326.53
Observations	33

ANOVA Statistics:

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1.28E+07	1.28E+07	**120.23**	**3.40E-12**
Residual	32	3.41E+06	1.07E+05		
Total	33	1.62E+07			

Figure 9-3: **Scatterplot and Accuracy Statistics of Broward Transit Route Boardings**
Southeast Regional Planning Model VI



RMSE:	47.38%

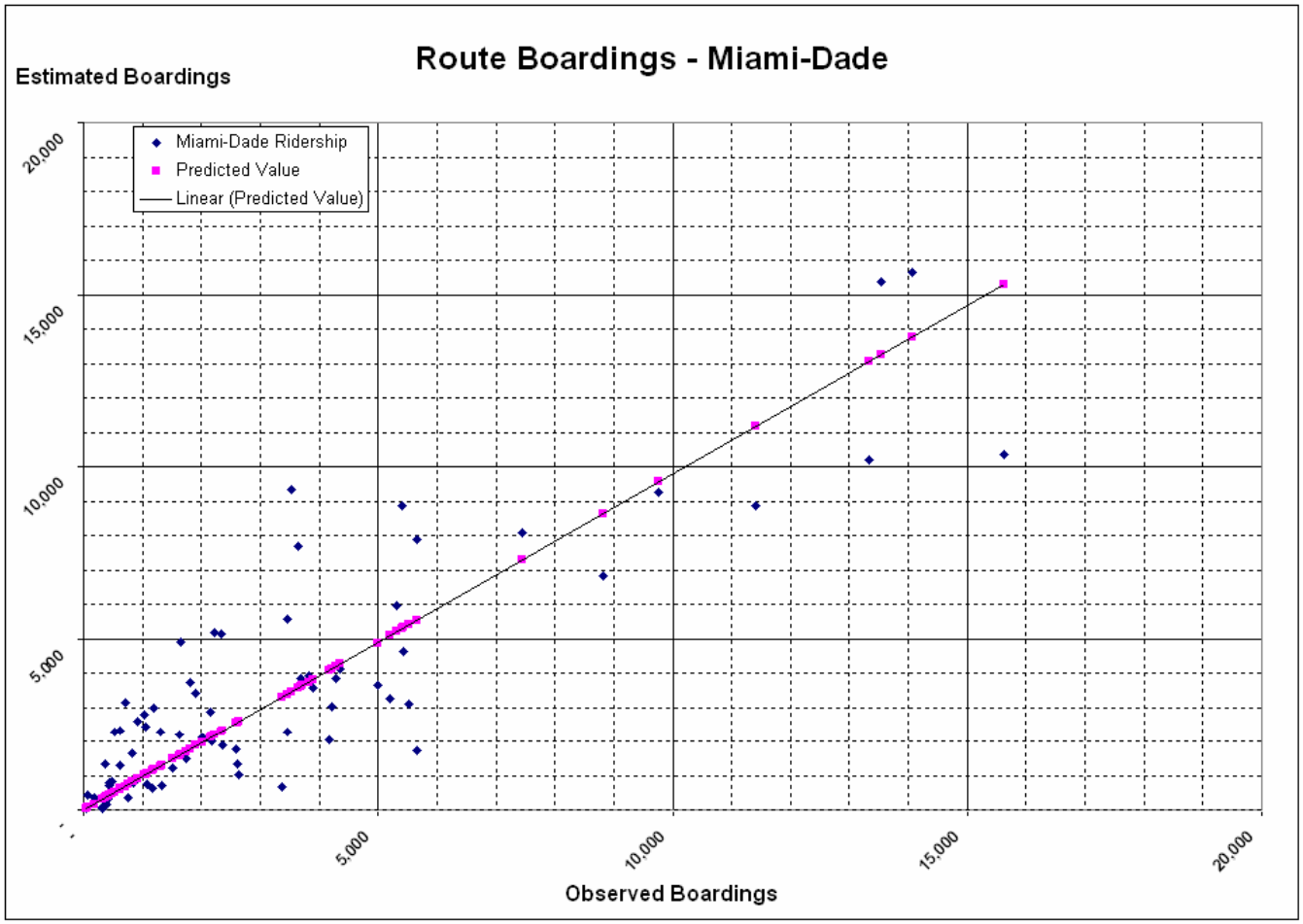
Systemwide Statistics:	Observed	Model	Model-OBS	Error(%)
Total Volume	94,252	94,979	727	0.77%
Ave Volume per Route	1,571	1,583	12	

Regression Statistics	
Multiple R	**93.91%**
R Square	**88.19%**
Adjusted R Square	**86.50%**
Standard Error	743.37
Observations	60

ANOVA Statistics:

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	2.44E+08	2.44E+08	**440.68**	**8.85E-29**
Residual	59	3.26E+07	5.53E+05		
Total	60	2.76E+08			

Figure 9-4: **Scatterplot and Accuracy Statistics of Miami-Dade Transit Route Boardings**
Southeast Regional Planning Model VI



RMSE:	45.96%

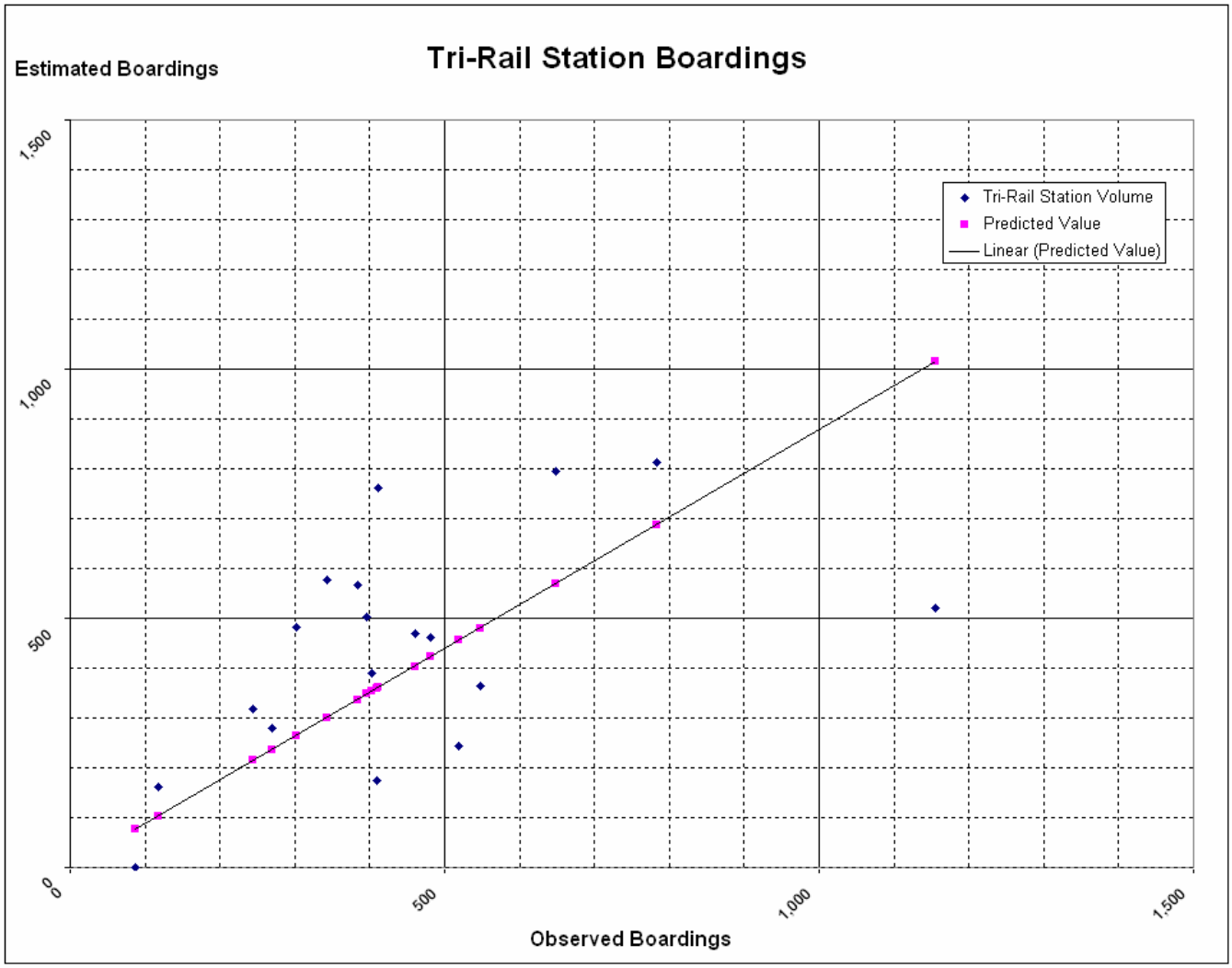
Systemwide Statistics:	Observed	Model	Model-OBS	Error(%)
Total Volume	285,593	300,248	14,655	5.13%
Ave Volume per Route	3,967	4,170	204	

Regression Statistics	
Multiple R	**95.93%**
R Square	**92.03%**
Adjusted R Square	**90.62%**
Standard Error	1815.60
Observations	72

ANOVA Statistics:

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	2.70E+09	2.70E+09	**819.57**	**2.25E-40**
Residual	71	2.34E+08	3.30E+06		
Total	72	2.94E+09			

Figure 9-5: **Scatterplot and Accuracy Statistics of Tri-Rail Station Boardings**
Southeast Regional Planning Model VI



RMSE:	50.84%

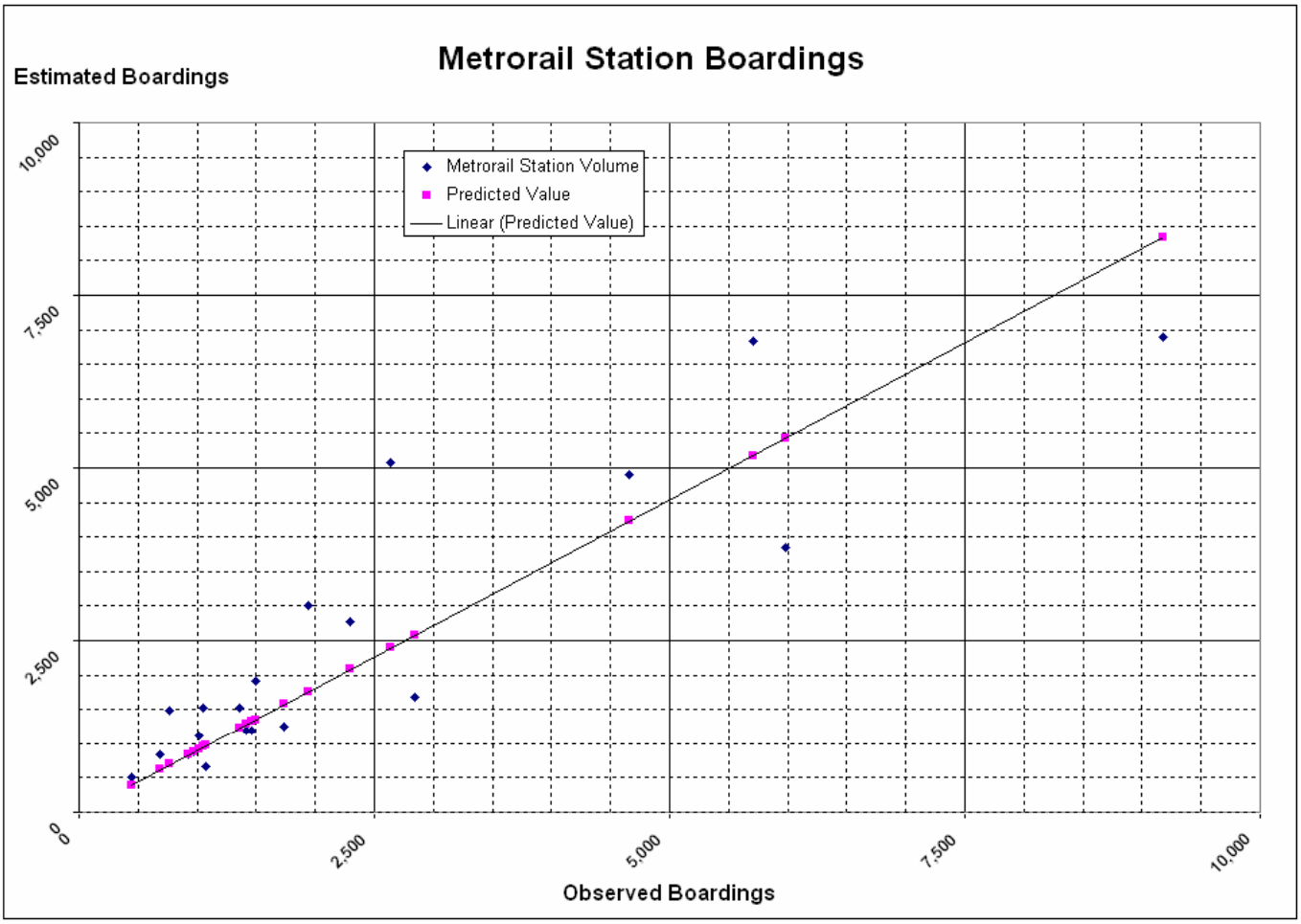
Systemwide Statistics:	Observed	Model	Model-OBS	Error(%)
Total Volume	7,962	7,884	-79	-0.99%
Ave Volume per Route	442	438	-4	

Regression Statistics	
Multiple R	**90.32%**
R Square	**81.57%**
Adjusted R Square	**75.69%**
Standard Error	215.83
Observations	18

ANOVA Statistics:

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	3.51E+06	3.51E+06	**75.25**	**1.91E-07**
Residual	17	7.92E+05	4.66E+04		
Total	18	4.30E+06			

Figure 9-6: **Scatterplot and Accuracy Statistics of Metrorail Station Boardings**
Southeast Regional Planning Model VI



RMSE:	43.64%

Systemwide Statistics:	Observed	Model	Model-OBS	Error(%)
Total Volume	49,622	49,974	352	0.71%
Ave Volume per Route	2,363	2,380	17	

Regression Statistics	
Multiple R	**94.95%**
R Square	**90.15%**
Adjusted R Square	**85.15%**
Standard Error	986.46
Observations	21

ANOVA Statistics:

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1.78E+08	1.78E+08	**183.13**	**3.32E-11**
Residual	20	1.95E+07	9.73E+05		
Total	21	1.98E+08			

Table 9-5: **Year 2030 Transit Ridership Comparison by Mode and County**
Southeast Regional Planning Model VI

Description	PT Mode	TrnBuild Mode	2000 Observed Ridership	2000 Model Estimated Ridership [A]	2030 Model Estimated Ridership: Peak Period	2030 Model Estimated Ridership: Off-Peak Period	2030 Model Estimated Ridership: Total [B]	Growth (2030/2000) in Model Est Ridership [B/A]
Palm Beach Local Bus	4	4	18,802	20,705	28,304	30,089	58,393	2.82
Tri-Rail Shuttle (PB) [NA]	12	12	149	331				
Palm Beach Express Bus	6	16			2,569	1,988	4,557	
Limited Stop Buses (PB) [NA]	13	19						
NEW Mode (PB) [NA]	10	20						
Palm Beach Bus Subtotal:			**18,951**	**21,036**			**62,950**	**2.99**
Broward Local Bus	4	14	93,426	96,041	94,393	105,457	199,850	2.08
Tri-Rail Shuttle (BO)	12	12	752	88	30	33	63	0.72
Broward Express Bus	6	6	186	360	1,316	14	1,330	3.69
Limited Stop Buses (BO)	13	18			14,106	7,363	21,469	
NEW Mode (BO)	10	10			14,002	6,600	20,602	
Broward Bus Subtotal:			**94,364**	**96,489**			**243,314**	**2.52**
Miami-Dade Local Bus	5	5	210,121	219,984	203,743	177,350	381,093	1.73
Miami-Dade Express Bus	6	15	4,246	6,957	6,308	4,840	11,148	1.60
Limited Stop Buses (MD)	13	13	5,985	8,567	6,050	2,364	8,414	0.98
NEW Mode (MD)	10	17			3,086	735	3,821	
Miami-Dade Bus Subtotal:			**220,352**	**235,508**			**404,476**	**1.72**
Mover	9	9	15,619	10,774	12,793	10,088	22,881	2.12
Project Mode [NA]	**11**	11						
Rail	7	7	**49,622**	**50,238**	136,549	100,672	**237,221**	**4.72**
Tri-Rail	8	8	**7,959**	**7,957**	**36,808**	**12,220**	**49,028**	**6.16**
ALL MODES/COUNTIES:			**406,867**	**422,002**	**560,057**	**459,813**	**1,019,870**	**2.42**
Tri-Rail (Main)	8	8	7,959	7,957	24,638	9,916	34,554	4.34
Tri-Rail (FEC)	8	8			9,697	1,414	11,111	
Tri-Rail (Jupiter)	8	8			2,371	847	3,218	
Tri-Rail (scripps)	8	8			102	43	145	

- The 2030 model estimated trips (1,042,510) are almost two and half times of the 2000 trips (427,378) with a ratio of 1.87.
- The growths in bus trips in the 2030 model compared to the 2000 model are 165%, 156% and 72% for Palm Beach, Broward and Miami-Dade Counties, respectively. These dissimilar growth rates among the three counties are due mostly to (1) significant growth in transit services and (2) socioeconomic data. A comparison of the peak-period transit vehicle miles shows that (1) there is a 91% increase in Palm Beach, (2) 140% increase in Broward and (3) 86% increase in Miami-Dade (see **Tables 7-9** and **7-10**). A similar comparison for the off-peak period results in 127% increase in Palm Beach, (2) 96% increase in Broward and (3) 78% increase in Miami-Dade vehicle miles.
- Three Tri-Rail lines (existing, Jupiter extension, Broward Dixie line) have accounted for 17,034 trips compared to 7,878 trips in the 2000 model. Tri-Rail shows a growth of 116 percents, whereas, the VMT of Tri-rail modes for both periods (peak and off-peak) has increased to 11,711 in 2030 from 4,653 in 2000 – a 152 percent increase.
- The 2030 rail lines are significantly different than that in 2000 model. The 2030 rail lines includes following lines: (1) Kendall-Okeechobee, (2) Stage1 plus Florida City and NW 27th extension, (3) East-West and (4) East-West via Earlington Heights. The 2030 rail VMT of peak and off-peak periods is 11,949 and 11,893, respectively (see **Table 7-10**). On the other hand, the 2000 Metrorail VMT is only 2,513 and 2,094 for the peak and off-peak periods, respectively (see **Table 7-9**). Overall, the growths in rail VMT and directional distance in 2030 model are about 417 and 406 percents, respectively. The significant growth in rail lines had caused a higher rail trips in 2030 model. The rail trips in 2030 model are 289,669 compared to 49,972 trips in 2000 model, an increase of about 480 percent. Metro-mover has a modest increase in trips in 2030 model compare to 2000 model (18,870 versus 10,347).
- In case of premium bus services (express and limited stop), there is significant growth in 2030 model trips compared to the 2000 model. The growth in passenger trips and vehicle miles are compared in **Table 9-6** between the two models for these special bus services. Overall, premium buses (Express & Limited) are expected to experience a 190 percent growth in passengers. These growths are 99 and 278 percents for the express and limited stop buses, respectively.

Table 9-6

Comparison of 2000 and 2030 Premium Bus Services and Estimated Passengers

Southeast Regional Planning Model VI

		Peak VMT			Off-Peak VMT			Total Estimated Passengers		
TRNBUILD Mode	County: System	2000	2030	% Change	2000	2030	% Change	2000	2030	% Change
11	PB: Express Bus		1,027			1,712			3,615	
6	BO: Express Bus	1,063	3,625	241%	365	365	0%	436	1,726	296%
15	MD: Express Bus	3,701	7,835	112%	319	4,703	1374%	8,068	11,599	44%
13 [NA]	PB: Limited Stop Bus									
18	BO: Limited Stop Bus		7,461			5,460			24,083	
13	MD: Limited Stop Bus	3,299	3,064	-7%	355	2,130	500%	8,740	8,913	2%
6, 11 & 15	Express Bus Total	4,764	12,487	162%	684	6,780	891%	8,504	16,940	99%
13 & 18	Limited Stop Bus Total	3,299	10,525	219%	355	7,590	2038%	8,740	32,996	278%
ALL	Premium - Express & Limited Bus Total	8,063	23,012	185%	1,039	14,370	1283%	17,244	49,936	190%

- The new mode (BRT/LRT) services in Broward and Miami-Dade Counties have 2030 estimated trips of 27,088 and 3,964, respectively. The estimated vehicle miles for the Broward BRT/LRT services are 1,930 and 1,838 in peak and off-peak periods, respectively. Miami-Dade has 1,659 and 1,382 vehicle miles of BRT/LRT services in the peak and off-peak periods. The Miami-Dade new mode line (Beach LRT) have more competition from other transit lines along the corridor, whereas the Broward lines run along the highly traveled I-595 corridor and Downtown to FLL airport with very little competition from other transit services.

Beside the growth in Tri-Rail trips, the growth patterns in transit ridership of other modes in 2030 model compared to 2000 model are very reasonable with respect to services provided in each of the models. The trips do not show significantly higher growth rates than the other fixed guideway modes (fixed guideway). It was concluded from the transit validation results that SERPM6 transit model does an excellent job of replicating existing transit use.

10. HIGHWAY ASSIGNMENT MODEL

The last step of the four-step modeling process is assignment. The SERPM6 is a multi-period (AM, PM and off-peak) and multi-class TOD model. The highway assignments are performed separately for each of the three periods. Each period highway assignment uses trips of that period, factored to a peak hour for volume-to-capacity calculations. This was accomplished through an equilibrium assignment process. Unlike previous versions of SERPM, truck trips are assigned simultaneously with the drive-alone and shared ride trips. All period final assignments are followed by a warm-up assignment to derive the penalties that are expected to occur at the freeway and on-ramp junctions.

Evaluation of the highway assignment model is based on comparisons between traffic counts and model assigned volumes. Simulated traffic volumes are compared to traffic counts in several ways to determine whether the coded highway network accurately represents the highway system, and to determine whether the various assumptions used in the model chain are reasonable. The highway evaluation program (HEVAL) is the primary tool used in comparing simulated volumes with the traffic counts. The SERPM6 three final period model assigned volumes are compared corresponding period traffic counts. The assigned volumes and other assigned attributes are then combined for the 24-hour assigned statistics. Validation of model also include to run 2030 model and to make sure that 2030 results are reasonable.

This chapter provides the model descriptions and validation statistics of highway assignment of both 2000 and 2030 SERPM6 models. Key assignments results of the model runs were summarized in numerous tables and figures.

10.1 Model Enhancements

The highway assignment model uses an equilibrium assignment algorithm. In equilibrium, all travelers are assigned to their optimum path; no traveler can have a shorter path available. Each assignment of trips from all zones is considered one assignment iteration. Typically, multiple iterations are required before networks reaches full equilibrium. After each assignment iteration, link speeds are readjusted and the next assignment is performed.

All SERPM models starting with version 4 include several model enhancements – application of multiple BPR curves, variable UROAD factors, CONFAC factors. Unlike other versions, the truck trips are assigned simultaneously along with the drive alone and shared ride trips. HOVs are also separately loaded and tracked onto the network in order to allow for planning for HOV lanes. The SERPM6 model also simulates the traffic delays that are expected to occur at the freeway ramp junctions.

Each period highway assignment is a multi-step process. The delays that are expected to occur at the freeway and ramp junction are evaluated in a warm-up assignment step. Model application then computes the approach delays based on their volumes. Those delays along with the other normal turning delays and prohibitors are then used in each period final assignment. The model also uses multi-modal assignments in the feedback loops of the distribution steps.

The warm-up assignments are run for a fixed 15 equilibrium iterations. The final period assignments are allowed to run for a maximum of 60 iterations or until the equilibrium process converge according to GAPS (less than equal to 0.0005) convergence criterion for three successive iterations. **Table 10-1** presents the highway traffic assignment convergence summary for the 2000 validated model.

Table 10-1: **Year 2000 Highway Assignment Convergence Statistics**
Southeast Regional Planning Model VI

Period Assignment	Warm-up Assignment			Final Assignment		
	No of Iterations	GAPS of Last Iteration	Overall Speed (*), mph	No of Iterations	GAPS of Last Iteration	Overall Speed (*), mph
A1. AM Peak Period Pre-Assignment (Feedback Iter 1)	15	0.00623	**25.37**	55	0.00045	**26.00**
A2. AM Peak Period Pre-Assignment (Feedback Iter 2)	15	0.00166	**28.58**	33	0.00022	**28.51**
B. AM Peak Period Assignment	15	0.00338	**28.31**	37	0.00013	**28.27**
C. PM Peak Period Assignment	15	0.00367	**26.25**	38	0.00049	**26.33**
D. Off Peak Period Assignment	15	0.00056	**31.30**	23	0.00039	**31.10**

(*) Includes Centroid Connectors Links

The following subsections describe enhancements and parameters of the SERPM6 model.

10.1.1 Freeway-Ramp Merge Delays

All period final assignments are followed by a warm-up assignment to derive the penalties that are expected to occur at the freeway and on-ramp junctions. The initial experimentation with Cube-Voyager junction model indicated unstable results. A simplified method was then developed to derive the freeway-ramp merging penalties. This method is primarily based on suggestions from the 1985 Highway Capacity Manual. These relationships were not included in more recent versions of the HCM. Nevertheless they were deemed relevant for this modeling procedure.

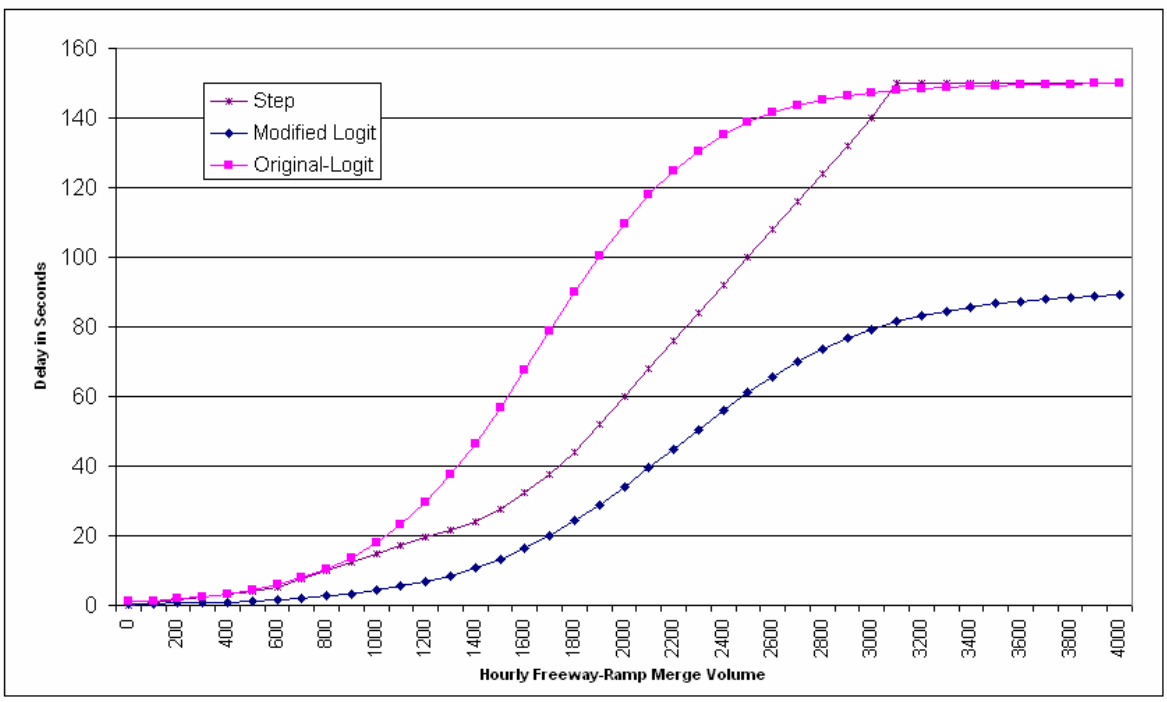
Based on the warm-up model volume, the model then calculates the fraction of the warm-up volume that is expected to use the merge lane. **Table 10-2** presents the fractions of the freeway and ramp warm-up volume to derive the freeway-ramp merge volume. The fractions for freeways are taken from the 1985 HCM.

The merge volume is then used in a logit equation to derive the expected freeway-ramp merge delays. **Figure 10-1** presents these logit curves. Initially, the 1985 HCM-based step functions were used. A logit curve was then used in place of step functions. The logit curve is preferable because it is continuous in nature. The original logit curve was then modified to dampen the merge delays because of its influence in high congestion, particularly for future year model runs. Both initial and modified curves are compared in **Figure 10-1**. The delays that will then be carried to approach legs of freeway-ramp junctions are assumed to be the fraction of their merged volume. This process was completely coded in Cube-Voyager scripts. Model users do not need to supply any data other than maintaining the facility types codes (see **Table 2-2**) and code "1" for LFWYMRG link attribute for left ramp freeway merging.

Table 10-2: **Freeway and Ramp Merge Volume Fractions**
Southeast Regional Planning Model VI

No of Freeway Directional Lanes	Warmup Volume (PreVol)	Freeway Fraction of Merge Volume
2	<1500	0.20
	1500-3500	(0.05 + 0.0001 * PreVol)
	>3500	0.40
3	<3500	0.06
	3500-5000	(-0.22 + 0.00008 * PreVol)
	>5000	0.18
>= 4	<4500	0.08
	4500-6000	(0.04 + 0.00001 * PreVol)
	>6000	0.10
	No of Ramp Directional Lanes	**Ramp Fraction of Merge Volume**
	1	1.00
	2	0.75
	>=3	0.50
	Freeway-to-Freeway Ramps	0.25

Figure 10-1: **Freeway and Ramp Merge Delay Functions**
Southeast Regional Planning Model VI



Step Functions:

Merge Volume (MV)	Delay Function
<= 600	[0.0 + 0.008334*(MV-0)]
600-1000	[5.0 + 0.025*(MV-600)]
1000-1450	[15.0 + 0.02222*(MV-1000)]
1450-1750	[25.0 + 0.05*(MV-1450)]
1750-2000	[40.0 + 0.08*(MV-1750)]
2000-3000	[60.0 + 0.08*(MV-600)]
>3000	150

Logit Function:

Delay = [C / (1 + EXP(A*MV + B)

where,	Original	Modified
MV = Merge Volume		
A = Slope	-0.003	-0.0025
B = Offset	5	5.5
C = Maximum Delay	150	90

10.1.2 Modified Volume-Delay Functions

An iterative equilibrium technique is used in SERPM. It is also a standard practice in most of the FSUTMS highway models in Florida. In this type of assignment, all of the trips are loaded, the paths are revised, the trips are again loaded, and the procedure is repeated until equilibrium is reached. This technique uses the BPR formulation, in which link travel time is recomputed using the following relationship:

$$T_c = T_f * \{1 + \alpha (v/c)^{\beta}\}$$

Where,

T_c = congested link travel time
T_f = link free-flow travel time
v = assigned volume
c = link capacity
α,β = BPR parameters

Since speed is distance divided travel time, the BPR formulation in terms of speeds is expressed as follows:

$$S_c = S_f \ / \{1 + \alpha (v/c)^{\beta}\}$$

Where,

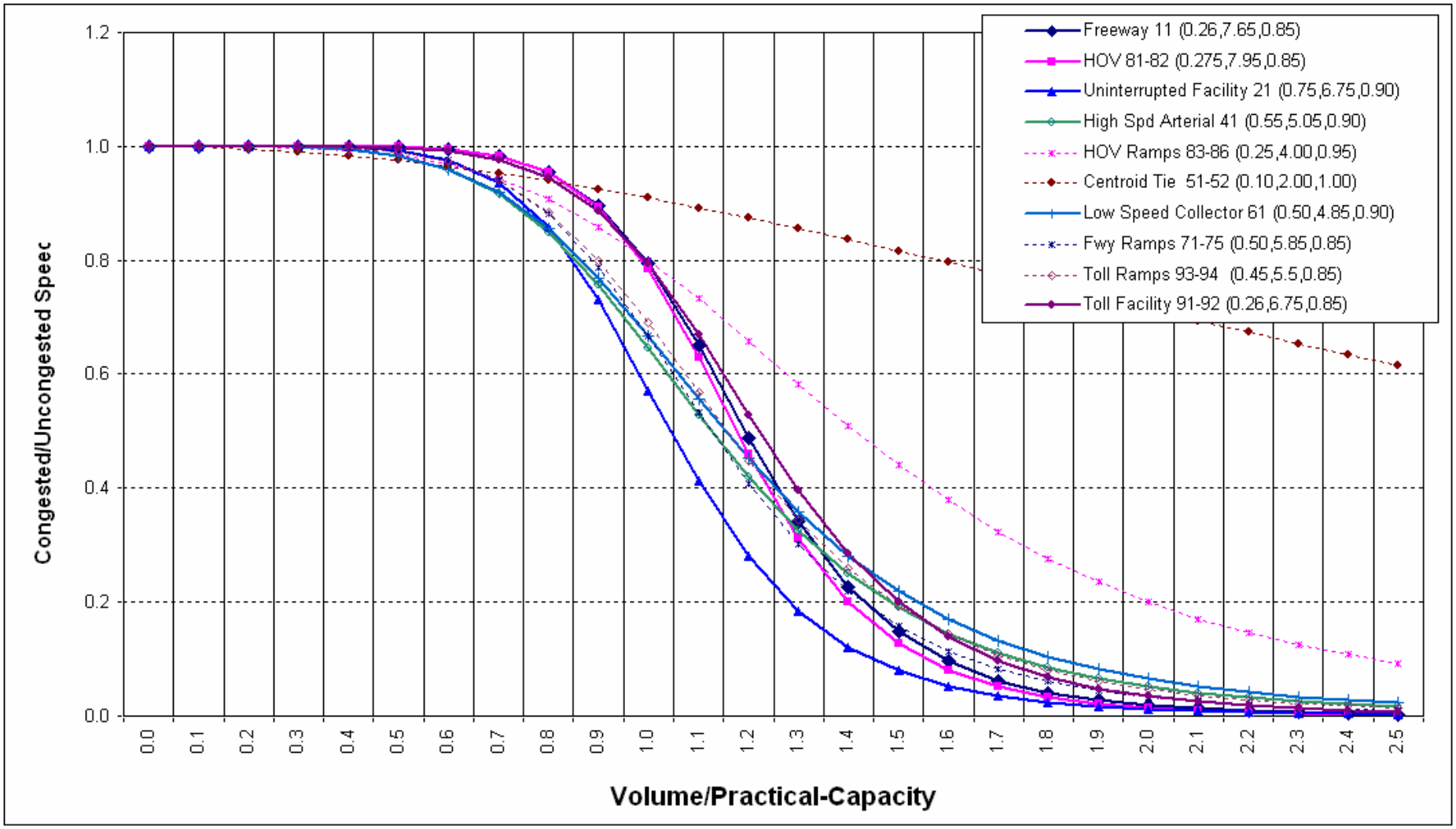
S_c = estimated congested speed
S_f = link free-flow speed

One of the enhancements in SERPM highway assignment process is the incorporation of multiple BPR curves based on the facility type of the roadways. Using different BPR curves for different types of facilities recognizes that each facility type has its own unique characteristics for responding to congestion. For example, freeways can generally handle a higher level of congestion than surface streets before speeds begin to deteriorate. However, with more congestion, speeds deteriorate to stop-and-go conditions much more quickly on freeways than they do on surface streets. It should be noted that the BPR curve is not sensitive to the impacts of signal spacing, timing and coordination. However, the free-flow speed calculation process implemented in SERPM6 (see Section 2.3) considers the signal cycle length and coordination. The BPR curve does not accurately estimate speeds for volume/capacity ratios greater than 1.0.

The BPR curves determine both the level of congestion (the volume/capacity ratio at which speeds begin to deteriorate) and the rate at which they deteriorate as congestion increases. In the southeast Florida models, modified BPR curves have been used, with different coefficients and exponents for each facility type. Similar to SEERPM4 and SERPM5 validation, the 2000 validation of SERPM6 used multiple BPR curves. The curves are specified in the MVFACTORS file (see **Figure C-2** of Appendix C). The adjustment to the BPR curves was made by changing the α and the β values. In addition, speeds were also adjusted. The facility specific BPR curves, used in the 2000 validated model, are shown in **Figure 10-2**. The curves used in the 2000 model validation were also tested in 2030 model to ensure that the assigned speeds are reasonable. A relatively steeper curve was used for freeways and HOV facilities. The curves for arterials were comparatively less steep.

Model users could use the links attributes (ALPHA_OVERRIDE and BETA_OVERRIDE, see **Table B-1**) if they need to overwrite any facility specific ALPHA or BETA values that are entered in the MVFACTORS file. The factors entered in the MVFACTORS are usually validated parameters and should not be changed for model application.

Figure 10-2: **Volume-Delay Curves**
Southeast Regional Planning Model VI



Note: Facility-specific ALPHA and BETA parameters are shown as FACILITY TYPE - FTC2 (ALPHA,BETA,UROADFAC)

10.1.3 UROAD Factors

The volume-delay relationship assumes practical capacity. A UROAD factor of 0.75 has commonly used since FSUTMS was first developed. The UROAD factors, entered in the MVFACTORS file (see **Figures 10-2** and **C-2**), convert the possible (LOS E) capacity to the practical/design capacity (LOS C) – a condition at which trips generally begin diverting to less congested facilities. Volume-Delay relationships and UROAD factors work together. The capacities calculated in CV application of highway module are converted to the practical capacity for use in the volume-delay relationship. The LOS C capacity is largely subjective and is determined by different methods, depending upon the facility type and traffic control. Thus, there no longer exists a simple method of relating LOS C to LOS E capacity that works across the full range of facilities or traffic controls. For example, LOS C on freeway is determined by traffic density; while LOS on two-lane roads is determined by percent time delay. Similar to SERPM4 and SERPM5, the SERPM6 model used multiple UROAD factors (see **Figures 10-2** and **C-2**).

10.1.4 CONFAC Factors

For the 24-hour model, CONFAC is the ratio between the peak hour traffic and the daily traffic. The FSUTMS programs use the CONFAC parameter to convert hourly capacity to a daily value so that a 24-hour assignment can be made. Historically, the method for obtaining daily capacity restrained traffic assignments has been to divide the hourly capacity by CONFAC (say, 0.10) to reflect the daily highway capacity.

The MVFACTORS file specifies the value of CONFAC, which is the fraction of the 24-hour trip table that occurs in the peak hour for the purpose of calculating volume/capacity (capacities almost always are stated as hourly volumes). Empirical evidence shows that as overall congestion grows, the value of CONFAC decreases. The theoretical lower limit for CONFAC is 0.042 (1/24), that is, conditions are equally congested during every hour of the day. The upper limit is 1.00, which would occur when all traffic moves during a single hour (admittedly unlikely). Quick Response values for CONFAC for areas with a population of more than one million are about 0.095. Generally, FDOT District Four 24-hour models use a value between 0.07 and 0.10.

The CONFAC values for the TOD model represent a fraction of the peak hour trips of the period. The AM and PM peak periods SERPM6 TOD models, each of periods has 3 peak hours. The rest of the 18 hours represents off-peak period. The facility specific CONFAC values that were used in 2000 model are entered in MVFACTORS file (see **Figure C-2**). Variation of CONFAC values by facility type is very small. For the two peak periods, CONFAC values are 0.33333 for freeway, toll and HOV facilities. The surface street CONFAC values are 0.34333. For the off-peak period CONFAC values are 0.095 for freeways and HOV and 0.115 and 0.110 for other facilities.

The SERPM6 model used smaller values of CONFAC for the limited access facilities (freeways, expressways, HOV facility, and toll facilities) compared to those used for other facilities, recognizing the fact that limited access facilities in general are more congested compared to other facilities.

10.2 Model Process

The period specific multipurpose trip tables are generated first in the "Highway Trip Table" module (see **Figure 1-1**). This module creates highway trip tables, including trucks, needed for the AM peak period, PM peak period, and off-peak highway assignments. The SERPM6 period models use two periods (peak and off-peak) trip tables from the mode choice module and then separates the peak trips into AM and PM period trips using purpose specific splitting factors (see Sections B and C of **Table 4-1**).

The highway assignment module (**see Figure 1-1**) then performs AM peak period, PM peak period and off-peak highway multi-modal assignments (drive-alone, shared-ride, and trucks) using the iterative equilibrium method.

Before the final assignments are made, "warm-up" assignments are made for each time period to estimate freeway ramp merge delays. It also utilizes the turning penalties and prohibitors from the highway path module. The highway assignment model loads vehicle trips onto the highway network. The model loads truck, HOV, and drive-alone trips. The assignment model uses revised volume/delay curves developed during calibration and facility-type-specific UROAD factors to convert the input level-of-service "E" capacities from possible to practical capacities.

The highway assignment module also combines the highway loads from three period assignments to develop 24-hour loads and other loaded network attributes (for example, VMT, VHT and congested speeds etc.). The combined loaded network contains each period's as well as 24-hour assignment attributes. **Table B-2** of Appendix B describes the attributes of the combined loaded network. This combined loaded network is used in highway evaluation module.

The highway evaluation module uses database versions of the Florida HEVAL and RMSE routines. Other summary statistics are generated using CV scripts. Outputs of HEVAL and RMSE routines were used to perform systems evaluation activities and to assist in the model validation process. HEVAL operates in two modes (validation and analysis). The validation mode allows the user to print a variety of reports designed to assist in the validation task. The validation mode does not require any input data other than the loaded highway network file. The analysis mode requires a series of input parameters to calculate the number of accidents, emissions, fuel consumption, and construction costs in addition to the loaded link record file.

10.3 Model Validation

Validation of a traffic assignment involves an examination of several statistics, most of which are related to actual ground counts taken on various links throughout the network. The traffic counts for SERPM6 are carried initially from the urban models through the highway merging process. Section 2.4.1 contains numerous tables and figures that summarize the traffic counts. One key to successful highway model validation is the availability of accurate traffic counts, in sufficient quantity. Efforts were made to insure that sufficient counts were included in the model for all available area type and facility combinations. The percentages of the links with traffic counts by the facility and area types are shown in **Tables 2-6** to **2-8** of Chapter 2. **Table 2-6** shows that overall 18.51 and 15.25 percents of the links have 24-hour and period traffic counts. The percentages of the links with traffic counts vary between 10-30 percent among the counties. The Miami-Dade network has the lowest percentage of the links with traffic counts. **Table 2-6** also shows the links with counts information by the facility and area types for each of the counties as well as the whole region. These statistics were used to evaluate the validation results presented in this chapter. For example, there will be less confidence in the evaluation results (say volume-over-count ratio) in locations where fewer links have traffic counts. These counts provide the basis for highway assignment evaluation, and are input into the model as link attributes.

The highway assignment model was validated by adjusting several model parameters, most notably, the parameters of the VFACTORS file and the speeds. A few changes were made to the initial free-flow speeds. The speed adjustment factors are read from the speed modifier file (MSPDADJ_YY.DBF). The speed adjustment factors are presented in **Table C-6**. Numerous manual adjustments were made to the speed values through the use of posted speed and signalization data during the earlier stages of model validation. The hierarchy of speeds and capacities among the facility and area types as well as time periods were always checked when a change in speed was made.

Comparisons between uncongested (original) and congested highway operating speeds provide reliable indicators of congestion and associated delays. Tables **2-9** to **2-14** of Chapter 2 presents these speed statistics for the 2000 and 2030 SERPM6 model runs. A comparison of the original and the congested speeds was made for each main facility and area types combinations. Post-assignment network speeds (often known as congested speeds) reflect a substantial decrease in operating speeds for selected facility and area types. The congested speeds were also compared to the observed speeds and are presented later in this chapter. Speed validation is not very common in Florida. Most of the model validation compares model volume against the traffic count. Validation of speeds often needs a compromise of results of speeds and volumes.

For the 2000 model in 24-hour period, there is 3.97 mph (11.3%) decrease in speed from an original speed of 35.11 mph. Freeways, ramps and HOV showed the greatest speed decreases among the facilities. Freeway speed decreased by 7.41 mph (14.0%) due to congestion. The percent decrease in speeds is higher in the 2030 model run with an overall decrease in speed of 7.4 mph (20.8%). Section 2.4.2 provides more discussion of these speed comparisons by periods.

10.4 Results and Comparisons

The HEVAL and RMSE generated statistics provide the basis on which the ability of the model to simulate observed conditions is judged and include VMT-V/C ratios, VHT-V/C ratios, volume-over-count (V/C) ratios, volume to count comparisons for screenlines and cutlines, and percent root mean square error.

These statistics summarized from HEVAL and RMSE outputs are presented in numerous tables in this chapter for the 24-hour highway loads, which is a combination of each period assignment loads. The results of the 24-hour assignments were primarily used to validate the SERPM6 model. However, the TOD summaries were also summarized to compare TOD results with period specific traffic counts. Chapters 8 and 9 of this report provide a detailed discussion on the transit model and validation results. Under SERPM, the results of each county were also summarized. The subsections present the validation results largely in tabular form.

10.4.1 Systemwide Statistics

The ratios of VMT and VHT, as calculated from assigned volumes versus those calculated from ground counts, were available. Further aggregations of these statistics were compared by area type, facility type, and for the total of all links. A ratio of 1.0 indicates exact agreement between the assignment and the traffic counts. The systemwide values (see **Table 10-3**) of total VMT-V/C, VHT-V/C and V/C ratios range 0.98-0.99 for the region. The ranges of these ratios are 0.98-0.99, 0.99-1.01 and 0.94-0.99 for Palm Beach, Broward and Miami-Dade Counties, respectively. The results of the each period are also shown in **Table 10-3**. For the period models, the ranges of these ratios are 1.03-1.06, 1.05-1.08 and 0.93-0.95 for the AM peak, PM peak and off-peak periods, respectively. ***Table 3*** *of the* ***FDOT Model Update Task C Report*** suggests that the systemwide V/C ratios should be within ±5 percent. These overall 24-hour ratios indicate that the 2000 model perform extremely well relative to these performance standards.

Beside volume-over-count ratios, the systemwide results from the 2000 SERPM6 validation run are also summarized in **Tables 10-3** and **10-4** for each county and the region and time periods on the following items:

- Number of Links
- System Miles
- Lane Miles
- Directional Miles
- Average Link Volume

Table 10-3: **Year 2000 Systemwide Highway Model Validation Statistics**
Southeast Regional Planning Model VI

ITEM	24 Hour (Sum of Period Models) - Systemwide Statistics				Systemwide Statistics by Period		
	Palm Beach	Broward	Miami-Dade	All Counties	AM Peak Period	PM Peak Period	Off-Peak Period
Total Households	469,395	654,199	774,339	1,897,933			
Total Population	1,086,640	1,601,918	2,204,713	4,893,271			
Total Number of Links	4,350	4,149	7,691	16,188			
Total System Miles	1,222	1,303	1,787	4,311			
Total Lane Miles	3,771	4,492	5,404	13,666			
Total Directional Miles	2,190	2,217	3,124	7,531			
Average Non-Centroid Total Volume	18,932	25,975	20,361	21,418	4,192	4,953	12,274
Total Non-Centroid VMT(NC-VMT)	24,036,596	33,452,934	37,752,064	95,241,568	18,582,970	22,033,458	54,625,176
NC-VMT per Household	51.21	51.14	48.75	50.18	9.79	11.61	28.78
NC-VMT per Capita	22.12	20.88	17.12	19.46	3.80	4.50	11.16
Total Non-Centroid VHT(NC-VHT)	671,223	950,286	1,282,202	2,903,711	588,705	757,523	1,557,566
NC-VHT per Household	1.43	1.45	1.66	1.53	0.31	0.40	0.82
NC-VHT per Capita	0.62	0.59	0.58	0.59	0.12	0.15	0.32
Total NC ORIGINAL Speed (mph)	36.42	36.64	33.29	35.11	35.11		
Total NC CONGESTED Speed (mph)	33.60	32.69	28.69	31.13	31.34	29.40	32.78
Total Change in Speed (mph)	-2.82	-3.95	-4.60	-3.98	-3.77	-5.71	-2.33
Total Percent Change in Speed	-7.74%	-10.78%	-13.82%	-11.34%	-10.74%	-16.26%	-6.64%
Total VMT-Volume/Count (VMT-V/C)	0.98	0.99	0.99	0.99	1.03	1.05	0.95
Total VHT-Volume/Count (VHT-V/C)	0.99	1.00	0.97	0.99	1.06	1.08	0.94
Total Volume/Count (V/C)	0.98	1.01	0.94	0.98	1.04	1.05	0.93
Total TRUCK Volume/Count (Trk-V/C)	1.00	0.98	1.03	1.00			

Symbol Used:

NC = Non-Centroid, VMT = Vehicle-Miles-of-Travel, VHT = Vehicle-Hours-of-Travel, V/C = Volume-over-Count, and

Note: Statistics for Palm Beach, Broward and Miami-Dade Counties are generated from SERPM6 runs.

Table 10-4: **Root Mean Square Error Statistics**
Southeast Regional Planning Model VI

Count Range	Acceptable RMSE Range	24 Hour (Sum of Period Models) - RMSE Statistics								RMSE Statistics by Period					
		Palm Beach		Broward		Miami-Dade		All Counties		AM Peak Period		PM Peak Period		Off-Peak Period	
		RMSE	*N*	RMSE	*N*	RMSE	*N*	RMSE	*N*	RMSE	*N*	RMSE	*N*	RMSE	*N*
<5,000	45 - 55	56.9	330	83.9	457	74.9	128	73.6	915	44.2	4,170	41.0	3,923	56.9	1,589
5,000 - 10,000	35 - 45	36.5	518	46.9	521	43.2	218	42.3	1,257	26.9	300	23.8	543	38.5	1,526
10,000 - 20,000	27 - 35	27.9	758	31.4	723	35.6	464	31.3	1,945	21.6	125	22.7	124	27.8	1,250
20,000 - 30,000	24 - 27	23.3	169	20.3	398	27.0	271	23.2	838	21.0	17	13.5	22	21.6	111
30,000 - 40,000	22 - 24	19.8	21	23.1	92	18.0	69	20.8	182					20.1	27
40,000 - 50,000	20 - 22	16.4	4	11.7	7	22.0	48	20.5	59					16.0	49
50,000 - 60,000	18 - 20	23.5	2	7.6	11	12.7	8	10.6	21					12.0	39
60,000 - 70,000	17 - 18	8.9	8	6.3	10	21.6	22	16.4	40					15.3	10
70,000 - 80,000	16 - 17	11.7	26	11.3	2	19.1	12	13.8	40					6.3	10
80,000 - 90,000	15 - 16	4.9	12	13.3	16	15.5	14	12.2	42					?	1
90,000 - 100,000	14 - 15			11.4	10	17.3	13	14.6	23						
100,000 - 400,000	<14			10.9	18	13.4	14	11.8	32						
ALL	**32 - 39**	28.4	1,848	29.5	2,265	29.9	1,281	29.9	5,394	40.9	4,612	36.4	4,612	33.7	4,612

Symbol Used:
RMSE = Root-Mean-Square-Error
Note: Statistics for Palm Beach, Broward and Miami-Dade Counties are generated from SERPM6 runs.

- VMT
- VMT per household
- VMT per Capita
- VHT
- VHT per household
- VHT per Capita
- Input (Free-Flow) Speed
- Model Congested Speed
- Change and Percent Change in Speed
- Root Mean Square Error (RMSE) percentage

The volume, VMT, VHT, Speed, and RMSE statistics are very reasonable. More discussion of these items is provided later. **Table 10-3** presents the summary of all-day systemwide statistics of the 2000 TOD model runs. The loaded networks of three periods (AM, PM and midday) are combined to generate the all-day results.

The systemwide results of the 2030 SERPM6 model run are summarized in **Tables 10-5**. For the 2030 model, volume-over-capacity ratios (v/c) are reported. A few comparisons of systemwide 24-hour model results of 2000 and 2030 runs (see **Tables 10-3** and **10-5**) follow:

- The total lane-miles are 16,498 and 13,666 in the 2030 and 2000 networks, respectively, which represents about a 21% change.
- The average link volumes are 21,438 (2000 model) and 29,099 (2030 model), which represent about a 36% change.
- The percent changes in uncongested and congested speeds are 11.31 and 20.85 in 2000 and 2030 model runs, respectively. The changes in speed are 3.97 mph (2000 model) and 7.40 mph (2030 model).
- The 2030 network has approached LOS E (possible) capacity in many cases with volume/capacity (v/c) ratios in the ranges of 0.52-0.75. The Palm Beach region is somewhat less congested than the Broward and Miami-Dade regions.
- The VHT travel per household has changed from 1.53 (92 minutes) in 2000 to 1.80 (108 minutes) in 2030.
- The overall VMT/household has increased from 50.22 in 2000 to 53.56 in 2030. The VMT/household figures are very similar to the reported national statistics.
- The growth in 2030 VMT compared to 2000 VMT is approximately 53 percent, which is equal to 1.42% annual compound growth.

The above comparisons suggest that results of both 2000 and 2030 models are very reasonable.

10.4.2 Percent Root Mean Square Error Statistics

The percent Root Mean Square Error (RMSE) for total areawide assignment is another aggregate measure to show how well the model chain has replicated ground counts. RMSE is the standard measure of error in system planning model. The smaller the percent RMSE in the model, the higher the level of confidence in the model's ability to replicate existing traffic. The RMSE values (see **Table 10-1**) for the validated model is 29.8. For the 24-hour model, the RMSE statistics for the three counties are 28.4 (Palm Beach), 29.5 (Broward) and 29.7 (Miami-Dade). These statistics fall within the suggested range of 32-39 percent. Moreover, all regions show equal level of validation. Except very lower volume groups, the RMSE values are either within the range or even below the lower limit of the allowable ranges. The overall RMSE's are 40.9, 36.4 and 33.6 for the AM, PM and off-peak periods, respectively.

Table 10-5: **Year 2030 Systemwide Highway Model Validation Statistics**
Southeast Regional Planning Model VI

ITEM	24 Hour (Sum of Period Models) - Systemwide Statistics				Systemwide Statistics by Period		
	Palm Beach	Broward	Miami-Dade	All Counties	AM Peak Period	PM Peak Period	Off-Peak Period
Total Households	702,953	931,345	1,084,890	2,719,188			
Total Population	1,754,825	2,383,116	3,149,291	7,287,232			
Total Number of Links	5,136	4,260	8,495	17,891			
Total System Miles	1,410	1,325	1,979	4,715			
Total Lane Miles	5,139	5,032	6,327	16,498			
Total Directional Miles	2,476	2,261	3,384	8,122			
Average Non-Centroid Total Volume	27,149	35,929	26,882	29,113	5,388	6,385	17,339
Total Non-Centroid VMT(NC-VMT)	40,591,968	49,073,608	55,993,328	145,658,896	26,947,190	32,034,862	86,676,872
NC-VMT per Household	57.74	52.69	51.61	53.57	9.91	11.78	31.88
NC-VMT per Capita	23.13	20.59	17.78	19.99	3.70	4.40	11.89
Total Non-Centroid VHT(NC-VHT)	1,172,015	1,522,260	2,218,896	4,913,172	944,473	1,259,845	2,708,774
NC-VHT per Household	1.67	1.63	2.05	1.81	0.35	0.46	1.00
NC-VHT per Capita	0.67	0.64	0.70	0.67	0.13	0.17	0.37
Total NC ORIGINAL Speed (mph)	37.44	36.89	33.40	35.50	35.50		
Total NC CONGESTED Speed (mph)	32.22	29.63	24.63	27.95	28.78	25.80	30.33
Total Change in Speed (mph)	-5.22	-7.26	-8.77	-7.55	-6.72	-9.70	-5.17
Total Percent Change in Speed	-13.94%	-19.68%	-26.26%	-21.27%	-18.93%	-27.32%	-14.56%
Total VMT-Volume/Capacity-LOSE (VMT-V/CapE)	0.57	0.70	0.67	0.65	0.52	0.62	0.53
Total VHT-Volume/Capacity-LOSE (VHT-V/CapE)	0.60	0.75	0.74	0.70	0.61	0.73	0.59
Total Volume/Capacity-LOSE (V/CapE)	0.60	0.73	0.68	0.67	0.54	0.64	0.56

Symbol Used:

NC = Non-Centroid, VMT = Vehicle-Miles-of -Travel, VHT = Vehicle-Hours-of-Travel, V/CapE = Volume-over-Capacity-LOS-E, and RMSE = Root-Mean-Square-Error

Note: Statistics for Palm Beach, Broward and Miami-Dade Counties are generated from SERPM6 runs.

Percent RMSE provides a comparison of estimated traffic volumes to observed counts by volume groups of different ranges for all links for which traffic counts are available. The RMSE results for all volume groups greater than 5,000 VPD are either better or within the suggested ranges. In case of the low volume group (<5,000 VPD), the RMSE statistics are slightly higher than the upper limits of suggested range. In case of low volume groups, these slight discrepancies are "tolerable", since errors introduced in such cases generally do not alter the design consideration. The RMSE statistics by the volume groups indicate that the simulated network contains the correct number and type of facilities and the relative speeds and capacities among facilities have resulted in an accurate assignment of traffic. Thus, by both systemwide V/C and RMSE measures, the validated models did an excellent job of replicating traffic counts.

10.4.3 Screenline, Cutline and Corridor Volume-over-Count Ratios

Screenlines, cutlines and corridors are groups of roadways oriented in the same direction, and carry traffic considered to be significant within the study area. Screenlines and cutlines of the SERPM model are primarily based on those selected for the individual counties. Several duplicate lines at county boundary were eliminated and a few extra lines were coded for the 2000 network. The locations of the screenlines and cutlines for the SERPM6 model are depicted in **Figures 10-3 and 10-4**. Beside screenlines and cutlines, a few corridors (I-95, I-75, I-595, turnpike, etc.) are coded in the screenline field of the network to evaluate the volume/count statistics of the selected corridors.

In addition to aggregate summaries by area type and facility type, screenline summaries are produced by the HEVAL. **Table 10-6** summarizes the validation results of the screenlines and cutlines and several selected corridors in terms of assigned volume-to-ground-count (V/C) ratios. Results are summarized from 24-hour highway evaluation outputs.

Most of the screenline volume-over-count ratios lie within the FDOT-suggested guidelines of ±10 percent. The FDOT also suggested that the screenlines with volumes over 50,000 vehicle per day (VPD), estimated traffic volumes at screenlines should be within 10% of observed volumes for screenlines. Estimated traffic volumes for screenlines less than 50,000 VPD should be within 20% of observed traffic volumes. The screenlines that exceeded the suggested limit were investigated to see if any systematic pattern existed. Many of them were found to have only a few links with traffic counts. The individual link volume/count ratios were examined through VIPER to see any systematic pattern. No such patters were found.

To get a better understanding of the screenline performance, the deviation of loaded volumes with reference to the ground counts was plotted for each screenline and cutline. For the validated 2000 SERPM6 24-hour model, the results are presented in **Figures 10-5** (Screenline) and **10-6** (corridor and cutline). These figures are supposed to display only the screenline's volume. However, the volumes of cutlines and corridors were also displayed to gauge their performances with respect to screenline's desirable deviation. Cutline volumes generally warrant larger deviation than screenline volumes. At lower screenline volumes, the permitted volume deviation is quite large, since such deviations would not result in significant design differences. Conversely, at higher screenline volumes, a lower deviation is desired in order to be confident that any design decisions would be valid.

The key results of **Table 10-6** and **Figures 10-5** and **10-6** are:

- All screenlines (No. 2-7, 18, 21-28, 42-53) V/C ratios are in the range of 0.85 to1.20 for the 24-hour model. The percent deviations of all but one of these screenlines are above the maximum desirable deviation line (see **Figure 10-5**). Screenline 23 (Broward east-west screenline along River Canal) fall above the maximum desirable deviation. The nearby parallel screenline 28 is fall below the maximum desirable deviation line. A parallel screenline (No. 22) to number 23 is also below the line with V/C ratio of 0.94. So, no corrective measures were taken for the screenline 23 that fall above the desirable line.

Figure 10-3: **Screenline Locations**
Southeast Regional Planning Model VI

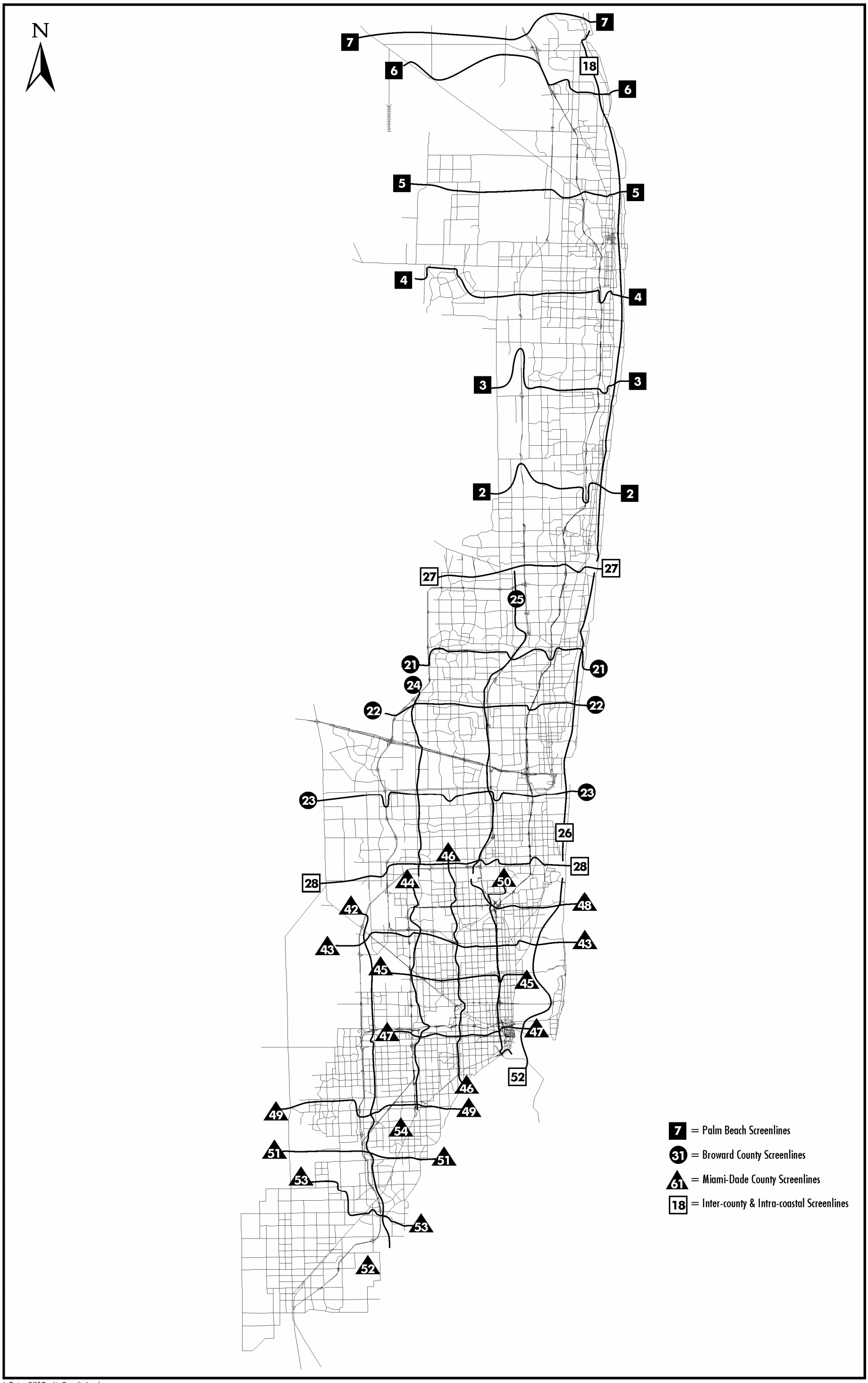


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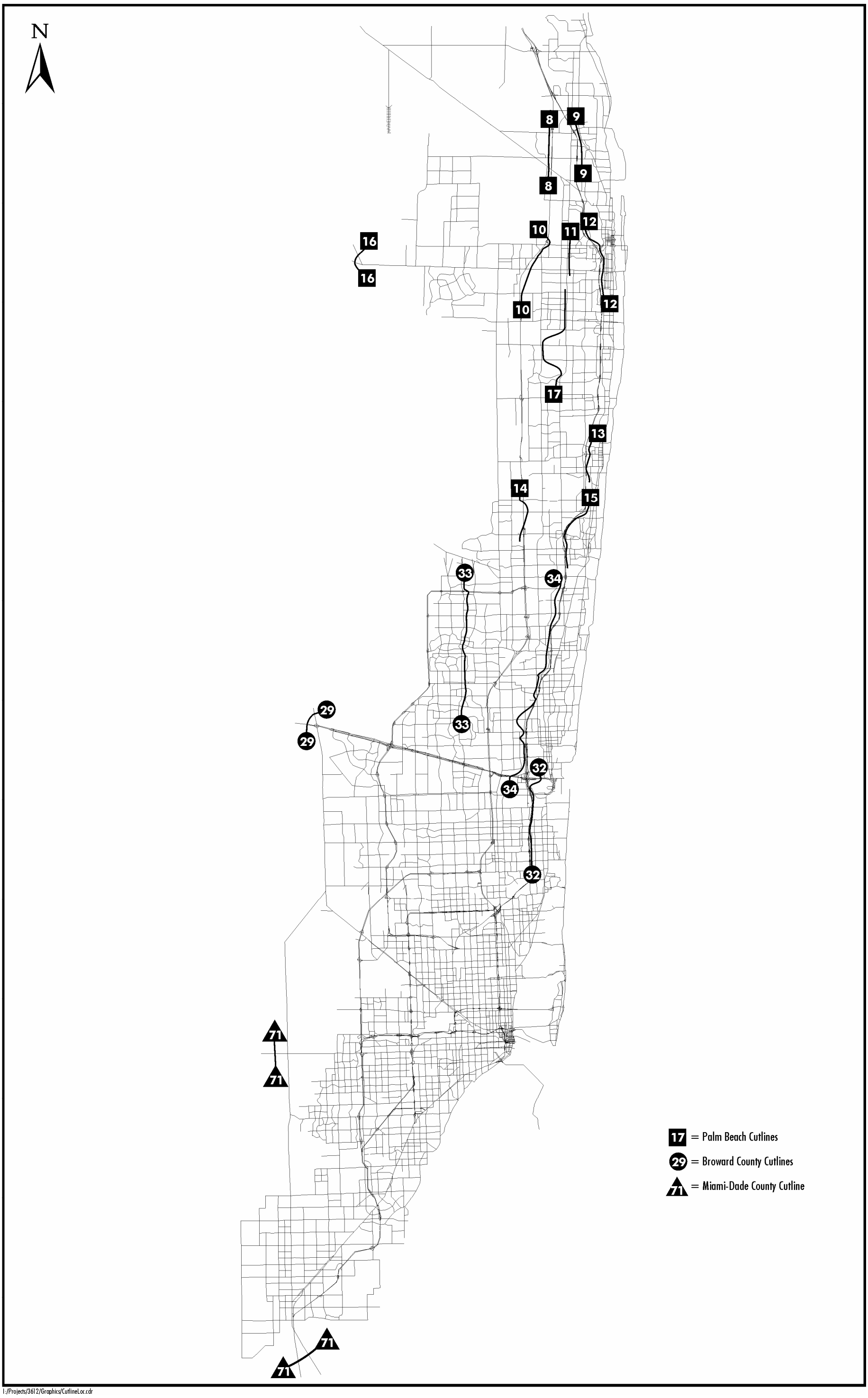
Figure 10-4: **Cutline Locations**
Southeast Regional Planning Model VI



I:/Projects/3612/Graphics/CutlineLoc.cdr

Table 10-6: **Volume/Count Ratios of Screenlines, Cutlines and Selected Corridors**
Southeast Regional Planning Model VI

SL, CL & Corridor Number	Screenline(SL), Cutline(CL) & Corrodor Name	Number of Links	No. of Links with Counts	Pct of Links with Counts	Total Count	Total Volume	Volume / Count Ratio (V/C)	SERPM6 (2000) Percent Deviation	Maximum Desirable Percent Deviation (*)
Screenlines (SL)									
2	PB: EW Southern SL North of Clintmore Rd	15	15	100%	388,142	416,505	1.07	7	
3	PB: EW SL along North of Boynton Beach Blvd	13	13	100%	368,358	378,851	1.03	3	
4	PB: EW Middle SL along South of Forest Hill	23	20	87%	509,238	486,943	0.96	4	
5	PB: EW Northern SL along N of 45th Street	13	12	92%	339,872	315,342	0.93	7	
6	PB: EW Northern SL along N of Donald Ross	13	12	92%	216,862	205,706	0.95	5	**17.1**
21	BO: EW Northern SL along Pompano Canal	22	20	91%	690,250	674,957	0.98	2	
22	BO: EW Middle SL along Oakland Park Blvd	26	24	92%	899,580	848,121	0.94	6	
23	BO: EW Southern SL along River Canal	25	23	92%	694,400	831,659	1.20	**20**	
24	BO: NS Western SL between I-75 and Turnpike	23	19	83%	482,300	463,825	0.96	4	
25	BO: NS Middle SL along Turnpike	29	28	97%	1,022,000	1,074,969	1.05	5	
42	MD: NS SL east of TPK	39	18	46%	613,726	551,254	0.90	10	
43	MD: EW SL south of I-75/Gratigney (SR 924)	39	21	54%	660,487	610,587	0.92	8	
44	MD: NS SL east of Palmeto Expwy (SR 826)	36	17	47%	788,158	766,552	0.97	3	
45	MD: EW Sl south of SR 934	29	20	69%	788,714	806,333	1.02	2	
46	MD: NS SL west of SR 9/27th Avenue	45	19	42%	777,148	763,781	0.98	2	
47	MD: EW SL south of Dolphin Expwy (SR 836)	36	13	36%	706,229	679,217	0.96	4	
48	MD: EW CL along TPK ext and SR 826	24	7	29%	293,960	247,706	0.84	**16**	**14.1**
49	MD: EW SL south of SR 986 (72nd St) and Snapper Expwy	25	9	36%	275,501	309,728	1.12	12	**14.8**
50	MD: NS SL west of I-95	51	23	45%	703,320	721,260	1.03	3	
51	MD: EW SL north of 152nd St (SR 992)	13	3	23%	199,448	226,294	1.13	13	**17.8**
53	MD: EW SL between 200th and 216th St	15	3	20%	43,360	45,045	1.04	4	**36.2**
18	PB: NS SL along Intra-Coastal Crossings	20	20	100%	319,574	309,229	0.97	3	
26	BO: NS Eastern SL along Intra-Coastal Crossings	12	12	100%	285,900	297,293	1.04	4	**14.4**
52	MD: NS Eastern SL along Intra-Coastal Crossings	15	6	40%	220,646	233,514	1.06	6	**16.9**
Inter-County Screenlines									
27	EW SL Palm Beach/Broward County Line	17	13	76%	414,100	454,746	1.10	10	
28	EW SL Broward/Miami-Dade County Line	25	23	92%	735,842	811,444	1.10	10	

Table 10-6 (Continued)

SL, CL & Corridor Number	Screenline(SL), Cutline(CL) & Corrodor Name	Number of Links	No. of Links with Counts	Pct of Links with Counts	Total Count	Total Volume	Volume / Count Ratio (V/C)	SERPM6 (2000) Percent Deviation	Maximum Desirable Percent Deviation (*)
	Cutlines (CL)								
8	PB: NS CL - West of Turnpike from PGA to Beeline	3	3	100%	57,402	86,535	1.51	51	31.5
9	PB: NS CL - East of I-95 from PGA to Northlake	5	4	80%	133,230	151,126	1.13	13	21.1
10	PB: NS CL along Turnpike from SR 704 to SR 822	4	4	100%	136,410	150,368	1.10	10	20.9
11	PB: NS CL - East of SR 809 from SR 704 to Gun Club	5	5	100%	149,636	151,910	1.02	2	20.1
12	PB: NS CL- East of I-95 from PB Lakes to Summitt	9	8	89%	236,982	254,438	1.07	7	16.3
13	PB: NS CL along I-95 from Lake IDA to Linton	4	4	100%	124,474	130,201	1.05	5	21.7
14	PB: NS CL along Turnpike from Clintmore to SR 806	3	3	100%	90,958	76,860	0.85	15	25.0
15	PB: NS CL along I-95 from SR 794 to SW 18th Street	7	7	100%	203,698	232,291	1.14	14	17.6
17	PB: NS CL by Heaven Hill from Summitt to Gateway	10	10	100%	198,760	170,261	0.86	14	17.8
32	BO: NS I-95 CL from Miami-Dade to I-595	11	11	100%	391,300	423,532	1.08	8	
33	BO: NS Western CL along SR 897 from Palm Beach to SR 816	20	17	85%	405,200	334,395	0.83	17	
34	BO: NS I-95 CL from Palm Beach to I-595	22	22	100%	983,000	912,971	0.93	7	
	Corridors								
59	BO: I-595 corridor links not specified in any other SL or CL (21-34)	10	10	100%	725,000	667,820	0.92	8	
75	BO: I-75 corridor links not specified in any other SL or CL (21-34)	10	10	100%	442,200	425,769	0.96	4	
86	BO: Sawgrass (SR 869) links not specified in any other SL or CL (21-34)	14	14	100%	294,200	231,584	0.79	21	14.1
91	BO: FL TPK (SR 91) corridor links not specified in any other SL or CL (21-34)	12	12	100%	432,100	446,213	1.03	3	
96	PB: TPK Links not in any other Palm Beach SL/CL	10	8	80%	160,998	165,712	1.03	3	19.5
95	PB/BO: I-95 Corridor links not specified in any other SL or CL	110	110	100%	6,778,732	6,817,892	1.01	1	
x	PB Corridor 95 Links	54	54	100%	3,378,832	3,365,064	1.00	0	
x	BO Corridor 95 Links	56	56	100%	3,399,900	3,452,828	1.02	2	
	External Stations								
7	PB: EW External SL at Martin County Line	9	8	89%	126,800	126,528	1.00	0	21.5
16	PB: Two Western External Stations	2	1	50%	11,200	11,179	1.00	0	56.0
29	BO: Western External CL at Collier County Line	3	3	100%	27,400	27,429	1.00	0	44.0
71	MD: Three Miami-Dade External Stations	3	3	100%	29,540	29,915	1.01	1	42.7
	All Other Count Locations								
99	All other Count locations (All Three Counties)				60,122,912	58,069,848	0.97	3	
	All other Count locations - Palm Beach County				16,944,936	16,341,220	0.96	4	
	All other Count locations - Broward County				22,758,446	22,901,002	1.01	1	
	All other Count locations - Miami-Dade County				20,419,560	18,827,600	0.92	8	

(*) Reference: Figure A-9, NCHRP 255 (for Counts <=300,000)

Figure 10-5: **Total Screenline Volumes and Maximum Desirable Deviation**
Southeast Regional Planning Model VI

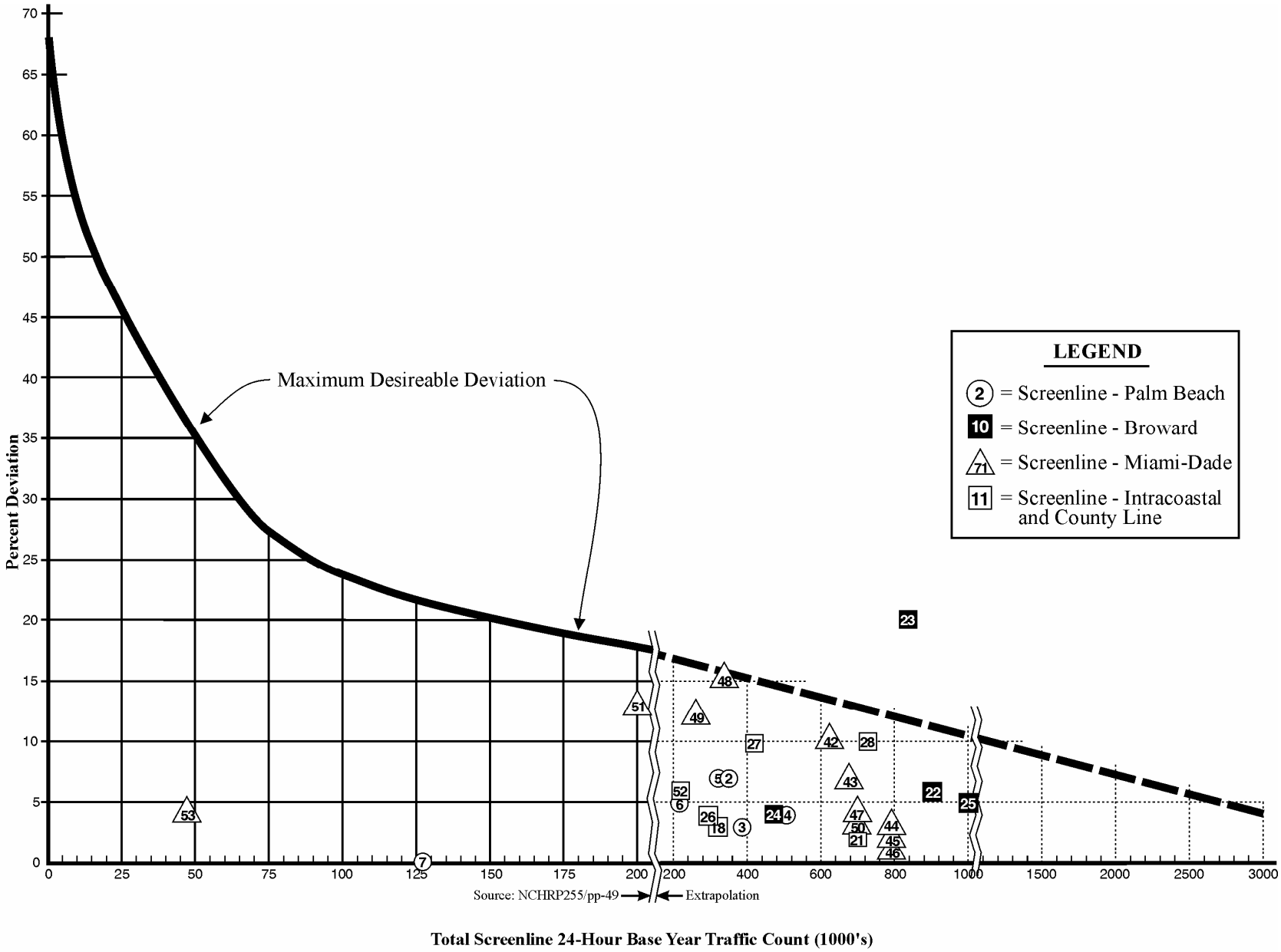
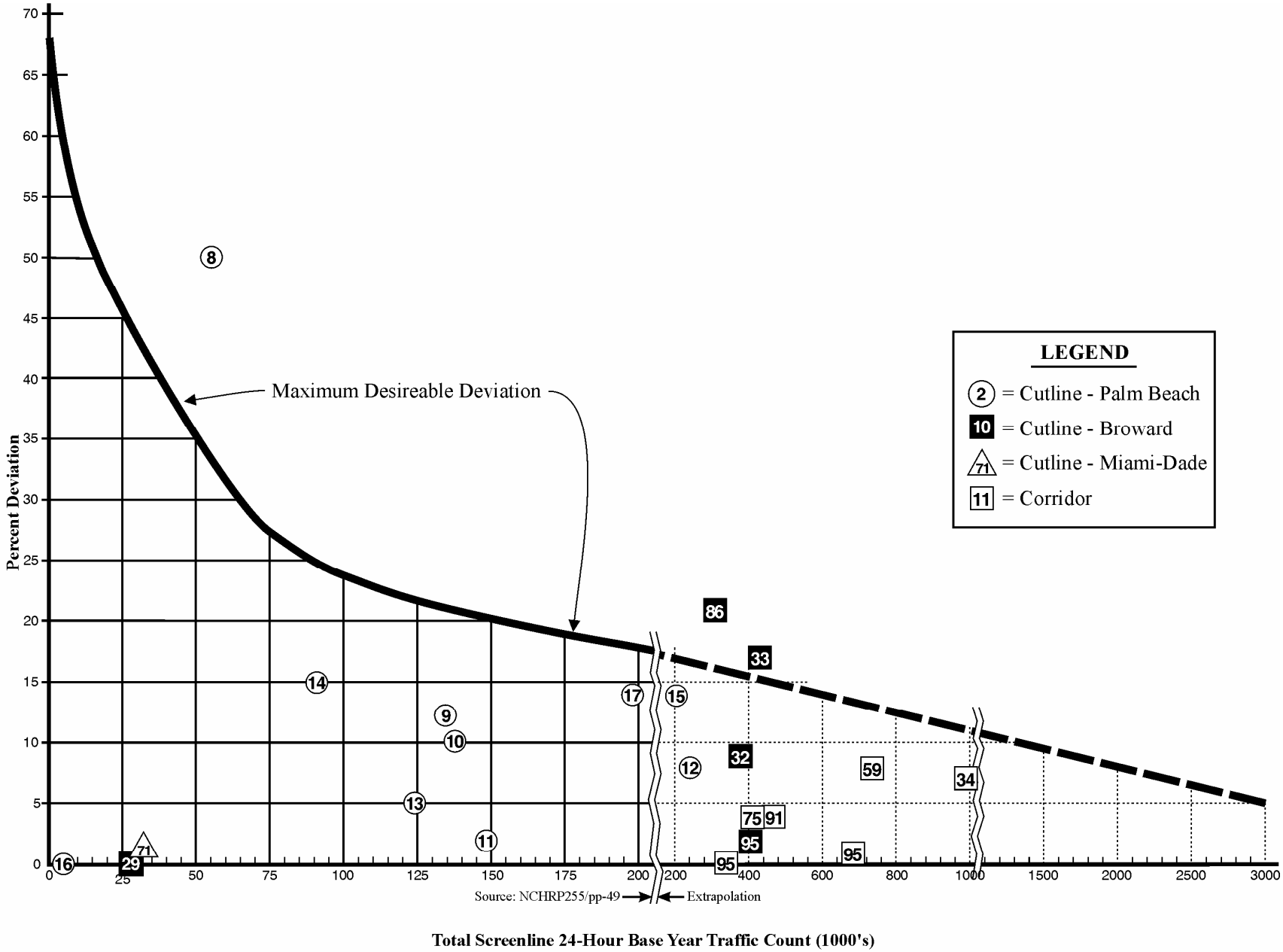


Figure 10-6: **Total Corridor and Cutline Volumes and Maximum Desirable Deviation**
Southeast Regional Planning Model VI



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- Two inter-county screenlines (27 and 28) have very good V/C ratios without any K-factors in SERPM6 model for controlling inter-county movement.

- Six corridors (Nos. 59, 75, 86, 91, 95 and 96) have V/C ratios in the range of 0.79 to 1.04. These corridors represent the 2000 Palm Beach and Broward model corridors. No corridors were established in the Miami-Dade region. Corridors 59, 75, 86, 91 and 95 represent I-595, I-75, Sawgrass Expressway (SR 869), Turnpike (SR 91) and I-95 links, which were not selected in any other screenlines or cutlines. All corridors, but 86, are below the maximum desirable deviation line of **Figure 10-6** and their V/C ratios range 0.92 to 1.04. The Sawgrass Expressway corridor is at the study boundary and assigned volumes always fell little short of counts in almost all previous regional and MPO models. The I-95 corridor, which captures most of the north-south traffic has V/C ratio of 1.01.

- All cutlines (Numbers 8-17, 29, 32-33, 71) V/C ratios are in the range of 0.83 to 1.51. It should be mentioned that no cutlines were coded in the Miami-Dade model. For the assessment of external model validation, a regional model cutline (no. 71) was coded in the regional model, which includes three Miami-Dade external station links. All but two of the cutlines (No. 8 and 33) fall below the maximum desirable deviation (see **Figure 10-6**). Cutline 8 with three traffic count locations runs north-south along the west of the Turnpike from PGA Boulevard to Beeline Highway, has a V/C ratio of 1.51 and combined traffic counts of 57,402. A parallel cutline (no. 9) has a V/C ratio of 1.13 and combined traffic counts of 133,230. Cutline 9 falls below the desirable line of **Figure 10-6**. It is very possible that traffic counts on one of the cutlines are underestimated in other cases. Cutline 33 falls just above the maximum desirable line. An observation of the V/C ratios through VIPER in this region does not reveal any overall pattern of underestimation and/or overestimation. So, no further actions were taken for cutlines 8 and 33.

Users should be cautioned to adjust the loaded volumes near the screenline(s) and cutline(s) where the departure from the desirable line is significant enough to alter planning and design decisions.

10.4.4 Volume-over-Count Ratios

Several indicators are available for determining the overall performance of the highway assignment model. The volume-over-count (V/C) statistics are one of the key statistics. The ratios of VMT and VHT, as calculated from assigned volume versus those calculated from ground counts were evaluated for those links where ground counts were available. The simple ratios of assigned volume over count also were recorded. Further aggregations of these statistics were compared by area type, facility type, and for the total of all links. A ratio of 1.0 indicates exact agreement between the assignment and the traffic count.

The FDOT Model Update Task C Report recommends a ±15 percent accuracy for assigned VMT (or VHT) to count VMT (or VHT). It is assumed that each combination of area/facility/number of lanes and link group contains a statistically valid number of links. For link groups having less than 100,000 total VMT (or less than 20,000 VHT), only a ±25 percent accuracy level is desired. Although not specified in the Task C report, assigned V/C ratios by their facility and area type were also analyzed. The analysis was based on a ±10 percent accuracy level, as was recommended for screenlines and cutlines.

<u>24-Hour Volume/Count Ratios</u>

The summaries of daily VMT based volume/count, VHT based volume/count and simple unweighted volume/count statistics by major facility and area type are summarized in **Table 10-7**. The averages of these three V/C ratios range between 0.92-1.09 for the major facility types for the whole region. The area types V/C ratios have a range of 0.92-1.01 for the whole region. The V/C ratios by facility and area type were also reported for each of the counties. The overall volume/count ratios for the three counties and region are as follows:

Table 10-7: **Year 2000 24-Hour Volume-over-Count Ratio by Facility and Area Types**
Southeast Regional Planning Model VI

0. ALL Counties

Facility Type	VMT Vol./Count	VHT Vol./Count	Volume/ Count	Ave. of 3 Vol/ Count Ratios	Area Type	VMT Vol./Count	VHT Vol./Count	Volume/ Count	Ave. of 3 Vol/ Count Ratios
1. Freeway (11)	1.02	1.03	1.03	1.03	1. CBD	0.91	0.90	0.94	0.92
2. Uninterrupted Roadways (21)	1.12	1.12	1.02	1.09	2. NonCBD HiDen	1.05	1.05	1.02	1.04
4. High Speed Arterials (41)	0.97	0.97	0.97	0.97	3. NonCBDMedDen	0.99	0.98	0.97	0.98
6. Low Speed Collectors (61)	0.92	0.93	0.88	0.91	4. NonCBDLowDen	0.98	0.99	0.98	0.98
7. Ramps (71-75, 93,94)	0.99	1.00	0.93	0.97	5. NonCBD VeryLowDen	1.00	1.03	0.99	1.01
8. HOV (81-84)	1.02	1.02	1.02	1.02					
9. Toll Facility (91-92)	0.98	0.98	0.99	0.98	**TOTAL**	**0.99**	**0.99**	**0.98**	**0.99**

1. Palm Beach County

Facility Type	VMT Vol./Count	VHT Vol./Count	Volume/ Count	Ave. of 3 Vol/ Count Ratios	Area Type	VMT Vol./Count	VHT Vol./Count	Volume/ Count	Ave. of 3 Vol/ Count Ratios
1. Freeway (11)	0.98	0.99	1.00	0.99	1. CBD	0.86	0.86	0.95	0.89
2. Uninterrupted Roadways (21)	1.20	1.21	1.10	1.17	2. NonCBD HiDen	1.17	1.21	1.01	1.13
4. High Speed Arterials (41)	0.99	1.00	0.99	0.99	3. NonCBDMedDen	0.96	0.95	0.98	0.96
6. Low Speed Collectors (61)	0.73	0.78	0.72	0.74	4. NonCBDLowDen	0.97	0.98	0.97	0.97
7. Ramps (71-75, 93,94)					5. NonCBD VeryLowDen	1.06	1.11	1.04	1.07
8. HOV (81-84)	1.04	1.04	1.00	1.03					
9. Toll Facility (91-92)	0.93	0.93	0.90	0.92	**TOTAL**	**0.98**	**0.99**	**0.98**	**0.98**

Table 10-7 (Continued)

2. Broward County

Facility Type	VMT Vol./Count	VHT Vol./Count	Volume/ Count	Ave. of 3 Vol/ Count Ratios	Area Type	VMT Vol./Count	VHT Vol./Count	Volume/ Count	Ave. of 3 Vol/ Count Ratios
1. Freeway (11)	1.00	1.00	1.01	1.00	1. CBD	0.88	0.88	0.98	0.91
2. Uninterrupted Roadways (21)	0.97	0.97	1.03	0.99	2. NonCBD HiDen	1.09	1.12	1.14	1.12
4. High Speed Arterials (41)	1.00	1.01	1.01	1.01	3. NonCBDMedDen	0.99	1.00	1.01	1.00
6. Low Speed Collectors (61)	0.98	0.98	0.99	0.98	4. NonCBDLowDen	0.99	1.00	1.00	1.00
7. Ramps (71-75, 93,94)					5. NonCBD VeryLowDen	0.98	0.98	0.98	0.98
8. HOV (81-84)	1.00	1.01	1.02	1.01					
9. Toll Facility (91-92)	0.91	0.91	0.98	0.93	**TOTAL**	**0.99**	**1.00**	**1.01**	**1.00**

3. Miami-Dade County

Facility Type	VMT Vol./Count	VHT Vol./Count	Volume/ Count	Ave. of 3 Vol/ Count Ratios	Area Type	VMT Vol./Count	VHT Vol./Count	Volume/ Count	Ave. of 3 Vol/ Count Ratios
1. Freeway (11)	1.07	1.08	1.06	1.07	1. CBD	0.94	0.92	0.91	0.92
2. Uninterrupted Roadways (21)	0.23	0.23	0.22	0.23	2. NonCBD HiDen	1.04	1.04	1.01	1.03
4. High Speed Arterials (41)	0.88	0.88	0.87	0.88	3. NonCBDMedDen	0.99	0.97	0.94	0.97
6. Low Speed Collectors (61)	1.01	1.01	0.87	0.96	4. NonCBDLowDen	0.98	0.95	0.91	0.95
7. Ramps (71-75, 93,94)	0.99	1.00	0.93	0.97	5. NonCBD VeryLowDen	0.89	0.87	0.88	0.88
8. HOV (81-84)	1.05	1.06	1.03	1.05					
9. Toll Facility (91-92)	1.08	1.09	1.03	1.07	**TOTAL**	**0.99**	**0.97**	**0.94**	**0.97**

Note: Statistics for Palm Beach, Broward and Miami-Dade Counties are generated from SERPM6 runs.

County	VMT Volume/ Count	VHT Volume/ Count	Volume/ Count	Average of three V/C Ratios
Palm Beach	0.98	0.99	0.98	0.98
Broward	0.99	1.00	1.01	1.00
Miami-Dade	0.99	0.97	0.94	0.97
All County	0.99	0.99	0.98	0.99

Most of these ratios of **Table 10-7** are within FDOT acceptable tolerances. The higher departures occur mainly when the link groups have few links with traffic counts (see **Table 2-6**). An example of this is the uninterrupted roadways in Miami-Dade County with only 2 links with traffic counts. Volume/Count ratios by area type and facility type provide measures of trip generation as well as trip distribution characteristics of the model chain. Results of these comparisons suggest that the highway assignment reflects well the observed vehicular traffic patterns in the SERPM region.

TOD Volume/Count Ratios

The summaries of the VMT based volume/count, VHT based volume/count and simple unweighted volume/count statistics by major facility type are summarized in **Table 10-8** for the three time periods (AM peak, PM peak and off-peak). The averages of these three V/C ratios range between 0.76-1.34, 0.70-1.25 and 0.66-1.13 by facility type for AM, PM and off-peak periods, respectively. The overall volume/count ratios for the three periods are as follows:

Period	VMT Volume/ Count	VHT Volume/ Count	Volume/ Count	Average of three V/C Ratios
AM-Peak	1.03	1.06	1.04	1.04
PM-Peak	1.05	1.08	1.05	1.06
Off-Peak	0.95	0.94	0.93	0.94

Validation of period volume to counts is also not very common. In SERPM6 model validation, the overall period volumes are used to adjust the TOD diurnal factors to make sure each period has right shares of model volumes. Very little emphasis was places on TOD volume/count ratios by facility type. The 24-hour counts were mainly used to evaluate the facility and area distribution of traffic volumes.

Posted Speed Group Volume/Count Ratios

SERPM6 model used posted speeds and signalization data as a major input to the initial speed calculation process. The process of calculation initial speeds is described in section 2.3. To assess the model performance, the posted speeds are grouped in the following groups to compute the volume/count ratios. Those groups are:

- Posted Speed Group 1: Less than and equal to 25 mph
- Posted Speed Group 2: More than 25 and less than equal to 35 mph
- Posted Speed Group 3: More than 35 and less than equal to 45 mph
- Posted Speed Group 4: More than 45 and less than equal to 55 mph
- Posted Speed Group 5: More than 55 and less than equal to 65 mph
- Posted Speed Group 6: More than 65 mph

Table 10-8: **Year 2000 TOD Volume-over-Count Ratio by Facility and Area Types**
Southeast Regional Planning Model VI

1. VMT-Volume/Count Ratio

Facility Type	AM Peak Period	PM Peak Period	Off-Peak Period
1. Freeway (11)	1.00	1.06	1.01
2. Uninterrupted Roadways (21)	1.16	1.27	1.13
4. High Speed Arterials (41)	1.05	1.05	0.92
6. Low Speed Collectors (61)	1.07	1.04	0.92
7. Ramps (71-75, 93,94)	1.37	0.76	0.92
8. HOV (81-82)	0.75	0.97	1.13
9. Toll Facility (91-92)	0.88	0.73	0.69
TOTAL	**1.03**	**1.05**	**0.95**

2. VHT-Volume/Count Ratio

Facility Type	AM Peak Period	PM Peak Period	Off-Peak Period
1. Freeway (11)	1.03	1.08	1.01
2. Uninterrupted Roadways (21)	1.18	1.30	1.12
4. High Speed Arterials (41)	1.07	1.08	0.92
6. Low Speed Collectors (61)	1.11	1.09	0.91
7. Ramps (71-75, 93,94)	1.40	0.77	0.96
8. HOV (81-82)	0.77	0.99	1.13
9. Toll Facility (91-92)	0.87	0.71	0.67
TOTAL	**1.06**	**1.08**	**0.94**

3. Volume/Count Ratio

Facility Type	AM Peak Period	PM Peak Period	Off-Peak Period
1. Freeway (11)	1.00	1.04	1.00
2. Uninterrupted Roadways (21)	1.07	1.18	0.99
4. High Speed Arterials (41)	1.06	1.05	0.91
6. Low Speed Collectors (61)	1.05	1.03	0.87
7. Ramps (71-75, 93,94)	1.25	0.68	0.75
8. HOV (81-82)	0.76	0.99	1.12
9. Toll Facility (91-92)	0.81	0.65	0.63
TOTAL	**1.04**	**1.05**	**0.93**

4. Averages of 3 Volume/Count Ratios

Facility Type	AM Peak Period	PM Peak Period	Off-Peak Period
1. Freeway (11)	1.01	1.06	1.01
2. Uninterrupted Roadways (21)	1.14	1.25	1.08
4. High Speed Arterials (41)	1.06	1.06	0.92
6. Low Speed Collectors (61)	1.08	1.05	0.90
7. Ramps (71-75, 93,94)	1.34	0.74	0.88
8. HOV (81-82)	0.76	0.98	1.13
9. Toll Facility (91-92)	0.85	0.70	0.66
TOTAL	**1.04**	**1.06**	**0.94**

Figure 2-2 depicts these posted speeds of 2000 network. **Table 2-7** presents the statistics on percentages and number of traffic counts on the basis of links and lane-miles for each of the posted speed group and major facility type combination. Overall, 19.2 % of links and 27.7% of lane-miles have 24-hour traffic counts. By posted speed groups, the percentages of links and lane-miles that have traffic counts are 9.8-29.8 and 15.2-39.3, respectively.

The volumes and traffic counts for each posted speed group and facility type combination were tabulated from the loaded network. **Table 10-9** presents the volume/count ratios (VMT, VHT and simple un-weighted) for each combination of the posted speed group and facility type. Beside lower speed group, all the volume/count ratios are within acceptable region. No systematic biases are across the speed groups. This is also true for the range of facility type. The overall volume/count ratios are very good. The averages of three V/C ratios range 0.92 to 1.09.

Cycle-Length Group Volume/Count Ratios

Signal cycle length is another major determinant of the initial free-flow speeds. Similar to posted speeds, cycle lengths groups were used to assess the model performances of the signal controlled facilities. Those groups are:

- Cycle Length Group 1: Less than and equal to 45 seconds
- Cycle Length Group 2: More than 45 and less than equal to 60 seconds
- Cycle Length Group 3: More than 60 and less than equal to 90 seconds
- Cycle Length Group 4: More than 90 and less than equal to 120 seconds
- Cycle Length Group 5: More than 120 seconds

Figure 2-3 depicts the signal-controlled facilities in the 2000 network. The locations of traffic signals are presented in Figure 2-4. **Table 2-8** presents the statistics on percentages and number of traffic counts on the basis of links and lane-miles for each of the cycle length group and major signal controlled facility type combination. Overall, 21.8 % of links and 28.1% of lane-miles have 24-hour traffic counts. By cycle length groups, the percentages of links and lane-miles that have traffic counts are 14.6-30.2 and 18.7-35.6, respectively.

The volumes and traffic counts for each cycle length group and facility type combination were tabulated from the loaded network. **Table 10-10** presents the volume/count ratios (VMT, VHT and simple un-weighted) for each combination of the cycle length group and facility type. For the signal-controlled facilities, the overall systemwide values of VMT-V/C, VHT-V/C and V/C are 0.961, 0.964 and 0.955, respectively.

Beside low speed collectors, all the volume/count ratios of other signal-controlled facilities are within acceptable region. Three V/C ratios of low speed collectors are 0.854, 0.872 and 0.846. It is a good comparison for this lower volume facility type. No systematic biases are across the cycle length groups. The overall volume/count ratios are very good. The averages of three V/C ratios range 0.925 to 1.039, with an overall value of 0.96.

Table 10-9: **Year 2000 24-Hour Volume-over-Count Ratio by Facility and Posted Speed Group Combination**
Southeast Regional Planning Model VI

A. VMT Volume/Count Ratio

	Posted Speed (in mph) Group						
Facility Type	**<25**	**25-35**	**35-45**	**45-55**	**55-65**	**>65**	**TOTAL**
1. Freeway (11)				1.04	1.02	0.99	**1.03**
2. Uninterrupted Roadways (21)			0.89	1.27	0.87		**1.12**
4. High Speed Arterials (41)		0.87	0.99	1.04	1.11		**0.97**
6. Low Speed Collectors (61)	0.54	0.93	1.46				**0.93**
7. Ramps (71-75, 93,94)			1.06	0.87			**0.99**
8. HOV (81-82)				1.06	1.00		**1.01**
9. Toll Facility (91-92)			1.30	0.59	1.00	0.95	**0.98**
TOTAL	**0.54**	**0.88**	**1.00**	**1.04**	**1.01**	**0.98**	**0.99**

B. VHT Volume/Count Ratio

	Posted Speed (in mph) Group						
Facility Type	**<25**	**25-35**	**35-45**	**45-55**	**55-65**	**>65**	**TOTAL**
1. Freeway (11)				1.05	1.02	0.99	**1.03**
2. Uninterrupted Roadways (21)			0.89	1.28	0.87		**1.13**
4. High Speed Arterials (41)		0.88	1.00	1.05	1.11		**0.97**
6. Low Speed Collectors (61)	0.60	0.93	1.52				**0.94**
7. Ramps (71-75, 93,94)			1.05	0.88			**1.00**
8. HOV (81-82)				1.06	1.00		**1.01**
9. Toll Facility (91-92)			1.30	0.57	1.01	0.94	**0.98**
TOTAL	**0.60**	**0.89**	**1.00**	**1.05**	**1.02**	**0.97**	**0.99**

C. Volume/Count Ratio

	Posted Speed (in mph) Group						
Facility Type	**<25**	**25-35**	**35-45**	**45-55**	**55-65**	**>65**	**TOTAL**
1. Freeway (11)				1.04	1.03	0.97	**1.03**
2. Uninterrupted Roadways (21)			0.95	1.09	0.88		**1.03**
4. High Speed Arterials (41)		0.88	0.99	1.05	1.08		**0.97**
6. Low Speed Collectors (61)	0.55	0.91	1.13				**0.89**
7. Ramps (71-75, 93,94)			0.99	0.78			**0.92**
8. HOV (81-82)				1.03	1.00		**1.01**
9. Toll Facility (91-92)			1.30	0.60	1.03	0.96	**0.99**
TOTAL	**0.55**	**0.89**	**0.99**	**1.03**	**1.03**	**0.97**	**0.98**

D. Average of 3 Volume/Count Ratio [(A+B+C)/3]

	Posted Speed (in mph) Group						
Facility Type	**<25**	**25-35**	**35-45**	**45-55**	**55-65**	**>65**	**TOTAL**
1. Freeway (11)				1.04	1.02	0.99	**1.03**
2. Uninterrupted Roadways (21)			0.91	1.21	0.87		**1.09**
4. High Speed Arterials (41)		0.88	0.99	1.05	1.10		**0.97**
6. Low Speed Collectors (61)	0.56	0.92	1.37				**0.92**
7. Ramps (71-75, 93,94)			1.03	0.84			**0.97**
8. HOV (81-82)				1.05	1.00		**1.01**
9. Toll Facility (91-92)			1.30	0.59	1.01	0.95	**0.98**
TOTAL	**0.56**	**0.89**	**1.00**	**1.04**	**1.02**	**0.97**	**0.99**

Table 10-10: **Year 2000 24-Hour Volume-over-Count Ratio by Facility and Cycle Length Group Combination**
Southeast Regional Planning Model VI

A. VMT Volume/Count Ratio

	Signal Cycle Length (in secs) Group					
Facility Type	**<45**	**45-60**	**60-90**	**90-120**	**>120**	**TOTAL**
2. Uninterrupted Roadways (21)			0.966	1.167		**1.141**
4. High Speed Arterials (41)	0.881	0.931	0.963	1.000		**0.962**
6. Low Speed Collectors (61)	1.302	0.883	0.800	0.416		**0.854**
7. Ramps (71-75, 93,94)						
9. Toll Facility (91-92)						
TOTAL	**0.951**	**0.915**	**0.960**	**1.063**		**0.961**

B. VHT Volume/Count Ratio

	Signal Cycle Length (in secs) Group					
Facility Type	**<45**	**45-60**	**60-90**	**90-120**	**>120**	**TOTAL**
2. Uninterrupted Roadways (21)			0.967	1.166		**1.144**
4. High Speed Arterials (41)	0.889	0.942	0.967	0.991		**0.966**
6. Low Speed Collectors (61)	1.308	0.906	0.802	0.415		**0.872**
7. Ramps (71-75, 93,94)						
9. Toll Facility (91-92)						
TOTAL	**0.964**	**0.928**	**0.964**	**1.047**		**0.964**

C. Volume/Count Ratio

	Signal Cycle Length (in secs) Group					
Facility Type	**<45**	**45-60**	**60-90**	**90-120**	**>120**	**TOTAL**
2. Uninterrupted Roadways (21)			0.816	1.084		**1.042**
4. High Speed Arterials (41)	0.944	0.961	0.958	1.010		**0.960**
6. Low Speed Collectors (61)	1.277	0.884	0.786	0.417		**0.846**
7. Ramps (71-75, 93,94)						
9. Toll Facility (91-92)						
TOTAL	**1.045**	**0.933**	**0.955**	**1.008**		**0.955**

D. Average of 3 Volume/Count Ratio [(A+B+C)/3]

	Signal Cycle Length (in secs) Group					
Facility Type	**<45**	**45-60**	**60-90**	**90-120**	**>120**	**TOTAL**
2. Uninterrupted Roadways (21)			0.916	1.139		**1.109**
4. High Speed Arterials (41)	0.905	0.945	0.963	1.000		**0.963**
6. Low Speed Collectors (61)	1.296	0.891	0.796	0.416		**0.857**
7. Ramps (71-75, 93,94)						
9. Toll Facility (91-92)						
TOTAL	**0.987**	**0.925**	**0.960**	**1.039**		**0.960**

10.4.5 Model and Observed Speeds

SERPM6 is a TOD model, where each period assignment generates its own constrained speeds. SERPM6 uses a new process to develop the initial speeds for the network (see Section 2.3). The initial speed is one of the key model parameters adjusted during the validation process. This adjustment can make specific transportation facilities more or less attractive, thereby causing the model to produce estimates that are closer in magnitude to observed conditions. Several changes were made to the initial speeds during the course of 2000 model validation process. The adjustments to the initial speeds were an iterative process designed to yield better estimates of traffic volumes that reflect observed traffic flows as well as to replicate observed speeds. The adjustments often been compromised to achieve both better traffic volumes and observed speeds. Section 2.4.2 compared model initial speeds to the period-specific constrained speeds of both 2000 and 2030 models. This section discusses period-specific constrained speeds to the observed speeds.

Speed validation is not very common in Florida. Most of the model validation assesses model volume against the traffic count. Validation of speeds often needs a compromise of results of speeds and volumes. The SERPM6 study gathers several recent speed and delay studies that were conducted by different agencies in the Southeast Florida regions. The observed speed study sections are coded onto highway network (see TDSECID link attribute of **Table B-1**). The speed studies are directional. The northbound and eastbound sections have TDSECID codes 1-57. The southbound and westbound sections used 101-157 codes. **Figure 10-7** depicts these sections and they represent approximately 2,117 directional miles of roadways. **Tables E-1** through **E-4** of Appendix E summarizes the period-specific model constrained and observed speeds. The speeds of these tables are aggregated by facility type and periods and are shown in **Table 10-11**. Both observed and estimated speeds are weighted to their segment length. Overall ratio of model estimated speed and that of observed speed is 1.01 for the 24-hour periods. Those ratios are 1.03, 0.94 and 1.07 for the AM, PM and off-peak periods, respectively. The differences in observed and model estimated speeds are also shown in **Table 10-11**. The speed differences are little more pronounced in facility types. In general, model estimated freeway speeds are less than the observed speeds. The reverse is true for the surface streets. The trends in model estimated are more reasonable than those exist in observed speeds. This may due to the fact that multiple agencies conducted the speed delay studies and many unforeseen incidents may distort the observed speeds.

Speed comparisons of some of the sections (see Tables **E-1** to **E-4**) show more variability in the differences of the estimated and observed speeds. To assess the variances in the sectional speeds, graphs (scatter-plots) of the section-level estimated constrained speeds versus observed speeds are presented in **Figures 10-8** to **10-10.** The statistical accuracy statistics (for example, RMSE and correlation) were also computed and presented in these figures. The scatter-plots exhibit a good linear trend (a high degree of correlation - 98 percent or higher) without any significant outliers.

Analyses of regression results are shown in each of these figures. The overall R-SQUARE of the fitted lines is in the range of 96-98 percent and the "F-statistics" are also very high. The RMSE of the estimated and observed speeds are 22.44, 17.79 and 21.26 for the AM, PM and off-peak periods, respectively. These low RMSE values and other comparisons of speeds (see Table 10-11) suggest that model is replicating the observed speeds reasonably well.

Figure 10-7: **Highway Sections of Observed Speed Study**
Southeast Regional Planning Model VI

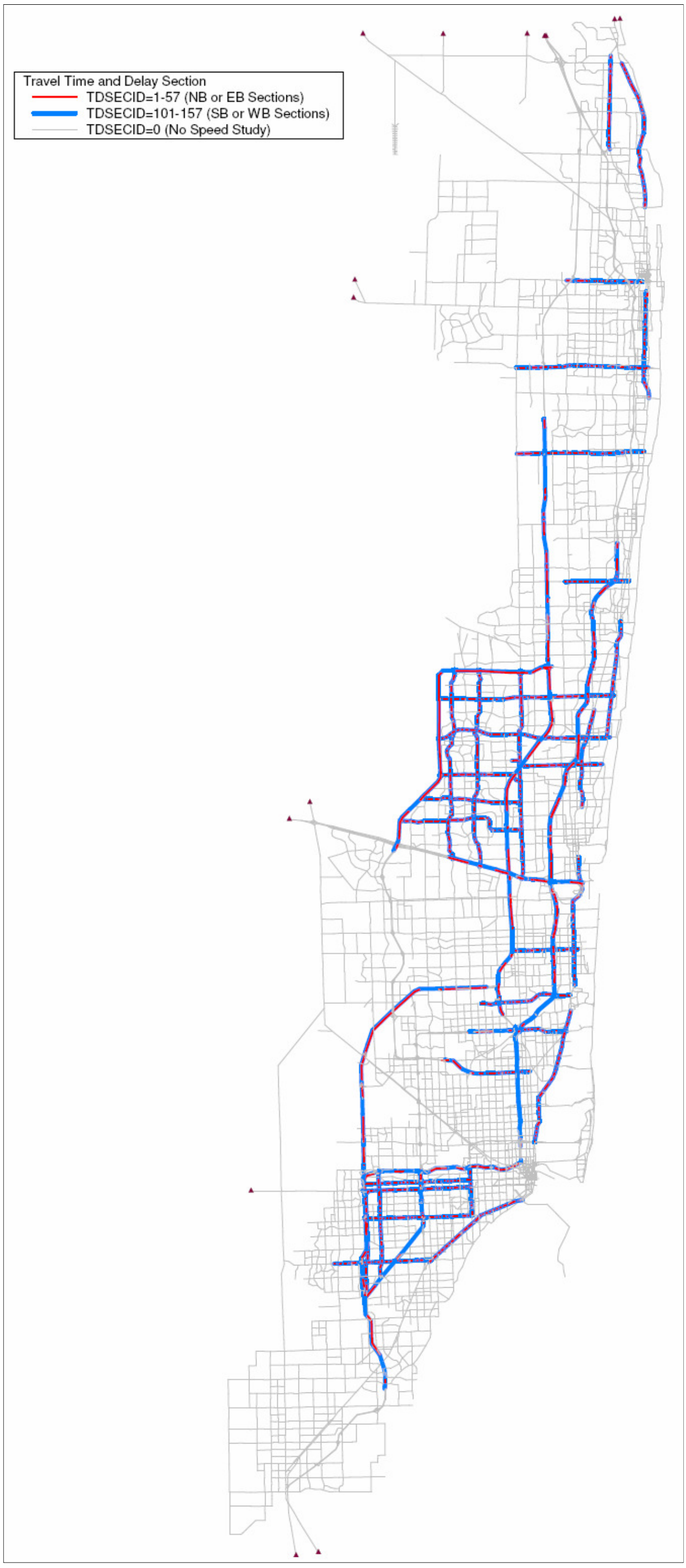


Table 10-11: **Comparison of Model Estimated and Observed Speeds**
Southeast Regional Planning Model VI

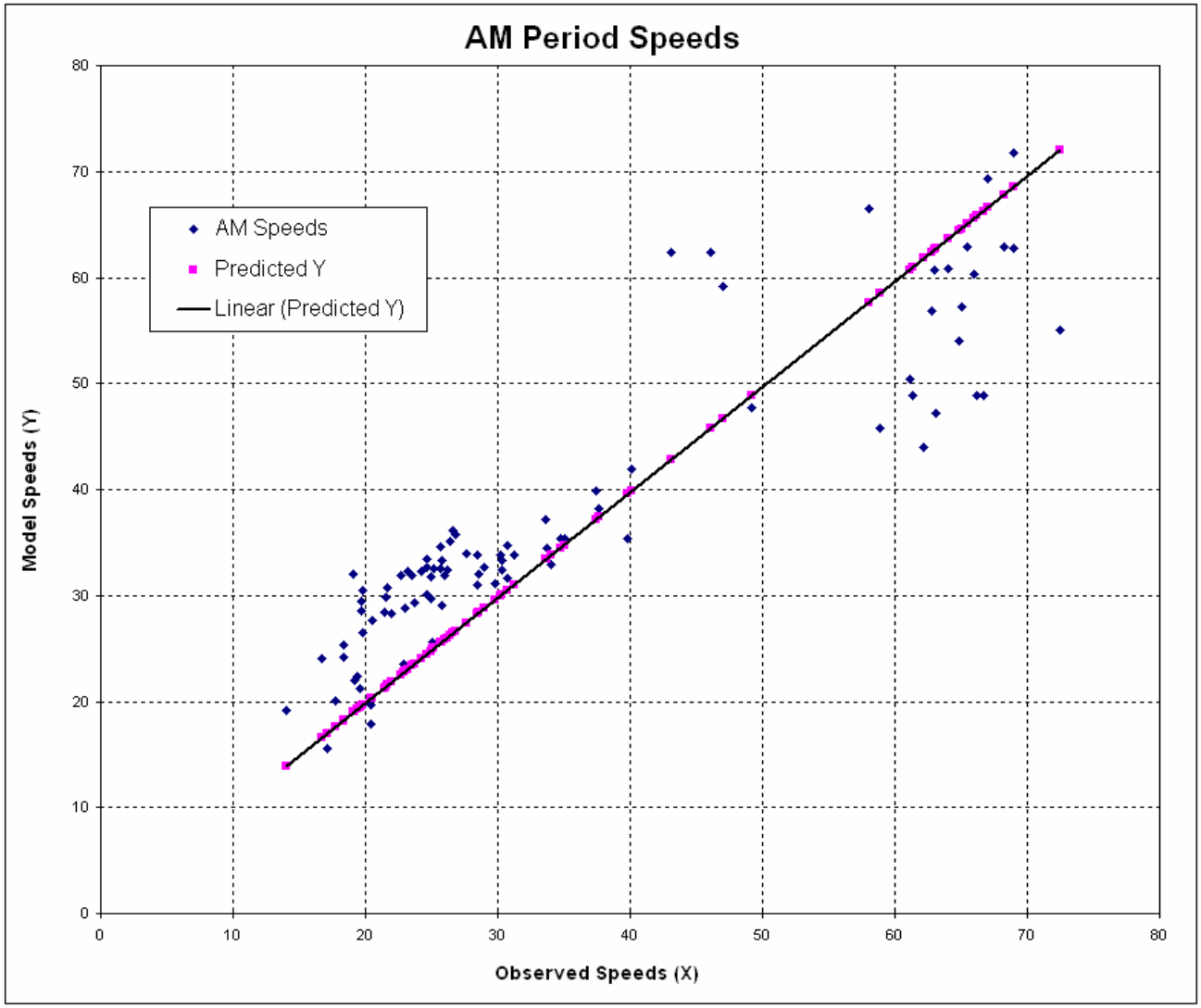
	Average Weighted Speed (mph)							
	Model				Observed			
Facility Type	AM	PM	Off Peak	All Periods	AM	PM	Off Peak	All Periods
Freeway - 11	45.36	45.40	48.78	46.39	46.84	54.15	52.25	50.58
Surface Streets - 41	29.83	27.42	31.71	30.13	24.69	23.60	26.62	25.25
HOV Lanes - 81	54.05	51.59		52.82	64.19	57.58		60.89
Toll Facility - 91	63.79	62.19	62.84	62.97	65.16	65.47	63.97	65.17
All Facilities:	40.97	43.92	37.88	40.87	39.97	46.75	35.41	40.48

	Speed Difference (Model-Obssrved), mph			
Facility Type	AM	PM	Off Peak	All Periods
Freeway - 11	-1.49	-8.75	-3.47	-4.19
Surface Streets - 41	5.14	3.83	5.09	4.88
HOV Lanes - 81	-10.14	-5.99		-8.07
Toll Facility - 91	-1.37	-3.29	-1.13	-2.19
All Facilities:	1.01	-2.83	2.47	0.39

	Model/Observed Speed Ratio			
Facility Type	AM	PM	Off Peak	All Periods
Freeway - 11	0.97	0.84	0.93	0.92
Surface Streets - 41	1.21	1.16	1.19	1.19
HOV Lanes - 81	0.84	0.90		0.87
Toll Facility - 91	0.98	0.95	0.98	0.97
All Facilities:	1.03	0.94	1.07	1.01

	Total Segment Length (miles)			
Facility Type	AM	PM	Off Peak	All Periods
Freeway - 11	233	164	168	565
Surface Streets - 41	459	198	427	1,084
HOV Lanes - 81	91	91		182
Toll Facility - 91	127	127	32	287
All Facilities:	910	580	627	2,117

Figure 10-8: **Scatterplot and Accuracy Statistics of AM Period Speeds**
Southeast Regional Planning Model VI



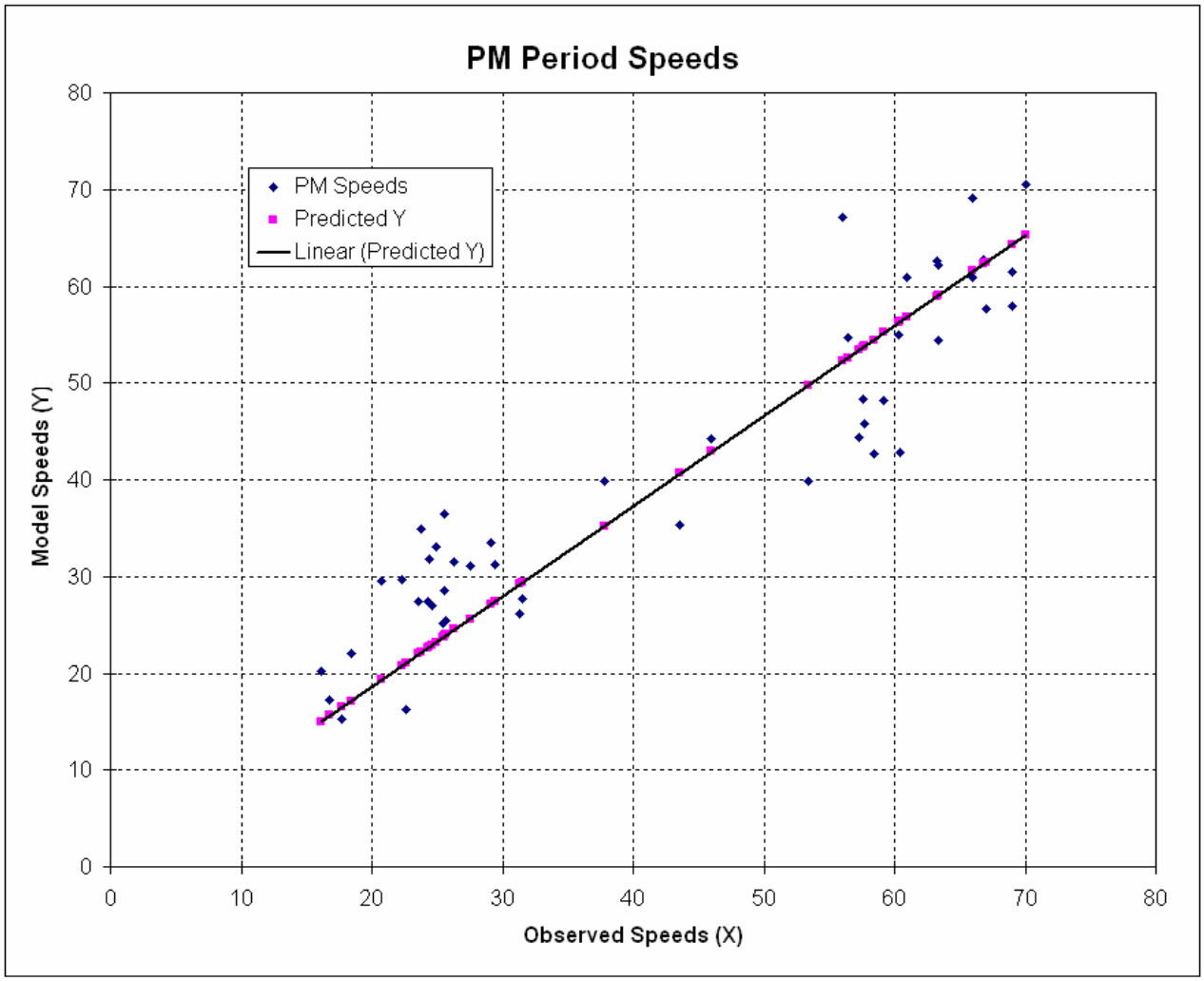
RMSE:	22.44%

Regression Statistics	
Multiple R	98.03%
R Square	**96.09%**
Adjusted R Square	**94.96%**
Standard Error	7.91
Observations	89

ANOVA Statistics:

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	135,569	135,569	**2164.96**	**2.96E-63**
Residual	88	5,511	63		
Total	89	141,080			

Figure 10-9: **Scatterplot and Accuracy Statistics of PM Period Speeds**
Southeast Regional Planning Model VI



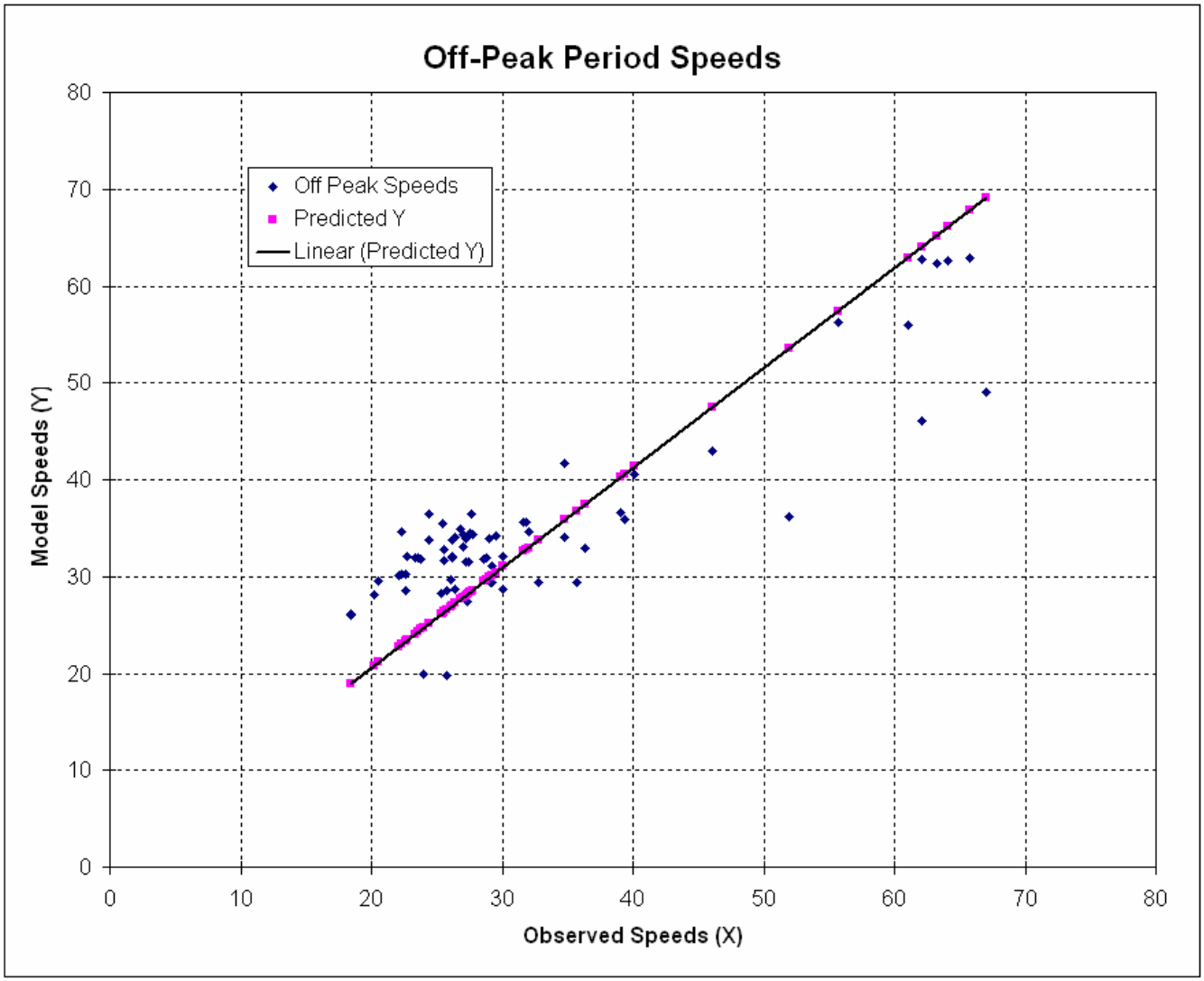
RMSE:	17.79%

Regression Statistics	
Multiple R	98.79%
R Square	**97.60%**
Adjusted R Square	**95.43%**
Standard Error	6.83
Observations	47

ANOVA Statistics:

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	87,421	87,421	**1874.09**	**2.54E-38**
Residual	46	2,146	47		
Total	47	89,567			

Figure 10-10: **Scatterplot and Accuracy Statistics of Midday Period Speeds**
Southeast Regional Planning Model VI



RMSE:	21.26%

Regression Statistics	
Multiple R	98.27%
R Square	**96.58%**
Adjusted R Square	**95.09%**
Standard Error	6.76
Observations	68

ANOVA Statistics:

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	86,438	86,438	**1890.69**	**2.65E-50**
Residual	67	3,063	46		
Total	68	89,501			

10.4.6 Average Volume and Vehicle-Miles-of-Travel

Assigned volumes multiplied by link distances equals vehicle miles of travel (VMT). The link times in hour multiplied by assigned volumes results in vehicle hours of travel (VHT). These measures of system demand provide insight into other network attributes, such as fuel consumption and emissions. To assess the reasonableness of the loaded volume as well as model performance evaluation, HEVAL-generated average link loads, VMT and VHT by the major facility and area types are summarized in **Table 10-12** for both 2000 and 2030 model runs**.** It also presents the VMT distribution and growths in VMT, VHT and average link volumes. Results are prepared for the whole region as well as for each county. In 2000, the average directional freeway volume is approximately 69,951 with 21.2% of VMT on freeways. HOV lane loads and VMTs are shown separately. High-speed arterials (53% VMT in 2000) account for most of the travel.

Average loaded volumes by facility type follow the expected trend. Examples are much higher levels of traffic on limited access facilities. The per-capita and per-household VMT and VHT of the 2000 and 2030 SERPM6 runs are calculated and are shown in **Tables 10-3** and **10-5**. They are:

	VMT/HH		VMT/Person		VHT/HH		VHT/Person	
County	**Yr 2000**	**Yr 2030**	**Yr 2000**	**Yr 2030**	**Yr 2000**	**Yr 2030**	**Yr 2000**	**Yr 2030**
Palm Beach	51.26	57.91	22.14	23.20	1.43	1.68	0.62	0.67
Broward	51.20	52.84	20.91	20.65	1.46	1.64	0.59	0.64
Miami-Dade	48.76	51.35	17.13	17.69	1.65	2.01	0.58	0.69
All County	50.22	53.56	19.48	19.99	1.53	1.80	0.59	0.67

In general, VMT/HH and VMT/person indices are higher in Palm Beach and Broward compare to those in Miami-Dade. On the other hand, VHT/HH index is higher in Miami-Dade. The growths in VMT, VHT and average volumes in 2030 compare to 2000 are also very reasonable by facilities and counties.

The VMT statistics compare very well to those found in many other areas and in the literature. According to the "*Model Validation and Reasonableness Checking Manual* [Reference 29], reasonable ranges of VMT per household are 40-60 miles per day for large urban areas and 30-40 miles per day for small urban areas. The 1990 NPTS reported an average of 41.37 vehicle miles traveled per household daily. Reasonable ranges of VMT per person are 17-24 miles per day for large urban areas and 10-16 miles per day for small urban areas. The FDOT Task C report recommends that the VMT per capita per day be in the range of 10-15, which includes the effects of the mode choice and auto occupancy models. VMT per person for the SERPM6 and its constituent counties are higher than suggested by FDOT. Per reference 29, the VMT/person and VMT/HH statistics for SERPM and its constituent counties fall within the suggested ranges.

Table 10-12 presents the distribution of VMT among the facilities for region and the constituent counties for the 2000 and 2030 model runs. To gauge the reasonableness of the VMT by functional classification, a table from Reference 29 (a recent FHWA/TMIP publication) is reproduced below:

Table 10-12: **Comparison of 2030 and 2000 VMT, VHT and Average Volume by Facility Type**
Southeast Regional Planning Model VI

0. ALL Counties

Facility Type	Year 2000 Model				Year 2030 Model				Growth (2030/2000)		
	VMT	% VMT	VHT	Avg Vol	VMT	% VMT	VHT	Avg Vol	VMT	VHT	Avg Vol
1. Freeway (11)	24,290,686	25.5%	554,648	69,800	30,906,332	21.2%	750,086	86,329	1.27	1.35	1.24
2. Uninterrupted Roadways (21)	1,746,695	1.8%	45,751	17,329	4,148,306	2.8%	105,151	35,052	2.37	2.30	2.02
4. High Speed Arterials (41)	50,782,568	53.3%	1,775,328	23,033	73,143,208	50.2%	2,857,599	31,483	1.44	1.61	1.37
6. Low Speed Collectors (61)	6,808,197	7.1%	270,708	8,738	11,859,997	8.1%	580,283	13,433	1.74	2.14	1.54
7. Ramps (71-75, 93,94)	2,751,526	2.9%	102,584	11,859	4,274,876	2.9%	190,410	14,671	1.55	1.86	1.24
8. HOV (81-84)	1,765,616	1.9%	34,804	18,522	4,757,961	3.3%	104,736	20,988	2.69	3.01	1.13
9. Toll Facility (91-92)	7,096,283	7.5%	119,888	23,024	16,568,210	11.4%	324,908	50,012	2.33	2.71	2.17
ALL Facility:	95,241,571	100.0%	2,903,711	21,418	145,658,890	100.0%	4,913,173	29,113	1.53	1.69	1.36

1. Palm Beach County

Facility Type	Year 2000 Model				Year 2030 Model				Growth (2030/2000)		
	VMT	% VMT	VHT	Avg Vol	VMT	% VMT	VHT	Avg Vol	VMT	VHT	Avg Vol
1. Freeway (11)	5,935,144	24.7%	126,028	66,240	7,609,840	18.7%	163,464	87,981	1.28	1.30	1.33
2. Uninterrupted Roadways (21)	1,232,330	5.1%	32,718	15,625	3,345,100	8.2%	82,018	41,121	2.71	2.51	2.63
4. High Speed Arterials (41)	13,576,866	56.5%	428,004	19,941	20,962,492	51.6%	669,360	28,115	1.54	1.56	1.41
6. Low Speed Collectors (61)	868,057	3.6%	35,255	6,035	2,847,794	7.0%	132,823	14,458	3.28	3.77	2.40
7. Ramps (71-75, 93,94)	576,478	2.4%	19,116	13,530	934,527	2.3%	34,860	12,793	1.62	1.82	0.95
8. HOV (81-84)	289,554	1.2%	5,328	18,466	1,643,872	4.0%	33,472	19,368	5.68	6.28	1.05
9. Toll Facility (91-92)	1,558,166	6.5%	24,774	17,803	3,248,344	8.0%	56,018	38,902	2.08	2.26	2.19
ALL Facility:	24,036,595	100.0%	671,223	18,932	40,591,969	100.0%	1,172,015	27,149	1.69	1.75	1.43

Table 10-12 (Continued)

2. Broward County

Facility Type	Year 2000 Model				Year 2030 Model				Growth (2030/2000)		
	VMT	% VMT	VHT	Avg Vol	VMT	% VMT	VHT	Avg Vol	VMT	VHT	Avg Vol
1. Freeway (11)	8,090,965	24.2%	164,939	75,314	11,033,684	22.5%	241,263	96,373	1.36	1.46	1.28
2. Uninterrupted Roadways (21)	502,617	1.5%	12,746	21,233	779,470	1.6%	22,616	28,836	1.55	1.77	1.36
4. High Speed Arterials (41)	18,464,414	55.2%	608,647	28,126	25,919,670	52.8%	957,339	38,611	1.40	1.57	1.37
6. Low Speed Collectors (61)	1,800,360	5.4%	70,266	8,915	2,567,712	5.2%	111,147	11,770	1.43	1.58	1.32
7. Ramps (71-75, 93,94)	742,446	2.2%	29,331	12,492	1,075,225	2.2%	53,380	17,045	1.45	1.82	1.36
8. HOV (81-84)	1,008,525	3.0%	19,312	19,683	1,263,767	2.6%	27,271	24,640	1.25	1.41	1.25
9. Toll Facility (91-92)	2,843,609	8.5%	45,045	22,670	6,434,085	13.1%	109,244	50,656	2.26	2.43	2.23
ALL Facility:	33,452,936	100.0%	950,286	25,975	49,073,613	100.0%	1,522,260	35,929	1.47	1.60	1.38

3. Miami-Dade County

Facility Type	Year 2000 Model				Year 2030 Model				Growth (2030/2000)		
	VMT	% VMT	VHT	Avg Vol	VMT	% VMT	VHT	Avg Vol	VMT	VHT	Avg Vol
1. Freeway (11)	10,264,577	27.2%	263,681	67,755	12,262,809	21.9%	345,358	79,053	1.19	1.31	1.17
2. Uninterrupted Roadways (21)	11,748	0.0%	287	6,553	23,736	0.0%	517	13,269	2.02	1.80	2.02
4. High Speed Arterials (41)	18,741,316	49.6%	738,677	22,283	26,261,070	46.9%	1,230,900	29,761	1.40	1.67	1.34
6. Low Speed Collectors (61)	4,139,777	11.0%	165,187	9,875	6,444,489	11.5%	336,313	13,481	1.56	2.04	1.37
7. Ramps (71-75, 93,94)	1,432,603	3.8%	54,138	11,291	2,265,124	4.0%	102,170	14,558	1.58	1.89	1.29
8. HOV (81-84)	467,538	1.2%	10,164	16,870	1,850,321	3.3%	43,993	20,429	3.96	4.33	1.21
9. Toll Facility (91-92)	2,694,508	7.1%	50,069	26,804	6,885,781	12.3%	159,646	54,142	2.56	3.19	2.02
ALL Facility:	37,752,067	100.0%	1,282,203	20,361	55,993,330	100.0%	2,218,897	26,882	1.48	1.73	1.32

Note: Statistics for Palm Beach, Broward and Miami-Dade Counties are generated from SERPM6 runs.

VMT Distribution – National Statistics

Functional Class	Small 50-200K	Medium 200-1M	Large >1M
Freeway/Expressway	18-23%	33-38%	40%
Other Principal Arterials	37-43%	27-33%	27%
Minor Arterials	25-28%	18-22%	18-22%
Collectors	12-15%	8-12%	8-12%

Source: Table 7-4, Model Validation and Reasonableness Checking Manual, FHWA, 1997.

The percent distribution of VMT by the facility for the 2000 and 2030 24-hour period is:

	Freeway, Toll, Ramp & HOV		Uninterrupted Roadways & Arterials		Collectors	
	2000	2030	2000	2030	2000	2030
SERPM	37.6	38.8	55.1	53.1	7.2	8.1
Palm Beach	34.8	33.1	61.6	59.8	3.6	7.0
Broward	37.9	40.5	56.7	54.4	5.4	5.2
Miami-Dade	39.3	41.5	49.7	46.9	11.0	11.5

The VMT distribution is highly dependent on the distribution of facility types. The SERPM model VMT distribution by facility type follows the national trend very closely. The limited access facilities (Freeway, Toll, Ramp and HOV) do show small increasing trends in VMT distribution over the time.

The average link volumes of the 2030 SERPM6 24-hour period volumes by facility types are compared in **Table 10-12**. This comparison was made for the whole region as well as for each county. Overall, there are 44, 38, 31 and 36 percent growth in link average volumes for the Palm Beach, Broward, Miami-Dade and SERPM region, respectively. The growth in average link volume by facility types is not same among the counties. This is mostly due to the dissimilar lane-miles patterns in the three counties (see **Table 2-4**). In the case of HOV facilities, although average volume has increased modestly in the 2030 model to about 15 percent for the region, the growth in VMT is significant (172%). The HOV lane miles in 2030 showed more growth (145% for the region and Palm Beach itself 480%, see **Table 2-4**) than the other facilities. This has produced more growth in the overall travel (VMT measure) for the HOV facilities.

The VMT of the 2030 SERPM6 24-hour period are compared in **Table 10-12** by facility and area types. This comparison was made for the whole region as well as for each county. Overall, there are 69, 47, 48 and 53 percent growth in travel for the Palm Beach, Broward, Miami-Dade and the SERPM region, respectively. For the regions all the facilities types have shown positive growths. The overall growth by facility types varies among the counties. By facility type, the HOV and toll facilities show the largest growth.

Two important statistics for highway planning, design, and management are VMT and VHT. All national statistics show an increase in these measures every year. For instance, Table 2 of the 1990 Nationwide Personal Transportation Survey reports the following:

	1969	1977	1983	1990
(a) Daily VMT per household	34.01	32.97	32.16	41.37
(b) Persons per household	3.16	2.83	2.69	2.56
(c) Daily VMT per capita [computed as (a)/(b)]	10.76	11.65	11.96	16.16

Daily VMT/HH and VMT/person of the SERPM model from 1990 [Reference 18], 1996 [Reference 16], 1999 & 2025 [Reference 12], 2000 & 2030 (SERPM6) of the 24-hour period are shown in the following table:

	Daily VMT per Household					
	1990	1996	1999	2000	2025	2030
Palm Beach	47.6	50.8	50.2	51.3	57.4	57.9
Broward	40.6	47.3	52.0	51.2	57.7	52.8
Miami-Dade	44.0	43.4	50.5	48.8	58.8	51.4
All County	43.7	46.5	50.9	50.2	58.1	53.6

	Daily VMT per Capita					
	1990	1996	1999	2000	2025	2030
Palm Beach	21.0	22.1	22.3	22.1	25.1	23.2
Broward	17.7	20.3	22.0	20.9	24.5	20.7
Miami-Dade	16.4	16.2	18.2	17.1	20.6	17.7
All County	17.8	18.9	20.4	19.5	22.9	20.0

Similar to the national trend, a slight increasing trend in both VMT/HH and VMT/person was found in the region as well as for each individual county. However, for this large urbanized region, the increasing trend was judged to be insignificant.

All of the statistics from the SERPM6 model presented in numerous tables and figures in this chapter indicate that the SERPM6 model produces quality results and the model is validated well with respect to FDOT and national standards. Unlike the predecessor models, SERPM6 model was validated against the observed speeds and traffic counts.

The SERPM6 model was validated to 2000 data. In addition, a 2030 SERPM6 model was developed using the MPO's 2030 model data. The data on which the model was based were generally developed from the 2000 Southeast Florida Travel Characteristics Survey and the 2000 Census data. The zonal data were developed by the three MPOs for 2000. Traffic count data for 2000 were obtained from FDOT and the counties. Transit supply and ridership data were obtained from the transit operators through MPO modeling process.

The model validation demonstrates that SERPM6 does an excellent job of replicating existing travel conditions. Modeling theory suggests that if the model performs well in the validation year, it would provide reasonable travel estimates for other years and travel assumptions. However, occasionally modelers discover that a model that is thought to be well calibrated does not provide reasonable and logical results in future years. Because of this, the SERPM6 model validation includes both 2000 and 2030 models and compare their results.

11. TRUCK ASSIGNMENT MODEL

The SERPM5 and SERPM6 truck model was updated using a truck model similar to the recommendation of Quick Response Freight Manual [QRFM, Reference 30]. This QRFM model was also implemented in 2000 Palm Beach and Broward models. The SERPM6 truck model was enhanced incorporating national research and guidelines to develop urban area truck model. The SERPM6 truck assignment follows a multi-class multi-period iterative assignment process. In this truck trips are simultaneously assigned with other highway trips (drive alone and shared rides). In SERPM6, three period truck loadings are combined to form 24-hour truck volumes, which are then compared to the 24-hour truck traffic counts.

11.1 Model Process and Enhancements

Separate generation and distribution procedures are used to model the three truck purposes - Four-tired Commercial Vehicle, Single Units and Combinations. The generation and distribution of the truck model were patterned after the QRFM. The truck multi-class truck assignment process in SERPM6 is new. The earlier versions of SERPM used a free-flow assignment of truck only trips. The truck loads were then used as a preload in final assignment. In SERPM6, both warm-up and final assignments use a truck as a class in the multi-class assignment process. The trip assignment process includes a truck assignment preloading and a truck-only assignment. The salient features of the SERPM6 truck assignment method are as follows:

- The four-tired truck table is added to the drive alone trips and is not included in the truck-only assignment.
- The method then combines single-unit and combinations truck internal (including internal-external) trip tables and the external truck tables for combined truck traffic assignment.
- The period trip table module develops period-specific truck OD tables along with other highway trips.
- The total truck OD tables are assigned to network for each period separately using CV multi-class equilibrium technique.
- The three period truck loads are converted to truck units using a Passenger-Car-Equivalent (PCE) and then added to for an estimate of 24-hour truck load.
- The 24-hour truck loads are then compared to the 24-hour truck counts for all region and each county separately using a database version of FAUTMS HEVAL routine.

A capacity restraint assignment of the 4-tire trucks was made with DA trips. This assignment process uses the existing network and travel characteristics data for truck traffic assignment. The two underlying reasons for adding four-tired trucks to Drive-Alone (DA) trips are: (1) they are not included in the FDOT's truck count percentages, (2) the congestion of the network influence the paths taken for 4-tired trucks in assignment similar to other cars.

11.2 Truck Traffic Counts

The truck count percentages (T) in Florida's Traffic Information CDROM are based on FHWA's vehicle classes 4 to 13. The thirteen vehicle classes are:

1. Motorcycles
2. Passenger Cars
3. Other Two-axles, Four-tire, Single Unit Vehicles
4. Buses
5. Two-axles, Six-tire, Single Unit Trucks
6. Three-axles, Single Unit Trucks
7. Four- or more-axles, Single Unit Trucks
8. Three- or Four-axles, Single Trailer Trucks

9. Five-axles, Single Trailer Trucks
10. Six- or more-axles, Single Trailer Trucks
11. Five- or less-axles, Multi-trailer Trucks
12. Six-axles, Multi-trailer Trucks
13. Seven- or more-axles, Multi-trailer Trucks

It should be noted that the model estimated truck volumes do not include four-tired commercial vehicle (FHWA's vehicle class 3). Vehicle class three represents two-axles, four-tire vehicles other than passenger cars (including pickups, panels, vans and other vehicles such as campers, motor homes, ambulances). Since vehicle class three is not included in the truck count statistics, a direct comparison is possible between model estimated truck volume and truck traffic count generated from Florida's Traffic Information CDROM.

SERPM6 model included truck traffic counts used in the 2000 Palm Beach and Broward models. Additional classification counts were assembled for the Miami-Dade region and were entered in the network. **Figure 11-1** depicts the location where truck traffic counts exist for 2000 model validation. There are 6.65 of the links with truck traffic counts. However, these percentages are generally higher for Palm Beach and Broward.

The main source of the truck data was FDOT's "Florida Traffic Information" CDROM. The CDROM contains data, in the form of an ArcView point shape file, on AADTs, K, D and T. This data are often used to check the classification counts. **Table 11-1** presents the summary of truck traffic counts in terms of percentage and average counts by facility and area types for the whole region as well as for each individual county.

11.3 Results and Comparisons

This section compares the model estimated truck volume summary against the truck count summary. Although evaluation outputs create link-by-link summaries of truck volumes against the truck counts, a link-by-link comparison was not primarily done for the following reasons:

- Only a small percentage of links has truck traffic counts (about 6.65 % links in the study area).
- Truck counts based on truck classification data are usually daily average data and the ADT used to compute truck count percentages often does not conform to the well reviewed AADT traffic counts on the network.
- The double-line coding of freeways and expressways would need extensive further adjustment to truck count. On freeways, the truck traffic counts were often tagged on HOV lanes and ramps. They are also tagged on one of the two-directional facilities.

For these reasons, an "aggregate" comparison was performed. Similar to the truck traffic count statistics, model generated average truck traffic volumes, VMT and their percentages were summarized. **Table 11-2** presents these statistics by the major facility and area types and the regions.

The truck volume statistics do not include 4-tire trucks. The model generated truck percentages replicate the truck count percentages. For the truck counts and volumes and their VMT, a few notable observations are (**Tables 11-1** and **11-2**):

- Overall truck count percentage is 5.1% and the model truck volume is 6.1%.
- Overall truck count VMT percentage is 5.5% and the model truck volume is 6.3%.
- 7.54% of the model truck volume is on freeways (including HOV) and 7.28% of the truck counts are on freeways (including HOV).
- 7.54% of the model truck VMT is on freeways (including HOV) and 7.14% of the truck count VMT is on freeways (including HOV).
- For the surface streets (Uninterrupted roadways, high speed arterials and collectors), truck count percentage is 4.73% compare to 5.36% truck volume.

Figure 11-1: **24-Hour Truck Count Locations**
Southeast Regional Planning Model VI

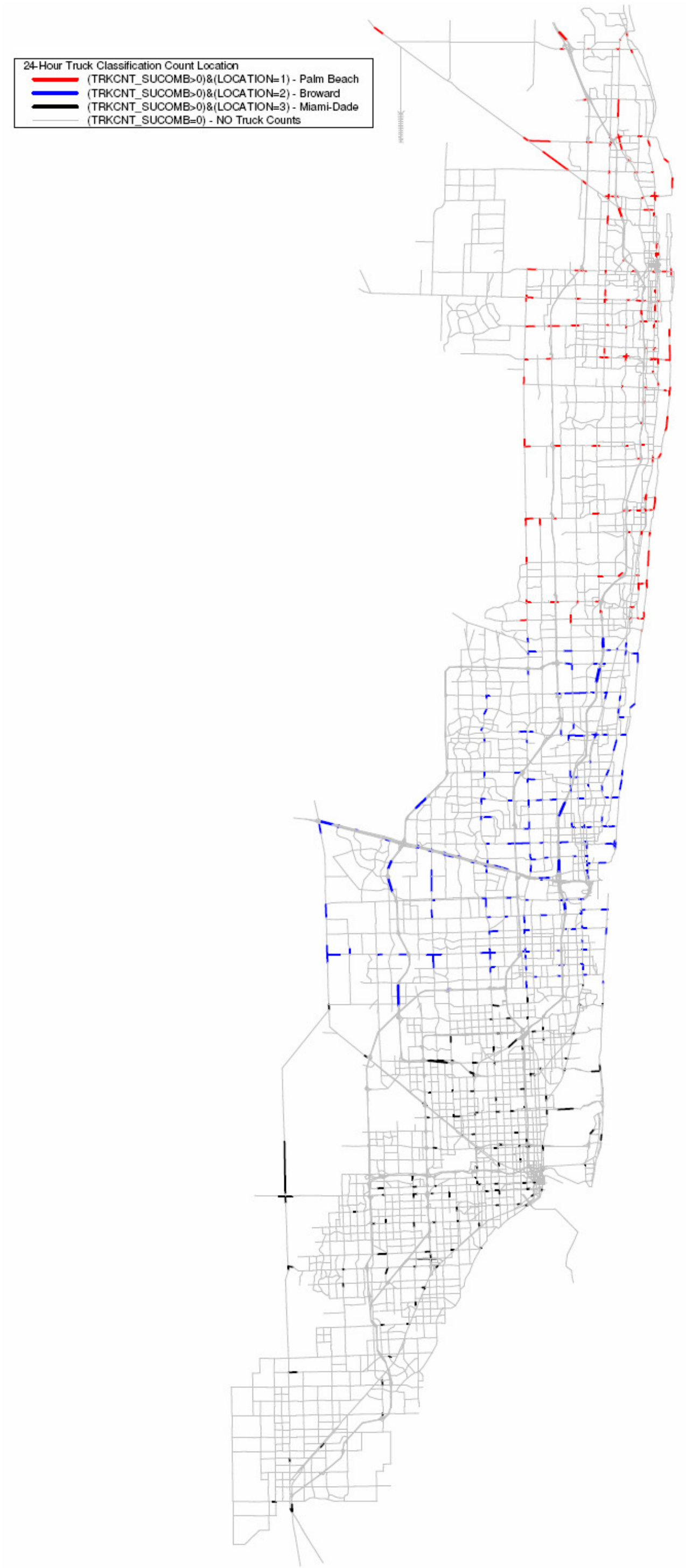


Table 11-1: **Truck (*) Count and Count-VMT Summary by Facility, Area and County**
Southeast Regional Planning Model VI

		COUNTS				VEHICLE MILES OF TRAVEL (COUNTS)			
Facility Type / Area Type / County	**Number of Links**	**All AADT**	**Truck AADT**	**Truck Count Percent**	**Average Truck Count**	**Truck-Count VMT**	**Truck-Count VMT Distribution**	**ALL Vehicle Count-VMT**	**Percent Truck Count VMT**
1. Freeway (11)	40	2,712,014	196,854	7.3%	4,921	114,161	31.9%	1,606,193	7.1%
2. Uninterrupted Roadways (21)	31	325,628	20,113	6.2%	649	9,648	2.7%	110,388	8.7%
4. High Speed Arterials (41)	929	15,969,144	756,497	4.7%	814	214,831	60.1%	4,428,181	4.9%
6. Low Speed Collectors (61)	59	553,238	20,362	3.7%	345	4,672	1.3%	127,908	3.7%
7. Ramps (71-75, 93,94)									
8. HOV (81-84)	14	270,700	20,220	7.5%	1,444	11,795	3.3%	158,253	7.5%
9. Toll Facility (91-92)	4	90,078	4,122	4.6%	1,031	2,249	0.6%	63,631	3.5%
ALL Facility Types	**1,077**	**19,920,802**	**1,018,168**	**5.1%**	**945**	**357,356**	**100%**	**6,494,554**	**5.5%**
1. CBD	27	357,586	15,858	4.4%	587	2,573	0.7%	58,589	4.4%
2. High Density - NonCBD	41	678,739	27,822	4.1%	679	7,829	2.2%	198,423	3.9%
3. Medium Density - NonCBD	338	6,538,775	327,531	5.0%	969	80,952	22.7%	1,650,732	4.9%
4. Low Density - NonCBD	595	11,519,138	570,967	5.0%	960	211,153	59.1%	3,988,451	5.3%
5. Very Low Density - NonCBD	76	826,565	75,990	9.2%	1,000	54,849	15.3%	598,359	9.2%
ALL Area Types	**1,077**	**19,920,803**	**1,018,168**	**5.1%**	**945**	**357,356**	**100%**	**6,494,554**	**5.5%**
1. Palm Beach County	383	5,533,364	268,352	4.8%	701	74,742	20.9%	1,405,954	5.3%
2. Broward County	428	9,696,498	471,135	4.9%	1,101	205,514	57.5%	3,798,532	5.4%
3. Miami-Dade County	266	4,690,941	278,681	5.9%	1,048	77,101	21.6%	1,290,068	6.0%
ALL Counties	**1,077**	**19,920,803**	**1,018,168**	**5.1%**	**945**	**357,357**	**100%**	**6,494,554**	**5.5%**

(*) Single Units and Combination Trucks

Table 11-2: **Truck (*) Volume and VMT Summary by Facility, Area and County**
Southeast Regional Planning Model VI

	VOLUMES				VEHICLE MILES OF TRAVEL				
Facility Type / Area Type / County	**All Traffic Volume**	**Truck Volume**	**Truck Volume (%)**	**Ave Truck Volume**	**Truck-Volume VMT**	**Truck-Volume VMT Distrib**	**ALL Vehicle VMT**	**All Vehicle VMT Distrib**	**Truck VMT (%)**
1. Freeway (11)	69,321,488	5,194,091	7.5%	5,241	1,824,919	30.3%	24,334,580	25.5%	7.5%
2. Uninterrupted Roadways (21)	4,005,048	251,404	6.3%	1,088	111,499	1.9%	1,748,093	1.8%	6.4%
4. High Speed Arterials (41)	205,797,664	10,950,647	5.3%	1,227	2,682,830	44.5%	50,818,596	53.3%	5.3%
6. Low Speed Collectors (61)	31,370,644	1,719,484	5.5%	480	399,139	6.6%	6,815,789	7.2%	5.9%
7. Ramps (71-75, 93,94)	19,900,772	1,486,206	7.5%	886	194,041	3.2%	2,753,275	2.9%	7.0%
8. HOV (81-84)	4,763,830	397,473	8.3%	1,529	143,771	2.4%	1,746,331	1.8%	8.2%
9. Toll Facility (91-92)	11,886,677	1,102,777	9.3%	2,137	670,097	11.1%	7,098,538	7.4%	9.4%
ALL Facility Types	**347,046,123**	**21,102,082**	**6.1%**	**1,304**	**6,026,296**	**100%**	**95,315,202**	**100%**	**6.3%**
1. CBD	12,108,645	617,837	5.1%	686	63,117	1.0%	1,207,650	1.3%	5.2%
2. High Density - NonCBD	24,974,952	1,457,699	5.8%	1,364	331,507	5.5%	5,435,546	5.7%	6.1%
3. Medium Density - NonCBD	122,564,640	7,895,869	6.4%	1,625	1,847,003	30.6%	29,015,733	30.4%	6.4%
4. Low Density - NonCBD	177,219,744	10,134,569	5.7%	1,229	3,212,823	53.3%	54,057,986	56.7%	5.9%
5. Very Low Density - NonCBD	10,178,142	996,108	9.8%	896	571,846	9.5%	5,598,287	5.87%	10.2%
ALL Area Types	**347,046,123**	**21,102,082**	**6.1%**	**1,304**	**6,026,296**	**100%**	**95,315,202**	**100%**	**6.3%**
1. Palm Beach County	82,446,238	4,383,560	5.3%	1,008	1,375,823	22.8%	24,059,793	25.2%	5.7%
2. Broward County	107,929,685	5,616,603	5.2%	1,354	1,832,882	30.4%	33,497,254	35.1%	5.5%
3. Miami-Dade County	156,670,200	11,101,919	7.1%	1,443	2,817,591	46.8%	37,758,155	39.6%	7.5%
ALL Counties	**347,046,123**	**21,102,082**	**6.1%**	**1,304**	**6,026,296**	**100%**	**95,315,202**	**100%**	**6.3%**

(*) Single Units and Combination Trucks

- For the surface streets, the truck count VMT percentage is 5.01% compared to 5.38% truck volume.
- By area, very low-density area has a higher percentage of truck counts (9.2% for both count and count VMT), which compares well with the model estimation (9.8% for model truck volume and 10.2% for model truck VMT).
- By county, the truck counts are 4.8, 4.9 and 5.9% and the model estimated truck volumes are 5.3, 5.2 and 7.1% for Palm Beach Broward and Miami-Dade, respectively.
- By county, the truck count VMT are 5.3, 5.4 and 6.0% and the model estimated truck volume VMT are 5.7, 5.5 and 7.5% for Palm Beach Broward and Miami-Dade, respectively.

The variation between the model estimated truck volume percentages and counts percentages on toll facilities is larger than expected. Users should take this into accounts for any project involving toll facilities. Although overall model estimated truck percentages are similar to count percentages, average truck volumes differ significantly from average truck counts.

To gauge the truck volume further, volume/count ratios by facility type were also summarized from truck evaluation outputs and are shown in **Table 11-3**. The link level average truck-VMT-V/C ratios are 0.98, 0.97, 1.12 and 1.01 for the truck travel of Palm Beach, Broward, Miami-Dade and the SERPM region. The link level average truck-V/C ratios are 1.00, 0.98, 1.03 and 1.00 for Palm Beach, Broward, Miami-Dade and the SERPM region. By facility the ratios vary from ideal ratio of 1. Often, this is due to lower percentages of category links with truck traffic counts. More effort should be made to obtain more truck counts in future model update efforts.

The truck VMT distributions of Tables 11-1 and 11-2 are further summarized in the following table:

	Observed	Model
Freeway System (1)	35.8	47.0
Surface Streets (2)	64.1	53.0
Med-High Density (3)	25.6	37.1
Low Density (4)	74.4	62.8

(1) Includes Freeway, Ramps, HOV and Toll Facility
(2) Includes Un-interrupted roads, High Speed Arterials and Low Speed Collectors
(3) Includes CBD, High Density Non-CBD and Medium Density Non-CBD
(4) Includes Low and Very-low Density Non-CBD

The model generated truck VMT distribution exhibits the truck count VMT distribution by both facility type and area types. The truck VMT distribution as well as truck percentages and volume/count ratios assert that truck travels are distributed well among the facility and area types.

Table 11-3: **Truck (*) Volume-over-Count Ratio by Facility, Area and County**
Southeast Regional Planning Model VI

Facility Type / Area Type	All Three Counties			Palm Beach County			Broward County			Miami-Dade County		
	No of Truck Counts	Volume/ Count Ratio	VMT Vol/Cnt Ratio	No of Truck Counts	Volume/ Count Ratio	VMT Vol/Cnt Ratio	No of Truck Counts	Volume/ Count Ratio	VMT Vol/Cnt Ratio	No of Truck Counts	Volume/ Count Ratio	VMT Vol/Cnt Ratio
1. Freeway (11)	40	1.02	1.05	8	0.81	0.79	24	1.03	1.03	8	1.55	1.72
2. Uninterrupted Roadways (21)	31	0.89	0.86	20	0.90	0.87	9	0.90	0.84	2	0.62	0.62
4. High Speed Arterials (41)	929	1.00	0.98	312	1.06	1.09	371	0.96	0.90	246	1.00	1.05
6. Low Speed Collectors (61)	59	0.86	0.78	41	0.98	0.88	10	0.68	0.71	8	0.81	0.67
7. Ramps (71-75, 93,94)												
8. HOV (81-84)	14	1.09	1.09	2	0.93	0.93	12	1.12	1.09			
9. Toll Facility (91-92)	4	1.07	1.66				2	2.67	2.67	2	0.38	0.38
ALL Facility Types	**1,077**	**1.00**	**1.01**	**383**	**1.00**	**0.98**	**428**	**0.98**	**0.97**	**266**	**1.03**	**1.12**
1. CBD	27	0.90	0.87	16	0.86	0.78	3	0.94	0.97	8	0.97	0.98
2. High Density - NonCBD	41	1.06	1.16	9	1.23	1.30	4	1.09	1.09	28	1.03	1.15
3. Medium Density - NonCBD	338	1.02	1.05	60	1.12	1.13	144	0.98	0.90	134	1.04	1.19
4. Low Density - NonCBD	595	0.99	0.98	258	0.97	0.93	259	0.99	0.99	78	1.03	1.05
5. Very Low Density - NonCBD	76	0.97	1.02	40	1.04	1.05	18	0.93	0.98	18	0.96	1.04
ALL Area Types	**1,077**	**1.00**	**1.01**	**383**	**1.00**	**0.98**	**428**	**0.98**	**0.97**	**266**	**1.03**	**1.12**

(*) Single Units and Combination Trucks

12. SUMMARY AND CONCLUSION

The 2000 and 2030 SERPM6 models provide the MPO, the Department and others with a dependable tool for forecasting travel demand in the three county (Palm Beach Broward and Miami-Dade) region of Southeast Florida. SERPM6 is an outgrowth of SERPM5, modified to respond to issues raised by the FTA. It adopts the mode choice structure of the revised SERPM5 model. SERPM6 is a TOD model, where multiple periods are implemented in trip distribution, mode-choice and trip assignment. It is implemented in the CV platform and uses floating point matrices. All earlier versions of SERPM were FSUTMS/Tranplan based models that used integer matrices.

The SERPM6 model is not simply an update to its predecessor models. It adopts the major enhancements of recent SERPM versions and then includes a number of major new enhancements, as listed in the introduction chapter. Notable enhancements include:

- implements a new process to estimate the free-flow speeds based on posted speed limits and signalization data,
- estimates travel speeds from roadway physical characteristics, posted speeds, and traffic control device data, eliminating lookup tables,
- uses a new capacity estimator process that emulates the capacities published in the Florida LOS manual,
- uses lifestyle variables that eliminate the anomaly of generating working trips from retirement communities,
- uses special tabulation data (STP60) and other socioeconomic data based on the 2000 Census,
- uses a dynamic process to determine area type,
- treats internal-external trips as internal trips and improves the modeling of these trips by eliminating the internal-external purpose,
- includes an airport purpose and two non-home-based purposes to enhance the modeling for those trips,
- implements the trip attraction rates that not only depend on employment classes and other production variables but also on area types,
- uses the recent 1999 Southeast Florida travel surveys to develop the transit validation targets,
- implements time-of-day models,
- implements a three purpose truck model to simulate the truck traffic to meet the SAFETEA-LU emphasis on freight movement planning,
- explicitly models school trips in an independent trip purpose based on school zone boundaries,
- uses the CV model platform for all highway modeling processes,
- uses separate distribution for households with and without autos,
- implements an automated turning routine to make movement specific penalties by facility type,
- incorporates an HOV model where access to the HOV links is controlled using access links,
- uses a feedback loop to arrive at stable highway travel times for use in peak period distribution and peak period transit model,
- evaluates and uses delays in highway skimming that are expected to occur at freeway-ramp merges,
- uses a multi-class equilibrium assignment technique for simultaneous assignment of drive-alone, shared ride and truck trips for each of the three periods of the model,
- validates both highway speeds and traffic counts,

- uses new PT platform to store transit network and accesses and TRNBUILD for the rest of the transit modeling process (skimming and assignment)
- implements a logit model to separate the non-motorized trips from the motorized trips, and
- uses nested logit structure for mode choice analysis for both transit and policy-sensitive highway-only models with fewer market segments to validate.

A wide range of adjustments was made to the modeling system to produce good calibration. Some of the adjustments are global in nature, some are local in nature, and some are combinations of both. The approach taken in the model validation was disaggregate in nature where simultaneous adjustments at the regional and at the county level were made. The validation statistics demonstrates that SERPM6 does an excellent job of replicating existing travel conditions.

The validation of the SERPM6 was not limited to the evaluation of the model results to the 2000 traffic counts and transit patronage. The results of 2030 model were compared to the 2000 model results to ensure that the model produces reasonable results. The SERPM6 model also evaluates the model estimated volumes for each time period against the corresponding period traffic counts. Another important improvement in SERPM6 validation is the validation of model speeds against the observed speeds.

All key model statistics and data were summarized and compared through numerous tables and figures. The SERPM6 transit model does an excellent job of replicating existing transit use. This report summarized the model validation efforts for the 2000 and 2030 SERPM6 and compared the results with the surveys and national statistics. It demonstrates the strengths and weakness of the model. It was shown that both highway and transit models do a good job of replicating ground counts and transit use. The period model provides valuable statistics for each of the time periods and provides traffic loads by direction.

Model results were also compared to the validation criteria established for FSUTMS and elsewhere in nation. Overall highway evaluation measures indicate a high degree of correlation between observed and estimated traffic volumes as forecasted by the 2000 SERPM6 model. In most cases, the performance of the model meets or exceeds the established criteria. The 2000 model is a reliable tool for system level transportation planning analyses. As with all models, however, the model results should be adjusted before using them in planning and design.

SERPM6 provides the Department and MPO with a valuable tool for forecasting travel in the three-county region. SERPM6 is particularly useful in studies larger than a single Southeast Florida county (for example, the I-95/I-595 Master Plan Major Investment Study, Tri-Rail Master Plan, etc.). Another application is to provide additional estimates of external trip tables and forecasts of intercounty transit travel in the region.

The SERPM6 model can estimate the number of vehicles on a future road, passengers on a new local/express bus service, riders on a new rapid transit line, or the response to certain travel demand management polices such as imposing higher parking fees. This information is used in the MPO planning process to aid decision makers in their selection of transportation plan alternatives, polices and programs. In addition, the model results could be used to provide detailed information, such as traffic volumes, rapid transit and bus patronage to state, district and local engineers and planners for use in their design of facilities.

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Appendix A

Model CUBE Keys and PROFILE.MAS

Table **Page**

A-1 SERPM6 Cube-Voyager Catalog Keys A-2

Figure

A-1 Year 2000 PROFILE.MAS File Parameters A-4

A-2 Year 2030 PROFILE.MAS File Parameters A-7

SERPM6 Model Cube Keys & PROFILE.MAS

SERPM6 uses a variety of Cube-Voyager catalog keys that have been created and defined during the model development process. Many variables that were previously defined in the PROFILE.MAS have been defined as "keys" in SERPM6. The keys are listed in **Table A-1**. It list the keys name, description and values used in base (2000) and future (2030) scenarios. Year 2000 and 2030 "PROFILE.MAS" files are listed **Figures A-1 and A-2**, respectively.

[**A Note**: AUTOCON program uses MAXMODE, PREMIUMFLAG and MODEPRIORITY parameters of PROFILE.MAS to help determine the best stations for each origin zone. The PREMIUMFLAG matches the PROFILE.MAS description, 1 if premium service and zero otherwise. It reads from left-to-right in PT mode order. So the example below shows that modes 6, 7, 8, 10, 11 and 13 are premium modes.

```
&MAXMODE       Number of Transit modes
13
&PREMIUMFLAG   1 if premium service, 0 otherwise
0000011101101
&MODEPRIORITY  Priority in increasing order given to a mode in autocon
 17 18 19  7  7  6  2  1  7  4  3  7  5
```

Lower numbers of MODEPRIORITY indicate a higher priority. These rankings are in PT modes from left-to-right. The example shows that Tri-Rail is #1, Metrorail #2, project mode #3 and new mode #4, etc.

These flags come into play because sometimes multiple stations are eligible for use by a zone. AUTOCON uses rule-bases logic to determine the best stations. One of the rules is whether or not the station has a premium mode available to it (via PREMIUMFLAG). Another is if a zone has multiple modes available to it via multiple stations, the MODEPRIORITY rankings will make AUTOCON favor stations using the highest available mode.]

Table A-1: **SERPM6 Cube-Voyager Catalog Keys**
Southeast Regional Planning Model VI

Sl No	Keys Name	Keys Description	Base (2000) Scenario Value	Future-CF (2030) Scenario Value(*)
1	Scen.Name	Scenario Name	Base	Future-CF
2	USER1		(Note)	
3	DESCR	Description of Alternative	SERPM6 Model	
4	Year	Year (2 digits)	00	30
5	ALT	Alternative (1 Letter)	R	
6	CUBE	Cube Directory	E:\fsutms\d4\S6TrnBuild\Cube	
7	PATH1	Location of User Written Program	E:\fsutms\d4\S6TrnBuild\user.prg	
8	DATADIR	Input Data Directory	E:\fsutms\d4\S6TrnBuild\IN-00R	E:\fsutms\d4\S6TrnBuild\IN-30R
9	OUTDIR	Output Data Directory	E:\fsutms\d4\S6TrnBuild\out-00R	E:\fsutms\d4\S6TrnBuild\out-30R
10	USER2		(Note)	
11	INTTAZS	Internal TAZs	4016	
12	POP_EMP_RTO	Regional Population/Employment Ratio	2.097	2.2049
13	NAME	Study Area Name	2000 SERPM	2030 SERPM
14	ANALYSIS	Sets HEVAL to run in analysis mode if "YES"	NO	YES
15	VALIDATE	Sets HEVAL to run in validate mode if "YES"	YES	NO
16	ZONESI	Number of Internal Zones	4050	
17	ZONESA	Total number of zones including internal and external	4134	
18	EXTK	External zones	4051-4134	
19	CBDZONE	Home node for path skimming	3101	
20	NODES	Highest node number permitted	35000	
21	UNITS	Coordinate units per mile	5280	
22	ATITERFF	Maximum number of attraction iterations (gravity model) using Free Flow Skims	40	
23	ATITERCF	Maximum number of attraction iterations (gravity model) using Congested Flow Sk	40	
24	ITERD	Max number of initial equilibrium assignment iterations	60	
25	ITERD	Max number of initial equilibrium assignment iterations	50	
26	EPSILON2	Specifies closure criterion for equilibrium acceptance	0.0005	
27	CITYCODE	Identifies City	SOUTHEAST REGIONAL PLANNING MODEL	
28	TITLE	Title use in reporting	2000 SERPM6 - Base Run	2030 SERPM6 - Future-CF Run
29	TERM1	Terminal time for SAT1 (CBD)	4.5	
30	TERM2	Terminal time for SAT2 (High Density NonCBD)	3.25	
31	TERM3	Terminal time for SAT3 (Medium Density NonCBD)	2.5	
32	TERM4	Terminal time for SAT4 (Low Density NonCBD)	0.75	
33	TERM5	Terminal time for SAT5 (Very-Low Density NonCBD)	0.5	
34	MAXTIM	Maximum time used in FF.yya file (friction factors)	500	
35	CTOLL	Impedance units per dollar of toll	0.085	
36	EE1OCC	Percentage of EE trips that are DA	0.7326	
37	EE2OCC	Percentage of EE trips that are 2 occupancy	0.1718	
38	VCMAX	Maximun Vol-over-CAP Ratio for BPR equation	4	
39	VCMAXD	Maximun Vol-over-CAP Ratio for BPR equation in DISTRIB	3	
40	ACCELRATE	Acceleration Rate im mph/sec	2.5	

Table A-1 (continued)

Sl No	Keys Name	Keys Description	Base (2000) Scenario Value	Future-CF (2030) Scenario Value(*)
41	EE-PK	EE Peak Period Factor	0.4029	
42	EE-AMPK	EE AM-Peak Period Factor	0.1847	
43	EE-PMPK	EE PM-Peak Period Factor	0.2182	
44	HBW-PK	HB Work Trip Peak Period Factor	0.59802	
45	HBSHP-PK	HB Shopping Trip Peak Period Factor	0.37898	
46	HBSCR-PK	HB SocRec Trip Peak Period Factor	0.38608	
47	HBSCH-PK	HB School (Private School and College/University) Trip Peak Period Factor	0.5225	
48	HBO-PK	HB Other Trip Peak Period Factor	0.38208	
49	NHBW-PK	Non HB Work Trip Peak Period Factor	0.39146	
50	NHBO-PK	Non HB Other Trip Peak Period Factor	0.29908	
51	ARPT-PK	Airport Trip Peak Period Factor	0.33162	
52	T4TRK-PK	Four-Tired Truck Trip Peak Period Factor	0.38638	
53	SUTRK-PK	Single Unit Truck Trip Peak Period Factor	0.45412	
54	COMBTRK-PK	Combination Truck Trip Peak Period Factor	0.35942	
55	PCE-TRK	Passenger-Car-Equivalents for Trucks	1.5	
56	SIG-SPACE	Signal Spacing in Miles for Uninterrupted Condition	1.5	
57	UNINTSPEED	Maximum speed in MPH for Uninterrupted Condition of Unsignalized Facilities	40	
58	MAXMODE	Highest PT Mode Number for generatin Acesss Connector	13	
59	CBDSIDEWALK	Maximum Length of Transfer Connector in CBD in Miles	0.6	
60	ZONESA1	Lowest non-centroid node number in Highway Network	5000	
61	MAXWALKDIST	Maximum Walk Acess Walking Distance	1.1	
62	MAXLEGSBYMODE	Maximum number connectors by mode	6*5,2,1,1,2,2,1,5	
63	XFERWALKDIST	Max Cost of Transfer Connector [Not used, superceded by CBDSIDEWALK - #59)	0.3	
64	AMPKSF-HBW	AM Peak Splitting Factor - HBW Trips	0.4834	
65	AMPKSF-HBNW	AM Peak Splitting Factor - HBNW Trips	0.4482	
66	AMPKSF-NHB	AM Peak Splitting Factor - NHB Trips	0.3983	
67	AMPKPAF-HBW	AM Peak P-to-A Factor - HBW Trips	0.9549	
68	AMPKPAF-HBNW	AM Peak P-to-A Factor - HBNW Trips	0.7683	
69	PMPKPAF-HBW	PM Peak P-to-A Factor - HBW Trips	0.0963	
70	PKPKPAF-HBNW	PM Peak P-to-A Factor - HBNW Trips	0.3051	
71	OFPKPAF-HBW	Off Peak P-to-A Factor - HBW Trips	0.4947	
72	OFPKPAF-HBNW	Off Peak P-to-A Factor - HBNW Trips	0.4889	
73	AMPKSF-4TTRK	AM Peak Splitting Factor - 4TTRK Trips	0.4755	
74	AMPKSF-SUTRK	AM Peak Splitting Factor - SUTRK Trips	0.483	
75	AMPKSF-COMBTRK	AM Peak Splitting Factor - COMBTRK Trips	0.4492	
76	SELORIG	Selected Origin node(s) for path skimming	974,1107,2322	
77	SELDEST	Selected Destination node(s) for path skimming	3756,3920,3973	
78	RegTimeFac	Generic Travel Time Improvement for Limited or Premium Buses (Not Used)	0.75	

(*) Values for Future Year remain same as Base year unless specified.

Figure A-1: **Year 2000 PROFILE.MAS File Parameters**
Southeast Regional Planning Model VI

```
&HEVALDBF
LNKSCNT.DBF
&ZAPZERO       Zeroing out DA as a submode for 0-car HH (1=YES, others = NO)
1
&PATH1         Location of User Written Program
..\user.prg\
&FSUTMS        Location of special control files (blank = present directory)
..\fulscrpt\
&SCENARIO      Use by LSTGEN program for any future year
FUTURE
&BALATTR       Option to balance attrac to prod controls (0=NO, 1=YES)
0
&MOBILE        Location of Mobile5a files (IMDATA & TECH12)
c:\FSUTMS.v55
&NAME          Study area name
2000 SOUTHEAST REGIONAL VI
&TWODIGIT      The twodigit network flag
YES
&ZONESI        Number of internal zones
4050
&ZONESA        Total number of zones including internal and external
4134
&PALMBEACH     Palm Beach Internal and Dummy Zones
1-1600
&BROWARD       Broward Internal and Dummy Zones
1601-2550
&MIAMI         Miami-Dade Internal and Dummy Zones
2551-4050
&MAXZPB        Maximum Palm Beach MPO Zone Number
1600
&MAXZBO        Maximum Broward MPO Zone Number
950
&MAXZMI        Maximum Miami-Dade MPO Zone Number
1500
&EXTZONE       External zones
4051-4134
&EXTK          External zones for K-Factors
4051-4134
&CBDZONE       Home node for path skimming
3101
&NODES         Highest node number permitted
30000
&UNITS         Coordinate units per mile
5280
&CITYCODE      Identifies City
SERPM
&TITLE         Title use in reporting
2000 SERPM6
&MAXD          Maximum sidewalk area around stations
0.5
&TERM          Auto access terminal time (home end)
2.0
&DEF           Default auto access time
2.0
&NOPT          Usage check on second auto connector
1
&BACK          Backtrack flag for auto connector
1
&AOC           Auto operating costs
9.5
&OC3           Average 3+ auto occupancy
3.20  3.20  3.20  3.20  3.20  3.20
&OCTA          Average park/ride auto occupancy
1.2  1.2  1.2  1.2  1.2  1.2
&TASPD         Average auto access speed
26.0  26.0
```

Figure A-1 (Continued)

```
&MINRUN1       Minimum walk-to-local run distance
0.6
&MINRUN2       Minimum walk-to-premium run distance
0.6
&MINRUN3       Minimum auto-to-local run distance
1.2
&MINRUN4       Minimum auto-to-premium run distance
1.2
&INFL1         Transit fare inflation
1.0
&INFL2         Auto operating cost inflation
1.0
&INFL3         Parking cost inflation
1.0
&MSMIN         Minimum mode split
0.00  0.00  0.00  0.00  0.00  0.00
&HOVUSE        HOV usage flag
2
&HOVMIN        HOV minimum time
3.0
&RAILAC        Station walk access impedance flag
0
&VAL           Validation summary flag
0
&KRFAC         Kiss/ride additional impedance factor
1.50
&JITNEY        Jitney flag (0=none, 1=base, 2=alt)
0
&VERS          Model Version (1=standard FSUTMS, 2=Orlando 10 purposes)
1
&DEFMS         Default Regional Mode Splits
.0318 .0108 .0130 .0299 .0117 .0064
&DEFUPD        Update Zonal Default Mode Splits (1=yes, 2=no)
2
&EMISFAC       Model VMT to HPMS VMT Factor
0.850
&IMFAC         IM/ATP credit adjustment factor
.8000
&CTPBINDE      Palm Beach Co Ind Employ Cntrl Tot - Using 2000 FSA derived Control Total
78460
&CTPBCOME      Palm Beach County Commercial Employ Control Total
117627
&CTPBSERE      Palm Beach County Service Employ Control Total
284955
&CTBOINDE      Broward County Industrial Employ Control Total
84748
&CTBOCOME      Broward County Commercial Employ Control Total
183751
&CTBOSERE      Broward County Service Employ Control Total
375841
&CTMIINDE      Dade (Miami) County Industrial Employ Control Total
118061
&CTMICOME      Dade (miami) County Commercial Employ Control Total
254339
&CTMISERE      Dade (miami) County Service Employ Control Total
608012
&CTOLL         Impedance units per dollar of toll
0.085
&CBDPB        PB CBDZONE xxx for Auto Connector backtracking
3095
&CBDBO        BO CBDZONE xxx for Auto Connector backtracking
3095
&CBDMI        MI CBDZONE for Auto Connector backtracking
3095
```

Figure A-1 (Continued)

```
&VFACTORS      Required entry.  YES must start in column one
YES
&MINUROADFAC   Specifies minimum UROAD factor allowed   (Optional)
0.50
&MAXUROADFAC   Specifies maximum UROAD factor allowed
1.00
&MINCONFAC     Specifies minimum CONFAC factor allowed
0.04
&MAXCONFAC     Specifies maximum CONFAC factor allowed
1.00
&MINBPRCOEFF   Specifies minimum BPR coefficient allowed
0.0
&MAXBPRCOEFF   Specifies maximum BPR coefficient allowed
1.00
&MINBPREXP     Specifies minimum BPR exponent allowed
1.00
&MAXBPREXP     Specifies maximum BPR exponent allowed
10.00
&EMISTABLES    Tables on HTTAB file for intrazonal emissions (default = 1)
1
&ASCII
YES
&TWOWAY        Generates second ASCII file (HRLDXY2.ASC) with 2-way vol and cap
YES
&MODELCAP      For maximum capacity use MAXIMUM CAPACITY
MODEL CAPACITY
&BWABSPB       Walk-Access Bus Bias - Palm Beach
1.35
&BWABSBO       Walk-Access Bus Bias - Broward
0.55
&BWABSMD       Walk-Access Bus Bias - Miami-Dade
0.00
&BAABSPB       Auto-Access Bus Bias - Palm Beach
1.35
&BAABSBO       Auto-Access Bus Bias - Broward
1.35
&BAABSMD       Auto-Access Bus Bias - Miami-Dade
1.15
&WKBRTF        Walk Access BRT/LRT Bias Factor as frac of Walk-Access Bus Biases
0.00
&PKBRTF        Auto Access BRT/LRT Bias Factor as frac of Walk-Access Bus Biases
0.00
&PENMD         Transit Run Time Factor for Penalized Modes
1.20
&FAVMD         Transit Run Time Factor for Favored Modes
1.00
&IBUCK         0=none, 1=modified, 2=original for mode choice
1
&WALKSPD       Sidewalk walking speed
2.5
&SHTWALK       Short walk distance
0.33333
&AVGLONG       Average long walk distance
0.66667
&MAXMODE       Number of Transit modes
13
&PREMIUMFLAG   1 if premium service, 0 otherwise
0000011101101
&MODEPRIORITY  Priority in increasing order given to a mode in autocon
 17 18 19  7  7  6  2  1  7  4  3  7  5
&CTOTAM        AM Factors to convert Station PARK and AO cost (cents to min)
0.16
```

Figure A-1 (Continued)

```
&CTOTMD        MD Factors to convert Station PARK and AO cost (cents to min)
0.32
&WTOAAM        AM Factors to convert Station Terminal time to IVT minutes
2.25
&WTOAMD        MD Factors to convert Station Terminal time to IVT minutes
2.33
&AATFAM        AM Factors to convert Station Auto Access time to IVT minutes
1.5
&AATFMD        MD Factors to convert Station Auto Access time to IVT minutes
1.5
```

Figure A-2: **Year 2030 PROFILE.MAS File Parameters**
Southeast Regional Planning Model VI

```
&HEVALDBF
LNKSCNT.DBF
&ZAPZERO       Zeroing out DA as a submode for 0-car HH (1=YES, others = NO)
1
&PATH1         Location of User Written Program
..\user.prg\
&FSUTMS        Location of special control files (blank = present directory)
..\fulscrpt\
&SCENARIO      Use by LSTGEN program for any future year
FUTURE
&BALATTR       Option to balance attrac to prod controls (0=NO, 1=YES)
0
&MOBILE        Location of Mobile5a files (IMDATA & TECH12)
c:\FSUTMS.v55
&NAME          Study area name
2030 SOUTHEAST REGIONAL VI
&TWODIGIT      The twodigit network flag
YES
&ZONESI        Number of internal zones
4050
&ZONESA        Total number of zones including internal and external
4134
&PALMBEACH     Palm Beach Internal and Dummy Zones
1-1600
&BROWARD       Broward Internal and Dummy Zones
1601-2550
&MIAMI         Miami-Dade Internal and Dummy Zones
2551-4050
&MAXZPB        Maximum Palm Beach MPO Zone Number
1600
&MAXZBO        Maximum Broward MPO Zone Number
950
&MAXZMI        Maximum Miami-Dade MPO Zone Number
1500
&EXTZONE       External zones
4051-4134
&EXTK          External zones for K-Factors
4051-4134
&CBDZONE       Home node for path skimming
3101
&NODES         Highest node number permitted
35000
&UNITS         Coordinate units per mile
5280
```

Figure A-2 (Continued)

```
&CITYCODE      Identifies City
SERPM
&TITLE         Title use in reporting
2030 SERPM6
&MAXD          Maximum sidewalk area around stations
0.5
&TERM          Auto access terminal time (home end)
2.0
&DEF           Default auto access time
2.0
&NOPT          Usage check on second auto connector
1
&BACK          Backtrack flag for auto connector
1
&MXTFERWA      Maximum Number of Transfer for Transit Path - Walk Access
3
&MXTFERAA      Maximum Number of Transfer for Transit Path - Auto Access
2
&AOC           Auto operating costs
9.5
&OC3           Average 3+ auto occupancy
3.20  3.20  3.20  3.20  3.20  3.20
&OCTA          Average park/ride auto occupancy
1.2  1.2  1.2  1.2  1.2  1.2
&TASPD         Average auto access speed
26.0  26.0
&MINRUN1       Minimum walk-to-local run distance
0.6
&MINRUN2       Minimum walk-to-premium run distance
0.6
&MINRUN3       Minimum auto-to-local run distance
1.2
&MINRUN4       Minimum auto-to-premium run distance
1.2
&INFL1         Transit fare inflation
0.85
&INFL2         Auto operating cost inflation
1.0
&INFL3         Parking cost inflation
1.0
&MSMIN         Minimum mode split
0.00  0.00  0.00  0.00  0.00  0.00
&HOVUSE        HOV usage flag
2
&HOVMIN        HOV minimum time
3.0
&RAILAC        Station walk access impedance flag
0
&VAL           Validation summary flag
0
&KRFAC         Kiss/ride additional impedance factor
1.50
&JITNEY        Jitney flag (0=none, 1=base, 2=alt)
0
&VERS          Model Version (1=standard FSUTMS, 2=Orlando 10 purposes)
1
&DEFMS         Default Regional Mode Splits
.0482 .0154 .0172 .0404 .0161 .0093
&DEFUPD        Update Zonal Default Mode Splits (1=yes, 2=no)
2
&EMISFAC       Model VMT to HPMS VMT Factor
0.850
&IMFAC         IM/ATP credit adjustment factor
.8000
```

Figure A-2 (Continued)

```
&CTPBINDE      Palm Beach Co Ind Employ Cntrl Tot -Reflect 2000 Control/MPO Ratio
132830
&CTPBCOME      Palm Beach County Commercial Employ Control Total
175635
&CTPBSERE      Palm Beach County Service Employ Control Total
436035
&CTBOINDE      Broward County Industrial Employ Control Total
107369
&CTBOCOME      Broward County Commercial Employ Control Total
272820
&CTBOSERE      Broward County Service Employ Control Total
558361
&CTMIINDE      Dade (Miami) County Industrial Employ Control Total
115968
&CTMICOME      Dade (miami) County Commercial Employ Control Total
404056
&CTMISERE      Dade (miami) County Service Employ Control Total
790571
&CTOLL         Impedance units per dollar of toll
0.085
&CBDPB        PB CBDZONE xxx for Auto Connector backtracking
3095
&CBDBO        BO CBDZONE xxx for Auto Connector backtracking
3095
&CBDMI        MI CBDZONE for Auto Connector backtracking
3095
&VFACTORS      Required entry.  YES must start in column one
YES
&MINUROADFAC   Specifies minimum UROAD factor allowed   (Optional)
0.50
&MAXUROADFAC   Specifies maximum UROAD factor allowed
1.00
&MINCONFAC     Specifies minimum CONFAC factor allowed
0.04
&MAXCONFAC     Specifies maximum CONFAC factor allowed
1.00
&MINBPRCOEFF   Specifies minimum BPR coefficient allowed
0.0
&MAXBPRCOEFF   Specifies maximum BPR coefficient allowed
1.00
&MINBPREXP     Specifies minimum BPR exponent allowed
1.00
&MAXBPREXP     Specifies maximum BPR exponent allowed
10.00
&EMISTABLES    Tables on HTTAB file for intrazonal emissions (default = 1)
1
&ASCII
YES
&TWOWAY        Generates second ASCII file (HRLDXY2.ASC) with 2-way vol and cap
YES
&MODELCAP      For maximum capacity use MAXIMUM CAPACITY
MODEL CAPACITY
&BWABSPB       Walk-Access Bus Bias - Palm Beach
1.35
&BWABSBO       Walk-Access Bus Bias - Broward
0.55
&BWABSMD       Walk-Access Bus Bias - Miami-Dade
0.00
&BAABSPB       Auto-Access Bus Bias - Palm Beach
1.35
&BAABSBO       Auto-Access Bus Bias - Broward
1.35
&BAABSMD       Auto-Access Bus Bias - Miami-Dade
1.15
```

Figure A-2 (Continued)

```
&WKBRTF        Walk Access BRT/LRT Bias Factor as frac of Walk-Access Bus Biases
0.00
&PKBRTF        Auto Access BRT/LRT Bias Factor as frac of Walk-Access Bus Biases
0.00
&PENMD         Transit Run Time Factor for Penalized Modes
1.20
&FAVMD         Transit Run Time Factor for Favored Modes
1.00
&IBUCK         0=none, 1=modified, 2=original for mode choice
1
&WALKSPD       Sidewalk walking speed
2.5
&SHTWALK       Short walk distance
0.33333
&AVGLONG       Average long walk distance
0.66667
&MAXMODE       Number of Transit modes
13
&PREMIUMFLAG   1 if premium service, 0 otherwise
0000011101101
&MODEPRIORITY  Priority in increasing order given to a mode in autocon
 17 18 19  7  7  6  2  1  7  4  3  7  5
&CTOTAM        AM Factors to convert Station PARK and AO cost (cents to min)
0.16
&CTOTMD        MD Factors to convert Station PARK and AO cost (cents to min)
0.32
&WTOAAM        AM Factors to convert Station Terminal time to IVT minutes
2.25
&WTOAMD        MD Factors to convert Station Terminal time to IVT minutes
2.33
&AATFAM        AM Factors to convert Station Auto Access time to IVT minutes
1.5
&AATFMD        MD Factors to convert Station Auto Access time to IVT minutes
1.5
```

Appendix B

Description of Unloaded and Loaded Highway Network Attributes

Table		Page
B-1	Description of Selected Network Attributes of Unloaded Network (MS6_00.NET)	B-1
B-2	Description of Selected Attributes of Loaded Highway Network (Combined-HLOAD-R00.NET)	B-3

Table B-1: **Description of Selected Network Attributes of Unloaded Network (MS6_00.NET)**
Southeast Regional Planning Model VI

Sl No	Node Attributes	Description	Comments
1	N	Node Number	
2	SIGLOC	Signal Location (1=Yes, 0/blank=No)	
3	STATIONNUMBER	Station ID Number	
4	STATIONZONE	Zone Centroid nearest to Station	
5	SERVICEMILES	Maximum driving distance (miles)	
6	PARKINGSPACES	Parking spaces	
7	PARKINGCOSTAM	All day (peak) parking cost (cents)	
8	PARKINGCOSTMD	Midday (off-peak) parking cost (cents)	
9	TERMTIMEPNR	Added park-and-ride impedance (terminal time - minutes)	
10	TERMTIMEKNR	Added drop-off impedance (terminal time - minutes)	
11	ACTIVEFLAG	Station Usuage Flag (1=yes, 0=No)	
12	STATIONDESC	Station Description	
13	FAREZONE	Tri-Rail Fare zone	
14	X	X-Coordinate	
15	Y	Y-Coordinate	
16	CONUM	County Number (1=PB, 2=BO, 3=MD)	
17	NODETYPE	Node Type (1=Centroid, 2=External , 3=Int Dummy , 4=Ext Dummy)	
18	CYC_LEN	User coded Signal Cycle Length (secs)	

Sl No	Link Attributes	Description	Comments
1	A	A-Node	
2	B	B-Node	
3	DISTANCE	Distance (miles)	
4	SCREENLINE	Screenline, Cutline and Corridor ID	
5	NUM_LANES	No of Lanes	
6	TOLL	Toll ID	
7	TWOWAY	Two-way Indicator (1=yes, 0=no)	
8	COUNT	Directional Traffic Count	
9	DIRCODE	Directional Code (1=1-way, 0=2-way)	
10	CONSTRUCTION	USED IN HEVAL	
11	LANDUSE	USED IN HEVAL	
12	LOCATION	Geographical Location (1=PB, 2=BO, 3=MD)	
13	OA	MPO A-Node	
14	OB	MPO B-Node	
15	TMODE	Transit Mode	
16	TDIST	Transit Distance	
17	TSPEED	Transit Speed	
18	TTIME	Transit Time	
19	SEGID	Segment ID	
20	POSTSPD	Posted Speed (mph)	
21	STATION	Count Station ID	
22	AADT	Annual Average Daily Traffic	
23	PASS_PCT	Classification Count Percent (Passenger Vehicles)	
24	F4T_PCT	Classification Count Percent (4-tired Trucks)	
25	SU_PCT	Classification Count Percent (Single-Unit Trucks)	
26	COMB_PCT	Classification Count Percent (Combination Trucks)	
27	COUNTY	County/MPO Provided AADT	
28	TOLLTYPE	Toll Type (1=coin, 2=card, 3=AVI)	
29	PLAZADESC	Toll Plaza Description	
30	PLZALNSMIN	Minimum No. of Lanes in Toll Plaza	

Table B-1 (continued)

Sl No	Link Attributes	Description	Comments
31	PLZALNSMAX	Maximum No. of Lanes in Toll Plaza	
32	CARTOLL	Car Toll Price ($)	
33	SVCMINUTES	Service Time (min)	
34	SVCSECONDS	Service Time (sec)	
35	PCTTRUCKS	Ratio of Heavy Trucks on Toll Links	
36	ROADNAME	Road Name	
37	CONUM	County Number (1=PB, 2=BO, 3=MD)	
38	STN	Period Count Station Number	
39	TODRC	Time-of-Day Total 24-Hour Raw Count (Directional)	
40	PAMPRD	Percent of AM Peak Period Traffic Count	
41	PMDPRD	Percent of MIDDAY Period Traffic Count	
42	PPMPRD	Percent of PM Peak Period Traffic Count	
43	PNTPRD	Percent of NIGHT Period Traffic Count	
44	PAMPH	Percent of AM Peak Hour Traffic Count	
45	PPMPH	Percent of PM Peak Hour Traffic Count	
46	TODRC2W	Time-of-Day Total 24-Hour Raw Count (2-way)	
47	CNT_AMPRD	AM Peak Period Traffic Count	
48	CNT_MDPRD	MIDDAY Period Traffic Count	
49	CNT_PMPRD	PM Peak Period Traffic Count	
50	CNT_NTPRD	NIGHT Period Traffic Count	
51	CNT_OFPRD	Off-Peak Period Traffic Count	
52	CNT_AMPKH	AM Peak Hour Traffic Count	
53	CNT_PMMPH	PM Peak Hour Traffic Count	
54	TRKCNT_PAS4T	24-Hour Classification Count - Passenger Cars & 4-Tire Truck	
55	TRKCNT_4TIRE	24-Hour Classification Count - 4-Tire Truck	
56	TRKCNT_SU	24-Hour Classification Count - Single-Unit Truck	
57	TRKCNT_COMB	24-Hour Classification Count - Combination Truck	
58	TRKCNT_SUCOMB	24-Hour Classification Count - SU & COMB Truck	
59	FT2_OLD	Old 2-digit Facility Type	
60	AT2_OLD	Old 2-digit Area Type	
61	FTC1	Revised Facility Type (Major Classification)	
62	FTC2	Revised Facility Type (Minor Classification)	
63	HOV	All HOV facilities including ramps (1=yes,0=no)	Used in Capacity Calculation
64	KTOLL	All Toll facilities including ramps & Plazas (1=yes,0=no)	Used in Capacity Calculation
65	TOLLPLAZA	Toll Plazas (1=yes,0=no)	Used in Capacity Calculation
66	FRWY	Freeway segments (1=yes,0=no)	Used in Capacity Calculation
67	UNINTRP	Uninterrupted Roadways (1=yes,0=no)	Used in Capacity Calculation
68	RAMPS	All Ramps including HOV and Toll (1=yes,0=no)	Used in Capacity Calculation
69	ON	Non-HOV and non-toll non-loop on-ramps (1=yes,0=no)	Used in Capacity Calculation
70	ONLOOP	Non-HOV and non-toll loop on-ramps (1=yes,0=no)	Used in Capacity Calculation
71	OFF	Non-HOV and non-toll non-loop off-ramps (1=yes,0=no)	Used in Capacity Calculation
72	OFFLOOP	Non-HOV and non-toll loop off-ramps (1=yes,0=no)	Used in Capacity Calculation
73	FRWY2FRWY	Freeway-to-freeway ramps (1=yes,0=no)	Used in Capacity Calculation
74	HOVPEAK	HOV peak (AM or PM) only ramps (1=yes,0=no)	Used in Capacity Calculation
75	HOVDAY	HOV all-day ramps (1=yes,0=no)	Used in Capacity Calculation
76	TOLLON	Toll Facilities on-ramps (1=yes,0=no)	Used in Capacity Calculation
77	TOLLOFF	Toll Facilities off-ramps (1=yes,0=no)	Used in Capacity Calculation
78	DIVIDED	Divided Arterials and Uninterrupted roadways (1=yes,0=no)	Used in Capacity Calculation
79	LEFTTURN	Presence of a left-turn bay (1=yes,0=no)	Used in Capacity Calculation
80	LOWSPD	Roadways with posted speed less than 35 mph (1=yes,0=no)	Used in Capacity Calculation
81	LFWYMRG	Left-side ramp and freeway merge (1=yes,0=no)	
82	TDSECID	Travel Time & Delay Section ID	
83	GC_RATIO	User-Coded Grren/Cycle_Length Ratio	
84	ALPHA_OVERRIDE	Override "Alpha" value for BPR volume-delay equation	
85	BETA_OVERRIDE	Override "Beta" value for BPR volume-delay equation	

Table B-2: **Description of Selected Attributes of Loaded Highway Network (Combined-HLOAD-R00.NET)**
Southeast Regional Planning Model VI

Sl No	Node Attributes	Description
1	N	Node Number
2	FWYRNDNODE	Freeway-Ramp Junction Node (1=Yes,0=No)
3	NODETYPE	Node Type (1=Centroid, 2=External , 3=Int Dummy , 4=Ext Dummy, 5=Fwy-Ramp-Jct)
4	ITAZNAT	Revised Area Type
5	OF_RMPMRGLNFAC	Off Peak Period Merge Ramp Volume Factor
6	OF_RAMPFACVOL	Off Peak Period Merge Ramp Hourly Volume
7	OF_FWYMRGLNFAC	Off Peak Period Merge Freeway Volume Factor
8	OF_FWYMRGLNVOL	Off Peak Period Merge Freeway Hourly Volume
9	OF_JCTMRGHRVOL	Off Peak Period Merge Ramp & Freeway Hourly Volume
10	OF_JCTMRGDELAY	Off Peak Period Merge Ramp & Freeway Delay (min)
11	OF_JCTFWYDELAY	Off Peak Period Merge Freeway Delay (min)
12	OF_JCTRAMPDELAY	Off Peak Period Merge Ramp Delay (min)
13	PM_RMPMRGLNFAC	PM Peak Period Merge Ramp Volume Factor
14	PM_RAMPFACVOL	PM Peak Period Merge Ramp Hourly Volume
15	PM_FWYMRGLNFAC	PM Peak Period Merge Freeway Volume Factor
16	PM_FWYMRGLNVOL	PM Peak Period Merge Freeway Hourly Volume
17	PM_JCTMRGHRVOL	PM Peak Period Merge Ramp & Freeway Hourly Volume
18	PM_JCTMRGDELAY	PM Peak Period Merge Ramp & Freeway Delay (min)
19	PM_JCTFWYDELAY	PM Peak Period Merge Freeway Delay (min)
20	PM_JCTRAMPDELAY	PM Peak Period Merge Ramp Delay (min)
21	AM_RMPMRGLNFAC	AM Peak Period Merge Ramp Volume Factor
22	AM_RAMPFACVOL	AM Peak Period Merge Ramp Hourly Volume
23	AM_FWYMRGLNFAC	AM Peak Period Merge Freeway Volume Factor
24	AM_FWYMRGLNVOL	AM Peak Period Merge Freeway Hourly Volume
25	AM_JCTMRGHRVOL	AM Peak Period Merge Ramp & Freeway Hourly Volume
26	AM_JCTMRGDELAY	AM Peak Period Merge Ramp & Freeway Delay (min)
27	AM_JCTFWYDELAY	AM Peak Period Merge Freeway Delay (min)
28	AM_JCTRAMPDELAY	AM Peak Period Merge Ramp Delay (min)

Sl No	Link Attributes	Description
1	A	A-Node
2	B	B-Node
3	CAPACITY	LOS E Capacity (24 Hour)
4	CYCLELENGTH	Approach Node Cycle Length (secs)
5	CYCLE	Approach Node Cycle Length (secs)
6	AREA_TYPE	Revised Activity Based Area Types
7	UROADFACTOR	UROADFAC Factors (LOS-C/LOS-E Capacities)
8	CONFAC24H	24-Hour "confac" factor
9	BPRCOEFFICIENT	BPR Coefficient (alpha)
10	BPREXPONENT	BPR Exponent (beta)

Table B-2 (Continued)

Sl No	Link Attributes	Description
11	CONFACAMP	AM Peak Period "confac" factor
12	CONFACPMP	PM Peak Period "confac" factor
13	CONFACOFP	Off Peak Period "confac" factor
14	LOSCCAP	LOS C Capacity (24 Hour)
15	LOSCCAP_AMPKPD	LOS C Capacity (AM Peak Period)
16	LOSCCAP_PMPKPD	LOS C Capacity (PM Peak Period)
17	LOSCCAP_OFPKPD	LOS C Capacity (Off-peakPeak Period)
18	TOLL_ACC	Toll Acceleration Link
19	TOLL_DEC	Toll Decelleration Link
20	RCTOLL	CTOLL values
21	POSTEDSPEED	Posted Speed (mph)
22	FREEFLOWSPEED	Free Flow Speed (mph)
23	POSTEDTIME	Posted Time (min)
24	FREEFLOWTIME	Free Flow Time (min)
25	ROUNDNODECLS	Approach Link of Freeway-Ramp Jct Nodes (1=yes,0=no)
26	OF_LNKJCTDELAY	Off Peak Period - Fwy/Ramp Merge Delay
27	OF_TOTVOL	Off Peak Period - Total Volume (directional)
28	OF_VCLOSC	Off Peak Period - Vol/LOSC Capacity Ratio (directional)
29	OF_CONGTIME	Off Peak Period - Congested time in min (directional)
30	OF_CONGSPD	Off Peak Period - Congested Speed in mph (directional)
31	OF_VHT	Off Peak Period - Vehicle-Hours-Travel (directional)
32	OF_VMT	Off Peak Period - Vehicle-Miles-Travel (directional)
33	OF_DAVOL	Off Peak Period - Drive-Alone Volume (directional)
34	OF_SRVOL	Off Peak Period - Shared-Ride Volume (directional)
35	OF_TRKVOL	Off Peak Period - Truck Volume (directional)
36	OF_TOTVOL2	Off Peak Period - Total Volume (2-way)
37	OF_DAVOL2	Off Peak Period - Drive-Alone Volume (2-way)
38	OF_SRVOL2	Off Peak Period - Shared-Ride Volume (2-way)
39	OF_TRKVOL2	Off Peak Period - Truck Volume (2-way)
40	OF_VCLOSE	Off Peak Period - Vol/LOSE Capacity Ratio (directional)
41	OF_VOLCNT	Off Peak Period - Vol/Count Ratio (directional)
42	PM_LNKJCTDELAY	PM Peak Period - Fwy/Ramp Merge Delay
43	PM_TOTVOL	PM Peak Period - Total Volume (directional)
44	PM_VCLOSC	PM Peak Period - Vol/LOSC Capacity Ratio (directional)
45	PM_CONGTIME	PM Peak Period - Congested time in min (directional)
46	PM_CONGSPD	PM Peak Period - Congested Speed in mph (directional)
47	PM_VHT	PM Peak Period - Vehicle-Hours-Travel (directional)
48	PM_VMT	PM Peak Period - Vehicle-Miles-Travel (directional)

Table B-2 (Continued)

Sl No	Link Attributes	Description
49	PM_DAVOL	PM Peak Period - Drive-Alone Volume (directional)
50	PM_SRVOL	PM Peak Period - Shared-Ride Volume (directional)
51	PM_TRKVOL	PM Peak Period - Truck Volume (directional)
52	PM_TOTVOL2	PM Peak Period - Total Volume (2-way)
53	PM_DAVOL2	PM Peak Period - Drive-Alone Volume (2-way)
54	PM_SRVOL2	PM Peak Period - Shared-Ride Volume (2-way)
55	PM_TRKVOL2	PM Peak Period - Truck Volume (2-way)
56	PM_VCLOSE	PM Peak Period - Vol/LOSE Capacity Ratio (directional)
57	PM_VOLCNT	PM Peak Period - Vol/Count Ratio (directional)
58	AM_LNKJCTDELAY	AM Peak Period - Fwy/Ramp Merge Delay
59	AM_TOTVOL	AM Peak Period - Total Volume (directional)
60	AM_VCLOSC	AM Peak Period - Vol/LOSC Capacity Ratio (directional)
61	AM_CONGTIME	AM Peak Period - Congested time in min (directional)
62	AM_CONGSPD	AM Peak Period - Congested Speed in mph (directional)
63	AM_VHT	AM Peak Period - Vehicle-Hours-Travel (directional)
64	AM_VMT	AM Peak Period - Vehicle-Miles-Travel (directional)
65	AM_DAVOL	AM Peak Period - Drive-Alone Volume (directional)
66	AM_SRVOL	AM Peak Period - Shared-Ride Volume (directional)
67	AM_TRKVOL	AM Peak Period - Truck Volume (directional)
68	AM_TOTVOL2	AM Peak Period - Total Volume (2-way)
69	AM_DAVOL2	AM Peak Period - Drive-Alone Volume (2-way)
70	AM_SRVOL2	AM Peak Period - Shared-Ride Volume (2-way)
71	AM_TRKVOL2	AM Peak Period - Truck Volume (2-way)
72	AM_VCLOSE	AM Peak Period - Vol/LOSE Capacity Ratio (directional)
73	AM_VOLCNT	AM Peak Period - Vol/Count Ratio (directional)
74	AL_TOTVOL	24-Hour - Total Volume (directional)
75	AL_VCLOSC	24-Hour - Vol/LOSC Capacity Ratio (directional)
76	AL_VMT	24-Hour - Vehicle-Miles-Travel (directional)
77	AL_VHT	24-Hour - Vehicle-Hours-Travel (directional)
78	AL_DAVOL	24-Hour - Drive-Alone Volume (directional)
79	AL_SRVOL	24-Hour - Shared-Ride Volume (directional)
80	AL_TRKVOL	24-Hour - Truck Volume (directional)
81	AL_TOTVOL2	24-Hour - Total Volume (2-way)
82	AL_DAVOL2	24-Hour - Drive-Alone Volume (2-way)
83	AL_SRVOL2	24-Hour - Shared-Ride Volume (2-way)
84	AL_TRKVOL2	24-Hour - Truck Volume (2-way)
85	AL_VCLOSE	24-Hour - Vol/LOSE Capacity Ratio (directional)
86	AL_VOLCNT	24-Hour - Vol/Count Ratio (directional)
87	AL_CONGTIME	24-Hour - Congested time in min (directional)
88	AL_CONGSPD	24-Hour - Congested Speed in mph (directional)

Appendix C

Selected Validated Model Parameters

Table **Page**

C-1 Household Stratification Models for Palm Beach County C-1
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C-6 Free-Flow Speed Modifier Factor C-12

Figure

C-1 Listing of Mode Choice Constants and Coefficients from Mode Choice Program Output..... C-13
C-2 Listing of MVFACTORS File..... C-16

Table C-1: **Household Stratification Models for Palm Beach County**
Southeast Regional Planning Model VI

A. Zonal Household Vehicles of "Without-Children-Households"

X = Average Number of "without-children-household" vehicles - 1.58565

Fraction of households with zero vehicle (C0PH0V):

C0PH0V = 0.035867 -0.125870 * X +0.189301 *X^2 -0.095668 *X^3

Fraction of households with one vehicle (C0PH1V):

C0PH1V = 0.452308 -0.512626 * X -0.183124 *X^2 +0.259758 *X^3

Fraction of households with two vehicles (C0PH2V):

C0PH2V = 0.408338 +0.432315 * X -0.177221 *X^2 -0.223960 *X^3

Fraction of households with three-or-more vehicles (C0PH3+V):

C0PH3+V = 0.099949 +0.244290 * X +0.180072 *X^2

B. Zonal Household Vehicles of "With-Children-Households"

X = Average Number of "with-children-household" vehicles - 1.95135

Fraction of households with zero vehicle (C1PH0V):

C1PH0V = 0.017867 -0.085370 * X +0.065094 *X^2

Fraction of households with one vehicle (C1PH1V):

C1PH1V = 0.191913 -0.393440 * X +0.194766 *X^2

Fraction of households with two vehicles (C1PH2V):

C1PH2V = 0.633600 +0.097488 * X -0.544195 *X^2

Fraction of households with three-or-more vehicles (C1PH3+V):

C1PH3+V = 0.156619 +0.381342 * X +0.284335 *X^2

C. Zonal Household Workers of "Without-Children-Households"

X = Average Number of "without-children-household" workers - 1.01889

Fraction of households with zero worker (C0PH0W):

C0PH0W = 0.325582 -0.481785 * X +0.180162 *X^2

Fraction of households with one worker (C0PH1W):

C0PH1W = 0.380620 +0.074061 * X -0.289445 *X^2

Fraction of households with two workers (C0PH2W):

C0PH2W = 0.255794 +0.307389 * X

Fraction of households with three-or-more workers (C0PH3+W):

C0PH3+W = 0.047026 +0.103363 * X +0.066306 *X^2

D. Zonal Household Workers of "With-Children-Households"

X = Average Number of "with-children-household" workers - 1.61187

Fraction of households with zero worker (C1PH0W):

C1PH0W = 0.043792 -0.155949 * X +0.117310 *X^2

Fraction of households with one worker (C1PH1W):

C1PH1W = 0.387386 -0.552158 * X +0.182364 *X^2

Fraction of households with two workers (C1PH2W):

C1PH2W = 0.471153 +0.506459 * X -0.219727 *X^2 -0.247347 *X^3

Fraction of households with three-or-more workers (C1PH3+W):

C1PH3+W = 0.082128 +0.240231 * X +0.219413 *X^2

E. Zonal Household Persons of "Without-Children-Households"

X = Average Number of "without-children-household" persons - 1.87029

Fraction of households with one person (C0PH1P):

C0PH1P = 0.295856 -0.549442 * X +0.246355 *X^2

Fraction of households with two persons (C0PH2P):

C0PH2P = 0.591943 +0.182330 * X -0.583917 *X^2 -0.168041 *X^3

Fraction of households with three persons (C0PH3P):

C0PH3P = 0.101356 +0.229718 * X -0.044549 *X^2

Fraction of households with four-or-more persons (C0PH4+P):

C0PH4+P = 0.026794 +0.109298 * X +0.122573 *X^2

F. Zonal Household Persons of "With-Children-Households"

X = Average Number of "with-children-household" persons - 3.67155

Fraction of households with one person (C1PH1P):

C1PH1P = 0.000000

Fraction of households with two persons (C1PH2P):

C1PH2P = 0.062271 -0.093534 * X -0.166102 *X^2

Fraction of households with three persons (C1PH3P):

C1PH3P = 0.362059 -0.617573 * X +0.296406 *X^2

Fraction of households with four-or-more persons (C1PH4+P):

C1PH4+P = 0.562322 +0.668370 * X +0.144536 *X^2

Table C-2: **Household Stratification Models for Broward County**
Southeast Regional Planning Model VI

A. Zonal Household Vehicles of "Without-Children-Households"

X = Average Number of "without-children-household" vehicles - 1.48163

Fraction of households with zero vehicle (C0PH0V):
C0PH0V = 0.072776 -0.174903 * X +0.202600 *X^2 -0.078867 *X^3

Fraction of households with one vehicle (C0PH1V):
C0PH1V = 0.482594 -0.425940 * X -0.242545 *X^2 +0.201796 *X^3

Fraction of households with two vehicles (C0PH2V):
C0PH2V = 0.333415 +0.422258 * X -0.191951 *X^3

Fraction of households with three-or-more vehicles (C0PH3+V):
C0PH3+V = 0.091395 +0.221173 * X +0.153701 *X^2

B. Zonal Household Vehicles of "With-Children-Households"

X = Average Number of "with-children-household" vehicles - 1.87622

Fraction of households with zero vehicle (C1PH0V):
C1PH0V = 0.018540 -0.057316 * X +0.110140 *X^2 -0.072534 *X^3

Fraction of households with one vehicle (C1PH1V):
C1PH1V = 0.269781 -0.532833 * X +0.195506 *X^3

Fraction of households with two vehicles (C1PH2V):
C1PH2V = 0.573846 +0.300282 * X -0.385719 *X^2 -0.201778 *X^3

Fraction of households with three-or-more vehicles (C1PH3+V):
C1PH3+V = 0.150200 +0.343300 * X +0.198200 *X^2

C. Zonal Household Workers of "Without-Children-Households"

X = Average Number of "without-children-household" workers - 1.06366

Fraction of households with zero worker (C0PH0W):
C0PH0W = 0.296204 -0.462422 * X +0.171256 *X^2

Fraction of households with one worker (C0PH1W):
C0PH1W = 0.407592 -0.303007 *X^2 +0.094322 *X^3

Fraction of households with two workers (C0PH2W):
C0PH2W = 0.261694 +0.374844 * X -0.104689 *X^3

Fraction of households with three-or-more workers (C0PH3+W):
C0PH3+W = 0.047641 +0.072716 * X +0.059803 *X^2 +0.050610 *X^3

D. Zonal Household Workers of "With-Children-Households"

X = Average Number of "with-children-household" workers - 1.63649

Fraction of households with zero worker (C1PH0W):
C1PH0W = 0.037779 -0.105925 * X +0.165710 *X^2 -0.078987 *X^3

Fraction of households with one worker (C1PH1W):
C1PH1W = 0.385018 -0.520355 * X +0.195933 *X^3

Fraction of households with two workers (C1PH2W):
C1PH2W = 0.470920 +0.438651 * X -0.200182 *X^2 -0.181715 *X^3

Fraction of households with three-or-more workers (C1PH3+W):
C1PH3+W = 0.090592 +0.245527 * X +0.172362 *X^2

E. Zonal Household Persons of "Without-Children-Households"

X = Average Number of "without-children-household" persons - 1.84769

Fraction of households with one person (C0PH1P):
C0PH1P = 0.341007 -0.540536 * X +0.199598 *X^2

Fraction of households with two persons (C0PH2P):
C0PH2P = 0.529833 +0.198791 * X -0.442505 *X^2 -0.111906 *X^3

Fraction of households with three persons (C0PH3P):
C0PH3P = 0.109413 +0.222457 * X -0.041524 *X^3

Fraction of households with four-or-more persons (C0PH4+P):
C0PH4+P = 0.033020 +0.111846 * X +0.103744 *X^2

F. Zonal Household Persons of "With-Children-Households"

X = Average Number of "with-children-household" persons - 3.69562

Fraction of households with one person (C1PH1P):
C1PH1P = 0.000000

Fraction of households with two persons (C1PH2P):
C1PH2P = 0.060251 -0.093107 * X +0.025287 *X^2 -0.144799 *X^3

Fraction of households with three persons (C1PH3P):
C1PH3P = 0.361326 -0.600386 * X +0.283011 *X^3

Fraction of households with four-or-more persons (C1PH4+P):
C1PH4+P = 0.564017 +0.650724 * X +0.145491 *X^2

Table C-3: **Household Stratification Models for Miami-Dade County**
Southeast Regional Planning Model VI

A. Zonal Household Vehicles of "Without-Children-Households"

X = Average Number of "without-children-household" vehicles - 1.48183

Fraction of households with zero vehicle (C0PH0V):

C0PH0V = 0.196192 -0.274719 * X +0.180500 *X^2

Fraction of households with one vehicle (C0PH1V):

C0PH1V = 0.465787 -0.294841 * X -0.231180 *X^2 +0.149518 *X^3

Fraction of households with two vehicles (C0PH2V):

C0PH2V = 0.311817 +0.235314 * X

Fraction of households with three-or-more vehicles (C0PH3+V):

C0PH3+V = 0.113374 +0.194682 * X

B. Zonal Household Vehicles of "With-Children-Households"

X = Average Number of "with-children-household" vehicles - 1.48183

Fraction of households with zero vehicle (C1PH0V):

C1PH0V = 0.114192 +0.135369 *X^2 -0.113850 *X^3

Fraction of households with one vehicle (C1PH1V):

C1PH1V = 0.290558 -0.406235 * X +0.164252 *X^3

Fraction of households with two vehicles (C1PH2V):

C1PH2V = 0.487862 +0.139621 * X -0.182361 *X^2

Fraction of households with three-or-more vehicles (C1PH3+V):

C1PH3+V = 0.169422 +0.240908 * X

C. Zonal Household Workers of "Without-Children-Households"

X = Average Number of "without-children-household" workers - 1.15597

Fraction of households with zero worker (C0PH0W):

C0PH0W = 0.267423 -0.388381 * X +0.160925 *X^2

Fraction of households with one worker (C0PH1W):

C0PH1W = 0.418636 -0.099562 * X -0.291896 *X^2 +0.115624 *X^3

Fraction of households with two workers (C0PH2W):

C0PH2W = 0.254228 +0.318221 * X -0.085668 *X^3

Fraction of households with three-or-more workers (C0PH3+W):

C0PH3+W = 0.064525 +0.147267 * X +0.098813 *X^2

D. Zonal Household Workers of "With-Children-Households"

X = Average Number of "with-children-household" workers - 1.61805

Fraction of households with zero worker (C1PH0W):

C1PH0W = 0.069970 -0.151200 * X +0.163823 *X^2 -0.059721 *X^3

Fraction of households with one worker (C1PH1W):

C1PH1W = 0.402778 -0.392128 * X +0.147463 *X^2 -0.146225 *X^3

Fraction of households with two workers (C1PH2W):

C1PH2W = 0.415610 +0.331196 * X -0.143583 *X^2 -0.107199 *X^3

Fraction of households with three-or-more workers (C1PH3+W):

C1PH3+W = 0.110703 +0.232679 * X +0.128870 *X^2

E. Zonal Household Persons of "Without-Children-Households"

X = Average Number of "without-children-household" persons - 2.00123

Fraction of households with one person (C0PH1P):

C0PH1P = 0.312240 -0.440685 * X +0.157273 *X^2

Fraction of households with two persons (C0PH2P):

C0PH2P = 0.498467 +0.047558 * X -0.353977 *X^2 +0.103046 *X^3

Fraction of households with three persons (C0PH3P):

C0PH3P = 0.138754 +0.204881 * X -0.039188 *X^3

Fraction of households with four-or-more persons (C0PH4+P):

C0PH4+P = 0.068102 +0.154930 * X +0.082930 *X^2

F. Zonal Household Persons of "With-Children-Households"

X = Average Number of "with-children-household" persons - 4.03679

Fraction of households with one person (C1PH1P):

C1PH1P = 0.000000

Fraction of households with two persons (C1PH2P):

C1PH2P = 0.058497 -0.076960 * X -0.084200 *X^3

Fraction of households with three persons (C1PH3P):

C1PH3P = 0.293406 -0.469217 * X +0.134022 *X^3

Fraction of households with four-or-more persons (C1PH4+P):

C1PH4+P = 0.648097 +0.546177 * X -0.049822 *X^3

Table C-4: **Free Flow Friction Factors (FF.CSV)**
Southeast Regional Planning Model VI

Time (minutes)	HB Work	HB Shopping	HB Social Recreation	HB School	HB Other	NHB Work	NHB Other	Airport	4-Tire Trucks	SU Trucks	Combination Trucks
1	901225	886920	923116	883380	911194	918512	912105	0	88692	90393	92035
2	789997	287723	311687	285431	250983	354472	349544	0	78663	81709	84705
3	700512	141694	159759	140004	113585	196054	191980	0	69768	73860	77958
4	624096	82785	97149	81471	62992	125650	122181	0	61878	66764	71749
5	557453	53115	64875	52063	39051	87300	84297	39369	54881	60351	66034
6	498740	36159	45966	35301	25976	63833	61207	32764	48675	54553	60774
7	446714	25642	33928	24934	18140	48348	46036	27283	43171	49312	55934
8	400445	18737	25803	18147	13127	37576	35530	22728	38289	44575	51479
9	359195	14007	20077	13512	9761	29786	27967	18939	33960	40293	47379
10	322355	10662	15906	10244	7415	23980	22359	15786	30119	36422	43605
11	289409	8235	12787	7881	5732	19550	18101	13160	26714	32923	40132
12	259916	6438	10404	6136	4494	16105	14808	10973	23693	29760	36935
13	233494	5084	8551	4826	3567	13383	12219	9151	21014	26901	33994
14	209808	4049	7089	3829	2860	11204	10158	7632	18637	24317	31286
15	188563	3249	5920	3060	2313	9440	8499	6366	16530	21981	28794
16	169500	2624	4977	2461	1886	7998	7151	5311	14661	19869	26501
17	152388	2131	4207	1991	1547	6810	6046	4430	13003	17960	24390
18	137022	1740	3575	1619	1278	5823	5134	3696	11533	16235	22447
19	123221	1427	3051	1322	1060	4999	4377	3084	10228	14675	20659
20	110822	1175	2614	1084	884	4306	3744	2573	9072	13266	19014
21	99681	971	2248	892	741	3721	3213	2147	8046	11991	17499
22	89668	805	1940	737	623	3225	2765	1792	7136	10839	16106
23	80667	669	1679	610	526	2802	2385	1495	6329	9798	14823
24	72576	558	1457	507	445	2440	2063	1248	5613	8857	13642
25	65301	466	1268	422	378	2130	1788	1042	4979	8006	12556
26	58758	391	1105	352	322	1862	1553	869	4416	7237	11556
27	52875	328	966	294	275	1632	1351	726	3916	6542	10635
28	47583	276	846	247	235	1432	1177	606	3474	5913	9788
29	42822	233	742	207	202	1259	1028	506	3081	5345	9009
30	38540	196	652	174	173	1108	898	422	2732	4832	8291
31	34688	166	574	147	149	977	786	352	2423	4367	7631
32	31222	141	506	124	129	863	689	294	2149	3948	7023
33	28104	119	447	105	111	762	605	245	1906	3569	6463
34	25297	101	395	88	96	675	532	205	1691	3226	5949
35	22772	86	350	75	83	598	468	171	1500	2916	5475
36	20500	73	310	64	72	530	412	143	1330	2636	5039
37	18455	63	275	54	63	470	363	119	1180	2383	4637
38	16614	53	244	46	55	418	320	100	1046	2154	4268
39	14957	46	217	39	48	371	283	83	928	1947	3928
40	13466	39	193	33	42	331	250	69	823	1760	3615
41	12124	33	172	28	36	294	221	58	730	1591	3327
42	10916	29	153	24	32	262	196	48	647	1438	3062
43	9829	24	137	21	28	234	173	40	574	1300	2818
44	8850	21	122	18	24	209	153	34	509	1175	2594
45	7968	18	109	15	21	186	136	28	452	1062	2387
46	7175	15	98	13	19	167	121	23	401	960	2197
47	6461	13	87	11	16	149	107	20	355	868	2022
48	5818	11	78	9	14	133	95	16	315	784	1861
49	5239	10	70	8	13	119	85	14	279	709	1713
50	4717	8	63	7	11	107	75	11	248	641	1576

Table C-4 (Continued)

Time (minutes)	HB Work	HB Shopping	HB Social Recreation	HB School	HB Other	NHB Work	NHB Other	Airport	4-Tire Trucks	SU Trucks	Combination Trucks
51	4248	7	56	6	10	96	67	10	220	579	1451
52	3826	6	51	5	9	86	60	8	195	524	1335
53	3445	5	45	4	8	77	53	7	173	473	1229
54	3102	5	41	4	7	69	47	6	153	428	1131
55	2794	4	37	3	6	62	42	5	136	387	1041
56	2516	4	33	3	5	56	38	4	121	350	958
57	2266	3	30	2	5	50	34	3	107	316	882
58	2041	3	27	2	4	45	30	3	95	286	812
59	1838	2	24	2	4	40	27	2	84	258	747
60	1655	2	22	2	3	36	24	2	75	233	687
61	1491	2	20	1	3	33	21	2	66	211	633
62	1343	1	18	1	3	29	19	1	59	191	582
63	1209	1	16	1	2	27	17	1	52	172	536
64	1089	1	14	1	2	24	15	1	46	156	493
65	981	1	13	1	2	22	14	1	41	141	454
66	884	1	12	1	2	19	12	1	36	127	418
67	796	1	11	1	1	17	11	1	32	115	384
68	717	1	10	0	1	16	10	0	29	104	354
69	646	1	9	0	1	14	9	0	25	94	326
70	581	0	8	0	1	13	8	0	22	85	300
71	524	0	7	0	1	12	7	0	20	77	276
72	472	0	6	0	1	10	6	0	18	69	254
73	425	0	6	0	1	9	6	0	16	63	234
74	383	0	5	0	1	9	5	0	14	57	215
75	345	0	5	0	1	8	5	0	12	51	198
76	311	0	4	0	0	7	4	0	11	46	182
77	280	0	4	0	0	6	4	0	10	42	168
78	252	0	4	0	0	6	3	0	9	38	154
79	227	0	3	0	0	5	3	0	8	34	142
80	204	0	3	0	0	5	3	0	7	31	131
81	184	0	3	0	0	4	2	0	6	28	120
82	166	0	2	0	0	4	2	0	5	25	111
83	149	0	2	0	0	3	2	0	5	23	102
84	135	0	2	0	0	3	2	0	4	21	94
85	121	0	2	0	0	3	2	0	4	19	86
86	109	0	2	0	0	3	1	0	3	17	79
87	98	0	1	0	0	2	1	0	3	15	73
88	89	0	1	0	0	2	1	0	3	14	67
89	80	0	1	0	0	2	1	0	2	12	62
90	72	0	1	0	0	2	1	0	2	11	57
91	65	0	1	0	0	2	1	0	2	10	52
92	58	0	1	0	0	1	1	0	2	9	48
93	53	0	1	0	0	1	1	0	1	8	44
94	47	0	1	0	0	1	1	0	1	8	41
95	43	0	1	0	0	1	1	0	1	7	38
96	38	0	1	0	0	1	0	0	1	6	35
97	35	0	1	0	0	1	0	0	1	6	32
98	31	0	1	0	0	1	0	0	1	5	29
99	28	0	0	0	0	1	0	0	1	5	27
100	25	0	0	0	0	1	0	0	1	4	25

Table C-4 (Continued)

Time (minutes)	HB Work	HB Shopping	HB Social Recreation	HB School	HB Other	NHB Work	NHB Other	Airport	4-Tire Trucks	SU Trucks	Combination Trucks
101	23	0	0	0	0	1	0	0	1	4	23
102	21	0	0	0	0	1	0	0	0	3	21
103	19	0	0	0	0	0	0	0	0	3	19
104	17	0	0	0	0	0	0	0	0	3	18
105	15	0	0	0	0	0	0	0	0	2	16
106	14	0	0	0	0	0	0	0	0	2	15
107	12	0	0	0	0	0	0	0	0	2	14
108	11	0	0	0	0	0	0	0	0	2	13
109	10	0	0	0	0	0	0	0	0	2	12
110	9	0	0	0	0	0	0	0	0	1	11
111	8	0	0	0	0	0	0	0	0	1	10
112	7	0	0	0	0	0	0	0	0	1	9
113	7	0	0	0	0	0	0	0	0	1	8
114	6	0	0	0	0	0	0	0	0	1	8
115	5	0	0	0	0	0	0	0	0	1	7
116	5	0	0	0	0	0	0	0	0	1	7
117	4	0	0	0	0	0	0	0	0	1	6
118	4	0	0	0	0	0	0	0	0	1	6
119	3	0	0	0	0	0	0	0	0	1	5
120	3	0	0	0	0	0	0	0	0	1	5
121	3	0	0	0	0	0	0	0	0	0	4
122	3	0	0	0	0	0	0	0	0	0	4
123	2	0	0	0	0	0	0	0	0	0	4
124	2	0	0	0	0	0	0	0	0	0	3
125	2	0	0	0	0	0	0	0	0	0	3
126	2	0	0	0	0	0	0	0	0	0	3
127	2	0	0	0	0	0	0	0	0	0	3
128	1	0	0	0	0	0	0	0	0	0	2
129	1	0	0	0	0	0	0	0	0	0	2
130	1	0	0	0	0	0	0	0	0	0	2
131	1	0	0	0	0	0	0	0	0	0	2
132	1	0	0	0	0	0	0	0	0	0	2
133	1	0	0	0	0	0	0	0	0	0	2
134	1	0	0	0	0	0	0	0	0	0	1
135	1	0	0	0	0	0	0	0	0	0	1
136	1	0	0	0	0	0	0	0	0	0	1
137	1	0	0	0	0	0	0	0	0	0	1
138	0	0	0	0	0	0	0	0	0	0	1
139	0	0	0	0	0	0	0	0	0	0	1
140	0	0	0	0	0	0	0	0	0	0	1
141	0	0	0	0	0	0	0	0	0	0	1
142	0	0	0	0	0	0	0	0	0	0	1
143	0	0	0	0	0	0	0	0	0	0	1
144	0	0	0	0	0	0	0	0	0	0	1
145	0	0	0	0	0	0	0	0	0	0	1
146	0	0	0	0	0	0	0	0	0	0	1
147	0	0	0	0	0	0	0	0	0	0	1
148	0	0	0	0	0	0	0	0	0	0	0
149	0	0	0	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0	0	0	0

Table C-4 (Continued)

Time (minutes)	HB Work	HB Shopping	HB Social Recreation	HB School	HB Other	NHB Work	NHB Other	Airport	4-Tire Trucks	SU Trucks	Combination Trucks
151	0	0	0	0	0	0	0	0	0	0	0
152	0	0	0	0	0	0	0	0	0	0	0
153	0	0	0	0	0	0	0	0	0	0	0
154	0	0	0	0	0	0	0	0	0	0	0
155	0	0	0	0	0	0	0	0	0	0	0
156	0	0	0	0	0	0	0	0	0	0	0
157	0	0	0	0	0	0	0	0	0	0	0
158	0	0	0	0	0	0	0	0	0	0	0
159	0	0	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0	0	0	0
161	0	0	0	0	0	0	0	0	0	0	0
162	0	0	0	0	0	0	0	0	0	0	0
163	0	0	0	0	0	0	0	0	0	0	0
164	0	0	0	0	0	0	0	0	0	0	0
165	0	0	0	0	0	0	0	0	0	0	0
166	0	0	0	0	0	0	0	0	0	0	0
167	0	0	0	0	0	0	0	0	0	0	0
168	0	0	0	0	0	0	0	0	0	0	0
169	0	0	0	0	0	0	0	0	0	0	0
170	0	0	0	0	0	0	0	0	0	0	0
171	0	0	0	0	0	0	0	0	0	0	0
172	0	0	0	0	0	0	0	0	0	0	0
173	0	0	0	0	0	0	0	0	0	0	0
174	0	0	0	0	0	0	0	0	0	0	0
175	0	0	0	0	0	0	0	0	0	0	0
176	0	0	0	0	0	0	0	0	0	0	0
177	0	0	0	0	0	0	0	0	0	0	0
178	0	0	0	0	0	0	0	0	0	0	0
179	0	0	0	0	0	0	0	0	0	0	0
180	0	0	0	0	0	0	0	0	0	0	0
181	0	0	0	0	0	0	0	0	0	0	0
182	0	0	0	0	0	0	0	0	0	0	0
183	0	0	0	0	0	0	0	0	0	0	0
184	0	0	0	0	0	0	0	0	0	0	0
185	0	0	0	0	0	0	0	0	0	0	0
186	0	0	0	0	0	0	0	0	0	0	0
187	0	0	0	0	0	0	0	0	0	0	0
188	0	0	0	0	0	0	0	0	0	0	0
189	0	0	0	0	0	0	0	0	0	0	0
190	0	0	0	0	0	0	0	0	0	0	0
191	0	0	0	0	0	0	0	0	0	0	0
192	0	0	0	0	0	0	0	0	0	0	0
193	0	0	0	0	0	0	0	0	0	0	0
194	0	0	0	0	0	0	0	0	0	0	0
195	0	0	0	0	0	0	0	0	0	0	0
196	0	0	0	0	0	0	0	0	0	0	0
197	0	0	0	0	0	0	0	0	0	0	0
198	0	0	0	0	0	0	0	0	0	0	0
199	0	0	0	0	0	0	0	0	0	0	0
200	0	0	0	0	0	0	0	0	0	0	0

Table C-5: **Free Flow Friction Factors (FF2.CSV)**
Southeast Regional Planning Model VI

Time (minutes)	HB Work	HB Shopping	HB Social Recreation	HB School	HB Other	NHB Work	NHB Other	Airport	4-Tire Trucks	SU Trucks	Combination Trucks
1	450613	443460	461558	441690	455597	466197	463408	0	69583	71302	70960
2	473998	172634	187012	171258	150590	226889	224182	0	62252	65360	66416
3	490358	99186	111832	98003	79509	151661	148955	0	55892	60109	62332
4	499276	66228	77719	65176	50394	114397	111684	0	50404	55489	58677
5	501707	47804	58387	46857	35146	91786	89073	39369	45695	51445	55420
6	498740	36159	45966	35301	25976	76390	73689	32764	41685	47926	52533
7	446714	25642	33928	24934	18140	59188	56753	27283	38301	44888	49990
8	400445	18737	25803	18147	13127	47009	44806	22728	35478	42287	47766
9	359195	14007	20077	13512	9761	38050	36049	18939	33158	40087	45840
10	322355	10662	15906	10244	7415	31260	29440	15786	31287	38252	44191
11	289409	8235	12787	7881	5732	25994	24334	13160	28820	35751	42798
12	259916	6438	10404	6136	4494	21832	20315	10973	26714	33554	40645
13	233494	5084	8551	4826	3567	18490	17103	9151	23931	30636	38213
14	209808	4049	7089	3829	2860	15772	14501	7632	21438	27971	35987
15	188563	3249	5920	3060	2313	13536	12371	6366	19205	25538	33454
16	169500	2624	4977	2461	1886	11680	10611	5311	17204	23317	31099
17	152388	2131	4207	1991	1547	10126	9144	4430	15412	21289	28909
18	137022	1740	3575	1619	1278	8815	7912	3696	13807	19437	26874
19	123221	1427	3051	1322	1060	7702	6872	3084	12369	17746	24982
20	110822	1175	2614	1084	884	6752	5989	2573	11080	16203	23224
21	99681	971	2248	892	741	5937	5235	2147	9926	14793	21589
22	89668	805	1940	737	623	5235	4588	1792	8892	13506	20069
23	80667	669	1679	610	526	4628	4031	1495	7966	12332	18656
24	72576	558	1457	507	445	4100	3550	1248	7136	11259	17343
25	65301	466	1268	422	378	3640	3133	1042	6393	10280	16122
26	58758	391	1105	352	322	3237	2770	869	5727	9386	14987
27	52875	328	966	294	275	2885	2453	726	5130	8569	13932
28	47583	276	846	247	235	2575	2177	606	4596	7824	12951
29	42822	233	742	207	202	2302	1934	506	4117	7143	12039
30	38540	196	652	174	173	2060	1721	422	3688	6522	11192
31	34688	166	574	147	149	1847	1533	352	3304	5955	10404
32	31222	141	506	124	129	1658	1368	294	2960	5437	9671
33	28104	119	447	105	111	1490	1222	245	2652	4964	8991
34	25297	101	395	88	96	1340	1093	205	2375	4532	8358
35	22772	86	350	75	83	1207	978	171	2128	4138	7769
36	20500	73	310	64	72	1088	876	143	1906	3778	7222
37	18455	63	275	54	63	981	786	119	1708	3449	6714
38	16614	53	244	46	55	886	705	100	1530	3149	6241
39	14957	46	217	39	48	801	634	83	1370	2875	5802
40	13466	39	193	33	42	724	570	69	1228	2625	5393
41	12124	33	172	28	36	656	513	58	1100	2397	5014
42	10916	29	153	24	32	594	462	48	985	2188	4661
43	9829	24	137	21	28	538	416	40	883	1998	4333
44	8850	21	122	18	24	488	375	34	791	1824	4028
45	7968	18	109	15	21	443	338	28	708	1666	3744
46	7175	15	98	13	19	402	305	23	635	1521	3480
47	6461	13	87	11	16	366	276	20	568	1388	3235
48	5818	11	78	9	14	332	249	16	509	1268	3008
49	5239	10	70	8	13	302	225	14	456	1157	2796
50	4717	8	63	7	11	275	204	11	409	1057	2599

Table C-5 (Continued)

Time (minutes)	HB Work	HB Shopping	HB Social Recreation	HB School	HB Other	NHB Work	NHB Other	Airport	4-Tire Trucks	SU Trucks	Combination Trucks
51	4248	7	56	6	10	250	184	10	366	965	2416
52	3826	6	51	5	9	228	167	8	328	881	2246
53	3445	5	45	4	8	208	151	7	294	804	2088
54	3102	5	41	4	7	190	137	6	263	734	1941
55	2794	4	37	3	6	173	124	5	236	670	1804
56	2516	4	33	3	5	158	113	4	211	612	1677
57	2266	3	30	2	5	144	102	3	189	559	1559
58	2041	3	27	2	4	131	93	3	170	510	1449
59	1838	2	24	2	4	120	84	2	152	466	1347
60	1655	2	22	2	3	110	77	2	136	425	1253
61	1491	2	20	1	3	100	70	2	122	388	1164
62	1343	1	18	1	3	92	63	1	109	355	1082
63	1209	1	16	1	2	84	57	1	98	324	1006
64	1089	1	14	1	2	77	52	1	88	296	935
65	981	1	13	1	2	70	48	1	78	270	870
66	884	1	12	1	2	64	43	1	70	246	808
67	796	1	11	1	1	59	39	1	63	225	751
68	717	1	10	0	1	54	36	0	56	205	698
69	646	1	9	0	1	49	33	0	51	188	649
70	581	0	8	0	1	45	30	0	45	171	604
71	524	0	7	0	1	42	27	0	41	156	561
72	472	0	6	0	1	38	25	0	36	143	522
73	425	0	6	0	1	35	23	0	33	130	485
74	383	0	5	0	1	32	21	0	29	119	451
75	345	0	5	0	1	29	19	0	26	109	419
76	311	0	4	0	0	27	17	0	23	99	390
77	280	0	4	0	0	25	16	0	21	91	362
78	252	0	4	0	0	23	14	0	19	83	337
79	227	0	3	0	0	21	13	0	17	75	313
80	204	0	3	0	0	19	12	0	15	69	291
81	184	0	3	0	0	18	11	0	14	63	270
82	166	0	2	0	0	16	10	0	12	57	251
83	149	0	2	0	0	15	9	0	11	52	234
84	135	0	2	0	0	14	8	0	10	48	217
85	121	0	2	0	0	13	8	0	9	44	202
86	109	0	2	0	0	12	7	0	8	40	188
87	98	0	1	0	0	11	6	0	7	36	175
88	89	0	1	0	0	10	6	0	6	33	162
89	80	0	1	0	0	9	5	0	6	30	151
90	72	0	1	0	0	8	5	0	5	28	140
91	65	0	1	0	0	8	4	0	4	25	130
92	58	0	1	0	0	7	4	0	4	23	121
93	53	0	1	0	0	6	4	0	4	21	113
94	47	0	1	0	0	6	3	0	3	19	105
95	43	0	1	0	0	5	3	0	3	18	97
96	38	0	1	0	0	5	3	0	3	16	90
97	35	0	1	0	0	5	3	0	2	15	84
98	31	0	1	0	0	4	2	0	2	13	78
99	28	0	0	0	0	4	2	0	2	12	73
100	25	0	0	0	0	4	2	0	2	11	68

Table C-5 (Continued)

Time (minutes)	HB Work	HB Shopping	HB Social Recreation	HB School	HB Other	NHB Work	NHB Other	Airport	4-Tire Trucks	SU Trucks	Combination Trucks
101	23	0	0	0	0	3	2	0	1	10	63
102	21	0	0	0	0	3	2	0	1	9	58
103	19	0	0	0	0	3	2	0	1	8	54
104	17	0	0	0	0	3	1	0	1	8	50
105	15	0	0	0	0	2	1	0	1	7	47
106	14	0	0	0	0	2	1	0	1	6	44
107	12	0	0	0	0	2	1	0	1	6	41
108	11	0	0	0	0	2	1	0	1	5	38
109	10	0	0	0	0	2	1	0	1	5	35
110	9	0	0	0	0	2	1	0	1	4	33
111	8	0	0	0	0	1	1	0	0	4	30
112	7	0	0	0	0	1	1	0	0	4	28
113	7	0	0	0	0	1	1	0	0	3	26
114	6	0	0	0	0	1	1	0	0	3	24
115	5	0	0	0	0	1	1	0	0	3	23
116	5	0	0	0	0	1	0	0	0	3	21
117	4	0	0	0	0	1	0	0	0	2	20
118	4	0	0	0	0	1	0	0	0	2	18
119	3	0	0	0	0	1	0	0	0	2	17
120	3	0	0	0	0	1	0	0	0	2	16
121	3	0	0	0	0	1	0	0	0	2	15
122	3	0	0	0	0	1	0	0	0	2	14
123	2	0	0	0	0	1	0	0	0	1	13
124	2	0	0	0	0	1	0	0	0	1	12
125	2	0	0	0	0	0	0	0	0	1	11
126	2	0	0	0	0	0	0	0	0	1	10
127	2	0	0	0	0	0	0	0	0	1	9
128	1	0	0	0	0	0	0	0	0	1	9
129	1	0	0	0	0	0	0	0	0	1	8
130	1	0	0	0	0	0	0	0	0	1	8
131	1	0	0	0	0	0	0	0	0	1	7
132	1	0	0	0	0	0	0	0	0	1	7
133	1	0	0	0	0	0	0	0	0	1	6
134	1	0	0	0	0	0	0	0	0	1	6
135	1	0	0	0	0	0	0	0	0	0	5
136	1	0	0	0	0	0	0	0	0	0	5
137	1	0	0	0	0	0	0	0	0	0	5
138	0	0	0	0	0	0	0	0	0	0	4
139	0	0	0	0	0	0	0	0	0	0	4
140	0	0	0	0	0	0	0	0	0	0	4
141	0	0	0	0	0	0	0	0	0	0	3
142	0	0	0	0	0	0	0	0	0	0	3
143	0	0	0	0	0	0	0	0	0	0	3
144	0	0	0	0	0	0	0	0	0	0	3
145	0	0	0	0	0	0	0	0	0	0	3
146	0	0	0	0	0	0	0	0	0	0	2
147	0	0	0	0	0	0	0	0	0	0	2
148	0	0	0	0	0	0	0	0	0	0	2
149	0	0	0	0	0	0	0	0	0	0	2
150	0	0	0	0	0	0	0	0	0	0	2

Table C-5 (Continued)

Time (minutes)	HB Work	HB Shopping	HB Social Recreation	HB School	HB Other	NHB Work	NHB Other	Airport	4-Tire Trucks	SU Trucks	Combination Trucks
151	0	0	0	0	0	0	0	0	0	0	2
152	0	0	0	0	0	0	0	0	0	0	2
153	0	0	0	0	0	0	0	0	0	0	1
154	0	0	0	0	0	0	0	0	0	0	1
155	0	0	0	0	0	0	0	0	0	0	1
156	0	0	0	0	0	0	0	0	0	0	1
157	0	0	0	0	0	0	0	0	0	0	1
158	0	0	0	0	0	0	0	0	0	0	1
159	0	0	0	0	0	0	0	0	0	0	1
160	0	0	0	0	0	0	0	0	0	0	1
161	0	0	0	0	0	0	0	0	0	0	1
162	0	0	0	0	0	0	0	0	0	0	1
163	0	0	0	0	0	0	0	0	0	0	1
164	0	0	0	0	0	0	0	0	0	0	1
165	0	0	0	0	0	0	0	0	0	0	1
166	0	0	0	0	0	0	0	0	0	0	1
167	0	0	0	0	0	0	0	0	0	0	1
168	0	0	0	0	0	0	0	0	0	0	0
169	0	0	0	0	0	0	0	0	0	0	0
170	0	0	0	0	0	0	0	0	0	0	0
171	0	0	0	0	0	0	0	0	0	0	0
172	0	0	0	0	0	0	0	0	0	0	0
173	0	0	0	0	0	0	0	0	0	0	0
174	0	0	0	0	0	0	0	0	0	0	0
175	0	0	0	0	0	0	0	0	0	0	0
176	0	0	0	0	0	0	0	0	0	0	0
177	0	0	0	0	0	0	0	0	0	0	0
178	0	0	0	0	0	0	0	0	0	0	0
179	0	0	0	0	0	0	0	0	0	0	0
180	0	0	0	0	0	0	0	0	0	0	0
181	0	0	0	0	0	0	0	0	0	0	0
182	0	0	0	0	0	0	0	0	0	0	0
183	0	0	0	0	0	0	0	0	0	0	0
184	0	0	0	0	0	0	0	0	0	0	0
185	0	0	0	0	0	0	0	0	0	0	0
186	0	0	0	0	0	0	0	0	0	0	0
187	0	0	0	0	0	0	0	0	0	0	0
188	0	0	0	0	0	0	0	0	0	0	0
189	0	0	0	0	0	0	0	0	0	0	0
190	0	0	0	0	0	0	0	0	0	0	0
191	0	0	0	0	0	0	0	0	0	0	0
192	0	0	0	0	0	0	0	0	0	0	0
193	0	0	0	0	0	0	0	0	0	0	0
194	0	0	0	0	0	0	0	0	0	0	0
195	0	0	0	0	0	0	0	0	0	0	0
196	0	0	0	0	0	0	0	0	0	0	0
197	0	0	0	0	0	0	0	0	0	0	0
198	0	0	0	0	0	0	0	0	0	0	0
199	0	0	0	0	0	0	0	0	0	0	0
200	0	0	0	0	0	0	0	0	0	0	0

Table C-6: **Free-Flow Speed Modifier Factor**
Southeast Regional Planning Model VI

AT		FTC2		Speed
Low	High	Low	High	Factor
1	1	11	11	0.80
1	1	21	21	0.95
1	1	41	41	0.90
1	1	61	61	0.98
1	1	71	75	0.95
1	1	81	82	0.83
1	1	83	86	1.00
1	1	91	92	0.95
1	1	93	95	1.00
2	2	11	11	0.85
2	2	21	21	0.92
2	2	41	41	0.95
2	2	61	61	0.90
2	2	71	75	0.80
2	2	81	82	0.88
2	2	83	86	1.00
2	2	91	92	0.88
2	2	93	95	0.95
3	3	11	11	0.85
3	3	21	21	0.80
3	3	41	41	0.98
3	3	61	61	1.00
3	3	71	75	0.92
3	3	81	82	0.85
3	3	83	86	1.00
3	3	91	92	0.95
3	3	93	95	0.95
4	4	11	11	0.82
4	4	21	21	0.85
4	4	41	41	0.97
4	4	61	61	1.00
4	4	71	75	0.90
4	4	81	82	0.83
4	4	83	86	1.00
4	4	91	92	0.95
4	4	93	95	0.95
5	5	11	11	0.97
5	5	21	21	0.83
5	5	41	41	0.93
5	5	61	61	0.95
5	5	71	75	0.88
5	5	81	82	0.97
5	5	83	86	1.00
5	5	91	92	1.03
5	5	93	95	0.98

Note: see **Tables 2-2** and **2-3** for definitions of AT and FTC2 codes.

Figure C-1: **Listing of Mode Choice Constants and Coefficients from Mode Choice Program Output**
Southeast Regional Planning Model VI

INPUT LOGIT CONSTANTS

	HBWRK PK	HBNW PK	NHB PK	HBWRK OP	HBNW OP	NHB OP
Shared Ride - Zero Car HH	0.00000	0.00000	-0.52530	0.00000	0.00000	-0.50770
Shared Ride - One Car HH	-1.33120	-0.00150	-0.52530	-1.33510	-0.01970	-0.50770
Shared Ride - Two+ Car HH	-1.93310	-0.00050	-0.52530	-1.93700	-0.02650	-0.50770
Shared Ride 3 - Zero Car HH	-0.31190	-0.17430	-0.20820	-0.30610	-0.17910	-0.19350
Shared Ride 3 - One Car HH	-0.31650	-0.19320	-0.20820	-0.31620	-0.19900	-0.19350
Shared Ride 3 - Two+ Car HH	-0.34110	-0.10800	-0.20820	-0.34010	-0.11790	-0.19350
Walk to Transit - Zero Car HH	1.88950	-0.11300	-1.70290	2.05450	0.12890	-2.11360
Walk to Transit - One Car HH	-0.00570	-1.07820	-1.70290	0.26470	-0.86320	-2.11360
Walk to Transit - Two+ Car HH	-2.23110	-2.69030	-1.70290	-1.91360	-2.40610	-2.11360
BRT/LRT	0.24000	0.18000	0.21600	0.24000	0.18000	0.21600
Metrorail	0.17090	0.30620	0.26920	0.51180	0.66250	0.53830
Tri Rail	0.26970	0.61230	0.89200	-0.38340	0.26400	0.65090
Park/Ride - Zero Car HH	-5.46850	-5.07650	-1.98510	-5.38010	-5.04410	-2.35880
Park/Ride - One Car HH	-0.00300	-1.42170	-1.98510	0.24590	-1.20490	-2.35880
Park/Ride - Two+ Car HH	-1.97810	-2.77580	-1.98510	-1.69740	-2.57260	-2.35880
Kiss/Ride - Zero Car HH	-5.46850	-5.07650	-1.76030	-5.38010	-5.04410	-2.09860
Kiss/Ride - One Car HH	0.16350	-1.22400	-1.76030	0.44410	-0.95610	-2.09860
Kiss/Ride - Two+ Car HH	-1.86500	-2.59280	-1.76030	-1.55170	-2.32110	-2.09860

NEW COEFFICIENTS AS RUN TIME MINUTES

	HBWRK PK	HBNW PK	NHB PK	HBWRK OP	HBNW OP	NHB OP
Shared Ride - Zero Car HH	0.0	0.0	-29.2	0.0	0.0	-28.2
Shared Ride - One Car HH	-66.6	-0.1	-29.2	-66.8	-1.3	-28.2
Shared Ride - Two+ Car HH	-96.7	0.0	-29.2	-96.8	-1.8	-28.2
Shared Ride 3 - Zero Car HH	-15.6	-11.6	-11.6	-15.3	-11.9	-10.8
Shared Ride 3 - One Car HH	-15.8	-12.9	-11.6	-15.8	-13.3	-10.8
Shared Ride 3 - Two + Car HH	-17.1	-7.2	-11.6	-17.0	-7.9	-10.8
Walk to Transit - Zero Car HH	94.5	-7.5	-94.6	102.7	8.6	-117.4
Walk to Transit - One Car HH	-0.3	-71.9	-94.6	13.2	-57.5	-117.4
Walk to Transit - Two+ Car HH	-111.6	-179.4	-94.6	-95.7	-160.4	-117.4
BRT/LRT	12.0	12.0	12.0	12.0	12.0	12.0
Metrorail	8.5	20.4	15.0	25.6	44.2	29.9
Tri Rail	13.5	40.8	49.6	-19.2	17.6	36.2
Park/Ride - Zero Car HH	-273.4	-338.4	-110.3	-269.0	-336.3	-131.0
Park/Ride - One Car HH	-0.1	-94.8	-110.3	12.3	-80.3	-131.0
Park/Ride - Two+ Car HH	-98.9	-185.1	-110.3	-84.9	-171.5	-131.0
Kiss/Ride - Zero Car HH	-273.4	-338.4	-97.8	-269.0	-336.3	-116.6
Kiss/Ride - One Car HH	8.2	-81.6	-97.8	22.2	-63.7	-116.6
Kiss/Ride - Two+ Car HH	-93.2	-172.9	-97.8	-77.6	-154.7	-116.6

Figure C-1 (Continued)

INPUT LOGIT CONSTANTS

	HBWRK PK	HBNW PK	NHB PK	HBWRK OP	HBNW OP	NHB OP
Transit Walk Time	-0.04500	-0.03500	-0.04500	-0.04500	-0.03500	-0.04500
Transit Auto Access Time	-0.02000	-0.01500	-0.01800	-0.02000	-0.01500	-0.01800
Transit Run Time	-0.02000	-0.01500	-0.01800	-0.02000	-0.01500	-0.01800
Transit First Wait Time < 7 min	-0.04500	-0.03500	-0.04500	-0.04500	-0.03500	-0.04500
Transit First Wait Time > 7 min	-0.02300	-0.03500	-0.04500	-0.02300	-0.03500	-0.04500
Transit Transfer (2nd Wait) Time	-0.04500	-0.03500	-0.04500	-0.04500	-0.03500	-0.04500
Transit Number of Transfers	-0.04500	-0.03500	-0.04500	-0.04500	-0.03500	-0.04500
Transit Fare	-0.00320	-0.00480	-0.00480	-0.00320	-0.00480	-0.00480
Highway Terminal Time	-0.04500	-0.03500	-0.04500	-0.04500	-0.03500	-0.04500
Highway Run Time	-0.02000	-0.01500	-0.01800	-0.02000	-0.01500	-0.01800
Auto Operating Costs	-0.00250	-0.00480	-0.00480	-0.00250	-0.00480	-0.00480
Highway Parking Costs	-0.00320	-0.00480	-0.00480	-0.00320	-0.00480	-0.00480
Hov Time Difference	-0.01800	-0.01500	-0.01800	-0.01800	-0.01500	-0.01800
Walk to Local Transit Coefficients						
- for Zero Car Households	1.88950	-0.11300	-1.70290	2.05450	0.12890	-2.11360
- for One Car Households	-0.00570	-1.07820	-1.70290	0.26470	-0.86320	-2.11360
- for Two+ Car Households	-2.23110	-2.69030	-1.70290	-1.91360	-2.40610	-2.11360
Walk to BRT/LRT Bus Transit Coefficients						
- for Zero Car Households	2.12950	0.06700	-1.48690	2.29450	0.30890	-1.89760
- for One Car Households	0.23430	-0.89820	-1.48690	0.50470	-0.68320	-1.89760
- for Two+ Car Households	-1.99110	-2.51030	-1.48690	-1.67360	-2.22610	-1.89760
Walk to Metro Rail Transit Coefficients						
- for Zero Car Households	2.06040	0.19320	-1.43370	2.56630	0.79140	-1.57530
- for One Car Households	0.16520	-0.77200	-1.43370	0.77650	-0.20070	-1.57530
- for Two+ Car Households	-2.06020	-2.38410	-1.43370	-1.40180	-1.74360	-1.57530
Walk to Tri Rail Transit Coefficients						
- for Zero Car Households	2.15920	0.49930	-0.81090	1.67110	0.39290	-1.46270
- for One Car Households	0.26400	-0.46590	-0.81090	-0.11870	-0.59920	-1.46270
- for Two+ Car Households	-1.96140	-2.07800	-0.81090	-2.29700	-2.14210	-1.46270
Premium Bus Coefficients	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Park-Ride to Bus Transit Coefficients						
- for Zero Car Households	-5.46850	-5.07650	-1.98510	-5.38010	-5.04410	-2.35880
- for One Car Households	-0.00300	-1.42170	-1.98510	0.24590	-1.20490	-2.35880
- for Two+ Car Households	-1.97810	-2.77580	-1.98510	-1.69740	-2.57260	-2.35880
Park-Ride to BRT/LRT Transit Coefficients						
- for Zero Car Households	-5.22850	-4.89650	-1.76910	-5.14010	-4.86410	-2.14280
- for One Car Households	0.23700	-1.24170	-1.76910	0.48590	-1.02490	-2.14280
- for Two+ Car Households	-1.73810	-2.59580	-1.76910	-1.45740	-2.39260	-2.14280
Park-Ride to Metro Rail Transit Coefficients						
- for Zero Car Households	-5.29760	-4.77030	-1.71590	-4.86830	-4.38160	-1.82050
- for One Car Households	0.16790	-1.11550	-1.71590	0.75770	-0.54240	-1.82050
- for Two+ Car Households	-1.80720	-2.46960	-1.71590	-1.18560	-1.91010	-1.82050
Park-Ride to Tri Rail Transit Coefficients						
- for Zero Car Households	-5.19880	-4.46420	-1.09310	-5.76350	-4.78010	-1.70790
- for One Car Households	0.26670	-0.80940	-1.09310	-0.13750	-0.94090	-1.70790
- for Two+ Car Households	-1.70840	-2.16350	-1.09310	-2.08080	-2.30860	-1.70790

Figure C-1 (Continued)

INPUT LOGIT CONSTANTS

	HBWRK PK	HBNW PK	NHB PK	HBWRK OP	HBNW OP	NHB OP
Kiss-Ride to Bus Transit Coefficients						
- for Zero Car Households	-5.46850	-5.07650	-1.76030	-5.38010	-5.04410	-2.09860
- for One Car Households	0.16350	-1.22400	-1.76030	0.44410	-0.95610	-2.09860
- for Two+ Car Households	-1.86500	-2.59280	-1.76030	-1.55170	-2.32110	-2.09860
Kiss-Ride to BRT/LRT Transit Coefficients						
- for Zero Car Households	-5.22850	-4.89650	-1.54430	-5.14010	-4.86410	-1.88260
- for One Car Households	0.40350	-1.04400	-1.54430	0.68410	-0.77610	-1.88260
- for Two+ Car Households	-1.62500	-2.41280	-1.54430	-1.31170	-2.14110	-1.88260
Kiss-Ride to Metro Rail Transit Coefficients						
- for Zero Car Households	-5.29760	-4.77030	-1.49110	-4.86830	-4.38160	-1.56030
- for One Car Households	0.33440	-0.91780	-1.49110	0.95590	-0.29360	-1.56030
- for Two+ Car Households	-1.69410	-2.28660	-1.49110	-1.03990	-1.65860	-1.56030
Kiss-Ride to Tri Rail Transit Coefficients						
- for Zero Car Households	-5.19880	-4.46420	-0.86830	-5.76350	-4.78010	-1.44770
- for One Car Households	0.43320	-0.61170	-0.86830	0.06070	-0.69210	-1.44770
- for Two+ Car Households	-1.59530	-1.98050	-0.86830	-1.93510	-2.05710	-1.44770

INPUT LOGIT CONSTANTS

	HBWRK PK	HBNW PK	NHB PK	HBWRK OP	HBNW OP	NHB OP
Auto Drive Alone Coefficients						
- for Zero Car Households	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
- for One Car Households	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
- for Two+ Car Households	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Auto One Passenger Coefficients						
- for Zero Car Households	0.00000	0.00000	-0.52530	0.00000	0.00000	-0.50770
- for One Car Households	-1.33120	-0.00150	-0.52530	-1.33510	-0.01970	-0.50770
- for Two+ Car Households	-1.93310	-0.00050	-0.52530	-1.93700	-0.02650	-0.50770
Auto Two+ Passengers Coefficients						
- for Zero Car Households	-0.31190	-0.17430	-0.73350	-0.30610	-0.17910	-0.70120
- for One Car Households	-1.64770	-0.19470	-0.73350	-1.65130	-0.21870	-0.70120
- for Two+ Car Households	-2.27420	-0.10850	-0.73350	-2.27710	-0.14440	-0.70120

Nesting Coefficients

Transit Nesting	0.50000	0.50000	0.50000	0.50000	0.50000	0.50000
Walk Access Local Bus Nesting	0.30000	0.30000	0.30000	0.30000	0.30000	0.30000
Walk Access Local Bus Nesting	0.30000	0.30000	0.30000	0.30000	0.30000	0.30000
Auto Access Nesting	0.30000	0.30000	0.30000	0.30000	0.30000	0.30000
Park "N" Ride	0.30000	0.30000	0.30000	0.30000	0.30000	0.30000
Kiss "N" Ride	0.30000	0.30000	0.30000	0.30000	0.30000	0.30000
Highway Nesting	0.80000	0.80000	0.80000	0.80000	0.80000	0.80000
Shared Ride Nesting	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000

Figure C-1 (Continued)

```
DISTRICT CONSTANTS:
DISTRICT  1  Miami CBD
DISTRICT  2  Fort Lauderdale CBD
DISTRICT  3  Outlying CBD'S
DISTRICT  4  Metro-Dade Other
DISTRICT  5  Broward Other
DISTRICT  6  West Palm Other

DISTRICT TO DISTRICT CONSTANTS
 I1  I2  J1  J2  P1  P2  VALUE:

  1   6   1   1   1   1    0.0000    0.0000
  1   6   1   1   2   2    0.0000    0.0000
  1   6   1   1   3   3    0.0000    0.0000
  1   6   2   2   1   1    0.0000    0.0000
  1   6   2   2   2   2    0.0000    0.0000
  1   6   2   2   3   3    0.0000    0.0000
  1   6   3   3   1   1    0.0000    0.0000
  1   6   3   3   2   2    0.0000    0.0000
  1   6   3   3   3   3    0.0000    0.0000
```

Figure C-2: **Listing of MVFACTORS File**
Southeast Regional Planning Model VI

```
FTC2 = 11, UROADF = 0.8750, CONFAC24H = .07781, BPR LOS = 0.2600, BPR EXP = 7.650, CONFACAMP = .33333, CONFACPMP = .33333, CONFACOFP = .09500
FTC2 = 21, UROADF = 0.9000, CONFAC24H = .07781, BPR LOS = 0.7500, BPR EXP = 6.750, CONFACAMP = .34333, CONFACPMP = .34333, CONFACOFP = .11500
FTC2 = 41, UROADF = 0.9000, CONFAC24H = .07781, BPR LOS = 0.5500, BPR EXP = 5.050, CONFACAMP = .34333, CONFACPMP = .34333, CONFACOFP = .11500
FTC2 = 51, UROADF = 1.0000, CONFAC24H = .07781, BPR LOS = 0.1000, BPR EXP = 2.000, CONFACAMP = .34333, CONFACPMP = .34333, CONFACOFP = .11500
FTC2 = 52, UROADF = 1.0000, CONFAC24H = .07781, BPR LOS = 0.1000, BPR EXP = 2.000, CONFACAMP = .34333, CONFACPMP = .34333, CONFACOFP = .11500
FTC2 = 59, UROADF = 1.0000, CONFAC24H = .07781, BPR LOS = 0.1000, BPR EXP = 2.000, CONFACAMP = .34333, CONFACPMP = .34333, CONFACOFP = .11500
FTC2 = 61, UROADF = 0.9000, CONFAC24H = .07781, BPR LOS = 0.5000, BPR EXP = 4.850, CONFACAMP = .34333, CONFACPMP = .34333, CONFACOFP = .11500
FTC2 = 69, UROADF = 1.0000, CONFAC24H = .07781, BPR LOS = 0.1000, BPR EXP = 2.000, CONFACAMP = .34333, CONFACPMP = .34333, CONFACOFP = .11500
FTC2 = 71, UROADF = 0.8750, CONFAC24H = .07781, BPR LOS = 0.5000, BPR EXP = 5.850, CONFACAMP = .33333, CONFACPMP = .33333, CONFACOFP = .11000
FTC2 = 72, UROADF = 0.8750, CONFAC24H = .07781, BPR LOS = 0.5000, BPR EXP = 5.850, CONFACAMP = .33333, CONFACPMP = .33333, CONFACOFP = .11000
FTC2 = 73, UROADF = 0.8750, CONFAC24H = .07781, BPR LOS = 0.5000, BPR EXP = 5.850, CONFACAMP = .33333, CONFACPMP = .33333, CONFACOFP = .11000
FTC2 = 74, UROADF = 0.8750, CONFAC24H = .07781, BPR LOS = 0.5000, BPR EXP = 5.850, CONFACAMP = .33333, CONFACPMP = .33333, CONFACOFP = .11000
FTC2 = 75, UROADF = 0.8750, CONFAC24H = .07781, BPR LOS = 0.4000, BPR EXP = 6.550, CONFACAMP = .33333, CONFACPMP = .33333, CONFACOFP = .11000
FTC2 = 81, UROADF = 0.8750, CONFAC24H = .07781, BPR LOS = 0.2750, BPR EXP = 7.950, CONFACAMP = .33333, CONFACPMP = .33333, CONFACOFP = .09500
FTC2 = 82, UROADF = 0.8750, CONFAC24H = .07781, BPR LOS = 0.2750, BPR EXP = 7.950, CONFACAMP = .33333, CONFACPMP = .33333, CONFACOFP = .09500
FTC2 = 83, UROADF = 0.9500, CONFAC24H = .07781, BPR LOS = 0.2500, BPR EXP = 4.000, CONFACAMP = .33333, CONFACPMP = .33333, CONFACOFP = .11000
FTC2 = 84, UROADF = 0.9500, CONFAC24H = .07781, BPR LOS = 0.2500, BPR EXP = 4.000, CONFACAMP = .33333, CONFACPMP = .33333, CONFACOFP = .11000
FTC2 = 85, UROADF = 0.9500, CONFAC24H = .07781, BPR LOS = 0.2500, BPR EXP = 4.000, CONFACAMP = .33333, CONFACPMP = .33333, CONFACOFP = .11000
FTC2 = 86, UROADF = 0.9500, CONFAC24H = .07781, BPR LOS = 0.2500, BPR EXP = 4.000, CONFACAMP = .33333, CONFACPMP = .33333, CONFACOFP = .11000
FTC2 = 91, UROADF = 0.8750, CONFAC24H = .07781, BPR LOS = 0.2600, BPR EXP = 6.750, CONFACAMP = .33333, CONFACPMP = .33333, CONFACOFP = .09500
FTC2 = 92, UROADF = 0.8750, CONFAC24H = .07781, BPR LOS = 0.2600, BPR EXP = 6.750, CONFACAMP = .33333, CONFACPMP = .33333, CONFACOFP = .09500
FTC2 = 93, UROADF = 0.8750, CONFAC24H = .07781, BPR LOS = 0.4500, BPR EXP = 5.500, CONFACAMP = .33333, CONFACPMP = .33333, CONFACOFP = .11250
FTC2 = 94, UROADF = 0.8750, CONFAC24H = .07781, BPR LOS = 0.4500, BPR EXP = 5.500, CONFACAMP = .33333, CONFACPMP = .33333, CONFACOFP = .11250
FTC2 = 95, UROADF = 1.0000, CONFAC24H = .07781, BPR LOS = 0.4500, BPR EXP = 3.000, CONFACAMP = .33333, CONFACPMP = .33333, CONFACOFP = .11250
```

Appendix D

Selected Transit Model Summary Results

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Table D-1: **Comparison of Mode Choice Model Transfers**
Southeast Regional Planning Model VI

(a) Home-Based-Work Peak (HBW-PK) Trips

			Number of Transfers					Percentages of Transfers			
MODE and ACCESS			NONE	ONE	TWO	THREE+	TOTAL	NONE	ONE	TWO	THREE+
Walk Access	Bus & Mover	(Walk-Bus)	24,716	19,444	3,689	345	48,194	51.3%	40.3%	7.7%	0.7%
	Metro-Rail	(Walk-MR)	714	4,440	4,816	536	10,506	6.8%	42.3%	45.8%	5.1%
	Tri-Rail	(Walk-TR)	33	207	308	149	697	4.7%	29.7%	44.2%	21.4%
	Subtotal		**25,463**	**24,091**	**8,813**	**1,030**	**59,397**	**42.9%**	**40.6%**	**14.8%**	**1.7%**
Auto Access	Bus &Mover	(Auto-Bus)	3,035	1,275	75	2	4,387	69.2%	29.1%	1.7%	0.0%
	Metro-Rail	(Auto-MR)	389	2,635	3,341	56	6,421	6.1%	41.0%	52.0%	0.9%
	Tri-Rail	(Auto-TR)	1,007	1,421	437	17	2,882	34.9%	49.3%	15.2%	0.6%
	Subtotal		**4,431**	**5,331**	**3,853**	**75**	**13,690**	**32.4%**	**38.9%**	**28.1%**	**0.5%**
TOTAL TRANSIT			**29,894**	**29,422**	**12,666**	**1,105**	**73,087**	**40.9%**	**40.3%**	**17.3%**	**1.5%**

(b) Home-Based-NonWork Peak (HBNW-PK) Trips

			Number of Transfers					Percentages of Transfers			
MODE and ACCESS			NONE	ONE	TWO	THREE+	TOTAL	NONE	ONE	TWO	THREE+
Walk Access	Bus & Mover	(Walk-Bus)	19,304	10,910	1,554	91	31,859	60.6%	34.2%	4.9%	0.3%
	Metro-Rail	(Walk-MR)	404	2,160	1,762	148	4,474	9.0%	48.3%	39.4%	3.3%
	Tri-Rail	(Walk-TR)	8	48	71	34	161	5.0%	29.8%	44.1%	21.1%
	Subtotal		**19,716**	**13,118**	**3,387**	**273**	**36,494**	**54.0%**	**35.9%**	**9.3%**	**0.7%**
Auto Access	Bus &Mover	(Auto-Bus)	1,468	457	32	1	1,958	75.0%	23.3%	1.6%	0.1%
	Metro-Rail	(Auto-MR)	55	448	742	10	1,255	4.4%	35.7%	59.1%	0.8%
	Tri-Rail	(Auto-TR)	187	425	107	6	725	25.8%	58.6%	14.8%	0.8%
	Subtotal		**1,710**	**1,330**	**881**	**17**	**3,938**	**43.4%**	**33.8%**	**22.4%**	**0.4%**
TOTAL TRANSIT			**21,426**	**14,448**	**4,268**	**290**	**40,432**	**53.0%**	**35.7%**	**10.6%**	**0.7%**

(c) Non-Home-Based Peak (NHB-PK) Trips

			Number of Transfers					Percentages of Transfers			
MODE and ACCESS			NONE	ONE	TWO	THREE+	TOTAL	NONE	ONE	TWO	THREE+
Walk Access	Bus & Mover	(Walk-Bus)	8,292	4,558	567	19	13,436	61.7%	33.9%	4.2%	0.1%
	Metro-Rail	(Walk-MR)	398	1,627	989	64	3,078	12.9%	52.9%	32.1%	2.1%
	Tri-Rail	(Walk-TR)	3	9	9	5	26	11.5%	34.6%	34.6%	19.2%
	Subtotal		**8,693**	**6,194**	**1,565**	**88**	**16,540**	**52.6%**	**37.4%**	**9.5%**	**0.5%**
Auto Access	Bus &Mover	(Auto-Bus)	1,003	342	16		1,361	73.7%	25.1%	1.2%	
	Metro-Rail	(Auto-MR)	46	273	262	8	589	7.8%	46.3%	44.5%	1.4%
	Tri-Rail	(Auto-TR)	172	333	115	4	624	27.6%	53.4%	18.4%	0.6%
	Subtotal		**1,221**	**948**	**393**	**12**	**2,574**	**47.4%**	**36.8%**	**15.3%**	**0.5%**
TOTAL TRANSIT			**9,914**	**7,142**	**1,958**	**100**	**19,114**	**51.9%**	**37.4%**	**10.2%**	**0.5%**

Table D-1 (Continued)

(d) Home-Based-Work Off-Peak (HBW-OP) Trips

MODE and ACCESS			Number of Transfers					Percentages of Transfers			
			NONE	ONE	TWO	THREE+	TOTAL	NONE	ONE	TWO	THREE+
Walk Access	Bus & Mover	(Walk-Bus)	16,821	13,230	2,386	251	32,688	51.5%	40.5%	7.3%	0.8%
	Metro-Rail	(Walk-MR)	724	3,415	2,704	228	7,071	10.2%	48.3%	38.2%	3.2%
	Tri-Rail	(Walk-TR)	18	70	78	24	190	9.5%	36.8%	41.1%	12.6%
	Subtotal		**17,563**	**16,715**	**5,168**	**503**	**39,949**	**44.0%**	**41.8%**	**12.9%**	**1.3%**
Auto Access	Bus &Mover	(Auto-Bus)	1,724	730	44	1	2,499	69.0%	29.2%	1.8%	0.0%
	Metro-Rail	(Auto-MR)	20	1,335	1,644	45	3,044	0.7%	43.9%	54.0%	1.5%
	Tri-Rail	(Auto-TR)	412	424	148	4	988	41.7%	42.9%	15.0%	0.4%
	Subtotal		**2,156**	**2,489**	**1,836**	**50**	**6,531**	**33.0%**	**38.1%**	**28.1%**	**0.8%**
TOTAL TRANSIT			**19,719**	**19,204**	**7,004**	**553**	**46,480**	**42.4%**	**41.3%**	**15.1%**	**1.2%**

(e) Home-Based-NonWork Off-Peak (HBNW-OP) Trips

MODE and ACCESS			Number of Transfers					Percentages of Transfers			
			NONE	ONE	TWO	THREE+	TOTAL	NONE	ONE	TWO	THREE+
Walk Access	Bus & Mover	(Walk-Bus)	25,765	16,197	2,372	143	44,477	57.9%	36.4%	5.3%	0.3%
	Metro-Rail	(Walk-MR)	1,000	3,952	2,266	174	7,392	13.5%	53.5%	30.7%	2.4%
	Tri-Rail	(Walk-TR)	18	59	64	36	177	10.2%	33.3%	36.2%	20.3%
	Subtotal		**26,783**	**20,208**	**4,702**	**353**	**52,046**	**51.5%**	**38.8%**	**9.0%**	**0.7%**
Auto Access	Bus &Mover	(Auto-Bus)	1,830	595	41	1	2,467	74.2%	24.1%	1.7%	0.0%
	Metro-Rail	(Auto-MR)	8	796	761	26	1,591	0.5%	50.0%	47.8%	1.6%
	Tri-Rail	(Auto-TR)	277	484	127	4	892	31.1%	54.3%	14.2%	0.4%
	Subtotal		**2,115**	**1,875**	**929**	**31**	**4,950**	**42.7%**	**37.9%**	**18.8%**	**0.6%**
TOTAL TRANSIT			**28,898**	**22,083**	**5,631**	**384**	**56,996**	**50.7%**	**38.7%**	**9.9%**	**0.7%**

(f) Non-Home-Based Off-Peak (NHB-OP) Trips

MODE and ACCESS			Number of Transfers					Percentages of Transfers			
			NONE	ONE	TWO	THREE+	TOTAL	NONE	ONE	TWO	THREE+
Walk Access	Bus & Mover	(Walk-Bus)	8,343	4,749	630	17	13,739	60.7%	34.6%	4.6%	0.1%
	Metro-Rail	(Walk-MR)	538	1,759	844	42	3,183	16.9%	55.3%	26.5%	1.3%
	Tri-Rail	(Walk-TR)	6	8	8	4	26	23.1%	30.8%	30.8%	15.4%
	Subtotal		**8,887**	**6,516**	**1,482**	**63**	**16,948**	**52.4%**	**38.4%**	**8.7%**	**0.4%**
Auto Access	Bus &Mover	(Auto-Bus)	849	282	14		1,145	74.1%	24.6%	1.2%	
	Metro-Rail	(Auto-MR)	2	248	248	6	504	0.4%	49.2%	49.2%	1.2%
	Tri-Rail	(Auto-TR)	172	241	79	1	493	34.9%	48.9%	16.0%	0.2%
	Subtotal		**1,023**	**771**	**341**	**7**	**2,142**	**47.8%**	**36.0%**	**15.9%**	**0.3%**
TOTAL TRANSIT			**9,910**	**7,287**	**1,823**	**70**	**19,090**	**51.9%**	**38.2%**	**9.5%**	**0.4%**

Table D-1 (Continued)

(g) ALL (peak & off-peak) Trips

MODE and ACCESS			Number of Transfers					Percentages of Transfers			
			NONE	ONE	TWO	THREE+	TOTAL	NONE	ONE	TWO	THREE+
Walk Access	Bus & Mover	(Walk-Bus)	103,241	69,088	11,198	866	184,393	56.0%	37.5%	6.1%	0.5%
	Metro-Rail	(Walk-MR)	3,778	17,353	13,381	1,192	35,704	10.6%	48.6%	37.5%	3.3%
	Tri-Rail	(Walk-TR)	86	401	538	252	1,277	6.7%	31.4%	42.1%	19.7%
	Subtotal		**107,105**	**86,842**	**25,117**	**2,310**	**221,374**	**48.4%**	**39.2%**	**11.3%**	**1.0%**
Auto Access	Bus &Mover	(Auto-Bus)	9,909	3,681	222	5	13,817	71.7%	26.6%	1.6%	0.0%
	Metro-Rail	(Auto-MR)	520	5,735	6,998	151	13,404	3.9%	42.8%	52.2%	1.1%
	Tri-Rail	(Auto-TR)	2,227	3,328	1,013	36	6,604	33.7%	50.4%	15.3%	0.5%
	Subtotal		**12,656**	**12,744**	**8,233**	**192**	**33,825**	**37.4%**	**37.7%**	**24.3%**	**0.6%**
TOTAL TRANSIT			**119,761**	**99,586**	**33,350**	**2,502**	**255,199**	**46.9%**	**39.0%**	**13.1%**	**1.0%**

(h) 1999 Southeast Florida Transit On-Board Survey Transfer Percentages

	Survey Xfer Percentages		
Trip Purp	**NONE**	**ONE**	**TWO+**
HBW	**49.0%**	**36.6%**	**14.4%**
HBNW	**53.5%**	**32.9%**	**13.6%**
NHB	**49.8%**	**32.5%**	**17.7%**
All Purpose	**50.9%**	**34.5%**	**14.6%**

Table D-2: **Year 2000 Estimated Linked Auto Person Trips –FULL Model**
Southeast Regional Planning Model VI

1. Peak Period Estimated Trips - Full Model

Trip Purpose	Household Type	Drive Alone	One Passenger	Two+ Passenger	Auto Person Total	Mean Auto Occupancy	Person Total	Percent Auto Trips	Percent Transit Trips
HBW-PK	0 CAR	0	35,409	8,232	43,641	2.152	66,037	66.09%	33.91%
	1 CAR	253,776	49,870	10,512	314,158	1.114	342,628	91.69%	8.31%
	2+CAR	1,675,874	159,869	30,271	1,866,014	1.057	1,888,152	98.83%	1.17%
	Subtotal	**1,929,650**	**245,148**	**49,015**	**2,223,813**	**1.076**	**2,296,817**	**96.82%**	**3.18%**
HBNW-PK	0 CAR	0	84,136	43,523	127,659	2.293	140,845	90.64%	9.36%
	1 CAR	318,737	286,232	137,187	742,156	1.470	757,897	97.92%	2.08%
	2+CAR	1,187,885	914,533	725,485	2,827,903	1.511	2,839,406	99.59%	0.41%
	Subtotal	**1,506,622**	**1,284,901**	**906,195**	**3,697,718**	**1.520**	**3,738,148**	**98.92%**	**1.08%**
NHB-PK	**Subtotal**	**824,853**	**403,382**	**222,785**	**1,451,020**	**1.324**	**1,470,135**	**98.70%**	**1.30%**
TOTAL-Peak		**4,261,125**	**1,933,431**	**1,177,995**	**7,372,551**	**1.317**	**7,505,100**	**98.23%**	**1.77%**

2. Off-Peak Period Estimated Trips - Full Model

Trip Purpose	Household Type	Drive Alone	One Passenger	Two+ Passenger	Auto Person Total	Mean Auto Occupancy	Person Total	Percent Auto Trips	Percent Transit Trips
HBW-OP	0 CAR	0	24,029	5,594	29,623	2.152	44,175	67.06%	32.94%
	1 CAR	170,773	33,571	7,094	211,438	1.114	229,441	92.15%	7.85%
	2+CAR	1,129,457	107,837	20,542	1,257,836	1.057	1,271,438	98.93%	1.07%
	Subtotal	**1,300,230**	**165,437**	**33,230**	**1,498,897**	**1.076**	**1,545,054**	**97.01%**	**2.99%**
HBNW-OP	0 CAR	0	107,275	55,479	162,754	2.293	181,164	89.84%	10.16%
	1 CAR	421,055	378,194	181,349	980,598	1.471	1,002,737	97.79%	2.21%
	2+CAR	1,534,980	1,181,692	938,948	3,655,620	1.511	3,671,913	99.56%	0.44%
	Subtotal	**1,956,035**	**1,667,161**	**1,175,776**	**4,798,972**	**1.520**	**4,855,814**	**98.83%**	**1.17%**
NHB-OP	**Subtotal**	**1,667,616**	**815,464**	**450,831**	**2,933,911**	**1.324**	**2,952,901**	**99.36%**	**0.64%**
TOTAL-Off Peak		**4,923,881**	**2,648,062**	**1,659,837**	**9,231,780**	**1.364**	**9,353,769**	**98.70%**	**1.30%**

Table D-3: **Year 2000 Estimated Linked Auto Person Trips – Highway-Only Model**
Southeast Regional Planning Model VI

1H. Peak Period Estimated Trips - Highway-Only Model (Pre-Assignment Step)

Trip Purpose	Household Type	Drive Alone	One Passenger	Two+ Passenger	Auto Person Total	Mean Auto Occupancy	Person Total	Percent Auto Trips	Percent Transit Trips
HBW-PK	0 CAR	0	50,137	10,533	60,670	2.139	62,675	96.80%	3.20%
	1 CAR	270,155	53,171	11,293	334,619	1.114	345,680	96.80%	3.20%
	2+CAR	1,640,915	155,793	28,888	1,825,596	1.057	1,885,945	96.80%	3.20%
	Subtotal	**1,911,070**	**259,101**	**50,714**	**2,220,885**	**1.080**	**2,294,300**	**96.80%**	**3.20%**
HBNW-PK	0 CAR	0	120,129	59,194	179,323	2.283	181,318	98.90%	1.10%
	1 CAR	324,740	289,788	129,364	743,892	1.458	752,166	98.90%	1.10%
	2+CAR	1,179,816	906,044	679,989	2,765,849	1.499	2,796,612	98.90%	1.10%
	Subtotal	**1,504,556**	**1,315,961**	**868,547**	**3,689,064**	**1.516**	**3,730,096**	**98.90%**	**1.10%**
NHB-PK	**Subtotal**	**842,014**	**408,981**	**197,980**	**1,448,975**	**1.307**	**1,468,060**	**98.70%**	**1.30%**
TOTAL-Peak		**4,257,640**	**1,984,043**	**1,117,241**	**7,358,924**	**1.314**	**7,492,456**	**98.22%**	**1.78%**

Table D-4: **Year 2000 Peak Period Estimated Linked Trip Summary**
Southeast Regional Planning Model VI

			HBW-Pk	HBNW-Pk	NHB-Pk	ToTal-Pk	HBW-Pk	HBNW-Pk	NHB-Pk	Total-Pk
	Drive Alone	0CAR	-	-						
		1CAR	253,776	318,737			74.07%	42.06%		
		2+CAR	1,675,874	1,187,885			88.76%	41.84%		
	Total:		1,929,650	1,506,622	824,853	4,261,125	84.01%	40.30%	56.11%	56.78%
1	Shared Ride 2 Constant - Zero Car Households	SR2_0	35,409	84,136			53.62%	59.74%		
2	Shared Ride 2 Constant - One Car Households	SR2_1	49,870	286,232			14.56%	37.77%		
3	Shared Ride 2 Constant - Two+ Car Households	SR2_2	159,869	914,533			8.47%	32.21%		
	Total:		245,148	1,284,901	403,382	1,933,431	10.67%	34.37%	27.44%	25.76%
4	Shared Ride 3+ Constant - Zero Car Households	SR3_0	8,232	43,523			12.47%	30.90%		
5	Shared Ride 3+ Constant - One Car Households	SR3_1	10,512	137,187			3.07%	18.10%		
6	Shared Ride 3+ Constant - Two+ Car Households	SR3_2	30,271	725,485			1.60%	25.55%		
	Total:		49,015	906,195	222,785	1,177,995	2.13%	24.24%	15.15%	15.70%
7	Walk to Transit - Zero Car Households	WT_0	22,395	13,186			33.91%	9.36%		
8	Walk to Transit - One Car Households	WT_1	22,424	13,953			6.54%	1.84%		
9	Walk to Transit - Two+ Car Households	WT_2	14,487	9,328			0.77%	0.33%		
	Total:		59,306	36,467	16,528	112,301	2.58%	0.98%	1.12%	1.50%
10	BRT/LRT Transit	BL	-	-	-	-				
11	MetroRail Transit	MR	16,876	5,722	3,659	26,257	0.73%	0.15%	0.25%	0.35%
12	TriRail Transit	TR	3,590	893	655	5,138	0.16%	0.02%	0.04%	0.07%
13	PNR to transit - Zero Car Households	PR_0	-	-						
14	PNR to transit - One Car Households	PR_1	4,081	948			1.19%	0.13%		
15	PNR to transit - Two+ Car Households	PR_2	5,795	1,257			0.31%	0.04%		
	Total:		9,876	2,205	1471	13,552	0.43%	0.06%	0.10%	0.18%
16	KNR to transit - Zero Car Households	KR_0	-	-						
17	KNR to transit - One Car Households	KR_1	1965	840			0.57%	0.11%		
18	KNR to transit - Two+ Car Households	KR_2	1857	917			0.10%	0.03%		
	Total:		3,822	1,757	1,114	6,693	0.17%	0.05%	0.08%	0.09%

Total Peak Transit Person Trips - Auto Access		13,698	3,962	2,585	20,245	0.60%	0.11%	0.18%	0.27%
Total Peak Transit Person Trips - Walk Access		59,306	36,467	16,528	112,301	2.58%	0.98%	1.12%	1.50%
Total Peak Transit person Trips		73,004	40,429	19,113	132,546	**3.18%**	**1.08%**	**1.30%**	**1.77%**
Total Peak Auto person Trips		2,223,813	3,697,718	1,451,020	7,372,551	96.8%	98.9%	98.7%	98.2%
Total Peak person Trips		2,296,817	3,738,148	1,470,135	7,505,100	100%	100%	100%	100%
	0 CAR	66,036	140,845			2.9%	3.8%		
	1 CAR	342,628	757,897			14.9%	20.3%		
	2+CAR	1,888,153	2,839,405			82.2%	76.0%		
	Total-Pk	2,296,817	3,738,147	1,470,133	7,505,097	100%	100%		

Table D-5: **Year 2000 Off-Peak Period Estimated Linked Trip Summary**
Southeast Regional Planning Model VI

			HBW-Op	HBNW-Op	NHB-Op	ToTal-Op	HBW-Op	HBNW-Op	NHB-Op	Total-Op
	Drive Alone	0CAR	-	-						
		1CAR	170,773	421,055			74.43%	41.99%		
		2+CAR	1,129,457	1,534,980			88.83%	41.80%		
	Total:		1,300,230	1,956,035	1,667,616	4,923,881	84.15%	40.28%	56.47%	52.64%
1	Shared Ride 2 Constant - Zero Car Households	SR2_0	24,029	107,275			54.40%	59.21%		
2	Shared Ride 2 Constant - One Car Households	SR2_1	33,571	378,194			14.63%	37.72%		
3	Shared Ride 2 Constant - Two+ Car Households	SR2_2	107,837	1,181,692			8.48%	32.18%		
	Total:		165,437	1,667,161	815,464	2,648,062	10.71%	34.33%	27.62%	28.31%
4	Shared Ride 3+ Constant - Zero Car Households	SR3_0	5,594	55,479			12.66%	30.62%		
5	Shared Ride 3+ Constant - One Car Households	SR3_1	7,094	181,349			3.09%	18.09%		
6	Shared Ride 3+ Constant - Two+ Car Households	SR3_2	20,542	938,948			1.62%	25.57%		
	Total:		33,230	1,175,776	450,831	1,659,837	2.15%	24.21%	15.27%	17.75%
7	Walk to Transit - Zero Car Households	WT_0	14,552	18,410			32.94%	10.16%		
8	Walk to Transit - One Car Households	WT_1	15,184	19,907			6.62%	1.99%		
9	Walk to Transit - Two+ Car Households	WT_2	9,907	13,545			0.78%	0.37%		
	Total:		39,643	51,862	16,823	108,328	2.57%	1.07%	0.57%	1.16%
10	BRT/LRT Transit	BL	-	-	-	-				
11	MetroRail Transit	MR	10,097	9,024	3,704	22,825	0.65%	0.19%	0.13%	0.24%
12	TriRail Transit	TR	1,193	1,091	535	2,819	0.08%	0.02%	0.02%	0.03%
13	PNR to transit - Zero Car Households	PR_0	-	-						
14	PNR to transit - One Car Households	PR_1	1,958	1,193			0.85%	0.12%		
15	PNR to transit - Two+ Car Households	PR_2	2,871	1,589			0.23%	0.04%		
	Total:		4,829	2,782	1279	8,890	0.31%	0.06%	0.04%	0.10%
16	KNR to transit - Zero Car Households	KR_0	-	-						
17	KNR to transit - One Car Households	KR_1	862	1038			0.38%	0.10%		
18	KNR to transit - Two+ Car Households	KR_2	823	1161			0.06%	0.03%		
	Total:		1,685	2,199	887	4,771	0.11%	0.05%	0.03%	0.05%

Total Off-Peak Transit Person Trips - Auto Access		6,514	4,981	2,166	13,661	0.42%	0.10%	0.07%	0.15%
Total Off-Peak Transit Person Trips - Walk Access		39,643	51,862	16,823	108,328	2.57%	1.07%	0.57%	1.16%
Total Off-Peak Transit person Trips		46,157	56,843	18,989	121,989	**2.99%**	**1.17%**	**0.64%**	**1.30%**
Total Off-Peak Auto person Trips		1,498,897	4,798,972	2,933,911	9,231,780	97.0%	98.8%	99.4%	98.7%
Total Off-Peak person Trips		1,545,054	4,855,814	2,952,901	9,353,769	100%	100%	100%	100%
	0 CAR	44,175	181,164			2.9%	3.7%		
	1 CAR	229,442	1,002,736			14.9%	20.7%		
	2+CAR	1,271,437	3,671,915			82.3%	75.6%		
	Total-Op	1,545,054	4,855,815	2,952,900	9,353,769	100%	100%		

Table D-6: **Year 2030 Estimated Linked Auto Person Trips –FULL Model**
Southeast Regional Planning Model VI

1. Peak Period Estimated Trips - Full Model

Trip Purpose	Household Type	Drive Alone	One Passenger	Two+ Passenger	Auto Person Total	Mean Auto Occupancy	Person Total	Percent Auto Trips	Percent Transit Trips
HBW-PK	0 CAR	0	52,116	14,108	66,224	2.174	107,026	61.88%	38.12%
	1 CAR	332,019	65,692	13,582	411,293	1.114	471,330	87.26%	12.74%
	2+CAR	2,470,437	243,278	46,279	2,759,994	1.059	2,827,442	97.61%	2.39%
	Subtotal	**2,802,456**	**361,086**	**73,969**	**3,237,511**	**1.077**	**3,405,798**	**95.06%**	**4.94%**
HBNW-PK	0 CAR	0	131,185	74,844	206,029	2.315	234,116	88.00%	12.00%
	1 CAR	431,523	389,235	192,812	1,013,570	1.477	1,043,805	97.10%	2.90%
	2+CAR	1,747,428	1,350,031	1,099,036	4,196,495	1.517	4,223,844	99.35%	0.65%
	Subtotal	**2,178,951**	**1,870,451**	**1,366,692**	**5,416,094**	**1.529**	**5,501,765**	**98.44%**	**1.56%**
NHB-PK	**Subtotal**	**1,230,372**	**599,249**	**318,796**	**2,148,417**	**1.318**	**2,190,353**	**98.09%**	**1.91%**
TOTAL-Peak		**6,211,779**	**2,830,786**	**1,759,457**	**10,802,022**	**1.321**	**11,097,916**	**97.33%**	**2.67%**

2. Off-Peak Period Estimated Trips - Full Model

Trip Purpose	Household Type	Drive Alone	One Passenger	Two+ Passenger	Auto Person Total	Mean Auto Occupancy	Person Total	Percent Auto Trips	Percent Transit Trips
HBW-OP	0 CAR	0	37,016	10,581	47,597	2.182	71,608	66.47%	33.53%
	1 CAR	227,926	44,990	9,621	282,537	1.115	317,554	88.97%	11.03%
	2+CAR	1,682,804	161,881	31,497	1,876,182	1.058	1,910,953	98.18%	1.82%
	Subtotal	**1,910,730**	**243,887**	**51,699**	**2,206,316**	**1.077**	**2,300,115**	**95.92%**	**4.08%**
HBNW-OP	0 CAR	0	170,573	100,444	271,017	2.323	307,915	88.02%	11.98%
	1 CAR	579,176	524,878	270,334	1,374,388	1.484	1,416,982	96.99%	3.01%
	2+CAR	2,300,284	1,780,755	1,507,552	5,588,591	1.526	5,628,739	99.29%	0.71%
	Subtotal	**2,879,460**	**2,476,206**	**1,878,330**	**7,233,996**	**1.538**	**7,353,636**	**98.37%**	**1.63%**
NHB-OP	**Subtotal**	**2,469,739**	**1,215,926**	**698,409**	**4,384,074**	**1.330**	**4,426,930**	**99.03%**	**0.97%**
TOTAL-Off Peak		**7,259,929**	**3,936,019**	**2,628,438**	**13,824,386**	**1.376**	**14,080,681**	**98.18%**	**1.82%**

Table D-7: **Year 2030 Estimated Linked Auto Person Trips – Highway-Only Model**
Southeast Regional Planning Model VI

1H. Peak Period Estimated Trips - Highway-Only Model (Pre-Assignment Step)

Trip Purpose	Household Type	Drive Alone	One Passenger	Two+ Passenger	Auto Person Total	Mean Auto Occupancy	Person Total	Percent Auto Trips	Percent Transit Trips
HBW-PK	0 CAR	0	76,757	15,958	92,715	2.138	97,390	95.20%	4.80%
	1 CAR	364,708	71,747	14,845	451,300	1.114	474,056	95.20%	4.80%
	2+CAR	2,417,403	231,652	42,257	2,691,312	1.057	2,827,009	95.20%	4.80%
	Subtotal	**2,782,111**	**380,156**	**73,060**	**3,235,327**	**1.080**	**3,398,455**	**95.20%**	**4.80%**
HBNW-PK	0 CAR	0	187,589	90,651	278,240	2.278	282,483	98.50%	1.50%
	1 CAR	444,080	396,800	180,173	1,021,053	1.461	1,036,603	98.50%	1.50%
	2+CAR	1,741,620	1,338,602	1,016,425	4,096,647	1.501	4,159,039	98.50%	1.50%
	Subtotal	**2,185,700**	**1,922,991**	**1,287,249**	**5,395,940**	**1.520**	**5,478,125**	**98.50%**	**1.50%**
NHB-PK	**Subtotal**	**1,253,195**	**604,993**	**286,756**	**2,144,944**	**1.304**	**2,182,039**	**98.30%**	**1.70%**
TOTAL-Peak		**6,221,006**	**2,908,140**	**1,647,065**	**10,776,211**	**1.316**	**11,058,619**	**97.45%**	**2.55%**

Table D-8: **Year 2030 Peak Period Estimated Linked Trip Summary**
Southeast Regional Planning Model VI

			HBW-Pk	HBNW-Pk	NHB-Pk	ToTal-Pk	HBW-Pk	HBNW-Pk	NHB-Pk	Total-Pk
	Drive Alone 0CAR		-	-						
	1CAR		332,019	431,523			70.44%	41.34%		
	2+CAR		2,470,437	1,747,428			87.37%	41.37%		
	Total:		2,802,456	2,178,951	1,230,372	6,211,779	82.28%	39.60%	56.17%	55.97%
1	Shared Ride 2 Constant - Zero Car Households	SR2_0	52,116	131,185			48.69%	56.03%		
2	Shared Ride 2 Constant - One Car Households	SR2_1	65,692	389,235			13.94%	37.29%		
3	Shared Ride 2 Constant - Two+ Car Households	SR2_2	243,278	1,350,031			8.60%	31.96%		
	Total:		361,086	1,870,451	599,249	2,830,786	10.60%	34.00%	27.36%	25.51%
4	Shared Ride 3+ Constant - Zero Car Households	SR3_0	14,108	74,844			13.18%	31.97%		
5	Shared Ride 3+ Constant - One Car Households	SR3_1	13,582	192,812			2.88%	18.47%		
6	Shared Ride 3+ Constant - Two+ Car Households	SR3_2	46,279	1,099,036			1.64%	26.02%		
	Total:		73,969	1,366,692	318,796	1,759,457	2.17%	24.84%	14.55%	15.85%
7	Walk to Transit - Zero Car Households	WT_0	40,802	28,080			38.12%	11.99%		
8	Walk to Transit - One Car Households	WT_1	34,256	21,811			7.27%	2.09%		
9	Walk to Transit - Two+ Car Households	WT_2	25,589	16,027			0.91%	0.38%		
	Total:		100,647	65,918	29,415	195,980	2.96%	1.20%	1.34%	1.77%
10	BRT/LRT Transit	BL	5,583	3,167	2,274	11,024	0.16%	0.06%	0.10%	0.10%
11	MetroRail Transit	MR	79,864	26,053	9,564	115,481	2.34%	0.47%	0.44%	1.04%
12	TriRail Transit	TR	19,861	9,112	7,623	36,596	0.58%	0.17%	0.35%	0.33%
13	PNR to transit - Zero Car Households	PR_0	1	4			0.00%	0.00%		
14	PNR to transit - One Car Households	PR_1	16,904	4,223			3.59%	0.40%		
15	PNR to transit - Two+ Car Households	PR_2	30,519	6,045			1.08%	0.14%		
	Total:		47,424	10,272	6204	63,900	1.39%	0.19%	0.28%	0.58%
16	KNR to transit - Zero Car Households	KR_0	-	-						
17	KNR to transit - One Car Households	KR_1	8879	4,201			1.88%	0.40%		
18	KNR to transit - Two+ Car Households	KR_2	11340	5,278			0.40%	0.12%		
	Total:		20,219	9,479	6,318	36,016	0.59%	0.17%	0.29%	0.32%

Total Peak Transit Person Trips - Auto Access		67,643	19,751	12,522	99,916	1.99%	0.36%	0.57%	0.90%
Total Peak Transit Person Trips - Walk Access		100,647	65,918	29,415	195,980	2.96%	1.20%	1.34%	1.77%
Total Peak Transit person Trips		168,290	85,669	41,937	295,896	**4.94%**	**1.56%**	**1.91%**	**2.67%**
Total Peak Auto person Trips		3,237,511	5,416,094	2,148,417	10,802,022	95.1%	98.4%	98.1%	97.3%
Total Peak person Trips		3,405,798	5,501,765	2,190,353	11,097,916	100%	100%	100%	100%
	0 CAR	107,027	234,113			3.1%	4.3%		
	1 CAR	471,332	1,043,805			13.8%	19.0%		
	2+CAR	2,827,442	4,223,845			83.0%	76.8%		
	Total-Pk	3,405,801	5,501,763	2,190,354	11,097,918	100%	100%		

Table D-9: **Year 2030 Off-Peak Period Estimated Linked Trip Summary**
Southeast Regional Planning Model VI

			HBW-Op	HBNW-Op	NHB-Op	ToTal-Op	HBW-Op	HBNW-Op	NHB-Op	Total-Op
	Drive Alone 0CAR		-	-						
	1CAR		227,926	579,176			71.78%	40.87%		
	2+CAR		1,682,804	2,300,284			88.06%	40.87%		
	Total:		1,910,730	2,879,460	2,469,739	7,259,929	83.07%	39.16%	55.79%	51.56%
1	Shared Ride 2 Constant - Zero Car Households	SR2_0	37,016	170,573			51.69%	55.40%		
2	Shared Ride 2 Constant - One Car Households	SR2_1	44,990	524,878			14.17%	37.04%		
3	Shared Ride 2 Constant - Two+ Car Households	SR2_2	161,881	1,780,755			8.47%	31.64%		
	Total:		243,887	2,476,206	1,215,926	3,936,019	10.60%	33.67%	27.47%	27.95%
4	Shared Ride 3+ Constant - Zero Car Households	SR3_0	10,581	100,444			14.78%	32.62%		
5	Shared Ride 3+ Constant - One Car Households	SR3_1	9,621	270,334			3.03%	19.08%		
6	Shared Ride 3+ Constant - Two+ Car Households	SR3_2	31,497	1,507,552			1.65%	26.78%		
	Total:		51,699	1,878,330	698,409	2,628,438	2.25%	25.54%	15.78%	18.67%
7	Walk to Transit - Zero Car Households	WT_0	24,011	36,894			33.53%	11.98%		
8	Walk to Transit - One Car Households	WT_1	23,310	32,000			7.34%	2.26%		
9	Walk to Transit - Two+ Car Households	WT_2	17,132	24,991			0.90%	0.44%		
	Total:		64,453	93,885	31,410	189,748	2.80%	1.28%	0.71%	1.35%
10	BRT/LRT Transit	BL	2,037	2,548	1,757	6,342	0.09%	0.03%	0.04%	0.05%
11	MetroRail Transit	MR	38,942	38,969	13,350	91,261	1.69%	0.53%	0.30%	0.65%
12	TriRail Transit	TR	3,566	5,460	3,167	12,193	0.16%	0.07%	0.07%	0.09%
13	PNR to transit - Zero Car Households	PR_0	-	1				0.00%		
14	PNR to transit - One Car Households	PR_1	7,416	4,736			2.34%	0.33%		
15	PNR to transit - Two+ Car Households	PR_2	12,473	6,745			0.65%	0.12%		
	Total:		19,889	11,482	5616	36,987	0.86%	0.16%	0.13%	0.26%
16	KNR to transit - Zero Car Households	KR_0	-	1				0.00%		
17	KNR to transit - One Car Households	KR_1	4290	5858			1.35%	0.41%		
18	KNR to transit - Two+ Car Households	KR_2	5167	8412			0.27%	0.15%		
	Total:		9,457	14,271	5,829	29,557	0.41%	0.19%	0.13%	0.21%

Total Off-Peak Transit Person Trips - Auto Access		29,346	25,753	11,445	66,544	1.28%	0.35%	0.26%	0.47%
Total Off-Peak Transit Person Trips - Walk Access		64,453	93,885	31,410	189,748	2.80%	1.28%	0.71%	1.35%
Total Off-Peak Transit person Trips		93,799	119,638	42,855	256,292	**4.08%**	**1.63%**	**0.97%**	**1.82%**
Total Off-Peak Auto person Trips		2,206,316	7,233,996	4,384,074	13,824,386	95.9%	98.4%	99.0%	98.2%
Total Off-Peak person Trips		2,300,115	7,353,636	4,426,930	14,080,681	100%	100%	100%	100%
	0 CAR	71,608	307,913			3.1%	4.2%		
	1 CAR	317,553	1,416,982			13.8%	19.3%		
	2+CAR	1,910,954	5,628,739			83.1%	76.5%		
	Total-Op	2,300,115	7,353,634	4,426,929	14,080,678	100%	100%		

Table D-10: **Comparison of Year 2000 Daily Model and Observed Boardings by Routes for PalmTran**
Southeast Regional Planning Model VI

Route	PT Mode	Operator	TrnBuild Mode	Observed Boardings (A)	NAME	Estimated Boardings (B)	Est/Obs Ratio (A/B)	Percent Error [(A-B)/A]
1	4	1	4	4,188	M4L1PB, M4L2PB	3,158	0.75	-25%
101	4	1	4	48	M4L3PB	441	9.23	823%
2	4	1	4	2,140	M4L4PB	2,940	1.37	37%
3	4	1	4	1,972	M4L5PB	1,026	0.52	-48%
4	4	1	4	244	M4L6PB	331	1.36	36%
20	4	1	4	406	M4L7PB	763	1.88	88%
21	4	1	4	249	M4L8PB	379	1.52	52%
30	4	1	4	295	M4L9PB	165	0.56	-44%
32	4	1	4	275	M4L10PB	335	1.22	22%
41	4	1	4	185	M4L11PB,M4L12PB	238	1.28	28%
42	4	1	4	126	M4L13PB	267	2.12	112%
52	4	1	4	68	M4L14PB	58	0.86	-14%
61	4	1	4	465	M4L15PB	425	0.91	-9%
63	4	1	4	214	M4L16PB	215	1.00	0%
71	4	1	4	380	M4L17PB	386	1.02	2%
72	4	1	4	110	M18L18PB	176	1.60	60%
80	4	1	4	346	M4L19PB	160	0.46	-54%
91	4	1	4	1,091	M4L20PB	1,052	0.96	-4%
92	4	1	4	319	M4L21PB	631	1.98	98%
97	4	1	4		M4L22PB	276		
Lake Worth	4	1	4	230	M4L23PB,M4L24PB,M4L25PB	102	0.44	-56%
31	4	2	4	748	M12L1PI,M12L1PO	896	1.20	20%
40	4	2	4	948	M12L2PB	1,002	1.06	6%
43	4	2	4	504	M12L3PB	873	1.73	73%
44	4	2	4	303	M12L4PB	380	1.25	25%
46	4	2	4	708	M12L5PB	843	1.19	19%
60	4	2	4	220	M12L9PI,M12L9PO	272	1.24	24%
62	4	2	4	648	M12L10PI,M12L10PO	826	1.27	27%
70	4	2	4	764	M12L11PB	1,374	1.80	80%
81	4	2	4	326	M12L12PB	262	0.80	-20%
94	4	2	4	283	M12L13PB	378	1.33	33%
				18,802	**MODE 4 (Local Bus) Subtotal:**	20,630	1.10	10%
53	12	2	12	40	M12L6PB	47	1.19	19%
54	12	2	12	53	M12L7PB	196	3.69	269%
55	12	2	12	57	M12L8PB	136	2.41	141%
				149	**MODE 12 (TR-Feeder Bus) Subtotal:**	379	2.54	154%
				18,951	**Mode 4 & 12 Total:**	21,009	1.11	11%

Table D-11: **Comparison of Year 2000 Daily Model and Observed Boardings by Routes for Broward County Transit**
Southeast Regional Planning Model VI

(a) Fixed Route (BCT) Daily Weekday Boardings

Route	PT Mode	Operator	TrnBuild Mode	Observed Boardings (A)	NAME	Estimated Boardings (B)	Est/Obs Ratio (A/B)	Percent Error [(A-B)/A]
1	4	3	14	5,562	M4L1BO, M4L2BO	6,711	1.21	21%
2	4	3	14	4,224	M4L3BI, M4L3BO	7,122	1.69	69%
3	4	3	14	1,106	M4L5BO	725	0.66	-34%
5	4	3	14	1,773	M4L5BO	489	0.28	-72%
6	4	3	14	1,915	M4L6BO,M4L7BO	1,263	0.66	-34%
7	4	3	14	3,242	M4L8BO	4,347	1.34	34%
9	4	3	14	3,462	M4L9BI,M4L9BO	2,812	0.81	-19%
10	4	3	14	3,269	M4L10BO	4,257	1.30	30%
11	4	3	14	4,219	M4L11BI,M4L11BO	3,644	0.86	-14%
12	4	3	14	1,311	M4L12BO	1,461	1.11	11%
14	4	3	14	2,963	M4L13BO	2,617	0.88	-12%
15	4	3	14	651	M4L14BO,M4L15BO	617	0.95	-5%
17	4	3	14	510	M4L16BO,M4L17BO	931	1.82	82%
18	4	3	14	10,038	M4L18BI,M4L18BO	11,403	1.14	14%
20	4	3	14	1,196	M4L19BO	1,287	1.08	8%
22	4	3	14	3,656	M4L20BO	4,326	1.18	18%
28	4	3	14	3,127	M4L21BO	2,499	0.80	-20%
30	4	3	14	2,238	M4L22BO	1,053	0.47	-53%
31	4	3	14	4,221	M4L23BO	2,639	0.63	-37%
34	**4**	**3**	**14**	779	M4L24BO	1,163	1.49	49%
36	4	3	14	6,382	M4L25BO	4,484	0.70	-30%
40	4	3	14	3,577	M4L26BI,M4L26BO	2,349	0.66	-34%
50	4	3	14	3,901	M4L27BI,M4L27BO	3,115	0.80	-20%
55	4	3	14	1,177	M4L28BO	2,655	2.26	126%
56	4	3	14	1,971	M4L29BO	2,223	1.13	13%
57	4	3	14	274	M4L30BO,M4L31BO	265	0.97	-3%
60	4	3	14	2,181	M4L32BO	2,201	1.01	1%
62	4	3	14	1,219	M4L33BO	1,103	0.90	-10%
72	4	3	14	4,805	M4L34BO	5,237	1.09	9%
75	4	3	14	250	M4L35BO	449	1.79	79%
81	4	3	14	2,497	M4L36BO,M4L37BO	1,783	0.71	-29%
83	4	3	14	1,755	M4L38BO	2,627	1.50	50%
84	**4**	**3**	**14**	1,239	M4L39BO	610	0.49	-51%
92	4	3	14	439	M4L40BO	760	1.73	73%
93	4	3	14	227	M4L41BO	91	0.40	-60%
94	4	3	14	169	M4L42BO	11	0.06	-94%
95	4	3	14	177	M4L43BO	190	1.08	8%
97	**4**	**3**	**14**	111				
TOTAL (a)				**91,815**		**91,519**	1.00	0%

Table D-11(Continued)

(b) Community Bus Daily Weekday Boardings

Route	PT Mode	Operator	TrnBuild Mode	Observed Boardings (A)	NAME	Estimated Boardings (B)	Est/Obs Ratio (A/B)	Percent Error [(A-B)/A]
Cooper City	4	3	14	38	M4L49BO	121	3.18	218%
Coconut Creek	4	3	14	87	M4L52BO	118	1.36	36%
Dania Beach	4	3	14	31	M4L123MD,M4L124MD,M4L125MD	45	1.47	47%
Davie (TMA)	6	5	6	97	M4L55BO	164	1.69	69%
Deerfield	4	3	14	24	M4L60BO,M4L61BO,M4L62BO	258	10.75	975%
Ft Lauderdale (TMA)	6	5	6	55	M4L64BO	71	1.29	29%
Hillsboro Beach	4	3	14	46	M4L50BO	179	3.89	289%
Margate	4	3	14	665	M4L45/46/47/48BO,M4L110/111/114/115MD	553	0.83	-17%
Miramar	4	3	14	146	M4L53BO	388	2.66	166%
Pembroke Pines	4	3	14	83	M4L51BO	182	2.19	119%
Ft Lauderdale (URC)	4	3	14	89	M4L54BO	99	1.11	11%
RTE=Weston/BON EXP	6	5	6	20	M4L56BO,M4L57BO	186	9.30	830%
RTE=PEM PINES EXP	6	5	6	13	M4L58BO,M4L59BO	15	1.15	15%
Courthouse Loop	4	3	14	402	M4L63BO	1,000	2.49	149%
TMAX Lunch (MD Only)	4	3	14	x				
Courthouse Trolley (MD Only)	4	3	14	x				
TOTAL (b)				1,796		3,379	1.88	88%

(c) Tri-Rail Feeder Services & Tri-Rail Daily Weekday Boardings

Route	PT Mode	Operator	TrnBuild Mode	Observed Boardings (A)	NAME	Estimated Boardings (B)	Est/Obs Ratio (A/B)	Percent Error [(A-B)/A]
23 (Hillsboro)	12	2	12	29	M12L7BO	0	0.00	-100%
24 (Hillsboro)	12	2	12	52	M12L8BO	18	0.35	-65%
33 (Pompano)	12	2	12	119	M12L5BO,M12L6BO	31	0.26	-74%
41 (Cypress Creek)	12	2	12	39	M12L3BO	15	0.38	-62%
42 (Cypress Creek)	12	2	12	37	M12L4BO	17	0.46	-54%
43 (Cypress Creek)	12	2	12	33	M12L2BO	0	0.00	-100%
53 (Ft. Lauderdale)	12	2	12	305	M12L1BO	0	0.00	-100%
63 (Airport)	12	2	12	118	M12L9BO	0	0.00	-100%
74 (Sheridan)	12	2	12	20	M12L10BO	0	0.00	-100%
TOTAL ©				752		81	0.11	-89%

(d) Systemwide Daily Weekday Boardings

Observed Boardings (A)	NAME	Estimated Boardings (B)	Est/Obs Ratio (A/B)	Percent Error [(A-B)/A]
94,363	Local & Express	94,979	1.01	1%
94,178	Local (M4 & M12)	94,543	1.00	0%
185	Express (M6)	436	2.36	136%

Table D-12: **Comparison of Year 2000 Daily Model and Observed Boardings by Routes for Metrobus, Mover and Rail**
Southeast Regional Planning Model VI

Route	PT Mode	Operator	TrnBuild Mode	Observed Boardings (A)	NAME	Estimated Boardings (B)	Est/Obs Ratio (A/B)	Percent Error [(A-B)/A]
A	5	4	5	486	M5L1MI,M5L1MO	826	1.70	70%
B	5	4	5	1,617	M5L2MI,M5L2MO	2,180	1.35	35%
C	5	4	5	4,219	M5L3MI,M5L3MO	3,003	0.71	-29%
E	5	4	5	1,067	M5L4MI,M5L4MO,M5L118MI,M5L118MO	744	0.70	-30%
G	5	4	5	3,448	M5L6MI,M5L6PM,M5L104MI,M5L104MO	2,281	0.66	-34%
H	5	4	5	5,528	M5L7MI,M5L7MO	3,111	0.56	-44%
J	5	4	5	5,402	M5L8MI,M5L8MO	8,847	1.64	64%
K	5	4	5	4,985	M5L9MI,M5L9MO,M5L10MI,M5L10MO	3,651	0.73	-27%
L	5	4	5	11,415	M5L11MI,M5L11MO,M5L12MI,M5L12MO	8,853	0.78	-22%
M	5	4	5	2,150	M5L5MI,M5L5MO	2,875	1.34	34%
R	5	4	5	388	M5L13MI,M5L13MO	144	0.37	-63%
S	5	4	5	13,328	M5L14MI,M5L14MO	10,201	0.77	-23%
T	5	4	5	2,187	M5L15MI,M5L15MO	2,005	0.92	-8%
V	5	4	5	68	M5L98MI,M5L98MO	447	6.57	557%
W	5	4	5	435	M5L16MI	712	1.64	64%
1	5	4	5	1,909	M5L20MI,M5L101MI,M5L101MO	3,397	1.78	78%
2	5	4	5	3,819	M5L21MI,M5L21MO,,M5L22MI,M5L22MO	3,906	1.02	2%
3/16	5	4	5	14,076	M5L23MI,M5L23MO,M5L36MI,M5L36MO	15,664	1.11	11%
6	5	4	5	329	M5L24MI,M5L24MO	63	0.19	-81%
7	5	4	5	3,709	M5L25MI,M5L25MO,M5L26MI,M5L26MO	3,809	1.03	3%
8	5	4	5	7,440	M5L27MI/O,M5L28MI/O,M5L29MI/O	8,081	1.09	9%
9	5	4	5	5,312	M5L30MI,M5L30MO,M5L31MI,M5L31MO	5,949	1.12	12%
10	5	4	5	2,606	M5L32MI,M5L32MO	1,350	0.52	-48%
11	5	4	5	13,533	M5L33MI,M5L33MO,M5L34MI,M5L34MO	15,358	1.13	13%
12	5	4	5	3,360	M5L35MI	657	0.20	-80%
17	5	4	5	5,667	M5L37MI,M5L38MI	1,722	0.30	-70%
21	5	4	5	2,626	M5L39MI,M5L30MO,M5L40MI,M5L40MO	1,001	0.38	-62%
22	5	4	5	4,292	M5L41MI/O,M5L42MI/O,M5L102MI/O	3,830	0.89	-11%
24	5	4	5	4,359	M5L43MI,M5L43MO,M5L44MI,M5L44MO	4,122	0.95	-5%
27	5	4	5	8,813	M5L45MI,M5L46MI	6,831	0.78	-22%
28	5	4	5	762	M5L47MI,M5L47MO	350	0.46	-54%
29	5	4	5	432	M5L48MI,M5L48MO	787	1.82	82%
31	5	4	5	1,032	M5L103MI	2,771	2.69	169%
32	5	4	5	3,889	M5L49MI,M5L49MO	3,582	0.92	-8%
33	5	4	5	2,368	M5L50MI	1,871	0.79	-21%
35/70	5	4	5	2,020	M5L51MI,M5L69MI	2,115	1.05	5%
36	5	4	5	3,636	M5L52MI,M5L53MI,M5L100MI	7,667	2.11	111%
37/72/57	5	4	5	5,660	M5L54MI/O,M5L64MI,M5L72MI,M5L71MI	7,892	1.39	39%
38 (BSWY MAX)	5	4	5	3,525	M5L17MI,M5L97MI	9,337	2.65	165%

Table D-12 (Continued)

Route	PT Mode	Operator	TrnBuild Mode	Observed Boardings	NAME	Estimated Boardings	Est/Obs Ratio (A/B)	Percent Error [(A-B)/A]
40	5	4	5	2,227	M5L55MI,M5L56MI	5,181	2.33	133%
42	5	4	5	1,058	M5L57MI,M5L57MO	2,440	2.31	131%
48	5	4	5	626	M5L58MI,M5L58MO	1,276	2.04	104%
51-FLAGLER MAX	5	4	13	1,799	M5L87MI,M5L87MO	3,707	2.06	106%
52	5	4	5	1,300	M5L59MI,M5L59MO,M5L60MI,M5L60MO	2,289	1.76	76%
54	5	4	5	3,459	M5L61MI	5,569	1.61	61%
56	5	4	5	1,162	M5L62MI,M5L63MI	636	0.55	-45%
62	5	4	5	5,439	M5L65MI/O,M5L66MI/O,M5L67MI/O,M5L68MI/O	4,610	0.85	-15%
71	5	4	5	850	M5L70MI	802	0.94	-6%
73	5	4	5	2,330	M5L73MI,M5L74MI	5,146	2.21	121%
75	5	4	5	4,174	M5L75MI,M5L75MO	2,058	0.49	-51%
77	5	4	5	9,763	M5L76MI,M5L76MO,M5L77MI,M5L77MO	9,267	0.95	-5%
83	5	4	5	5,194	M5L78MI,M5L79MI	3,241	0.62	-38%
87	5	4	5	1,645	M5L80MI	4,901	2.98	198%
88	5	4	5	3,691	M5L81MI,M5L181MD,M5L82MI	3,858	1.05	5%
91	5	4	5	1,325	M5L83MI	698	0.53	-47%
93-BISC MAX	5	4	13	2,586	M5L86MI,M5L86MO	1,756	0.68	-32%
97-27 MAX	5	4	13	825	M5L88MI	1,665	2.02	102%
104	5	4	5	1,518	M5L85MI	1,200	0.79	-21%
132-TR-36 ST	5	4	5	38	M5L84MI	22	0.58	-42%
133?-TR-MIA	5	4	5	537	M5L89MI,M5L90MI,M5L91MI	2,284	4.25	325%
231-BUSWAY LOCAL	5	4	5	614	M5L132MD	2,297	3.74	274%
240-BIRD MAX	5	4	13	372	M5L92MI,M5L92MO	1,314	3.53	253%
241-NORTH DADE CONN	5	4	5	176	M5L99MI,M5L99MO	366	2.08	108%
252-CORAL REEF	5	4	5	1,198	M5L19MI	3,000	2.50	150%
287-SAGA BAY	5	4	13	403	M5L18MI	298	0.74	-26%
Special	5	4	5	-				
Park n Ride	5	4	5	-				
	5	4	5		M5L93MI	1,972		
	5	4	5		M5L94MI	1,266		
	5	4	5		M5L95MI	14		
TOTALS - Local Bus	**5**	**4**	**5,13**	**216,206**		**235,125**	1.09	9%
	5	4	15		M5L114MI	12		
95EX	6	6	15	1,740	M5L109MI/PM,110MI/PM,111MI/PM112MI/PM,113MI/PM	1,485	0.85	-15%
65EX	6	6	15	312	M5L108MI/PM	30	0.10	-90%
204-KAT-KILLIAN	6	6	15	914	M5L106MI,M5L106MO	2,592	2.84	184%
272-KAT-SUNSET	6	6	15	700	M5L107MI,M5L107MO	3,119	4.46	346%
288-KAT-KENDALL	6	6	15	480	M5L105MI,M5L105MO	830	1.73	73%
TOTALS - Express Bus	**6**	**6**	**15**	**4,146**		**8,068**	1.95	95%
Metro-Mover	**9**	**9**	**9**	**15,619**	**M9L1MI,M9L2MI,M9L3MI**	**10,347**	0.66	-34%
Metro-Rail	**7**	**8**	**7**	**49,622**	**M7L1MI**	**49,972**	1.01	1%
Miami-Dade Totals:				**285,593**		**303,512**	1.06	6%
Tri-Rail	**8**	**10**	**8**	**7,959**	**M8L1S6**	**7,878**	0.99	-1%

Appendix E

Travel Time and Delay Section Speed Comparison by Period and Direction

Table		Page
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E-2	Observed and Model Estimated Speed Comparison of Sections 31-40	E-3
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Table E-1: **Observed and Model Estimated Speed Comparison of Sections 1-22**
Southeast Regional Planning Model VI

Survey Data				Section Speed of Model Run							Model vs Observed Speed			
Section (NB or EB)	Normal Speed (mph)	AM Period Avg Speed (mph)	MIDDAY Period Avg Speed (mph)	TDSECID	Distance (mile)	Posted Speed (mph)	Free-Flow Speed (mph)	AM Peak Period Congested Speed (mph)	PM Peak Period Congested Speed (mph)	Off-Peak Period Congested Speed (mph)	Change in AM Speed	Percent Change in AM Speed	Change in Off Peak Speed	Percent Change in Off Peak Speed
	(S1)	(S3)	(S4)		(M2)	(M1A)	(M1B)	(M3)	(M5)	(M4)	D3 =M3-S3	D3/S3	D4=M4-S4	D4/S4
1- US 1 Miami - NB	45	17.1	24.0	1	8.26	43.6	34.7	15.5	27.4	20.0	-1.6	-9%	-4.0	-17%
2- US 1 Miami - NB	45	25.8	22.6	2	10.00	36.1	29.5	29.0	23.4	28.5	3.2	13%	5.9	26%
3- Kendall Dr - EB	45	14.0	20.5	3	7.00	44.3	33.7	19.2	32.2	29.6	5.2	37%	9.1	44%
4- SR 826 - EB	50	19.1	29.0	4	7.38	43.8	36.3	32.0	32.8	33.9	12.9	67%	4.9	17%
5- SR 854 - EB	40	21.4	22.6	5	6.52	41.8	34.9	28.4	29.2	30.2	7.0	33%	7.6	34%
6- Gratigny - EB	45	30.2	34.8	6	6.67	41.9	35.3	33.9	33.9	34.0	3.7	12%	-0.8	-2%
7- SR 836 - EB	55	29.0	40.1	7	10.83	55.0	49.5	32.7	47.0	40.6	3.7	13%	0.5	1%
8- US 1 Broward - NB	35	25.1	25.3	8	9.51	38.2	30.9	25.6	29.0	28.2	0.5	2%	2.9	12%
9- SR 811/Dixie - NB	40	21.7	22.1	9	7.18	37.0	31.7	30.7	26.2	30.2	9.0	41%	8.1	36%
10- Sample Rd - EB	45	20.5	27.4	10	6.62	44.5	35.1	27.7	29.4	31.6	7.2	35%	4.2	15%
11- Atlantic Blvd - EB	45	18.4	26.1	11	6.55	42.0	32.6	24.2	30.3	29.6	5.8	32%	3.5	14%
12- Cypress Creek - EB	45	19.4	26.4	12	6.68	40.7	33.7	22.4	29.8	28.7	3.0	15%	2.3	9%
13- I 595 - EB	60	37.6	62.1	13	9.83	58.7	51.0	38.2	47.6	46.1	0.6	2%	-16.0	-26%
14- Hollywood Blvd - EB	40	18.3	18.4	14	4.59	35.0	27.4	25.3	25.1	26.0	7.0	38%	7.6	41%
15- SR 811 - NB	45	39.8	39.4	15	6.71	49.0	37.6	35.4	33.5	35.9	-4.4	-11%	-3.5	-9%
16- Okeechobee Blvd - EB	45	22.9	32.8	16	5.44	40.9	34.2	23.6	31.2	29.5	0.7	3%	-3.4	-10%
17- Yamato Rd - EB	45		26.2	17	4.57	43.2	34.8	26.5	31.6	32.0			5.8	22%
18- Boyton Beach Blvd - EB	45	30.7	25.4	18	9.10	43.3	35.9	34.8	34.0	35.5	4.1	13%	10.1	40%
19- Lake Worth Rd - EB	45	25.7	27.7	19	9.45	41.5	34.6	32.6	33.7	34.4	6.8	27%	6.7	24%
20- US 1 BO/PB - NB	45	27.6	32.0	20	8.45	43.5	35.5	33.9	31.9	34.6	6.3	23%	2.6	8%
21- US 1 Palm Beach - NB	35	28.5	30.1	21	7.82	34.6	32.3	31.0	31.9	32.1	2.5	9%	2.0	7%
22- US 1 Palm Beach - NB	40	34.7	31.8	22	10.77	43.3	36.6	35.4	32.6	35.6	0.6	2%	3.8	12%
Totals (NB or EB) [*]	43.7	25.84	30.2	1-22	169.93	42.5	35.1	28.2	31.5	31.7	2.3	9%	1.5	5%

Table E-1 (Continued)

Survey Data				Section Speed of Model Run							Model vs Observed Speed			
Section (SB or WB)	Normal Speed (mph)	AM Period Avg Speed (mph)	MIDDAY Period Avg Speed (mph)	TDSECID	Distance (mile)	Posted Speed (mph)	Free-Flow Speed (mph)	AM Peak Period Congested Speed (mph)	PM Peak Period Congested Speed (mph)	Off-Peak Period Congested Speed (mph)	Change in AM Speed	Percent Change in AM Speed	Change in Off Peak Speed	Percent Change in Off Peak Speed
	(S1)	(S3)	(S4)		(M2)	(M1A)	(M1B)	(M3)	(M5)	(M4)	D3 =M3-S3	D3/S3	D4=M4-S4	D4/S4
1- US 1 Miami - SB	45	26.2	25.8	101	8.26	43.6	35.1	32.4	13.2	19.8	6.2	24%	-6.0	-23%
2- US 1 Miami - SB	45	16.7	20.2	102	10.00	36.1	29.5	24.1	27.8	28.2	7.4	44%	8.0	39%
3- Kendall Dr - WB	45	24.2	25.8	103	7.00	44.3	33.5	32.2	16.7	28.6	8.0	33%	2.8	11%
4- SR 826 - WB	50	30.7	30.1	104	7.48	43.2	36.3	31.6	26.9	28.8	0.9	3%	-1.4	-4%
5- SR 854 - WB	40	26.0	29.2	105	6.52	41.8	34.8	31.9	26.3	31.1	5.9	23%	1.9	6%
6- Gratigny - WB	45	34.0	36.3	106	6.42	41.3	34.0	32.9	32.0	32.9	-1.1	-3%	-3.4	-9%
7- SR 836 - WB	55	49.2	51.9	107	10.64	54.7	49.1	47.7	24.5	36.2	-1.5	-3%	-15.7	-30%
8- US 1 Broward - SB	40	24.6	27.3	108	9.51	38.2	30.8	30.2	21.5	27.5	5.6	23%	0.2	1%
9- SR 811/Dixie - SB	40	19.7	22.3	109	7.20	37.0	32.1	28.6	29.0	30.2	8.9	45%	7.9	35%
10- Sample Rd - WB	45	23.2	27.2	110	6.62	44.5	35.2	32.3	24.9	31.5	9.1	39%	4.3	16%
11- Atlantic Blvd - WB	45	24.9	29.2	111	6.55	42.0	32.6	31.8	20.8	29.3	6.9	28%	0.1	0%
12- Cypress Creek - WB	45	23.5	29.1	112	6.68	40.7	33.8	31.9	19.5	29.3	8.4	36%	0.2	1%
13- I 595 - WB	60	61.1	67.0	113	9.84	58.3	50.7	50.4	37.2	49.0	-10.7	-18%	-18.0	-27%
14- Hollywood Blvd - WB	40	19.8	18.4	114	4.59	35.0	27.4	26.5	23.6	26.1	6.7	34%	7.7	42%
15- SR 811 - SB	45	35.0	39.1	115	6.71	49.0	38.4	35.3	34.6	36.6	0.3	1%	-2.5	-6%
16- Okeechobee Blvd - WB	45	30.3	35.7	116	5.44	40.9	34.1	33.3	21.0	29.4	3.0	10%	-6.3	-18%
17- Yamato Rd - WB	45		25.6	117	4.57	43.2	34.9	32.7	23.5	31.7			6.1	24%
18- Boyton Beach Blvd - WB	45	31.2	26.8	118	9.10	43.3	35.8	33.8	33.5	34.9	2.6	8%	8.1	30%
19- Lake Worth Rd - WB	45	25.7	27.5	119	9.43	41.5	34.8	34.6	30.5	34.5	8.9	35%	7.0	25%
20- US 1 BO/PB - SB	45	28.5	27.0	120	8.45	43.5	35.5	33.8	31.1	34.3	5.3	19%	7.3	27%
21- US 1 Palm Beach - SB	35	28.6	28.8	121	7.72	34.6	32.1	32.1	29.0	32.0	3.5	12%	3.2	11%
22- US 1 Palm Beach - SB	40	33.7	31.6	122	10.77	43.3	36.7	34.4	34.0	35.6	0.7	2%	4.0	13%
Totals (SB or WB) [*]	**44.0**	**30.32**	**31.9**	**101-122**	**169.50**	**42.4**	**35.1**	**33.0**	**25.2**	**31.2**	**2.7**	**9%**	**-0.7**	**-2%**

[*] Weighted Survey Speed. Weights are based on Section Length.

Table E-2: **Observed and Model Estimated Speed Comparison of Sections 31-40**
Southeast Regional Planning Model VI

Survey Data				Section Speed of Model Run							Model vs Observed Speed					
Section (NB or EB)	AM Period Avg Speed (mph)	MIDDAY Period Avg Speed (mph)	PM Period Avg Speed (mph)	TDSECID	Distance (mile)	Posted Speed (mph)	Free-Flow Speed (mph)	AM Peak Period Congested Speed (mph)	PM Peak Period Congested Speed (mph)	Off-Peak Period Congested Speed (mph)	Change in AM Speed	Percent Change in AM Speed	Change in PM Speed	Percent Change in PM Speed	Change in Off Peak Speed	Percent Change in Off Peak Speed
	(S3)	(S4)	(S5)		(M2)	(M1A)	(M1B)	(M3)	(M5)	(M4)	D3 =M3-S3	D3/S3	D5 =M5-S5	D5/S5	D4=M4-S4	D4/S4
31- Turnpike NB (I-595 to Sawgrass Expressway)	65.5	62.1	63.4	31	15.86	65.0	65.1	62.9	62.2	62.8	-2.6	-4%	-1.2	-2%	0.7	1%
32- Sawgrass NB/EB (I-595 to Turnpike)	46.1	64.1	63.2	32	22.01	65.0	64.9	62.4	62.6	62.7	16.3	35%	-0.6	-1%	-1.4	-2%
33- Atlantic/SR-814 EB (Sawgrass to US-441)	25.8	24.4	25.6	33	6.04	42.1	37.5	33.3	36.5	36.5	7.5	29%	10.9	43%	12.0	49%
34- Commercial/SR-870 EB (Sawgrass to US-441)	23.0	26.2	23.8	34	6.00	45.0	36.4	28.8	34.9	33.8	5.9	26%	11.1	47%	7.6	29%
35- Oakland/SR-816 EB (Sawgrass to US-441)	22.0	25.5	24.9	35	7.24	45.0	36.0	28.3	33.1	32.8	6.4	29%	8.2	33%	7.2	28%
36- Sample/SR-834 EB (Sawgrass to US-441)	21.5	23.3	24.4	36	5.95	37.9	32.6	29.8	31.9	32.0	8.3	39%	7.5	31%	8.6	37%
37- Sunrise/SR-838 EB (Sawgrass to US-441)	19.8	29.5	29.1	37	9.42	45.0	36.7	30.4	33.4	34.2	10.6	54%	4.4	15%	4.8	16%
38- Coral Ridge/Nob Hill NB (I-595 to Sawgrass)	25.1	27.8	28.1	38	14.09	41.7	34.8	33.5	31.1	33.9	8.4	33%	3.0	11%	6.1	22%
39- University/SR-817 NB (I-595 to Sawgrass)	25.2	23.6	23.6	39	14.48	42.5	35.1	32.5	27.4	32.0	7.3	29%	3.9	16%	8.4	36%
40- US-441/SR-7 NB (I-595 to Sawgrass)	22.7	28.6	24.6	40	15.00	41.9	34.3	31.9	27.1	31.9	9.2	40%	2.4	10%	3.3	11%
Totals (NB or EB)	**28.4**	**32.4**	**31.6**	**31-40**	**116.09**	**47.9**	**41.4**	**37.5**	**36.7**	**39.1**	**9.1**	**32%**	**5.0**	**16%**	**6.7**	**21%**

Survey Data				Section Speed of Model Run							Model vs Observed Speed					
Section (WB or SB)	AM Period Avg Speed (mph)	MIDDAY Period Avg Speed (mph)	PM Period Avg Speed (mph)	TDSECID	Distance (mile)	Posted Speed (mph)	Free-Flow Speed (mph)	AM Peak Period Congested Speed (mph)	PM Peak Period Congested Speed (mph)	Off-Peak Period Congested Speed (mph)	Change in AM Speed	Percent Change in AM Speed	Change in PM Speed	Percent Change in PM Speed	Change in Off Peak Speed	Percent Change in Off Peak Speed
	(S3)	(S4)	(S5)		(M2)	(M1A)	(M1B)	(M3)	(M5)	(M4)	D3 =M3-S3	D3/S3	D5 =M5-S5	D5/S5	D4=M4-S4	D4/S4
131- Turnpike SB (Sawgrass Expressway to I-595)	66.9	64.6	65.6	131	16.25	65.0	65.1	62.9	62.8	62.9	-4.0	-6%	-2.8	-4%	-1.7	-3%
132- Sawgrass SB/WB (Turnpike to I-595)	43.8	64.1	61.8	132	22.10	65.0	64.9	62.4	60.9	62.4	18.6	43%	-0.9	-1%	-1.8	-3%
133- Atlantic/SR-814 WB (US-441 to Sawgrass)	33.6	27.6	29.4	133	6.04	42.1	37.6	37.2	31.2	36.5	3.6	11%	1.7	6%	8.9	32%
134- Commercial/SR-870 WB (US-441 to Sawgras	26.6	26.4	25.4	134	6.00	45.0	36.6	36.2	25.2	34.0	9.5	36%	-0.3	-1%	7.6	29%
135- Oakland/SR-816 WB (US-441 to Sawgrass)	26.4	27.0	25.7	135	7.24	45.0	36.4	35.1	25.5	33.0	8.7	33%	-0.3	-1%	6.0	22%
136- Sample/SR-834 WB (US-441 to Sawgrass)	30.3	22.7	25.5	136	5.95	37.9	32.6	32.4	28.5	32.0	2.1	7%	3.0	12%	9.4	41%
137- Sunrise/SR-838 WB (US-441 to Sawgrass)	26.8	22.3	24.3	137	9.42	45.0	36.8	35.7	27.4	34.6	8.9	33%	3.2	13%	12.3	55%
138- Coral Ridge/Nob Hill SB (Sawgrass to I-595)	25.1	25.0	26.9	138	14.09	41.7	34.8	32.6	31.6	33.8	7.5	30%	4.7	17%	8.8	35%
139- University/SR-817 SB (Sawgrass to I-595)	23.7	23.8	22.3	139	14.48	42.5	35.0	29.3	29.7	31.8	5.6	24%	7.5	33%	8.0	33%
140- US-441/SR-7 SB (Sawgrass to I-595)	24.9	26.2	20.7	140	15.00	41.9	34.3	29.7	29.5	31.9	4.9	20%	8.8	43%	5.7	22%
Totals (SB or WB)	**31.1**	**31.2**	**30.3**	**131-140**	**116.57**	**48.0**	**41.5**	**38.5**	**35.0**	**39.2**	**7.4**	**24%**	**4.7**	**15%**	**8.0**	**26%**

Table E-3: **Observed and Model Estimated Speed Comparison of Sections 41-47**
Southeast Regional Planning Model VI

Survey Data	Peak Direction			Off-Peak Direction			Section Speed of Model Run							Model vs Observed Speed					
Section NB/EB	AM or PM	Peak HOUR Speed (mph)	Peak PERIOD Speed (mph)	AM or PM	Off-Peak HOUR Speed (mph)	Off-Peak PERIOD Speed (mph)	TDSECID	Distance (mile)	Posted Speed (mph)	Free-Flow Speed (mph)	AM Peak Period Cong Speed (mph)	PM Peak Period Cong Speed (mph)	Off-Peak Period Cong Speed (mph)	Change in AM Speed	Percent Change in AM Speed	Change in PM Speed	Percent Change in PM Speed	Change in Off Peak Speed	Percent Change in Off Peak Speed
		(S3A)	(S3B)		(S4A)	(S4B)		(M2)	(M1A)	(M1B)	(M3)	(M5)	(M4)	D3 =M3-S3B	D3/S3B	D5 =M5-S5B	D5/S5B	D4=M4-S4B	D4/S4B
41- HEFT to SR-836 NB/EB (Homestead Toll Plaza to SW 107th Ave)	AM	27.9	37.4	PM	59.0	61.0	41	16.48	59.60	59.43	39.83	57.20	56.02	2.5	7%			-5.0	-8%
42- HEFT to SR-874 to SR 826 to SR 836 NB/EB (Don Shula Expy to Dolphin Expy)	AM	21.6	29.8	PM	53.0	46.1	42	10.82	57.86	52.50	31.18	50.48	42.99	1.4	5%			-3.1	-7%
43- SW 107th Avenue NB (Killiam Pkwy to Dolphin Expy)	AM	16.2	19.6				43	7.51	39.67	32.49	21.25	29.02	29.10	1.7	9%				
44- SW 117th Avenue NB (SW 120th St to Tamiami Trail)	AM	15.6	19.2				44	7.51	30.40	28.20	22.02	26.45	25.93	2.8	14%				
45- Bird Road - SW 40th St EB (HEFT to Dolphin Expressway)	AM	16.4	20.4				45	11.05	40.01	31.33	19.71	28.63	27.43	-0.7	-4%				
46- Tamiami Trail - SW 8th St to LeJeune Road EB (HEFT to LeJeune Rd)	AM	17.7	20.4				46	7.74	39.12	31.20	17.88	30.58	28.23	-2.6	-13%				
47- West Flagler St EB (HEFT to LeJeune Rd)	AM	14.9	17.7				47	7.69	34.98	28.69	20.03	27.79	26.75	2.3	13%				
Totals (NB or EB)		18.8	23.5		56.7	54.8	41-47	68.80	43.17	37.20	24.29	35.08	33.43	0.8	4%			-5.3	-10%

Survey Data	Peak Direction			Off-Peak Direction			Section Speed of Model Run							Model vs Observed Speed					
Section NB/EB	AM or PM	Peak HOUR Speed (mph)	Peak PERIOD Speed (mph)	AM or PM	Off-Peak HOUR Speed (mph)	Off-Peak PERIOD Speed (mph)	TDSECID	Distance (mile)	Posted Speed (mph)	Free-Flow Speed (mph)	AM Peak Period Cong Speed (mph)	PM Peak Period Cong Speed (mph)	Off-Peak Period Cong Speed (mph)	Change in AM Speed	Percent Change in AM Speed	Change in PM Speed	Percent Change in PM Speed	Change in Off Peak Speed	Percent Change in Off Peak Speed
		(S3A)	(S3B)		(S4A)	(S4B)		(M2)	(M1A)	(M1B)	(M3)	(M5)	(M4)	D3 =M3-S3B	D3/S3B	D5 =M5-S5B	D5/S5B	D4=M4-S4B	D4/S4B
141- SR-836 to HEFT SB/WB (SW 107th Ave to Homestead Toll Plaza)	PM	39.9	43.6	AM	55.9	55.7	141	16.94	59.40	58.90	56.89	35.30	56.23			-8.3	-19%	0.5	1%
142- HEFT to SR-874 to SR 826 to SR 836 SB/WB (Dolphin Expy to Don Shula Expy)	PM	26.7	31.3	AM	39.8	34.8	142	10.82	58.02	52.60	50.48	26.19	41.69			-5.1	-16%	6.9	20%
143- SW 107th Avenue SB (Dolphin Expy to Killiam Pkwy)	PM	15.0	16.1				143	7.51	39.67	32.45	31.50	20.28	30.00			4.1	26%		
144- SW 117th Avenue SB (Tamiami Trail to SW 120th St)	PM	17.9	18.4				144	7.51	30.40	28.29	27.36	22.06	27.41			3.6	20%		
145- Bird Road - SW 40th St WB (Dolphin Expressway to HEFT)	PM	24.1	22.6				145	11.05	40.01	31.30	29.25	16.30	27.21			-6.3	-28%		
146- Tamiami Trail - SW 8th St to LeJeune Road WB (LeJeune Rd to HEFT)	PM	14.4	16.8				146	7.74	39.12	30.99	30.84	17.22	27.72			0.4	3%		
147- West Flagler St WB (LeJeune Rd to HEFT)	PM	16.5	17.7				147	7.69	34.98	28.63	28.23	15.29	26.19			-2.4	-14%		
Totals (SB or WB)		21.5	23.1		48.9	45.9	141-147	69.26	43.24	37.20	35.96	21.42	33.56			-1.6	-7%	3.0	7%

Table E-4: **Observed and Model Estimated Speed Comparison of Sections 48-57**
Southeast Regional Planning Model VI

Turnpike and I-95/SR9 Survey Speed Data				Section Speed of Model Run							Model vs Observed Speed			
Section (NB or EB)	GP or HOV Lanes	AM Average Speed (mph)	PM Average Speed (mph)	TDSECID	Distance (mile)	Posted Speed (mph)	Free-Flow Speed (mph)	AM Peak Period Congested Speed (mph)	PM Peak Period Congested Speed (mph)	Off-Peak Period Congested Speed (mph)	Change in AM Speed	Percent Change in AM Speed	Change in PM Speed	Percent Change in PM Speed
		(S3)	(S5)		(M2)	(M1A)	(M1B)	(M3)	(M5)	(M4)	D3 =M3-S3	D3/S3	D5=M5-S5	D5/S5
48- TPK: Deerfield to Lantana - NB		64.0	67.0	48	17.60	64.75	67.20	60.82	57.67	60.67	-3.2	-5%	-9.3	-14%
49- TPK: Golden Glades to I-595 - NB		63.0	69.0	49	10.28	63.78	63.89	60.73	61.42	61.24	-2.3	-4%	-7.6	-11%
50- TPK: Okeechobee to Miramar - NB/EB		67.0	66.0	50	14.16	69.98	72.43	69.33	69.14	69.51	2.3	3%	3.1	5%
51- TPK: Dolphin/SR-836 to Okeechobee - NB		47.0	56.0	51	5.77	68.69	69.95	59.15	67.19	67.25	12.2	26%	11.2	20%
52- I95: Commercial Blvd to Linton Blvd - NB	GP	61.3	60.4	52	18.30	65.01	56.72	48.85	42.80	48.81	-12.4	-20%	-17.6	-29%
53- I95: Commercial Blvd to Linton Blvd - NB	HOV	65.0	63.3	53	18.35	64.99	57.38	57.21	54.43	53.11	-7.8	-12%	-8.9	-14%
54- I95: Golden Glades to Commercial Blvd - NB	GP	62.2	57.7	54	19.61	62.32	54.30	43.94	45.82	47.35	-18.3	-29%	-11.9	-21%
55- I95: Golden Glades to Commercial Blvd - NB	HOV	64.8	60.3	55	19.54	62.33	55.09	53.99	54.96	52.64	-10.8	-17%	-5.4	-9%
56- I95: SR-112/Airport Expy to Golden Glades - NB	GP	63.1	31.5	56	8.14	55.00	48.69	47.25	27.66	39.34	-15.8	-25%	-3.8	-12%
57- I95: SR-112/Airport Expy to Golden Glades - NB	HOV	66.7	37.8	57	7.56	54.98	48.92	48.91	39.79	46.62	-17.7	-27%	2.0	5%
Totals (NB or EB) [*]		**63.2**	**59.3**	**48-57**	**139.31**	**63.41**	**58.51**	**53.77**	**49.83**	**53.12**	**-9.5**	**-15%**	**-9.5**	**-16%**

Turnpike and I-95/SR9 Survey Speed Data				Section Speed of Model Run							Model vs Observed Speed			
Section (SB or WB)	GP or HOV Lanes	AM Average Speed (mph)	PM Average Speed (mph)	TDSECID	Distance (mile)	Posted Speed (mph)	Free-Flow Speed (mph)	AM Peak Period Congested Speed (mph)	PM Peak Period Congested Speed (mph)	Off-Peak Period Congested Speed (mph)	Change in AM Speed	Percent Change in AM Speed	Change in PM Speed	Percent Change in PM Speed
		(S3)	(S5)		(M2)	(M1A)	(M1B)	(M3)	(M5)	(M4)	D3 =M3-S3	D3/S3	D5=M5-S5	D5/S5
148- TPK: Lantana to Deerfield - SB		66.0	66.0	148	16.99	64.72	67.28	60.35	60.95	60.93	-5.6	-9%	-5.0	-8%
149- TPK: I-595 to Golden Glades - SB		69.0	69.0	149	10.32	63.70	63.84	62.78	57.92	62.16	-6.2	-9%	-11.1	-16%
150- TPK: Miramar to Okeechobee - SB/WB		69.0	70.0	150	14.23	69.98	73.02	71.81	70.58	71.71	2.8	4%	0.6	1%
151- TPK: Okeechobee to Dolphin/SR-836 SB		58.0	46.0	151	5.88	70.00	71.25	66.46	44.19	66.05	8.5	15%	-1.8	-4%
152- I95: Linton Blvd to Commercial Blvd - SB	GP	58.9	57.3	152	18.38	65.02	56.76	45.75	44.40	47.54	-13.1	-22%	-12.9	-22%
153- I95: Linton Blvd to Commercial Blvd - SB	HOV	62.8	56.4	153	18.30	65.01	57.38	56.85	54.72	52.20	-6.0	-10%	-1.6	-3%
154- I95: Commercial Blvd to Golden Glades - SB	GP	66.2	53.4	154	19.55	62.29	54.43	48.87	39.86	46.84	-17.4	-26%	-13.5	-25%
155- I95: Commercial Blvd to Golden Glades - SB	HOV	72.5	57.6	155	19.60	62.35	55.11	55.10	48.38	52.16	-17.4	-24%	-9.2	-16%
156- I95: Golden Glades to SR-112/Airport Expy - SB	GP	19.7	58.4	156	8.16	55.01	48.62	29.50	42.75	38.37	9.8	50%	-15.6	-27%
157- I95: Golden Glades to SR-112/Airport Expy - SB	HOV	40.1	59.2	157	7.59	55.00	48.92	41.91	48.25	45.61	1.9	5%	-10.9	-18%
Totals (SB or WB) [*]		**61.6**	**59.6**	**148-157**	**139.00**	**63.46**	**58.60**	**52.07**	**49.93**	**52.62**	**-9.6**	**-16%**	**-9.6**	**-16%**