

# NEW YORK METROPOLITAN TRANSPORTATION COUNCIL BEST PRACTICE MODEL

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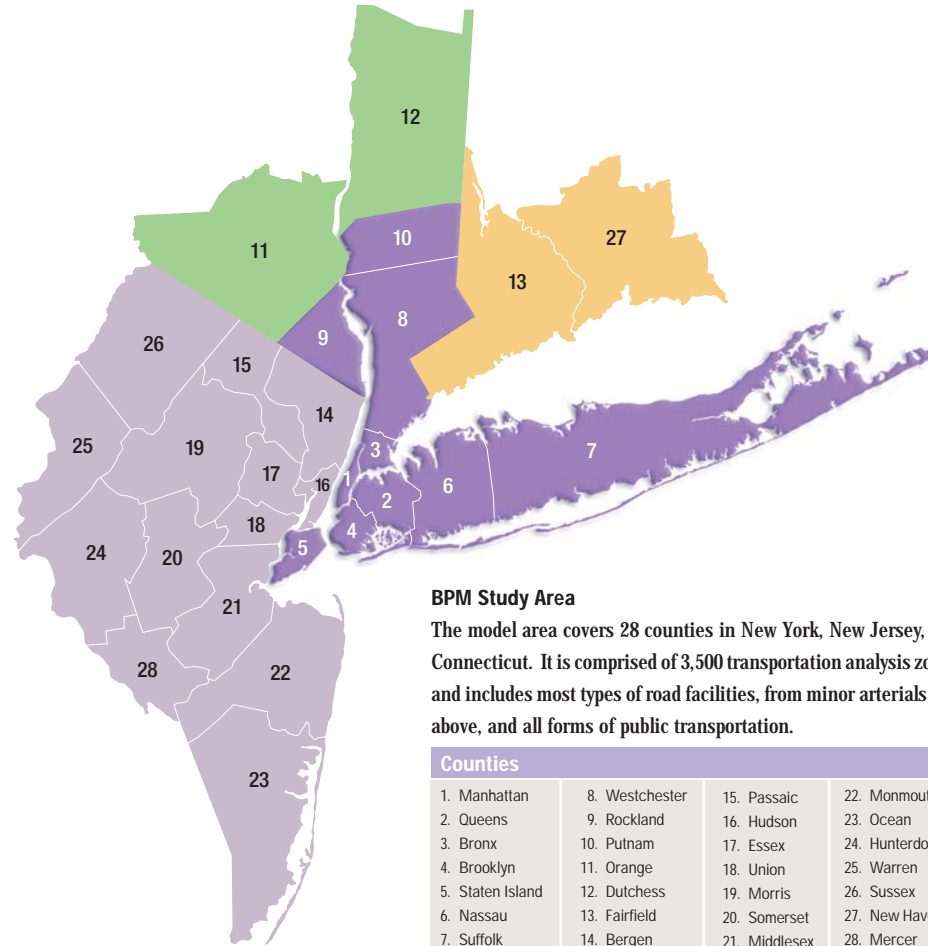
## NYMTC RELEASES BEST PRACTICE MODEL

### NEW TOOL ADDS INSIGHT

After a decade of work, the New York Metropolitan Transportation Council's (NYMTC) Best Practice Model is now finished, paving the way for critical improvements in research-based transportation planning in the NYMTC region. The Council is an association of governments and transportation providers which serves as the metropolitan planning organization for New York City, Long Island and the lower Hudson Valley. NYMTC's Best Practice Model, previewed before a national audience early last year during the TRB Conference in Washington, is now being used for several key transportation study projects in the NYMTC region.

Development of the BPM has been of great interest to planners locally and across the country because of the size and complexity of the NYMTC region, as well as the model's ability to study relationships between the current transportation system and how people in the region live, work and move, using this information to understand travel decisions, predict future travel patterns, and evaluate the effectiveness of proposed transportation improvements.

NYMTC's model development team included a diverse panel of experts, including modeling professionals working in academics, private industry and public agencies, as well as technical advis-



### BPM Study Area

The model area covers 28 counties in New York, New Jersey, and Connecticut. It is comprised of 3,500 transportation analysis zones and includes most types of road facilities, from minor arterials and above, and all forms of public transportation.

Counties			
1. Manhattan	8. Westchester	15. Passaic	22. Monmouth
2. Queens	9. Rockland	16. Hudson	23. Ocean
3. Bronx	10. Putnam	17. Essex	24. Hunterdon
4. Brooklyn	11. Orange	18. Union	25. Warren
5. Staten Island	12. Dutchess	19. Morris	26. Sussex
6. Nassau	13. Fairfield	20. Somerset	27. New Haven
7. Suffolk	14. Bergen	21. Middlesex	28. Mercer

ers and air quality experts from federal, environmental, local, and state agencies.

### 31-County Survey Provides Model Basis

A regional travel survey, conducted by NYMTC in conjunction with the New Jersey Transportation Planning Authority (NJTPA) over an 18-month period, in 1996 and 1997, provided the rich body of data used to develop the BPM. The survey offered the first detailed picture of regional travel in three decades, with information on the travel patterns of thousands of

New York, New Jersey and Connecticut residents.

The survey gathered responses from 27,369 people in 11,263 households in 31 counties, who kept diaries of all their daily travel and activities. The diaries provide information on the percentage of trips made by car, bus, commuter rail, subway, foot and other modes. They reveal travel patterns by age, gender, purpose, time of day and other factors, providing a foundation for transportation decision making in the metropolitan region.

"The information gathered is an extraordinarily rich source of

data," said Tom Schulze, Executive Director, NYMTC. "It provides an enhanced resource for regional transportation planning for several decades, from long range plan development and air quality analyses to major transit projects and sub regional traffic improvement projects."

### INNOVATIVE MODEL IN IMMEDIATE DEMAND

The release of the new model has created a high level demand among regional planners seeking



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a more accurate way to examine travel and identify transportation requirements. The BPM was almost immediately put to use on a wide range of regional studies to simulate travel patterns including where people travel; their modes (car, subway, bus or commuter rail); preferred routes (highways vs. local roads) and their trip times.

Some of the projects using the BPM are:

- Air Quality Conformity Analysis
- Southern Brooklyn Transportation Investment Studies
- The Gowanus Expressway and Kosciuszko Bridge Studies
- Tappan Zee Bridge and the I-287 Corridor Study
- Bruckner Sheridan Expressway Study
- Bronx Arterial Needs Study
- Goethals Bridge Study
- Regional Freight Plan Project

In addition, various governments and private institutions use the results of the BPM to estimate travel patterns for their individual studies.

The BPM is very flexible and can be tailored to fit the size, scope and coverage of various projects. Each project is very unique, and the project objectives have to be carefully evaluated against the structure of BPM to decide if the BPM can be used in part or in its entirety. Some of the BPM procedures are not yet adequate to address all of the region's transportation complexities. Efforts are already underway to develop enhancements.

## NEW YORK BPM'S INNOVATIVE FEATURES

The BPM is a very complex model which attempts to predict the detailed travel patterns of a diverse population using numerous travel modes. It does this by introducing some innovative approaches to the traditional travel demand models.

### Journey Based Models

Among its innovations is the new model's use of the concept of "journeys" rather than the more traditional "trips." The journey, defined as travel between principal locations, identifies anchor points in an individual's travel pattern, such as home, work or school.

The traditional trip, home to work, for example, would identify the point of origin and destination. It would not, however, include details specific to the individual, such as daily stops at a day

care center, gym or other unique aspect of travel that might very well influence the individual's decision regarding mode choice. Use of the journey allows for the purpose and time of each segment, providing additional insight into traveler decisions and needs.

Thus use of the journey helps planners form a more realistic analysis that is based on the various decisions made by travelers, such as mode, purpose, destination, frequency and location of intermediate stops, as well as time of day periods. The 9 million households of the study area generate 25 million paired journeys per day for the base year 1997.

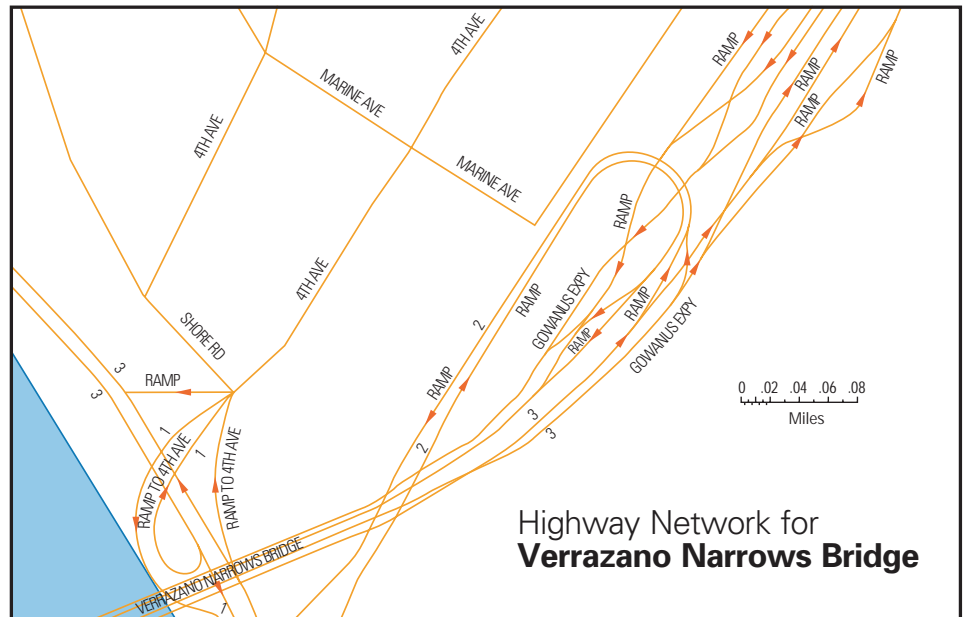
### Microsimulation Approach

Where traditional models use an average rate of travel, the BPM uses a microsimulation method to simulate the travel pattern of each person in the region. This provides a closer level of detail

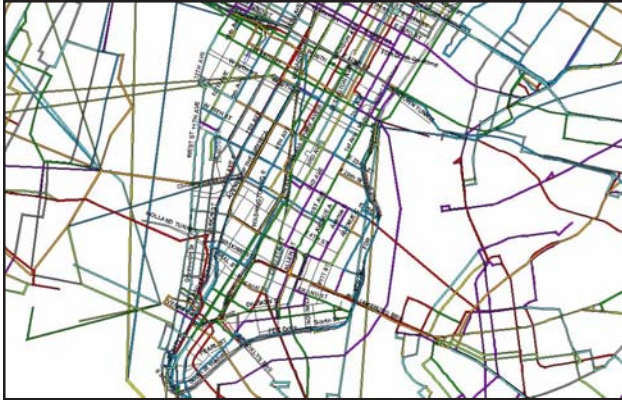
which, combined with the model's use of the journey, increases the accuracy and usefulness of analyses. However, this also increases the complexities of the model causing increased processing times and a requirement of high end computers. The file size of the combined highway and transit trip tables is about 2.5 Gig. The computer used for running this model had a 2 GB RAM, 1.5 Ghz speed and 80+ GB of hard drive. The total time to run the model from journey generation to highway and transit assignments is more than one hundred hours.

## HIGHLIGHTS OF THE MODEL

The BPM was developed using a combination of customized programs and TransCAD GIS software. The models are run using a menu driven system with par-



This map shows a portion of highway network with uni-directional ramp and expressway coding



Transit Network for Lower Manhattan Color Coded by Routes

tial user interaction. The models predict travel patterns by time of day and for various travel modes. Some of the highlights of the model are described below.

### BPM Features GIS Mapping

The highway and transit components of the BPM, are based on a Geographical Information System (GIS) to provide a more realistic representation of the highway and transit route systems.

### The Highway Network

The BPM highway network contains 53,000 links including most minor arterial and above roadway facilities. The database includes information on the number of lanes, functional class, speed, parking restriction, truck-usage and traffic flow.

### The Transit Network

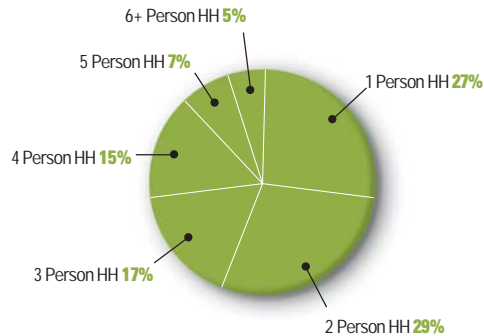
The transit network in the BPM is a very complex network and is based on information provided by the Metropolitan Transportation Authority, New Jersey Transit and other transit operators in the region. The network has 100 New York City subway routes and services, 900 commuter rail routes

and services, 2300 bus routes and 50 ferry routes, as well as the sidewalk network in Manhattan. In addition, the transit network components include station to station transfer databases, walk/drive links for rail and other transit connectivity, route coding and fare coding. The map above depicts the transit network for lower Manhattan.

### Household, Auto-Ownership and Journey-Frequency (HAJ) Model

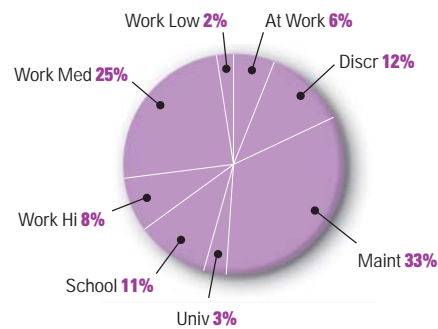
The Household, Auto-Ownership and Journey-Frequency (HAJ) Model in the BPM replaces the traditional trip generation model. It estimates the total number of households by income, size, number of children, number of workers and number of autos, and then determines the number of journeys that will be produced for each subgroup over a 24-hour period. This information is very helpful in understanding how variables such as income, number of children, and number of workers or autos in a household influence trip making decisions.

### 1997 Households by Household Size



The figure above shows distribution of households by household size for the 28-county model area. This subgrouping of household by household size is the product of the household model for the base year 1997.

### NYC 5 Borough Journey by Purpose



The chart above shows the breakup of journeys originating in New York City, by trip purpose, for the 1997 base year.

### Trip Purpose Key for the above Figure

WORK LOW	Journeys to or from work for low income group
WORK MED	Journeys to or from work for medium income group
WORK HI	Journeys to or from work for high income group
SCHOOL	Journeys to or from school
UNIV	Journeys to or from University
MAINT	Journeys for maintenance purposes such as going to the dentist or supermarkets
DISCR	Journeys for discretionary purposes such as going to restaurants, movies or picnics
AT WORK	Journeys originate from the workplace during work hours such as lunch, shopping, and meetings



### **Mode Destination Stop Choice (MDSC) Model**

This model replaces the traditional trip distribution and mode choice model. Based on the person and household characteristics, along with land-use densities around the journey origin, this model predicts which modes of travel each person chooses, where the person goes and if the person stops along the way on the journey. If a person does make a stop on his/her way to work or school or university, this model will predict the location of the stop.

### **USER'S GROUP FORMED**

NYMTC has formed the BPM User's Group, which meets monthly and consists of current BPM users. The function of this group is to allow BPM users to have direct contact with the model consultants and the NYMTC modeling group in order to clarify issues and resolve problems in running the model. This group also provides input from the user's perspective and suggests further improvements to the model.

The input from the User's Group will provide direction for further development to give the model more flexibility, create a common knowledge data base and incorporate network improvements to the BPM resulting from other sub-regional studies.

NYMTC plans to establish a Regional Model Coordination Committee that will meet less frequently but will examine broader and long-term issues related to the BPM and the region.

### **BPM REPORTS AVAILABLE**

In response to requests for information received during the Transportation Research Board (TRB) meeting last year from consultants, government agencies and academia, NYMTC has produced reports in a variety of application formats.

Model output may be obtained in any of the following application formats:

- TransCAD
- Arc view
- Dbase
- Excel

Output of the BPM is separated into two basic groupings: Highway and Transit. Information is further outlined by base 1997 and future year 2020, travel modes and assignments. Model capabilities also extend to specific sections of highway and include traffic flows, county charts, speed, and growth.

For further information please contact:

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### **ACKNOWLEDGEMENT**

It has been a long journey for many people who participated in the development process of the BPM over the past ten years. We completed the mission of building an advanced modeling system that could deal with the complex characteristics and issues in the New York Metropolitan area. Many

people and agencies contributed to this great team effort. We also are building a strong modeling group to provide support to the planning needs in the region.

Special thanks to the Advisory Committee members for their guidance, support, encouragement, and direction in the development of the Best Practices Model. The committee included:

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Finally thanks to NYMTC staff especially the IT group for supplying the most up-to-date computers, the Administrative Group for following up on numerous contracts, Personnel for going through the difficult process of hiring suitable candidates, the Data Group for coordinating the data collection for the models, and the TCCs and the Planning Group for endless coordination with member agencies on the model needs.

And last, but not the least thanks to our Consultant Team, lead by PB Consult, for putting this model in place.

### **Editors**

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