



FLORIDA TRANSPORTATION MODELING NEWSLETTER

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MODELING BUS DWELL TIME AND TRANSIT LINK TRAVEL TIME

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Introduction

The current FSUTMS model uses a set of highway-transit speed curves based on facility type and area type to model the relationship between highway speed and transit speed. This method has a number of limitations. One is the considerable vagueness in the definition of area types. Another is that the effect of ridership is not considered, which affects bus dwell time, therefore transit link travel time.

Estimating different components of transit travel time accurately to reflect the true traffic condition is important since delay significantly affects the operating statistics of a transit network. The components of transit travel time may include:

- ☞ Travel time between stops
- ☞ Traffic signal delay time
- ☞ Dwell time at stops
- ☞ General traffic delay time

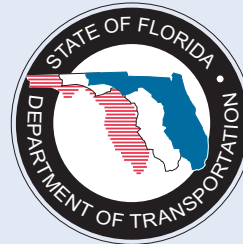
Travel time between stops is determined by highway travel speed and by the acceleration and deceleration rates of a transit vehicle. Traffic signal delay time depends on the intersection geometry, signal timing, and traffic volumes. Dwell time is the time when a transit vehicle is stopped for serving passengers. General traffic delay time is attributed to all other delays such as when a bus is unable to merge into the general traffic lane after a stop.

Dwell time at a bus stop is highly correlated with the number of boarding and alighting passengers. In a typical bus operation, passengers may board a bus only through the front door but may have the choice to get off the vehicle at either front or rear door. This study developed a methodology to more accurately estimate dwell time by predicting the proportion of alighting passengers that would choose the front or rear door to get off the bus using a door choice model based on a bus travel time survey. A transit link travel time model was then developed by considering the dwell

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FSUTMS CUBE VOYAGER TRAINING 2005-06 SCHEDULE UNDER DEVELOPMENT

The modeling workshops will focus exclusively on the new FSUTMS powered by Cube Voyager. A computer-based training (CBT) program for FSUTMS/Tranplan is now available. Visit the CBT distribution website to download a copy: <http://www.eng.fiu.edu/lctr/fsutmscibt.htm>

Course Topics

- Comprehensive Modeling Workshop
- Executive Summary Modeling Seminar
- Model Calibration Workshop
- Intermodal Modeling Workshop
- Model Scripting Workshop
- Florida Model Applications Conference

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time, acceleration and deceleration of a vehicle approaching or leaving a bus stop, and highway travel time.

Study Area and Data Collection

In this study, a transit dwell time survey was conducted to collect data on the durations and number of passengers boarding and alighting through the front and rear doors on a bus vehicle. The survey was conducted from three routes of the Broward County Transit (BCT) system. The following data were collected:

- ▣ type of delay encountered at a bus stop or signalized intersection;
- ▣ time when a bus completely stops at a bus stop or signalized intersection;
- ▣ time when the front door opens at a bus stop;
- ▣ number of alighting passengers and the time when alighting completes at the front door;
- ▣ number of boarding passengers and the time when boarding completes at the front door;
- ▣ time when the front door closes;
- ▣ time when a bus clears out of the bus stop or signalized intersection to traverse on a regular moving lane on the street;
- ▣ number of alighting passengers and the time when alighting completes at the rear door;
- ▣ GPS readings at bus stop or intersection; and
- ▣ notes of atypical delays, e.g., incidents, encountered at a particular location.

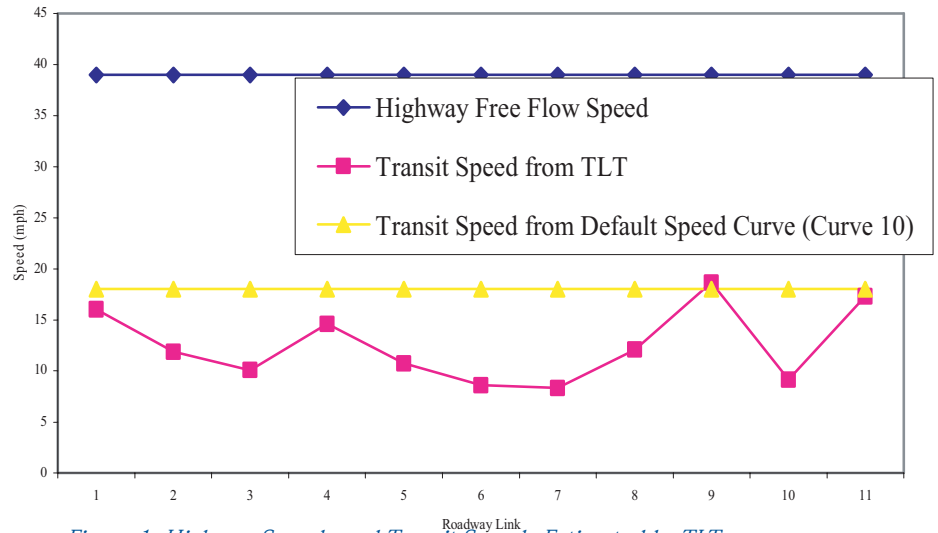


Figure 1. Highway Speeds and Transit Speeds Estimated by TLT Module and FSUTMS Speed Curve (Curve 10)

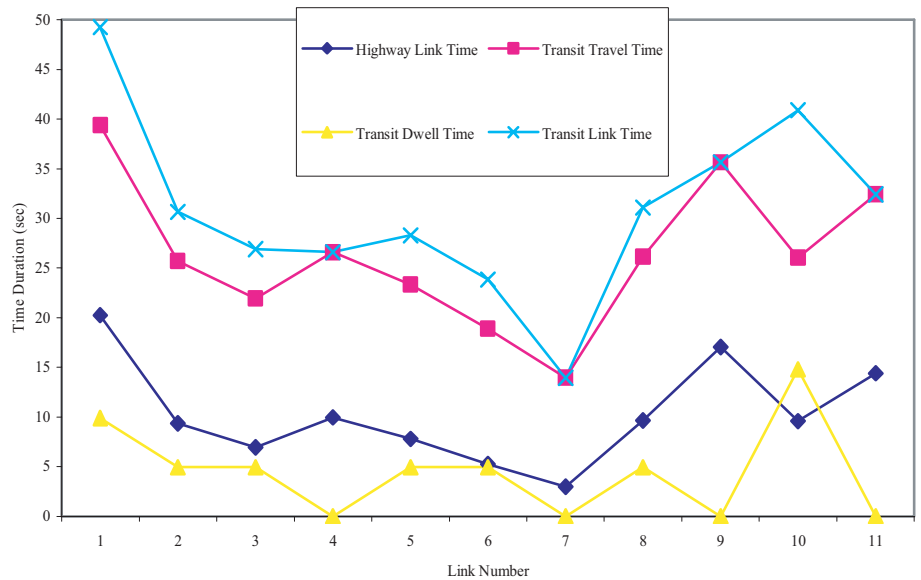


Figure 2. Highway Link Time and Components of Transit Link Time

Estimations of Dwell Time and Transit Link Travel Time

A binary choice model for an alighting passenger to choose either the front or rear door was developed that included five variables: total number of alighting passengers at a given stop, total passengers onboard before bus doors were open at a given stop, a variable indicating a stop being a

time point, a variable indicating AM peak (6:30-9:30 AM), and a variable indicating PM peak (3:00-7:30 PM). Based on the prediction from the door choice model, a computer program, DwellTime, was developed to estimate the dwell time based on alighting and boarding passengers and average alighting/boarding time per passenger obtained from the survey data.

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A second computer program, TLT, was developed to calculate transit link time considering both dwell time and deceleration/acceleration delay. **Figure 1** shows the bus speeds estimated by the TLT module and those from the current default transit/highway speed curve 10 for a roadway segment with area type 42 (outlying business district) and facility type 25 (divided arterial) on one of the sampled transit routes. The segment consists of eleven highway links with a free-flow highway speed of 39 mph. It may be seen that the current approach assumes a constant speed for transit vehicles and significantly overestimates transit speeds for most of the links on the bus route. In comparison, the speeds estimated by the TLT module were varied in terms of stop location and ridership.

Figure 2 illustrates the different components of transit link travel time, which includes the actual travel time and dwell time. It may be seen that dwell time may be significant at locations where there is a high level of boarding/alighting activities and that current speed curve approach underestimates transit link travel time.

Conclusions

Transit travel time estimation may be improved by modeling individual transit travel time components. This study developed a model to estimate the transit link travel time by considering the dwell time based on passenger activities at bus stops, vehicle acceleration and deceleration, and highway travel time. The dwell time depends on ridership, time of day, and average boarding/alighting duration per passenger. Because ridership data are required to estimate dwell time, to implement the model in FSUTMS, an iterative process that calculates transit link time based on boarding and alighting data from the previous traffic assignment iteration is necessary.

One limitation of the study is that demographics and climate are not considered in modeling the dwell time. Another possible improvement to the transit link travel time estimation may be made by considering transit vehicle delay at intersections and the general traffic delay component.

The full report of this study may be found at http://www.dot.state.fl.us/research-center/Completed_Proj/Summary_PL/FDOT_BD015_07_rpt.pdf.

USERS' GROUP MEETING DATES

The **Panhandle Transportation Applications and FSUTMS Users' Group** meets at the Washington County Public Library in Chipley from 1:15 p.m. - 3:00 p.m. Please contact **Linda Little** 850.638.0250. Meeting dates for 2005 are provided below:

Wednesday, August 3, 2005

Wednesday, November 2, 2005

The **Northeast Florida Transportation Applications Forum** meets at the new First Coast MPO location on 1022 Prudential Drive from 12:00 p.m. to 2:00 p.m. Please contact **Karen Taulbee** 904.360.5652 or **Jeanette Berk** 904.823.8982. Meeting dates for 2005 are provided below:

Thursday, August 18, 2005

Thursday, November 17, 2005

The **Southwest Florida Users' Group** is in the process of establishing a new meeting location. Meeting dates and times will be announced as scheduled. Please contact **Jim Baxter** 863. 519.2562.

The **Southeast Florida Users' Group** meets at the FDOT-District 4, "Old Auditorium". Please contact **Phil Steinmiller** 305.377.5896. Meeting dates for 2005 are provided below:

Thursday, September 15, 2005

Thursday, November 17, 2005

The **Central Florida Traffic Data Users' Group** meets at the FDOT-District 5 Orlando Urban Office at 2:00 p.m. Please contact **Simone Babb** 407.482.7876. The next meeting date for 2005 is provided below:

Thursday, August 11, 2005

The **Tampa Bay Applications Group** meets at the FDOT-District 7 Tampa Office from 12:00 p.m. to 2:00 p.m. Please contact **Danny Lamb** 813.975.6437. Meeting dates for 2005 are provided below:

Thursday, August 18 2005

Thursday, November 3, 2005

MAJOR TRANSIT SURVEY EFFORT COMPLETED FOR THE TAMPA BAY REGIONAL PLANNING MODEL





By: Cristy Mayer and Mary Ross, Gannett Fleming, Inc.

Securing Federal funds to construct premium transit systems has always been a tough, competitive arena for jurisdictions across the country. As funding continues to become scarce, the competition has become fierce and there is added pressure to provide modeling tools that more accurately reflect transit ridership.

The Florida Department of Transportation (FDOT) has long since recognized the importance of improving the transit component of local travel demand models to assist regional transit agencies in their efforts to receive federal funding from FTA through the *New Starts Program*. With the goal of improving the Tampa Bay Regional Planning Model (TBRPM), the FDOT, District Seven recently sponsored a major transit survey effort. The survey was done in coordination with local transit agencies and FTA in order to maximize the results and to obtain information useful to all parties.

With the goal of collecting the most accurate transit data possible, District Seven went all out and implemented the largest origin-destination transit survey effort this region has ever seen! Starting in late 2004, the FDOT began the task of conducting surveys for ALL FOUR transit providers within the District. The major purpose of this particular survey effort was to gain a better understanding of regional transit travel patterns, specifically to improve transit modeling in the Tampa Bay area.

Transit Agencies Surveyed

-  **Hillsborough Area Regional Transit (HART)**
-  **Pinellas Suncoast Transit Authority (PSTA)**
-  **Pasco County Public Transportation (PCPT)**
-  **The Hernando Express (THE Bus)**

the transit component of the TBRPM. The survey asked patrons about the origin and destination of individual linked trips. **A copy of the survey is provided on page 9.**

A pre-test was conducted on a heavily traveled transit route in Hillsborough County to assess transit passengers' reactions to the survey, their ability to understand the questions, and the length of time for completion. In addition, more in-depth interviews were held with various passengers to identify any specific problem areas with the questionnaire.

A survey questionnaire was developed in cooperation with all parties. However, the survey was designed with a main goal in mind: to collect the required information to update and revalidate

Based on the positive pre-test results and surveyor comments, no questions were changed or dropped from the original survey instrument.

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A little incentive never hurt... a magnetic 2005 calendar was provided to all patrons that participated in the surveys.



... 100% of express and 50% of local bus routes in Hillsborough and Pinellas Counties were surveyed.

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Surveys were conducted for the four area transit agencies beginning with Hillsborough Area Transit Agency (HART) in November 2004.

Implementation for the three additional agencies followed with the Pinellas Suncoast Transit Authority (PSTA) in February 2005, and Pasco County Public Transit (PCPT) and The Hernando Express (THE Bus) in March 2005.

The key to success of this major survey effort was organization and lots and lots of personnel! The overall implementation was managed by Gannett Fleming, Inc., along with the help of temporary personnel used to administer the onboard surveys.

Surveys were administered Monday through Friday between the hours of 3:30 a.m. and 12:00 midnight. A random sample of routes was chosen and then reviewed for sufficient coverage of AM and PM peak and midday periods for both inbound and outbound directions. To ensure the effort would accurately portray existing transit travel patterns, 100% of express and 50% of the local bus routes in Hillsborough and Pinellas Counties were surveyed. One hundred percent of the routes in Pasco and Hernando Counties were surveyed. This enormous effort required at times as many as 30 personnel in the field at one time.





Surveys were provided in both English and Spanish and bilingual survey personnel were used, particularly on routes identified by the transit agencies as having a

... 100% percent of the routes in Pasco and Hernando Counties were surveyed.

large Spanish-speaking ridership base. All surveys were completed and collected during the bus trip to encourage participation. As a token of FDOT's appreciation, magnets with the 2005 calendar year were provided to everyone that participated in the survey.

In order to maintain an accurate record of the number of riders, survey personnel offered the survey to each person onboard. If a rider refused to participate, the survey instrument was marked as such and retained so total ridership for that particular trip could be determined. Over 29,000 surveys were distributed among the four transit agencies.

The distribution and collection of surveys during the bus trip helped to achieve an average transit system participation rate of over 50%.

Participation Rate	
 HART	51%
 PSTA	46%
 PCPT	67%
 THE Bus	50%

Initial review and analysis of the survey results is currently underway. The analysis will provide information on origins and destinations by trip purpose and automobile ownership. This information will then be used to create an updated Transit Trip Target Matrix and be the basis for the Mode Choice model validation.

This survey effort was only successful because of the cooperative effort between survey personnel and transit staff – **FDOT thanks the transit agencies, particularly the drivers, for all of their cooperation and help!**

Stay tuned for more information regarding the analysis of the districtwide survey and the resulting changes to the TBPRM. For more information on the survey methodology and implementation, you may contact Mary Ross, Gannett Fleming, Inc., at mross@gfnet.com or Danny Lamb, FDOT, at daniel.lamb@dot.state.fl.us.

10TH TRB CONFERENCE ON THE APPLICATION OF TRANSPORTATION PLANNING METHODS

By: Robert G. Schiffer, AICP, Principal, Cambridge Systematics, Inc.

This year's 2005 TRB Planning Applications Conference was held in Portland, Oregon on April 24th through 28th. With its strong reputation for innovative urban planning, Portland was an ideal conference location. The conference lived up to its usual high expectations as a great forum for the presentation of innovative, yet practical transportation planning applications. Also, as with past conferences, presentations on travel demand modeling innovations were a major focus.

In terms of travel demand modeling, integration between four-step and traffic micro-simulation models continued to be a popular topic. Also, an entire session was devoted to activity-based modeling, with several additional presentations on such models appearing in other modeling sessions. There were also half sessions devoted to integrated transportation-land use modeling, as well as transit patronage forecasting. Presentations were made on TRANSIMS and projects that used similar concepts such as synthetic household generation. Sessions on freight and transit also included several presentations on the modeling of these modes. The North Carolina DOT made an interesting presentation on how the State is getting up to speed on modeling with several of its ideas being similar to techniques that Florida DOT and the Model Task Force have employed for many years.

In addition to a total of seven full- or half-sessions on travel demand models, the conference featured sessions

on a variety of transportation planning topics, and many of these presentations were related to travel demand model applications. Other sessions included Travel Survey Methods, Planning Processes, Land Use-Transportation Interactions, New Directions in Travel Data Applications, Long-Range Transportation Investments, Non-Response in Travel Surveys, Environmental Issues in Transportation Planning, Keeping Traffic Flowing, Global Positioning Systems in Transportation, Road Pricing, and Corridor Studies. As usual, there was an evening session on the latest products available from the U.S. Census. The conference closed with a series of locally-relevant presentations on Oregon planning initiatives.

Florida was well-represented, in spite of the lengthy travel, with numerous presentations, moderators, and conference attendees. Jerry Faris, Chairperson of the TRB Committee ADB50, which is responsible for putting on this conference every two years, worked with FDOT staff to bring the conference back to Florida in 2007. The next conference will be held in Daytona Beach. At our Committee meeting, it was agreed to hold the 2009 conference in Atlanta, Georgia. With the proximity of the next two conferences, we hope to have Florida well-represented on the agendas.

For additional information on the Portland Conference, please visit the following website:

<http://www.trb-portland-05.com/>

CUBE 4 NEWS FROM CITILABS

New Items for Cube Voyager/Base 4.0

- Dynamic Assignment with Full HCM Intersection and Spillback Modeling
- Reporting Module Complete with Wizards, Cross-tabulation, Charting and Report-ready Graphics
- Crowding Model for Public Transport
- Percent Walk Access to Transit (PCWALK) Calculator (when used with ArcGIS 9.X or higher)
- Interactive On-screen Reporting and Cross-tabulation of Network Characteristics
- Server/Multi-user License Management
- Major Enhancements to Existing Capabilities

Updated Web-based Interface for FSUTMS

- Additional Templates and Wizards
- Advanced CTPP Support including Updated TAZ Equivalency Automatic Update
- Choice of Routing Algorithms for Public Transport
- Advanced DBF Reporting, Calculation and Manipulation
- Activity-based and Destination-Choice Examples in "Cubetown" Demonstration Model
- Advanced Support for User-written Programs

DATA COMMITTEE GETS COLLECTED IN TAMPA

By: Frank Baron, Chairperson, MTF Data Committee

The Florida Statewide Model Task Force Data Committee held a formal meeting in Tampa, Florida on May 20, 2005. Interested modeling professionals from across the state participated in defining needs and setting initial courses for action. The mission of the Committee is...

Mission...To provide guidance to the Florida Model Task Force and the Florida transportation modeling community regarding modeling data needs to assist members in developing better models through data collection, analysis, and archiving, and modeling information management.

This Committee was recently formed because of increasing demands for accurate data. Sound input data is important for reliable outputs and analyses...an absolute necessity to securing funding for all types of projects. A major part of the Committee's function will include fostering MPO and DOT projects oriented to data collection. If an area wants to get projects approved and funded by federal agencies, local models have to be supported by timely, accurate, and comprehensive data. And while this most sensitively encompasses major capital transit projects with funding from FTA, highway projects like HOV, HOT and 'regular' toll facilities will immensely benefit from improved modeling founded upon good data.

The need for accurate data is truly overarching in that it spans all modes and all modules. For instance, with the integration of Cube/Voyager with ArcGIS, there is a tremendous potential to better manage, display, use, and analyze data of all types (e.g., zonal data, network data, stop and route data, survey data, etc.). More emphasis on developing accurate data that can be displayed as useful information for public review needs to be considered, as well. Working with other partners to mine their data for transportation patterns can also be a way to improve relevant information. School boards, community development agencies, welfare-to-work groups, and medical and health agencies all offer possible avenues of obtaining new transportation data that can be used to significantly augment demographic niches.

Sound input data is important for reliable outputs and analyses...an absolute necessity to securing funding for all types of projects.

The Committee focused on outlining technical details that need to be addressed throughout the model chain. In addition, collection methods and transferability issues were addressed. A central repository of survey data is needed, and the Systems Planning Office has initiated a new research project with USF College of Engineering to develop such a central repository on the Internet.

Several initiatives are underway that further support the Data Committee's purpose. The Public Transit Office is conducting a detailed transit speed study to investigate the relationship of transit speeds to the transit schedule, highway speeds, dwell time, stop frequency and spacing.

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The current highway-transit speed curves were developed in the 1980s and have not been updated for many years.

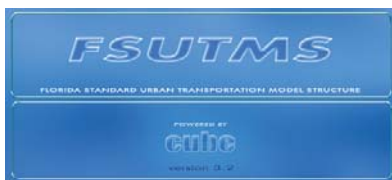
In addition, the Systems Planning Office has several ongoing initiatives to further enhance FSUTMS. A true ArcGIS integration within Cube/Voyager is on the immediate horizon, which is likely to have implications for data collection, manipulation, storage, and analysis. A time of day modeling initiative is also underway and will go beyond the previous study where time of day factors were derived and identified. Thus, the idea is to integrate true time of day choice modeling into FSUTMS. The Systems Planning Office is also working with Citilabs to develop a highway-only flowchart that would be standard in FSUTMS. There is also ongoing work on the development and identification of reasonableness checks.

The Transportation Statistics Office has data, which includes detailed roadway data, roadway geometrics, roadway jurisdiction, and traffic count data from 300 count stations. Many traffic counts are short-term counts with seasonal and other adjustment factors for AADT, number of trucks, etc. The GIS section in the Statistics office develops tools to help display and analyze data: www.dot.state.fl.us/planning/statistics, and is a user of HPMS data and MPO forecasts to provide roadway traffic forecasts to FHWA. All these are vital sources of data useful for modeling across the state.

Action Items in Coordination with MTF and Central Office

- Make a presentation to the MPOAC emphasizing the need for detailed and accurate data to support transportation planning and decision-making and the importance of allocating resources for data collection.
- The Committee should sponsor research that clearly articulates the need for data, the type(s) of data that should be collected in order of priority, and sets recommendations for collecting that data around the state.
- The Committee should produce a research paper that recommends uniform application of standard statistical tests and publication of results for all survey activities associated with modeling.
- The Committee should develop an overall comprehensive data structure for the Cube-Voyager model with a listing of all types of data formats: e.g., formats for the various GEN models used around the state. It would be an excellent idea to develop – and publish – a compendium of data formats – both input (I) and output (O) – for all the standard models across the state.

For more information on the *MTF Data Committee* you may contact Frank Baron at fbaron@miamidade.gov.



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On-Board Transit Survey

Por favor ver al reverso para español

The purpose of this survey is to help us plan future transit services.

Please tell us about the bus trip **you are making now.**

Please return this survey before getting off this bus.

Route #: _____

1. Did you transfer to this bus from another bus? (check one)

No. Please continue with Question No. 2.

Yes, Transferred from Route # _____; You do not need to complete the rest of this survey. Thank You.

Your bus trip began at:

2. Where are you coming from now? (check one)

- Work
- Home
- Shopping
- Daycare
- Hotel / Motel
- Medical or Dental Appointment
- School
- Recreational
- Visiting Family or Friends
- Other _____

3. What is the location of this place? (Name of this place, business, or building)

Address **or** Cross streets of nearest corner

City _____

Zip Code _____

4. How did you get to this bus? (check one)

- Walked
- Rode a bicycle
- Dropped off by someone
- Drove and parked
- Rode with Someone
- Other _____

5. What time did you get on this bus? _____:_____ **AM or PM**
Time (Hours and Minutes)

6. What is the location of the **bus stop** where you got **on** this bus?
Cross streets of nearest corner **or** name the transit center or park and ride lot

Cross Streets _____

Transit Center or Park and Ride Lot _____

Your bus trip will end at:

7. Where are you going? (check one)

- Work
- Home
- Shopping
- Daycare
- Hotel / Motel
- Medical or Dental Appointment
- School
- Recreational
- Visiting Family or Friends
- Other _____

8. What is the location of this place? (Name of this place, business, or building)

Address **or** Cross streets of nearest corner

City _____

Zip Code _____

9. How will you get there after your bus trip? (check one)

- Walk
- Ride a bicycle
- Picked up by someone
- Drive alone
- Ride with someone
- Other _____

10. What is the location of the **bus stop** where you will get **off** this bus?
Cross streets of nearest corner **or** name the transit center or park and ride lot

Cross Streets _____

Transit Center or Park and Ride Lot _____

11. After you get off this bus, will you transfer to other buses?

No Yes Routes _____, _____

12. How many motor vehicles (cars, motorcycles, trucks, vans) are at your home? (check one)

None 1 2 3 or more

13. Including yourself, how many people live in your home? _____

14. Of these, how many are under the age of 16? _____

How many are over the age of 65? _____

15. Including yourself, how many people in your home work?

Including yourself, how many work full time? _____

16. How many months will you live in Florida this year?

Less than one month More than 6 months per year
 1-6 months per year

17. How many days a week do you usually make this bus trip?

7 6 5 4 3 2 1
 Less than once a week First time riding

18. How many times a week do you ride the bus? _____

Please return this survey before getting off this bus.
Thank you for your participation.