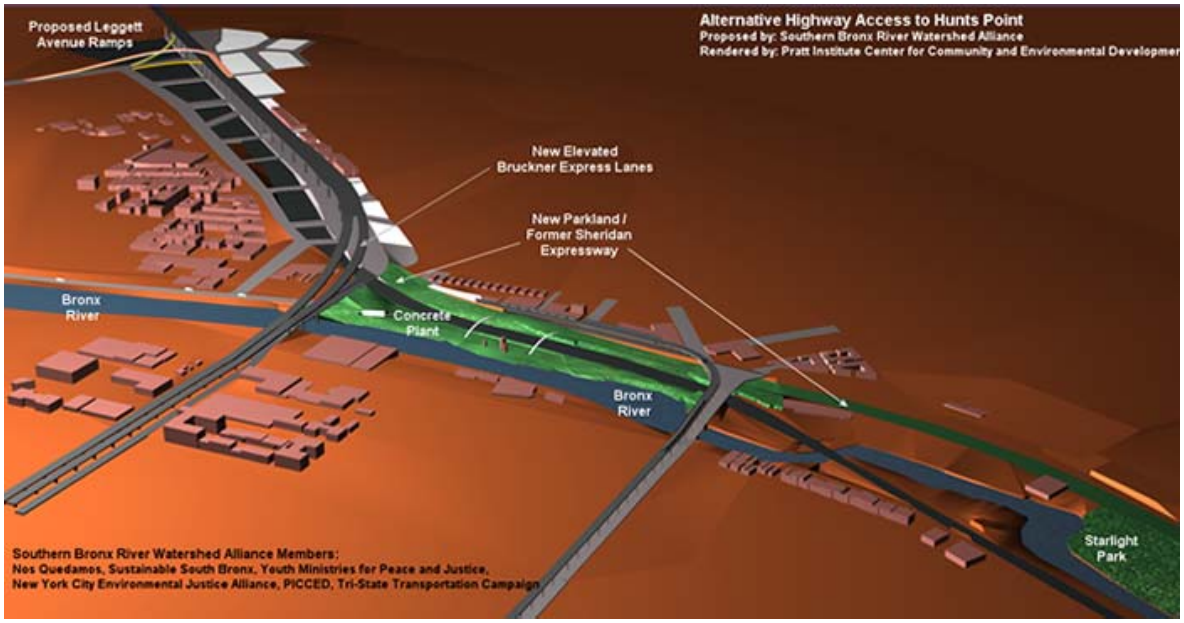
# TRAFFIC IMPACT ASSESSMENT OF THE SHERIDAN EXPRESSWAY DECONSTRUCTION




**Prepared for:**

SOUTHERN BRONX RIVER WATERSHED ALLIANCE
*a New Vision for the South Bronx*

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## Executive Summary

We have reviewed the transportation modeling conducted for the Bruckner-Sheridan Interchange Reconstruction/Hunts Point Peninsula EIS ("B-S EIS"). This modeling included two alternatives with the Sheridan Expressway removed and three alternatives with the Sheridan Expressway remaining. The EIS modeling shows future traffic benefits for the alternatives with no Sheridan Expressway relative to the No Build alternative.

The EIS modeling shows greater traffic benefits for the Build alternatives with the Sheridan Expressway remaining, but about half of the purported benefits result from model coding errors rather than any real transportation effects. Other modeling assumptions also exaggerate the differences in VHT between alternatives. The B-S EIS transportation model is not very accurate even for the base year 2003. The level of uncertainty in 2030 is great and can not be quantified. The remaining differences between traffic modeling results for future Build alternatives are too small, compared with the general level of model error, to be considered meaningful. Therefore, it is impossible to conclude from the B-S EIS modeling whether any future Build alternative offers any traffic advantages over any other alternative.

The B-S EIS transportation modeling assumed an implausibly high level of future traffic in the study area. The magnitude of future congestion related to this assumed growth dwarfs the small differences between alternatives. Rather than assuming undesirable and implausible levels of traffic growth, NYSDOT should be focused on travel demand management (TDM). Two especially significant TDM strategies are land use and pricing. The B-S alternatives in which the Sheridan Expressway is removed would result in very beneficial land use impacts. These land use impacts would result in lower regional vehicle miles traveled (VMT) and more regional transit trips. These beneficial transportation effects are not evaluated in the B-S EIS. Similarly, congestion pricing has the potential to have a dramatic effect on future traffic volumes, yet it was not considered among the B-S EIS alternatives.

Although the B-S EIS materials imply that the NYMTC Best Practice Model (BPM) was used to create the model outputs presented, in fact, this is not the case, and instead a grossly simplified model was used. The B-S EIS transportation modeling assumed a single future trip table, i.e. that the future traffic level would be unaffected by the characteristics of the alternatives, which is inappropriate. In this report, we recommend ways in which transportation models could be usefully applied within the B-S EIS. In particular, the BPM is an excellent tool for analyzing big picture land use and pricing assumptions. It is of more limited use in evaluating the different traffic impacts of the B-S Build alternatives, because the differences are small relative to the accuracy level of the model. Use of the BPM for screening the alternatives is appropriate, but it should be concluded that the modeling is too coarse to calculate significant differences in future traffic impacts between the alternatives. There are other models appropriate for smaller areas, which provide the greater level of detail needed to evaluate Transportation Systems Management (TSM) alternatives.

# Overview

We have reviewed the transportation modeling conducted for the Bruckner-Sheridan Interchange Reconstruction/Hunts Point Peninsula EIS ("B-S EIS"). This review has included public presentations and newsletters but also technical memoranda and the modeling files. In order to correct model coding errors, we also have rerun some of the model scenarios.

This report summarizes our review, including:

- demonstrating several ways that the B-S EIS modeling inflates or exaggerates the differences in traffic operations between the alternatives,
- showing that the B-S EIS modeling assumes an implausible level of traffic growth between 2003 and 2030, and
- discussing flaws in the ways in which the B-S EIS modeling was structured and making recommendations for how transportation modeling should be applied to the issues of the B-S EIS.

## *B-S EIS Presentations Overstate Benefits of Alternatives 2C and 2D*

After analyzing the B-S EIS transportation modeling files, we have determined that the purported benefits of the Build alternatives, in terms of reduction in vehicular delay, are primarily due to modeling errors. About half of the differences between the 2030 Build alternatives result from code errors rather than any real traffic operations effects. A large fraction of the remaining difference has been tracked to another incorrect parameter value on a single roadway link in the model. Other factors have been identified that cause the apparent differences between alternatives to be exaggerated. Compared with the general level of model errors in matching counted traffic volumes in 2003, any remaining traffic modeling differences between future Build alternatives are too small to be considered reliable.

### Errors in B-S EIS Modeling Inflate Differences between Alternatives

The B-S EIS alternatives summary of the modeling is given in the Table 1.

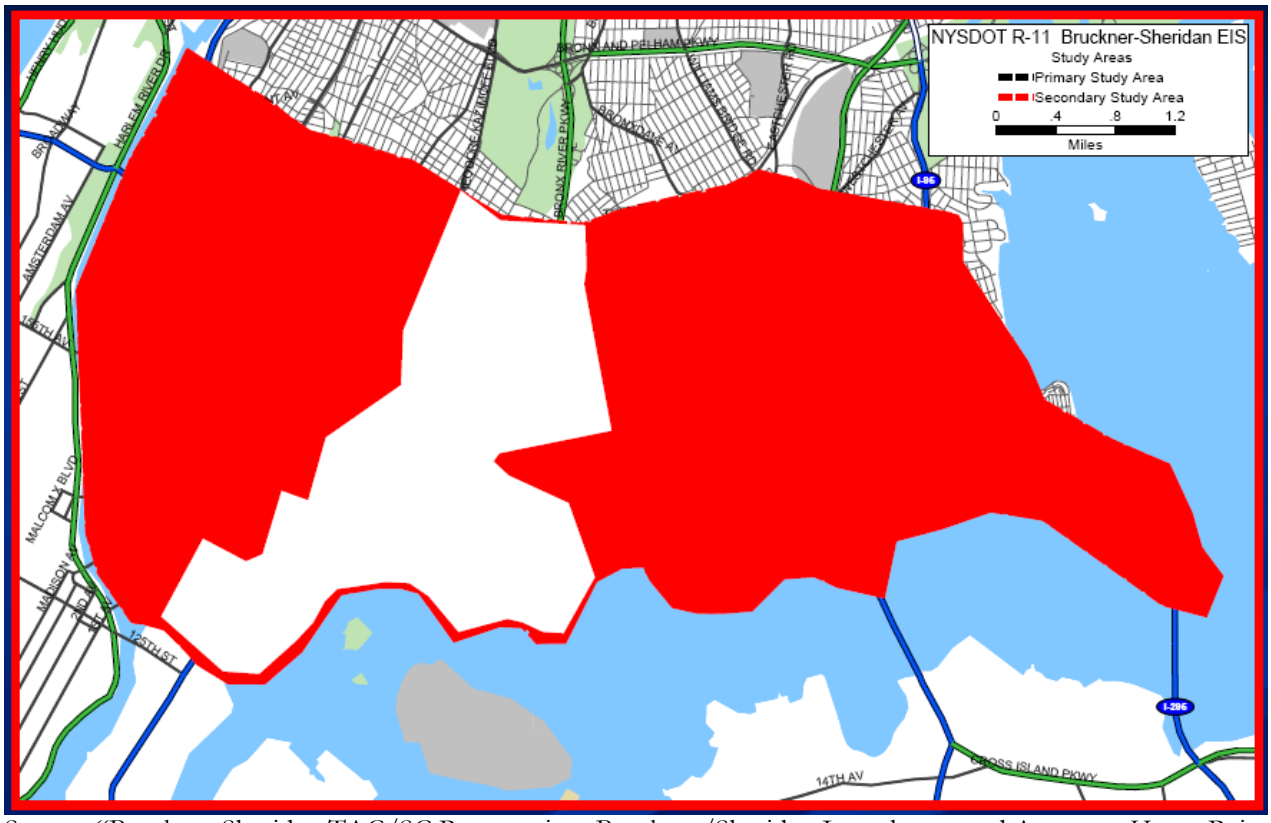
**Table 1: B-S EIS Modeling – 8-Hour VHT for Entire Study Area: No-Build vs. Build Alts (6-10 AM + 3-7 PM)**

| Alternative | VHT Vehicle-Hours | Change Over No-Bld | % Change |
|---|---|---|---|
| No-Build | 113,776 | | |
| 1A | 113,135 | -641 | -0.56% |
| 1B | 111,376 | -2,400 | -2.12% |
| 2C | 110,277 | -3,499 | -3.14% |
| 2D | 110,187 | -3,589 | -3.25% |

Source: "Bruckner Sheridan TAC/SC Presentation: Bruckner/Sheridan Interchange and Access to Hunts Point EIS Year 2030 Travel-Demand Modeling Results Build Alternatives Compared to No Build", June 2006

The "entire study area" referred to in the Table 1 modeling results is shown below in Figure 1.

**Figure 1: B-S EIS Study Area**




Source: "Bruckner Sheridan TAC/SC Presentation: Bruckner/Sheridan Interchange and Access to Hunts Point EIS Year 2030 Travel-Demand Modeling Results Build Alternatives Compared to No Build", June 2006

The B-S EIS modeling is done with a subarea transportation model based on the regional NYMTC model. The modeled area is much smaller than the entire NYMTC region but is considerably larger than the B-S EIS study area. In particular the model area extends further to the north. We have analyzed the B-S EIS model outputs and recomputed the values in Table 1 for the entire model area. These results are shown in Table 2.

**Table 2: B-S EIS Modeling – 8-Hour VHT for Entire Model Area: No-Build vs. Build Alts (6-10 AM + 3-7 PM)**

| Alternative | VHT Vehicle-Hours | Change Over No-Bld | % Change |
|---|---|---|---|
| No-Build | 225,010 | | |
| 1A | 224,118 | -892 | -0.40% |
| 1B | 222,134 | -2.875 | -1.28% |
| 2C | 220,923 | -4,086 | -1.82% |
| 2D | 220,979 | -4,030 | -1.79% |

Source: Smart Mobility, Inc. analysis of B-S EIS model files

We present the numbers in Table 2 for two reasons. First, there was no straightforward way to reproduce the numbers in Table 1 because we did not find any coding in the model files that distinguishes between model links within the study area and links outside the study area. Second, sometimes the arbitrary splitting of a model into separate areas ignores impacts outside the area of focus. In this case with the larger area, overall differences are slightly larger in terms of vehicle hours traveled (VHT), but represent smaller percentage changes.

## Model Coding Errors

In our analysis of the B-S EIS modeling files, we have uncovered coding errors in the afternoon peak period files for the No-Build and 1A alternatives that increase VHT for these alternatives and bias the results. These errors affect only a few of the model roadway segments, or links. However, the extreme amount of future congestion assumed in all future scenarios results in large amounts of vehicle delay, or VHT on individual links. A simple coding error on a single link has resulted in differences similar in magnitude to the differences between the B-S EIS alternatives.

The coding errors for No-Build and 1A alternatives for the morning period are:
link 62224, I-87 NB to I-95 WB ramp, capacity coded as 2580 instead of 4000
link 62226, I-95 EB to I-95 NB ramp, capacity coded as 2580 instead of 2752
link 62301, I-95 EB to I-95 SB ramp, capacity coded as 2580 instead of 2752
links 98568 and 99474, Tinton Avenue coded one-way in the wrong direction and with the wrong capacity.

We reran the No-Build and 1A alternatives for the morning period are recomputed the VHT numbers for these two alternatives. The corrected values are summarized in Table 3.

**Table 3: Corrected B-S EIS Modeling – 8-Hour VHT for Entire Model Area: No-Build vs. Build Alts (6-10 AM + 3-7 PM)**

| Alternative | VHT Vehicle-Hours | Change Over No-Bld | % Change |
|---|---|---|---|
| No-Build | 223,136 | | |
| 1A | 222,329 | -807 | -0.36% |
| 1B | 222,134 | -1,002 | -0.45% |
| 2C | 220,923 | -2,213 | -0.98% |
| 2D | 220,979 | -2,156 | -0.96% |

Source: Smart Mobility, Inc. analysis of B-S EIS model files and rerunning No-Build and 1A for morning period

As shown in Table 3, with the corrected modeling the VHT for all alternatives, including the No-Build alternative, are within 1 percent.

## Limitations in B-S EIS Modeling

Transportation modeling differences of less than 1 percent for the year 2030 are too small to draw reliable conclusions concerning whether one alternative performs better than another. Transportation models are known to be of limited precision and accuracy, and as is discussed below, the modeled traffic volumes for important roadway links for the 2003 base year can differ from the counted traffic volumes by 30 percent, 40 percent or even more. These errors translate into model-wide VHT differences that can be sufficient to skew the total in favor of one alternative or another.

Highlighting small percentage differences without discussing the uncertainty in the numbers implies a level of accuracy that is unattainable in modeling. Regional transportation models are most useful for understanding the big picture effects of different regional land use and transportation strategies. The models are never accurate for all roadway links – even for the base year where efforts can be focused on improving the model fit. For future years, the magnitude of error for individual roadway links is very high.

When regional transportation models are used for the analysis of individual road projects, there is generally an effort made to improve the model's performance within a subregional study area. The EIS Summer 2006 project newsletter states: "The model for the year 2030 was projected based on traffic flow in 2003 which was validated using extensive real-time traffic counts within the Bruckner-Sheridan EIS study area." This modeling process was unusually complex and included four separate stages:

Reproducing 1997 base year and 2020 no build regional modeling results and comparing 1997 base year model results to traffic counts in the B-S study area
Revising the model's coding in the study area, rerunning the model and comparing the 1997 base year model results to traffic counts in the B-S study area
Manipulating 2000 morning and afternoon peak period subarea trip tables to better match traffic counts
Manipulating 2003 morning and afternoon peak period subarea trip tables to better match traffic counts separated into autos, commercial vans and trucks

Despite these efforts to make the model match 2003 truck counts, there are still large discrepancies for individual roadway segments. The September 2004 *Transportation Modeling Stage 4 Summary Report* Table 24 shows that for the morning peak period (6 a.m. – 10 a.m.) the modeled truck volumes are within +/- 30% of the number of trucks counted for 50 out of 62 locations on the major roadways – Cross-Bronx, Major Deegan, Bruckner and Sheridan Expressways. Putting it the other way, the modeled truck volume for 12 of the 62 (19%) locations is off by more than 30%. The model fit is no better for the key roadways in the study, including the Sheridan Expressway, than for roadways less central to the purposes of this study. The modeled northbound truck traffic (trucks are defined as vehicles with 6 or more tires) on the Sheridan Expressway at Westchester Ave. is 48.8% too high, and the modeled number of vans (commercial vehicles with 4 tires) is 174.7% too high. The modeled car traffic at this location is also high by 39.3%, so total traffic is overestimated by 45.4%. The model also overestimates total (all vehicle types) traffic for all four Sheridan ramps reported, by 22.9%, 42.5%, 55.3%, and 110.9%.

For arterial roadways in the morning peak period, the model is within +/- 40% of the counted trucks for 47 of the 80 locations, which means that at for 33 of the 80 locations, the error exceeds 40%. Again, the key roadways perform no better than other roadways. Southern Boulevard has been identified as a potential diversion route for trucks if the Sheridan Expressway were closed. Therefore, it would be useful if Southern Boulevard truck assignments in the 2003 model were accurate. Table 12 of the *Stage 4 Summary Report* shows that the model error exceeds 40% for most of the road segments counted; 12 of 17. The errors range from -100% (i.e. the model assigned no trucks) to +300% (i.e. the model assigned 4 times the correct number of trucks). The model is even worse for some other arterial sections. For example, the model assigns 676 trucks to a section of the Grand Concourse during the morning peak period where only 63 were counted, an error of 973%.

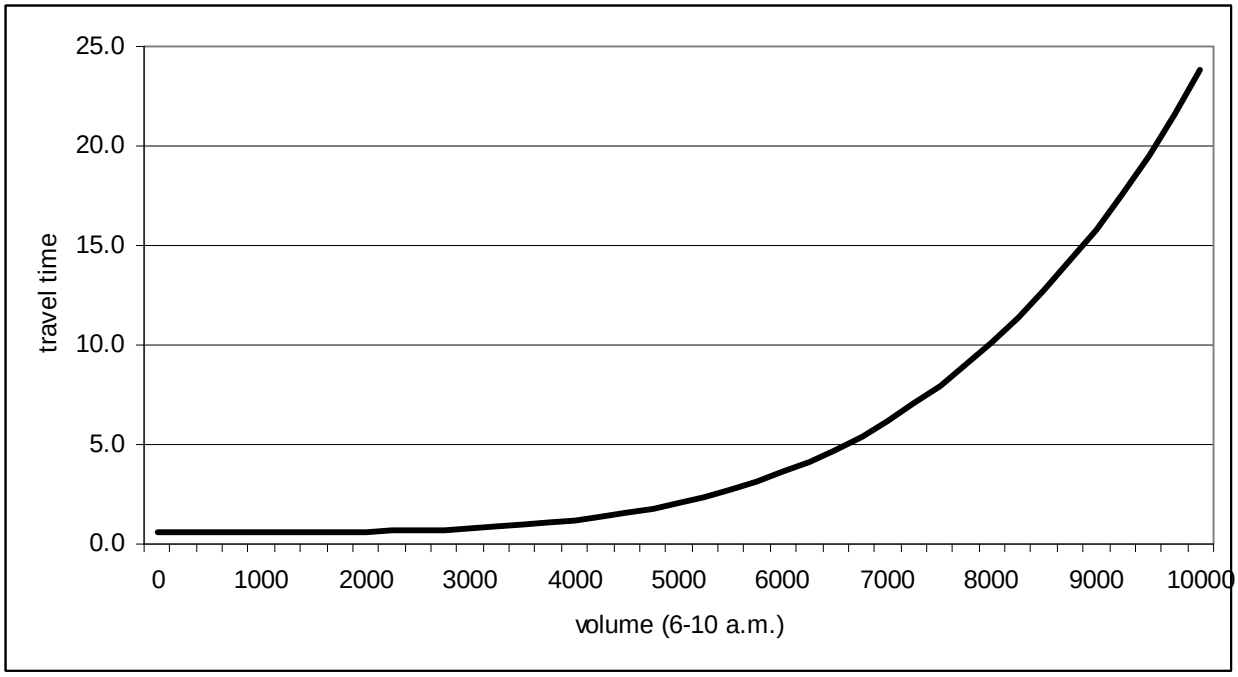
The model exhibits similar errors for the afternoon peak period, 3 p.m. - 7 p.m.

The *Stage 4 Summary Report* stresses that the model volumes are accurate at the model boundaries. This is not impressive, because the model was mathematically adjusted so that the volumes at the model boundaries match the counts. Similarly, it is not surprising that underestimates and overestimates are roughly balanced, so that the "average error" is small. Again, the model numbers were adjusted until this was true. As has been demonstrated with the roadway segment comparisons discussed above, these adjustments were insufficient to make the model match existing truck patterns closely. If the model could not be manipulated to match observed truck volumes for 2003, the level of uncertainty concerning future truck volumes on different roadways is very high.

Individual link errors can have significant impacts on total model VHT. For example, the link with the most significant coding error, the ramp from I-87 NB to I-95 WB ramp, is modeled as extremely congested in all scenarios. This link is of particular importance in that it may serve trucks that are diverted from the Sheridan in the decommissioning alternatives. Although the ramp currently is highly congested, the model shows the congestion level as overly severe.

The primary reason for the model showing this severe congestion is that the model assumes the capacity for this link is 4,000, or less than half of the actual traffic volume observed. While model capacity numbers are generally less than actual capacity in the NYMTC model, this value is too low. The model assumes that the time required for traveling the roadway link increases exponentially as traffic increases, beginning with 36 seconds with no congestion, and growing as shown in Figure 2 below.

**Figure 2: Modeled Travel Time (Minutes) for the I-87 NB to I-95 WB Ramp as a Function of Volume**




Modeled traffic on this ramp is below observed traffic counts. The Validation Report shows 2003 modeled traffic on this ramp during the morning peak period (6-10 a.m.) is 27.0% less than counted (Table 3) and that modeled truck traffic is 31.8% less than counted (Table 2). The total model volume reported for the 6-10 a.m. period is 6,912 which is 2,562 less than the 9,474 vehicles counted. For the modeled volume of 6,912, the modeled travel time for this single quarter mile ramp is about 6 minutes. For the observed volume of 9,474, the modeled travel time would be over 20 minutes to travel a distance less than a quarter of a mile. These extreme modeled delays exceed true delays and help to explain why the model is underestimating the traffic volume on this link.

In the model, the ramp is coded as a single lane. The observed traffic volume averages 2,368 per hour which is higher than would be expected for a single lane. However, as is shown in Figures 3 and 4 below, the ramp is not functioning strictly as a single lane ramp. Cars are forming parallel queues.

**Figure 3: I-95/I-87 Interchange (Immediately to East of Hamilton Bridge)**

**Figure 4: I-95/I-87 Interchange Detail Showing Cars Making 2 Lanes on NB to WB Ramp**


The inaccurate modeling of actual operation of this ramp translates into vehicle hours of travel (VHT) differences that are a significant portion of the total VHT differences between alternatives. As shown in Table 4, the B-S EIS modeling (corrected where necessary) estimates that 1,886 to 2,097 VHT per day during the morning and afternoon peak periods in 2030 will be on this single ramp.

**Table 4: Corrected B-S EIS Modeling – 8-Hour VHT for Link 6224 Only, I-87 NB to I-95 WB Ramp: No-Build vs. Build Alts (6-10 AM + 3-7 PM)**

| Alternative | Ramp Volume | Ramp VHT (Vehicle-Hours traveled) | Average Speed on ramp (mph) | Change in VHT Over No-Build |
|---|---|---|---|---|
| No-Build | 14,936 | 1,947 | 1.84 | |
| 1A | 15,167 | 2,097 | 1.74 | 150 |
| 1B | 15,579 | 2,374 | 1.57 | 427 |
| 2C | 14,838 | 1,887 | 1.89 | -60 |
| 2D | 14,837 | 1,886 | 1.89 | -61 |

Source: Smart Mobility, Inc. analysis of B-S EIS model files and rerunning No-Build and 1A for morning period

As shown in Table 4, the average modeled speed for every alternative is below 2 mph. This results in a huge difference of VHT in Table 4 between Alt 1B and Alt 2D of 488 hours, which is 42 percent of the total VHT difference between the alternatives across the entire model area, as shown in Table 3. This one link is contributing over 40 percent of the purported regional benefits of Alt 2D over Alt 1B from a difference of 5 percent in the model volume on this link. As was discussed above, the low modeled speeds in the 2003 base year model suppress model volumes to about 30 percent below traffic counts. With more realistic model capacity and speeds, (the modeled VHT on this ramp would be much lower and the absolute differences between the VHT of different alternatives would also be much smaller. If a single link coding error can cause such a high fraction of the differences between the alternatives, there can be no confidence that the model is providing an accurate depiction of the differences in traffic performance between the alternatives.

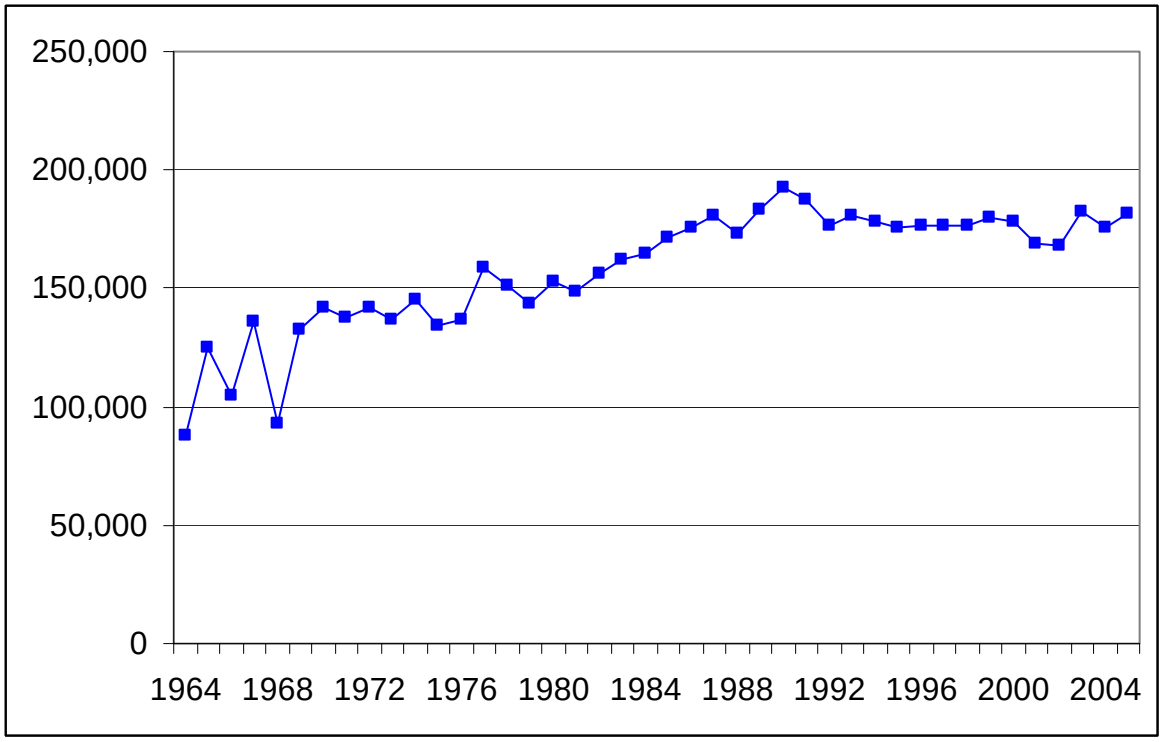
## *Future Traffic Growth Assumptions Are Implausible*

As has been discussed in the previous section, the B-S EIS model is unreliable for forecasting truck volumes on different roadway segments. Generally, travel demand models are more useful for evaluating the big picture effects that would result from alternative transportation and land use scenarios. How does the B-S EIS transportation model perform in this regard?

Unfortunately, the B-S EIS modeling also fails to provide meaningful information about the big picture impacts. The central problem is that the amount of traffic growth assumed is unrealistic. Rather than a "what if" analysis of plausible scenarios, instead the B-S EIS modeling is a comparison only of implausible scenarios.

The B-S EIS highlights truck travel from Hunts Point to the Hamilton Bridge as a central issue. The Hamilton Bridge also provides a good example of how the B-S EIS modeling assumes too much traffic growth. Figure 5 shows the average daily traffic volume for the Hamilton Bridge from 1964 (the first full year of operation) and 2005. As shown, the highest traffic volumes have been essentially flat for the bridge for 20 years with the highest historic traffic volume observed in 1990.

**Figure 5: Alexander Hamilton Bridge Average Daily Traffic Volumes 1964-2005**




Source: New York City Department of Transportation, *New York City Bridge Traffic Volumes 2005*

It is likely that there has been no traffic growth on the bridge because the bridge and the connecting roadway system including ramps are congested during significant portions of the day. Therefore, Hamilton Bridge traffic cannot grow unless there are significant increases in capacity. The B-S EIS assumes no increases in capacity at the Hamilton Bridge. Nevertheless, it assumes that the traffic volume on the Hamilton Bridge will increase by 13.0% between 2003 and 2030 in the morning peak period and by 12.0% in the afternoon peak period. This represents average daily traffic on the Hamilton Bridge in 2030 of 205,658 or considerably more than has ever used this bridge in a single day. This is implausible.

Similar traffic growth assumptions throughout the modeled area make the future look bleak. The modeled vehicle miles traveled (VMT) during the morning (6-10 a.m.) and afternoon (3-7 p.m.) are 11.3 percent higher for the 2030 No Build alternative as for the 2003 base year. The model assumes the same 2030 vehicle trip table for all alternatives, so the future modeled VMT is very similar across alternatives. In the model, vehicle travel time increases exponentially with traffic volume. Therefore, the 11.3 percent increase in VMT translates into a modeled increase in VHT of 21.5%, or about twice the impact. In comparison with this increase, the less than 1.0 percent modeled differences between alternatives shown in Table 3 are very small.

As pointed out above, the assumed amount of traffic growth is implausible because it assumes growth on congested roadways which in fact cannot accommodate such growth. Assuming this implausible rate of traffic growth exaggerates the future VHT calculations, and therefore likely exaggerates the differences in future VHT between alternatives.

In addition to being implausible, the assumed level of growth is clearly undesirable. Residents of the South Bronx already are subjected to high levels of air pollution, noise, and other negative impacts of the current traffic levels. There is no possibility of a large increase in roadway capacity, so greater traffic volumes imply more congestion and greater negative impacts on residents. Rather than assume an implausible and undesirable level of traffic growth as a given, it would be much more useful to focus on 1) travel demand management and 2) improving operations on the existing roadway system.

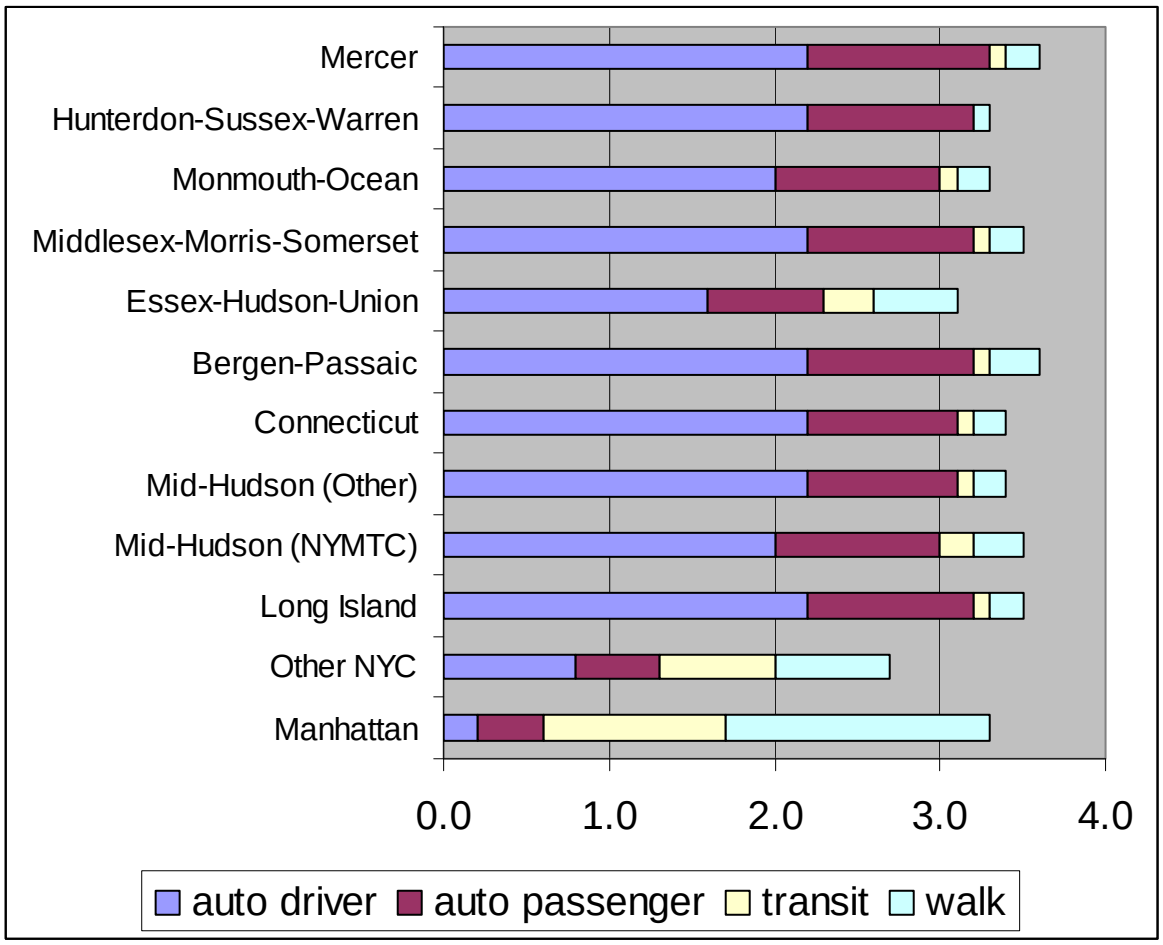
## *Travel Demand Management (TDM)*

There are numerous strategies that the region can pursue to reduce the growth of traffic while providing transportation choices and mobility. Among the most relevant strategies to consider in the B-S EIS are the effects of land use distribution, and of congestion pricing.

### Land use

The most important determinant of how much VMT a resident of the greater New York City region will generate is where they live. Figure 6 shows daily trip making per person for different parts of the region.

**Figure 6: Person Trip Rates by Modal Type by County Group of Residence**




Source: Parsons Brinckerhoff Quade & Douglas, Inc., *Regional Travel – Household Interview Survey General Final Report*, Table 27, p. 61. Prepared for the New York Metropolitan Transportation Council (NYMTC) and North Jersey Transportation Planning Authority (NJTPA), February 2000.

As shown above, Manhattan residents drive very little. Residents of the rest of New York City, including the Bronx, average about 0.8 auto trips per person per day (counted by counting drivers and not passengers). In comparison, all areas outside New York City and the Newark area average between 2.0 and 2.2 auto trips per person per day, or 2 ½ to 2 ¾ times as much.

Not only do New York City residents make very auto trips than suburban residents, the trips are generally shorter. Therefore, the amount of VMT generated by a New York City resident is much less than the VMT generated by suburban residents.

Much of the traffic in the South Bronx and other parts of New York City is caused by suburban drivers. Therefore, the best way to both control regional VMT and also to help in managing local VMT is to encourage population and employment growth within the City rather than in suburban areas. The proposed reuse of the Sheridan Expressway corridor would contribute directly to this objective by providing land for residential and mixed use development. It would also contribute indirectly by providing a valuable amenity in park land and greenway and by removing the negative impacts of the Sheridan Expressway on neighboring properties, thus encouraging further redevelopment. The close proximity of the proposed redevelopment area to existing transit stations will further contribute to reduced growth of vehicular traffic. The B-S EIS transportation modeling fails to account for these beneficial effects on land use and transportation for the alternatives that include the removal of the Sheridan Expressway.

## Pricing

The possibility of tolling New York City's East River and Harlem River bridges has been discussed for many years. A 1993 report by the City's Independent Budget Office concluded that tolling could reduce bridge crossings by 19 percent on the currently free East River Bridges, and by 36 percent on the Harlem River Bridges (except for the Hamilton Bridge which was not included in this analysis).[1]

It is important to note that no trip begins on ends on one of the bridges. If a bridge crossing in a car is replaced with a transit trip, this removes traffic from other streets and roadways as well. The effects of managing traffic at key points in the network can help manage traffic across a broader area.

Experience in London, England has helped to renew interest in roadway pricing in New York City. In 2003, London instituted a cordon price for vehicles entering central London. This has resulted in a decline in auto traffic in central London of about 20 percent. This 20 percent decline in auto traffic has caused a 37 percent improvement in travel times within central London, with bus congestion delays declining by 50 percent, allowing increased service levels without increased costs. Taxi charges have also declined due to faster travel.[2]

Litman summarizes the winners and losers with the London pricing initiative in the following table.

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[1] New York City Independent Budget Office, *Fiscal Brief: Bridge Tolls: Who Would Pay? And How Much?* October 2003.
[2] Litman, Todd. *London Congestion Pricing: Implications for Other Cities*, Victoria Transportation Policy Institute, January 2006.

**Table 5: Congestion Pricing Winners and Losers**

| Winners | Losers |
|---|---|
| Downtown bus riders<br>All transit riders (due to increased funding for improvements)<br>Taxi riders and drivers<br>Motorists with high-value trips<br>Most city center businesses<br>Overall city productivity<br>Pedestrians and cyclists | Motorists with marginal-value trips<br>City center businesses that depend on low-cost weekday car access<br>Residents and motorists in border areas who experience spillover effects<br>City center parking revenue recipients |

Source: Litman, Todd. *London Congestion Pricing: Implications for Other Cities*, Table 2, p. 10. Victoria Transportation Policy Institute, January 2006.

Transit oriented infill and redevelopment in combination with roadway pricing would encourage a virtuous cycle where increased levels of transit use, walking and cycling would lead to improved service levels for these alternative modes, which would in turn lead to even higher levels of usage.

## *Traffic Systems Management*

The big picture strategies for managing traffic in a dense urban area with a largely built-out roadway system are land use, pricing, and alternative travel modes. If these strategies are all in place, it is useful to explore ways to improve the efficiency of the roadway system.

All of the B-S Build alternatives would improve truck access from Hunts Point to the Bruckner Expressway and therefore remove trucks from local streets. There may be other points in the system where localized improvements would improve traffic operations and/or safety. Given the importance of trucks traffic in the study area, particular attention should be given to truck travel patterns. However, any improvements should have a multi-modal focus, balancing the needs of trucks and other roadway users with users of other modes.

The emphasis should be on smaller relatively inexpensive projects because large reconstruction projects focused narrowly on existing bottlenecks often are ineffective. Here's an example from Chicago, in which fixing the notorious bottleneck, the "Hillside Strangler", had no lasting benefit in travel time savings.

> *The Hillside Strangler: $140 Million to What End?*
>
> The "Hillside Strangler"—the point at which the East-West Tollway and the Tri-State Tollway converge with the Eisenhower Expressway—was long a notorious traffic bottleneck. After a $140 million construction project to "fix" the problem, the Daily Herald posed this question: "Many millions have been spent to change that evil Hillside Strangler. So, has it been rehabilitated?" This was the answer:

1. Getting through the Strangler is now about 15 minutes faster.
2. But the bottleneck has merely been pushed further up the road to a point where the Eisenhower funnels into three lanes.
3. And more motorists are now using the expressway since the Strangler work was completed.

The net effect? The Daily Herald concluded: "Overall, then, the commute time from the suburbs to the Loop, via the Eisenhower and its extension, is one hour—exactly what it was before the Hillside Strangler was repaired." (*More Costly Roadwork, and Travel Still Tough*, Daily Herald, October 3, 2002)[3]

## *Appropriate Use of Transportation Modeling*

Transportation modeling is a highly useful tool in urban planning. However, the way that it has been used in the B-S EIS work is ineffective. Regional models are simply not accurate enough to quantify the small differences between similar alternatives in 2030. Instead, the models should be focused more on big picture issues that can inform important transportation decisions, like land use and transportation strategies and congestion pricing.

### B-S EIS Modeling Not Really Best Practices Model

A B-S EIS Newsletter states:

If you are wondering how anyone can predict the traffic patterns in 2030 when we cannot even predict the weather for the weekend, the answer lies in travel-demand modeling. To forecast future traffic conditions, the New York State Department of Transportation (NYSDOT) uses the Best Practice Model created by the New York Metropolitan Transportation Council (NYMTC), a model that has become the standard for all transportation projects in the region, resulting in commonality, consistency and comparability of data across all projects. To provide the most reliable future forecast, the Best Practice Model combines state-of-the-art techniques, updated data from the latest U.S. Census Bureau's Census Transportation Planning Package, and various socio-economic forecasts including expected changes in population, employment and labor force between the years 2003 and 2030. The model for the year 2030 was projected based on traffic flow in 2003 which was validated using extensive real-time traffic counts within the Bruckner-Sheridan EIS study area.[4]

The Best Practice Model (BPM) really cannot accurately "predict traffic patterns in 2030" so this is an unfortunate piece of misinformation. In addition, the B-S EIS results are not really from the BPM. While the Best Practice Model (BPM) was used in the early stages of the B-S EIS modeling process, it is not accurate to imply that the results presented are outputs of the BPM. An obvious difference between the regional BPM and the B-S EIS model is that the B-S EIS model covers only a small area of that covered in the BPM. More significantly, the B-S EIS model uses a fixed trip table across all alternatives, while the entire premise of the BPM is sophisticated modeling of individual responses to different alternatives. A BPM newsletter states:

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[3] Chicago Metropolis 2020: *The Metropolis Plan: Choices for the Chicago Region*, p. 10. Chicago, IL: 2003.
[4] Burckner-Sheridan Interchange Reconstruction/Hunts Point Peninsula Access EIS Newsletter, Issue 5, Summary 2006.

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.[5]

The B-S EIS model includes none of the complexity described above. It includes no persons making decisions and no travel choices (such as using transit). Instead, it assumes a fixed number of trips made by cars and trucks, with the same origins and destinations regardless of the transportation alternative. Instead of the 100 hours running time described above, the B-S EIS model has eliminated all of the BPM complexity and runs in a few minutes. This is convenient to the modeler, but it is improper to describe the B-S EIS model as the BPM.

## B-S EIS Modeling Lacks Feedback and Exaggerates Differences between Alternatives

Instead of using the advances in the BPM, the B-S EIS model is a throwback to earlier discredited modeling methods. Alternatives with more transportation capacity will generally result in more traffic, which partially offsets any benefits of the added capacity. These effects are captured in models by feeding back congested travel times to travel demand. By using the same trip table for all alternatives, the feedback process built into the BPM is eliminated. This violates accepted modeling practice. Model feedback has been required by Federal air quality modeling regulations for conformity determinations since 1993 and this provision was reaffirmed in 1997 after public comments supportive of retaining the feedback requirement were received. Commenters pointed out that this type of consistency in the evaluation of travel time is almost universally recognized to be scientifically valid. A commenter stated that not requiring feedback would allow analyses to be manipulated to produce desired results. Another commenter stated that most MPOs have already implemented full feedback, and it is easy to perform and more accurate than partial feedback. Commenters submitted technical reports and papers to the docket in order to document their claims that full feedback is recognized to be a necessary and sound modeling improvement.

EPA agrees with commenters that there is clear theoretical justification for feedback between traffic assignment and trip distribution, and that feedback may be essential to accurate forecasts when congestion exists. In addition, EPA agrees that full feedback is already widely available and used. As a result, EPA believes it is appropriate to retain the feedback requirement.[6]

Modeling without feedback, as was conducted in the B-S EIS modeling, overestimates the differences between the alternatives and ignores the effects that each alternative will have on travel decisions.

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[5] New York Metropolitan Transportation Council, Best Practice Model, http://www.nymtc.org/project/BPM/background/BPMnewsltr.pdf

[6] Federal Register: August 15, 1997, Volume 62, Number 158, Page 43779-43818, Transportation Conformity Rule Amendments: Flexibility and Streamlining.

## BPM Useful for Evaluating Land Use and Pricing Scenarios

The BPM is designed to capture the complex decision making of individuals. Individuals with different travel times and costs for different modes will act differently. In the BPM, shifting land use from the suburbs to the South Bronx would reduce regional vehicle miles traveled (VMT) while increasing traffic volumes on some roadways and reducing traffic on others. It would increase the number of modeled transit and walk trips. In the BPM, tolling East River and Harlem River bridges would change the destinations of some trips to avoid crossings altogether, and shift other travelers to transit. The BPM is an excellent tool for performing these types of big picture analyses.

## BPM of Some Value to Analyzing B-S Alternatives

The BPM is an appropriate tool for evaluating major roadway and transit alternatives. However, given that the BPM covers the huge greater New York City region, it is not very sensitive to the differences between similar alternatives. With the B-S alternatives, it is appropriate to use the BPM as a screening tool, to determine whether there are significant differences between the alternatives.

As discussed above, once model coding errors are corrected, the difference in results between the B-S alternatives is small. A large portion of the remaining difference was shown to be determined by an inaccurate capacity value coded on a single ramp. The implausible assumed traffic growth exaggerates future vehicle hours of travel (VHT). The lack of feedback in the B-S EIS model also exaggerates the differences between alternatives. All that can be concluded from the B-S EIS modeling with confidence is that the overall traffic difference between the alternatives is small. While modelers are under some pressure to produce stronger conclusions, it is critical that these minor differences in modeling results not be overstated. Transportation modeling results are precise and can be stated to as many significant digits as desired. It is important not to confuse precision with accuracy, and not to misinform decision makers and the public. The sort of muddy picture that can be derived from the B-S EIS modeling certainly should not trump other community values and other community concerns because it appears to be objective.

If the modeling results are accepted as being inconclusive, the use of the B-S EIS model probably is sufficient. If it appeared that there was a significant difference between alternatives in the crude B-S EIS modeling, it would be important to use the entire BPM. The inclusion of model feedback on travel demand and possible mode shifts should be important to verify that the apparent differences were not a result of the artificial constraint of a fixed trip table. It is likely that one reason that the BPM was not used is that it fits traffic volumes on individual roadways less well than does the B-S EIS model, given that the major work on developing the B-S EIS model was on fitting traffic counts better. Compared to the B-S EIS model, the BPM therefore would be more accurate in some ways (inclusion of feedback, transit) and less accurate in others (fit with traffic counts). It is unlikely that evaluation of the B-S alternatives with the BPM would result in conclusive differences.

## BPM of Little Value for Transportation Systems Management (TSM) Analyses

The macroscopic nature of the BPM and similar regional models make them poorly suited for analyses of individual roadway segments or intersections. Intersections are not really modeled at all in such models, even though the great majority of non-freeway roadway delay is caused by intersections. When examined close up, the regional model's treatment of roadway segments is only slightly better. Instead of an absolute capacity at a particular bottleneck, the regional model assumes that more traffic can be squeezed through but more slowly. This is wrong. In the real world, traffic queues behind the bottleneck. In a regional model, there often is no apparent traffic problem behind a bottleneck. For TSM analyses there are better tools than regional transportation models. These include intersection, roadway segment, and roadway corridor capacity analyses, microsimulation, and dynamic assignment.

## *Conclusions*

Due to model errors and the general level of uncertainty in regional transportation modeling, it is impossible to conclude from the B-S EIS modeling whether any future Build alternative offers any traffic advantages over any other alternative. Therefore, the modeling results should be given little weight relative to other community objectives and community concerns. In particular, the land use benefits of removing the Sheridan Expressway are very great and would also result in transportation benefits which are ignored in the B-S EIS modeling.

Reconstruction of the Bruckner Expressway, and the decision of whether or not to decommission the Sheridan Expressway, are of critical importance and represent substantial investments of public funds. These decisions should rest more strongly on the City's and neighborhoods' vision and goals for its future, the effects on the quality of the environment, and the potential for economic development that the decommissioning would bring. The flawed modeling in the B-S EIS should be disregarded in this decision, for all the reasons described in detail in this report. The goals of more transportation choices, reduced regional VMT per capita, and the environmental, recreation, and economic development benefits of redevelopment of the Bronx River Waterfront are far more important factors in the impending decision.

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EDUCATION:

Master of Science in Engineering Sciences, Dartmouth College, Hanover, NH, 1982
Bachelor of Science in Mathematics, Worcester Polytechnic Institute, Worcester, MA, 1977

PROFESSIONAL EXPERIENCE:

Norm Marshall helped found Smart Mobility, Inc. in 2001 and is its President. Prior to this, he was at Resource Systems Group, Inc. for 14 years. He specializes in analyzing the relationships between the built environment and travel behavior, and doing planning that coordinates transportation with land use and community needs.

*Regional Land Use/Transportation Scenario Planning*

*Burlington, Vermont – Leading team that is developing a new transportation plan for the City based, in part, on an extensive public involvement process..*

*Chicago Metropolis Plan and Chicago Metropolis Freight Plan (6-county region)*— developed alternative transportation scenarios, made enhancements in the regional travel demand model, and used the enhanced model to evaluate alternative scenarios. Developed multi-class assignment model and used it to analyze freight alternatives including congestion pricing and other peak shifting strategies. Chicago Metropolis 2020 was awarded the Daniel Burnham Award for regional planning in 2004 by the American Planning Association, based in part on this work.

*Envision Central Texas Vision (5-countyregion)*—implemented many enhancements in regional model including multiple time periods, feedback from congestion to trip distribution and mode choice, new life style trip production rates, auto availability model sensitive to urban design variables, non-motorized trip model sensitive to urban design variables, and mode choice model sensitive to urban design variables and with higher values of time (more accurate for "choice" riders).

*Mid-Ohio Regional Planning Commission Regional Growth Strategy (7-county Columbus region)*—developed alternative future land use scenarios and calculated performance measures for use in a large public regional visioning project.

*Baltimore Vision 2030*—working with the Baltimore Metropolitan Council and the Baltimore Regional Partnership, increased regional travel demand model's sensitivity to land use and transportation infrastructure. Enhanced model was used to test alternative land use and transportation scenarios.

*Transit Planning*

*Capital Metropolitan Transportation Authority (Austin, TX) Transit Vision – analyzed the regional effects of implementing the transit vision in concert with an aggressive transit-oriented development plan developed by Calthorpe Associates. Transit vision includes commuter rail and BRT.*

*Bus Rapid Transit for Northern Virginia HOT Lanes (Breakthrough Technologies, Inc and Environmental Defense.) – analyzing alternative Bus Rapid Transit (BRT) strategies for proposed privately-developing High Occupancy Toll lanes on I-95 and I-495 (Capital Beltway).*

*Central Ohio Transportation Authority (Columbus) – analyzed the regional effects of implementing a rail vision plan on transit-oriented development potential and possible regional benefits that would result.*

*Essex (VT) Commuter Rail Environmental Assessment (Vermont Agency of Transportation and Chittenden County Metropolitan Planning Organization)*—estimated transit ridership for commuter rail and enhanced bus scenarios, as well as traffic volumes.

*Georgia Intercity Rail Plan (Georgia DOT)*—developed statewide travel demand model for the Georgia Department of Transportation including auto, air, bus and rail modes. Work included estimating travel demand and mode split models, and building the Departments ARC/INFO database for a model running with a GIS user interface.

*Roadway Corridor Planning and Air Quality Analysis*

*State Routes 5 & 92 Scoping Phase (NYSDOT)* —evaluated TSM, TDM, transit and highway widening alternatives for the New York State Department of Transportation using local and national data, and a linkage between a regional network model and a detailed subarea CORSIM model.

*Twin Cities Minnesota Area and Corridor Studies (MinnDOT)*—improved regional demand model to better match observed traffic volumes, particularly in suburban growth areas. Applied enhanced model in a series of subarea and corridor studies.

Seacoast Metropolitan Planning Organization (New Hampshire) — led team that developed integrated transportation, land use, and applied models in corridor studies and in regional air quality conformity modeling.

*Developing Regional Transportation Models*

*Pease Area Transportation and Air Quality Planning (New Hampshire DOT)*—developed an integrated land use allocation, transportation, and air quality model for a three-county New Hampshire and Maine seacoast region that covers two New Hampshire MPOs, the Seacoast MPO and the Salem-Plaistow MPO.

*Syracuse Intermodal Model (Syracuse Metropolitan Transportation Council)*—developed custom trip generation, trip distribution, and mode split models for the Syracuse Metropolitan Transportation Council. All of the new models were developed on a person-trip basis, with the trip distribution model and mode split models based on one estimated logit model formulation.

*Portland Area Comprehensive Travel Study (Portland Area Comprehensive Transportation Study)—Travel Demand Model Upgrade*—enhanced the Portland Maine regional model (TRIPS software). Estimated person-based trip generation and distribution, and a mode split model including drive alone, shared ride, bus, and walk/bike modes.

*Chittenden County ISTEA Planning (Chittenden County Metropolitan Planning Organization)*—developed a land use allocation model and a set of performance measures for Chittenden County (Burlington) Vermont for use in transportation planning studies required by the Intermodal Surface Transportation Efficiency Act (ISTEA).

*Research*

*Obesity and the Built Environment (National Institutes of Health and Robert Wood Johnson Foundation) – Working with the Dartmouth Medical School to study the influence of local land use on middle school students in Vermont and New Hampshire, with a focus on physical activity and obesity.*

*The Future of Transportation Modeling (New Jersey DOT)*—Member of Advisory Board on project for State of New Jersey researching trends and directions, and making recommendations for future practice.

*Trip Generation Characteristics of Multi-Use Development (Florida DOT)*—estimated internal vehicle trips, internal pedestrian trips, and trip-making characteristics of residents at large multi-use developments in Fort Lauderdale, Florida.

*Improved Transportation Models for the Future*—assisted Sandia National Laboratories in developing a prototype model of the future linking ARC/INFO to the EMME/2 Albuquerque model and adding a land use allocation model and auto ownership model including alternative vehicle types.

*Critiques*

*C-470 (Denver region) – Reviewed express toll lane proposal for Douglas County, Colorado and prepared reports on operations, safety, finances, and alternatives.*

*Intercounty Connector (Maryland)* – Reviewed proposed *toll road and modeled* alternatives with different combinations of roadway capacity, transit capacity and pricing.

Foothills South Toll Road (Orange County, CA) – Reviewed modeling of proposed toll road.

I-93 Widening (New Hampshire) – Reviewed Environment Impact Statement and modeling, with a particular focus on induced travel and secondary impacts.

*Stillwater Bridge* – Participated in 4-person expert panel assembled by Minnesota DOT to review modeling of proposed replacement bridge in Stillwater, with special attention to land use, induced travel, pricing, and transit use.

*Ohio River Bridges Project (Louisville region)* – Reviewed Environmental Impact Statement for proposed new freeway/Ohio River bridge.

*Indiana I-69* – Reviewed model analyses from Indiana statewide travel demand model of proposed new Interstate highway and performed sensitivity analyses for its benefit cost analysis.

*Atlanta, Georgia* – Critiqued conformity analyses and regional long-term transportation plan.

*Daniel Island (Charleston, South Carolina)* – Reviewed Draft Environmental Impact Statement for large proposed Port expansion (the "Global Gateway") for an environmental coalition.

MEMBERSHIPS/AFFILIATIONS

Member, Institute of Transportation Engineers
Individual Affiliate, Transportation Research Board
Member, American Planning Association
Member, Congress for New Urbanism
Technical Advisory Committee Member and past Board Member, Vital Communities (VT/NH)

PUBLICATIONS AND PRESENTATIONS (partial list)

*Sketch Transit Modeling Based on 2000 Census Data* with Brian Grady. Presented at the Annual Meeting of the Transportation Research Board, Washington DC, January 2006 and accepted for publication in the *Transportation Research Record*.

*Travel Demand Modeling for Regional Visioning and Scenario Analysis* with Brian Grady, *Transportation Research Record. Transportation Research Board, Journal of the Transportation Research Board, No. 1921, Travel Demand 2005*, 2005.

*Chicago Metropolis 2020: the Business Community Develops an Integrated Land Use/Transportation Plan* with Brian Grady, Frank Beal and John Fregonese, presented at the Transportation Research Board's Conference on Planning Applications, Baton Rouge LA, April 2003.

*Chicago Metropolis 2020: the Business Community Develops an Integrated Land Use/Transportation Plan* with Lucinda Gibson, P.E., Frank Beal and John Fregonese, presented at the Institute of Transportation Engineers Technical Conference on Transportation's Role in Successful Communities, Fort Lauderdale FL, March 2003.

*Evidence of Induced Travel* with Bill Cowart, presented in association with the Ninth Session of the Commission on Sustainable Development, United Nations, New York City, April 2001.

*Induced Demand at the Metropolitan Level – Regulatory Disputes in Conformity Determinations and Environmental Impact Statement Approvals*, Transportation Research Forum, Annapolis MD, November 2000.

*Evidence of Induced Demand in the Texas Transportation Institute's Urban Roadway Congestion Study Data Set, Transportation Research Board Annual Meeting*, Washington DC: January 2000.

Subarea Modeling with a Regional Model and CORSIM" with K. Kaliski, presented at *Seventh National Transportation Research Board Conference on the Application of Transportation Planning Methods, Boston MA, May 1999.*

*New Distribution and Mode Choice Models for Chicago* with K. Ballard, *Transportation Research Board Annual Meeting*, Washington DC: January 1998.

"Land Use Allocation Modeling in Uni-Centric and Multi-Centric Regions" with S. Lawe, *Transportation Research Board Annual Meeting,* Washington DC: January 1996.