



# FLORIDA TRANSPORTATION MODELING NEWSLETTER

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## TWO SURVEYS OR NOT TWO SURVEYS? . . . THAT IS THE QUESTION

by: Ed Christopher, Heather Contrino and Elaine Murakami Federal Highway Administration

Just like Hamlet, who faced a critical juncture in his life, some in the transportation community appear to be facing a similar dilemma. Should we support several special transportation-related tabulations of the new American Community Survey (ACS) under the Census Transportation Planning Products (CTPP) program, or should we throw our money and support behind the National Household Travel Survey (NHTS)? Unlike Hamlet, who was choosing between life or death and eventually chose one, the transportation community cannot choose -- they must have the results from both surveys.

The decision to fund CTPP or NHTS should not be characterized as an "either/or" proposition. The two types of data work together and, in fact, are complementary. Where the CTPP gives aggregate statistics and the quantity of work trips, household travel surveys like the NHTS extend that information and give the detailed characteristics

of each trip and the person making the trip. The reason for this is due to sample sizes and the information collected. The ACS, which is the source data for many of the CTPP products, collects a small amount of information from a large group of people. Household travel surveys on the other hand, collect a lot of very detailed information from a small group of people.

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## 11<sup>TH</sup> TRB NATIONAL TRANSPORTATION PLANNING APPLICATIONS CONFERENCE – DAYTONA BEACH, FLORIDA MAY 6-9, 2007

The goal of the conference is to provide an outlet for new applied techniques and methods. The conference is sponsored by the TRB Committee ABD50 Transportation Planning Applications and hosted by the Florida Department of Transportation (FDOT), Florida Metropolitan Planning Organization Advisory Council (MPOAC), Florida Model Task Force (MTF), Volusia County MPO and McTrans.

The early-bird registration deadline for the TRB conference is April 14, 2007. The fee for late registrations received after April 14, 2007 is posted on the web site.

Please make your reservation at the conference rate of \$99 (single or double) at the Hilton website [www.hilton.com](http://www.hilton.com) or 1-800-HILTONS and identifying the group code "TRB" or calling the hotel direct at (386) 254-8200.

Rooms are still available for May 6-12, 2007, at the conference rate. The initial program, registration forms, and conference information is on the website [www.trb-appcon.org](http://www.trb-appcon.org).

For questions on the conference please contact **Jerry M. Faris** at [jmfaris@ix.netcom.com](mailto:jmfaris@ix.netcom.com).

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The way to extend a household travel survey to cover a greater proportion of the population, as well as small areas like tracts or traffic analysis zones, is to have some linking data and sufficient characteristics for the smaller area. The CTPP provides this link.

There is another way to extend a household travel survey and that would be to collect more data. Unfortunately, the number of surveys needed would never be able to justify the cost. That is why one needs both a travel survey and the CTPP.

An example of how the two data sets work together is illustrated by the way the Chicago Area Transportation Study, the MPO for the Chicago region uses the CTPP Census data and its own household travel survey. According to the process, the trip rates for various trip purposes and demographic combinations are derived from the local survey. Then, the CTPP is used to develop a typical cross-classification matrix for each small traffic analysis zone with workers, households and vehicles available. Then the trip rates from the household travel survey for households with corresponding characteristics are applied to each zone. The process is documented in the Chicago conformity analysis<sup>(1)</sup>.

A similar but methodologically different example of combining standard Census, CTPP, and household travel activity surveys is in micro simulation models like TranSims. In this application CTPP data is used in combination with the Census 2000 Public Use Microdata Sample and household activity data to simulate travel along the transportation network.

A more advanced and emerging example showing the interaction between Census and household travel/activity surveys is in two separate FHWA projects dealing with transferability. In one project, trip generation rates by trip purpose for every tract in the US are estimated<sup>(2)</sup> while in the other, an entire regional household travel survey data

base can be created where no survey previously existed<sup>(3)</sup>.

The point here is that if you have your own household travel survey, have purchased a special add-on to the NHTS for your area or you are relying on the larger NHTS, you still need to have the data from the CTPP program. To date, there are no examples where someone has relied solely on their own local NHTS type of survey. However, if you try to rely only on the CTPP, you are selling your analysis capability short.



### Additional Information

Presented below is additional information on the CTPP data products and the NHTS or Regional Household Travel Surveys.

### CTPP Data

- The CTPP historically was based on the decennial census and was only available every 10 years, but the ACS allows for more timely data, since it is a continuous survey. This permits trend analysis for large geography, based on annual updates. The plan for next CTPP from ACS includes a 3-year special tabulation and a 5-year special tabulation, as well as annual transportation-related profiles drawn from the Census Bureau's standard tabulations.
- After 5 years of accumulating ACS data, the Census Bureau will be able to report data for small geographic units, specifically census tracts and locally defined TAZs. The CTPP 5-year data product will allow users to extract small-area statistics for every segment of the nation, down to units of geography measured in neighborhoods and even TAZs which support local planning and analysis. Small-area statistics are irreplaceable for local planning.
- Small area TAZ-to-TAZ flows from previous CTPP data products are often used for validation of travel demand models.
- Small area flows from CTPP are being used for transit ridership forecasts, particularly for New Starts and Small Starts applications. The detailed geography allows transit routes and service to be combined with

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results of travel mode to work from ACS. CTPP2000 has also been incorporated into the Aggregate Rail Ridership Forecasting (AARF) model used by FTA in its New Starts analysis.

- The journey-to-work data is a critical component for understanding all daily travel because it includes the two main anchors that define daily travel for workers. Trips to the market, restaurant, drop-offs/pick-ups, etc.—are as likely to start from work as home. Thus, for the majority of adults who work, the workplace location is a major force in the stimulus for travel, the direction, location, and time of travel and often, the mode of travel.
- Pisarski in “Commuting In America III” lists three reasons for the continued importance of examining commute trips:
  - Economic impact of commuting and community development
  - Commute trips made frequently and with regularity, and reliability of travel time is important.
  - Work travel is concentrated in specific times and locations and is a major factor in peak travel demand. Therefore, it serves to define the high-cost peak-capacity and service requirements of our transportation systems far more than other travel purposes<sup>(4)</sup>.

### National or Regional Household Travel Surveys

- Main benefit is that they collect all trip purposes across all modes, particularly non-work trips which have been growing faster than work trips. This is important for understanding both “actual” and “usual” travel and how different modes are used together and for what types of trips.
- Typically, these surveys are smaller in scale ranging from 2,000 to 10,000 households in a region, less than 0.5% of a population. As a result detailed geographic analysis is not possible, and analysis is limited to regions or districts. However level of detail that is collected is essential for any transportation planning and policy analysis. The 2001 NHTS included approximately 25,000 households in the national sample, compared to over 12 million

households sampled in the Census 2000 “long form.” The annual ACS sample is about 2 million completed households.

- Unlike the ACS, which is collected as a snapshot of a particular time period and reported out at an aggregate level, travel surveys are collected using a travel diary method and reported out in the context of household, person, trip and vehicle records. It is this detailed information that is a critical element when it comes to building behavioral travel demand models. The models coupled with trend data are used for a variety of analyses including safety, congestion and environmental planning.
- National or Regional Household Travel Surveys are conducted infrequently. Historically, the NHTS (formerly called the NPTS) has been conducted about every seven years (1969, 1977, 1983, 1990, 1995 and 2001). Many regional surveys are conducted on ten-, fifteen- or even twenty-year cycles because their unit cost is expensive (close to \$200 per completed household).

### References

1. Transportation Improvement Program for Northeastern Illinois—FY1996 to 2000: Conformity Analysis Documentation, Appendix B. Chicago Area Transportation study, Chicago, Illinois, March 1996.
2. Ruescher, T.; R. Schmoyer; and P. Hu “Transferability Of Nationwide Personal Transportation Survey Data To Regional And Local Scales”, Oak Ridge National Laboratory, Oak Ridge, Tennessee, October 2001, as found at <http://npts.ornl.gov/npts/1995/doc/transfer.pdf>, March 13, 2007
3. Mohammadian, A. and Zhang, Y., “Investigating the Transferability of National Household Travel Survey Data”, Paper 07-2030, Publication by the Transportation Research Board is forthcoming and available on the TRB 86 Annual Meeting CD, January 2007.
4. Pisarski, A. Commuting in America III. NCHRP Report 550 and TCRP Report 110, Transportation Research Board. Washington, D.C. 2006, page 5.

## A PROPOSED PRACTICE FOR THE CALCULATION OF INTERNAL CAPTURE PERCENTAGE BASED ON FSUTMS TRIP TABLES

by: Jon Weiss, Florida Department of Transportation, District Five

The ITE Trip Generation Handbook provides methodologies for estimating internal capture for various land uses internal to a development. However, as the size and intensity of the development increases to the levels of a Development of Regional Impact (DRI), a strict application of ITE internal capture methodologies may be difficult. As more DRIs are being proposed in Central Florida, FDOT District 5 has been asked to interpret the FSUTMS trip table for the estimation of internal capture calculations for site impact analysis. This article is intended to present the land use interaction and trip generation methodology, relate that to the FSUTMS model trip tables, and establish the process to calculate the internal capture percentage for a project. This process is only intended to quantify the reductions to ITE trip generation estimates for the purposes of off-site impact analysis. Finally, this article establishes the conditions that should be reviewed in order for the FSUTMS model to be appropriate as the basis for internal capture estimation for a project.

Trips between Zones 2 and 3 are internal trips, where all other trips are external trips. An important assumption is that each zone is assumed to be generating trips consistent with the ITE Trip Generation Manual, which is measured as daily trip ends external to the site. According to ITE rates and procedures, reductions should not be taken for residential-to-residential interaction or retail-to-retail interactions. In this case, *intra-zonal* trips should be zero.

Figure 2 presents directional daily trips for this example. As previously noted, Zones 2 and 3 are generating trip ends according to ITE, which are observed at the site driveways external to the zone. In this figure:

- Zone 2 is generating 1,200 trips external to the zone,
- Zone 3 is generating 800 trips external to the zone,
- There are 200 trips between Zone 2 and Zone 3,
- Total trips (Zone 2 + Zone 3) are 2,000 trips, matching ITE trip ends.
- External trips are 1,600 trips.

### Land Use and ITE Trip Interactions

Figure 1 shows the standard types of trip interactions for a two-zone project. Zones 2 and 3 are project zones (internal), and 1 and 4 are background zones (external). For this example, the following assumptions are made:

- Zone 2 is residential,
- Zone 3 is retail,
- Zone 1 and Zone 4 don't interact,
- Zone 2 doesn't interact with Zone 4, and
- Zone 3 doesn't interact with Zone 1,
- Zones 2 and 3 are generating trips consistent with ITE rates
- No reductions are considered for *intra-zonal* or pass-by trips

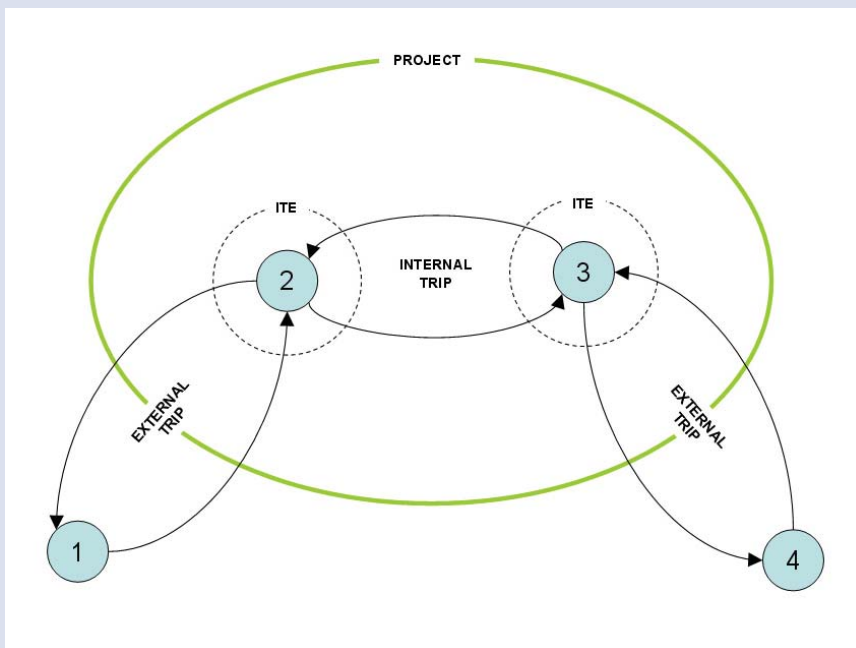


Figure 1 – Typical Land Use Interactions

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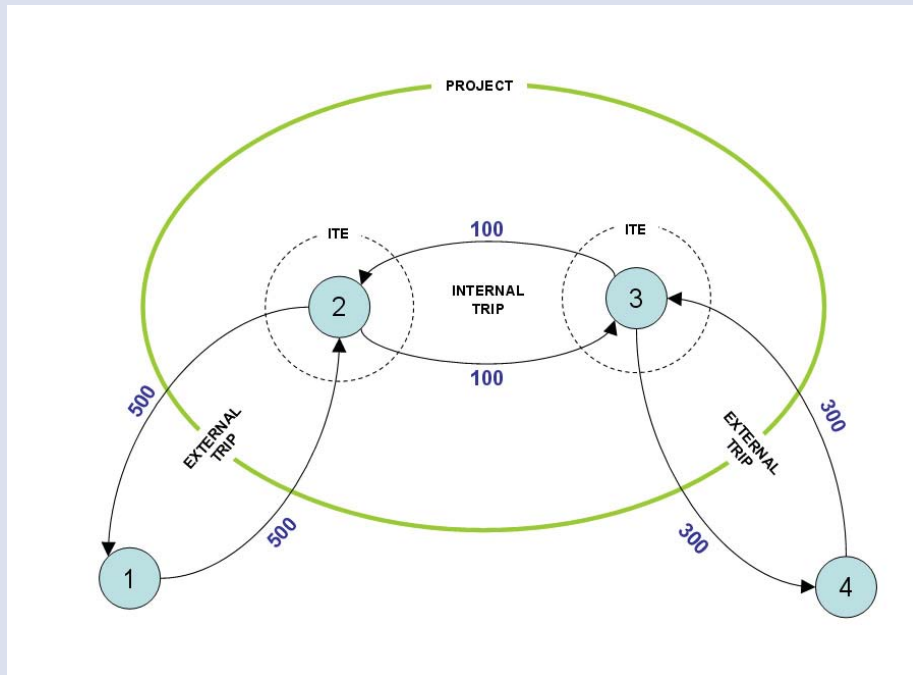


Figure 2 – Typical Land Use Interactions with Trips

In this example, the effective external percentage is 80%, or a 20% internal capture. Note that while ITE shows 400 trip ends between Zones 2 and 3, there are only 200 real trips.

**FSUTMS Trip Tables**

Figure 3 shows the trips from Figure 2 in matrix format, similar to what would be observed in a FSUTMS trip table (such as *HTTAB.YYA*). Again, it is important to note that each project zone is generally matching ITE trip generation estimates, which is measured in trip ends. In the FSUTMS trip table, the matrix row and column sum is equal to the ITE external number for each zone. For example, the row and column sum for Zone 2 is 1,200 trips.

According to the matrix, the sum of the external trips (blue cells) is again 1,600. However, as previously noted, there are only 200 internal trips in the matrix (green cells). From a review of the trip matrix, there are only 1,800 trips generated by Zones 2 and 3. In this example, only 11% of all trips are internal to the project. However, this calculation doesn't match the ITE trip end process as observed at the project

driveways (previously shown to be a 20% internal capture percentage). To equate this matrix to the ITE process, the internal trips (green cells) must be doubled before calculating a sum or percentage.

Based on this exercise, total trip generation of the zones to match ITE should be calculated as the sum of external trips plus two times the internal trips (sum of blue cells + 2 x sum of green cells). The internal capture percentage should be calculated as two times the internal trips divided by the total trip generation. Again, this approach doesn't evaluate the percentage of trips that are internal to the project (a lower number), but does show the appropriate calculation for developing

the external trips as would be consistent with the ITE methodologies that evaluate trip ends.

		TO			
		1	2	3	4
FROM	1	-	500	-	-
	2	500	0	100	-
	3	-	100	0	300
	4	-	-	300	-

Figure 3 – Example FSUTMS Trip Matrix

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### Conditions for Appropriate Use of FSUTMS for Internal Capture Estimates

In order for the FSUTMS model to be the appropriate tool for estimating internal capture within a project, the following conditions should be met:

- Each zone should contain a unique land use category,
- *Intrazonal* trips shown by the model should be zeroed out,
- The project zones should be calibrated to match ITE external generation,
- Land uses with a high directional split should be compared against ITE or TIPS (Trip generation, Internal capture, and Pass-by Software) internal capture methods to ensure that appropriate trip ends are available in a peak-hour context.

The project land uses should be separated into individual zones to the extent possible as shown by the site plan. This may be complicated with mixed-use zones and projects, but it is important to demonstrate the relationships that FSUTMS is predicting between project zones and land uses. ITE provides guidelines for appropriate interaction between different types of land use. The FSUTMS model does not consider these guidelines in the trip distribution process, but these still need to be followed for traditional site impact analysis. The separation of land uses into individual zones as shown by the site plan will also assist with forecasting on internal project roadways.

*Intrazonal* trips are built into the standard ITE rates, as ITE presents an external generation forecast for each land use. Therefore, no reduction should be allowed for these internal trips. This is an important reason to separate out the land uses. The FSUTMS model will actually distribute some trips as intrazonal even for a single-use residential zone, which is inconsistent with ITE methodologies. These trips should be zeroed out in the matrix before the calculation of total or internal capture trips.

The calibration of each land use to ITE is critical to the validity of the model as a tool for both internal capture estimation and background traffic forecasting. The calibration is necessary because the trip generation rates in the FSUTMS model are not based on ITE. As

an example, let's assume that the model is appropriately generating residential land use, showing 1,000 home-based work productions. Let's also assume that the model is generating 1,000 home-based work attractions for a retail land use. In this case, the model has the ability to satisfy all 1,000 trips on site (it probably wouldn't because this isn't the way the FSUTMS gravity model works, but it could). But if the retail attraction generation was 50% low and it should have been generating 2,000 trips, then the extra 1,000 would *have* to be satisfied off site. Thus, in order for the model to be appropriate, the land uses must be generating in correct proportion to each other to get the correct on-site interaction.

For background traffic, if the project zones are not generating according to ITE rates, which is often the basis for the generation estimates for the project, then the model won't be forecasting the appropriate levels of congestion on the adjacent roadways to the site. The correct project and non-project trips in the area are an input to the Equilibrium Highway Load assignment algorithm which optimizes a trip's route choice based on least congested travel times. If the model network isn't seeing the appropriate trip generation in an area, then route choice, for both project and non-project zones, may be biased based on available capacity.

Finally, the FSUTMS model is a daily transportation analysis tool. Most site impact analysis is performed for the p.m. peak hour. For project land uses that have a high directional split during the peak hours, an appropriate level of analysis should be performed to demonstrate that the daily interactions from the model are also appropriate in the peak hour. For example, consider Zone 2 (residential) and Zone 3 (retail) from the primary example. In the daily context, 100 trips traveled between these zones in each direction. However, in the p.m. peak hour context, Zone 2 could show 15 entering and 5 exiting and Zone 3 could show 10 exiting and 10 entering. Since these trip ends must be balanced in the p.m. peak hour as well, the correct peak hour trip interaction is 15 total trips, where each land use considered individually would estimate 20 trip ends interacting.

## 2006-07 FSUTMS CUBE WORKSHOPS & SCHEDULE

[http://www.fsutmsonline.net/modeling\\_training.aspx](http://www.fsutmsonline.net/modeling_training.aspx)

FSUTMS modeling training workshops are offered by FDOT to the Florida transportation modeling community. Live workshops focus exclusively on the new FSUTMS powered by Cube Voyager. A desktop computer-based training (CBT) program for the Tranplan version of FSUTMS is available for download.

Training workshops qualify for professional development hour (PDH) credit for Florida professional engineers. The number of PDH credits for each workshop is equal to the number of classroom hours. If you would like to obtain PDH credits, please provide your PE registration number to the Systems Planning Office prior to the workshop.

**There is no fee to attend the workshops; however, registration is required. An automated e-mail will be sent confirming your registration. A seat assignment will be sent at a later date.**

### FSUTMS Transit Modeling Workshop

Date: June 4 – 7, 2007  
Times: Monday, 1:00 PM – Thursday, 12:00 PM  
Location: Homewood Suites  
8745 International Drive  
Orlando, FL 32819  
Reservations: 1-888-697-8745  
Rate: \$98/night  
Group Code: FDOT Workshop  
Res. Deadline: 5/21/07

For further information please contact:  
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**For up-to-date information on upcoming meetings and minutes check out [www.FSUTMSOnline.net](http://www.FSUTMSOnline.net).**

## USERS' GROUP PAGES

[http://www.fsutmsonline.net/index.php?/user\\_groups\\_pages/user\\_groups\\_pages/](http://www.fsutmsonline.net/index.php?/user_groups_pages/user_groups_pages/)

Local FSUTMS users' groups have been formed to provide a forum to facilitate and promote understanding and proper application of the models. These groups maintain mailing lists and hold regular meetings that usually feature one or more guest presentations. Year 2007 meeting dates are provided below, or check out the web address above for future dates and meetings.

The **Central Florida Traffic Data Users' Group** meets at the FDOT-District 5 Orlando Urban Office from 2:00 to 4:00 p.m. For additional information, please contact **Jon Weiss** 407-482-7881.

The **Northeast Florida Transportation Applications Forum** meets at the First Coast MPO office at 1022 Prudential Drive. For additional information, please contact **Karen Taulbee** (904) 360-5652 or **Jeanette Berk** (904) 823-8982. Meeting dates are listed below:

**September 20, 2007, 11:00 a.m. - 3:00 p.m.**

The **Panhandle Transportation Applications and FSUTMS Users' Group** meets at the Washington County Public Library in Chipley from 1:15 p.m. to 3:00 p.m. For additional information, please contact **Linda Little** at (850) 638-0250. Meeting dates are listed below:

**Wednesday, May 2, 2007**

The **Southeast Florida Users' Group** meets at the FDOT-District 4 Auditorium. For additional information, please contact **Min-Tang Li** at (954) 777-4652. Meetings are tentatively scheduled to be held at the FDOT-D4 Headquarters Auditorium from 9:30 AM to noon on the following dates:

**Friday, May 4, 2007**

**Friday, August 3, 2007**

**Friday, November 2, 2007**

The **Southwest Florida Users' Group** meets at the Charlotte County Airport at 2800 A-6 Airport Road, Punta Gorda. For additional information, please contact **Jim Baxter** (863) 519-2562.

The **Tampa Bay Applications Group** meets at the FDOT-District 7 Tampa Office from 12:00 p.m. to 2:00 p.m. For additional information, please contact **Danny Lamb** (813) 975-6437. Meeting dates are listed below:

**Thursday, May 17, 2007**

**Thursday, August 23, 2007**

**Thursday, November 1, 2007**

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