

## **Appendix B: Transportation**

B-7 Diversion Analysis for Potential Toll Adjustments on the Tappan Zee Bridge

## DIVERSION ANALYSIS FOR POTENTIAL TOLL ADJUSTMENTS ON THE TAPPAN ZEE BRIDGE: SUMMARY OF RESULTS

### OVERVIEW

For the purpose of this diversion analysis, it was assumed as a worst-case scenario that the tolls on the Tappan Zee Bridge (TZB) would be adjusted to no more than the approved Port Authority of New York and New Jersey (PANYNJ) tolls in 2017. While a broad range of toll adjustments are under review, the analyzed option represents a worst-case scenario of the most probable of those options. To understand the impact of this toll adjustment on parallel Hudson River crossings, the diversion of traffic from the TZB was analyzed using the regionally adopted MPO Planning Model, the NYMTC BPM.

The analysis focused on future eastbound diversion patterns in the weekday morning peak hour, using the 2017 No-Build analysis year as developed for the *Tappan Zee Hudson River Crossing DEIS* ("the DEIS"). The same Best Practice Model (BPM) that was developed and used for all transportation analyses in the DEIS was used for these toll diversion analyses. The products of the analysis were:

- 1) Estimated eastbound total traffic diversion from the TZB for the four-hour (6AM-10AM) peak period and the 7AM-8AM peak hour for the specified toll adjustments; and
- 2) Estimated eastbound traffic increases on parallel Hudson River crossings (see Figure 1) -- George Washington Bridge (GWB), Lincoln and Holland Tunnels (LT and HT), Bear Mountain Bridge (BMB), and Newburgh-Beacon Bridge (NBB).

Figure 1: Hudson River Crossings



## Diversion Analysis For TZB Toll Adjustments Summary of Results

Eastbound AM peak-hour volumes (all crossings are tolled in the eastbound direction) were selected for analysis as they would represent the highest volume of diversions in any one hour. Volumes were also developed and analyzed in each of the four BPM analysis periods – AM, Midday, PM and Nighttime – which collectively cover the entire 24-hour day. The projected change in daily vehicle miles of travel (VMT) in the NYMTC region and its member counties due to the worst-case TZB toll adjustment were also calculated using the BPM’s air quality post-processor to support SIP conformity review procedures.

As discussed below, the approach used in these analyses provided a conservative estimate of traffic diversion, as it did not take into account such additional reactions to toll adjustments as cancelled trips or diversions to other modes (transit, car pool, etc.) or time periods.

### **THE TRAVEL DEMAND FORECASTING PROCESS**

The Best Practice Model (BPM), developed by the New York Metropolitan Transportation Council (NYMTC), was used to forecast future travel demand for all the transportation analyses included in the DEIS. This model forecasts future travel based on projected land use, employment, and demographic patterns, as well as planned transportation facilities and services. The BPM was adopted by NYMTC as the transportation planning model for the New York Metropolitan Area. It is frequently used by FHWA and other Federal agencies for large transportation projects in the region, and the Tappan Zee Bridge project was assessed using the BPM. The BPM also plays a central role in the mobile source air quality Conformity Determination studies completed by NYMTC for all Transportation Improvement Programs and Regional Transportation Plans. As with the application of this complex model to any project, the Tappan Zee Bridge Project used a recalibrated version of NYMTC’s BPM. Among the analyses included in the DEIS, future conditions were analyzed for 2017 (the project’s projected Build year) and 2047 (the mandated 30-year Design Year horizon mandated under State and Federal guidelines for major bridges).

While the present NYMTC BPM conformity analysis year is 2014, the analyses for this memo were completed for 2017 for the following reasons:

- The BPM model calibrated for use in the TZB DEIS analyses was developed for two analysis years – 2017 (Build year) and 2047 (Design year).
- It is projected that all of the planned (PANYNJ) or proposed (TZB) toll adjustments would not be in place by 2014. The earliest full year in which the toll adjustments on all involved crossing would be in place is 2016.
- Diversion estimates for 2017 would be more conservative due to the projected growth in traffic from 2014 to 2017.

The analyses started with the 2017 TZB BPM model runs already completed for the DEIS. The following steps were then taken:

***Establish New 2017 Baseline Conditions***

- The TZB BPM model’s assumed 2017 average car and truck tolls at the Port Authority crossings were updated to be consistent with existing and announced future toll levels and policies at those locations. Toll levels at the other crossings were assumed to remain unchanged.
- The 2017 model was re-run in its entirety to establish a new 2017 Baseline.

***Estimate the Diversion Impacts of Adjusted TZB Tolls***

- The TZB car and truck tolls in the new 2017 Baseline model assumed as a worst case scenario that the tolls on the TZB would be no more than the approved PANYNJ tolls. For this worst-case scenario, the TZB tolls, including the commercial vehicle tolls were adjusted in rough proportion to the change in car cash tolls. The model uses a blended toll rate reflecting the approximate mixture of vehicles by payment method (cash, E-ZPass, Commuter E-ZPass, etc.). Toll levels for the Bear Mountain and Newburgh-Beacon Bridges (both presently at \$1.50 cash toll for cars) were assumed to remain unchanged.
- The relevant components of the model were then re-run to estimate traffic diversions at the following Hudson River crossings:
  - George Washington Bridge
  - Lincoln and Holland Tunnels
  - Bear Mountain Bridge and Newburgh-Beacon Bridge
- The BPM model analyzes potential travel times and costs faced by travelers, including congestion, the tolls encountered and trip distance, and projects the number of trips made between each of about 4,000 traffic analysis zones across the entire 28-county BPM analysis area. Relevant to the present analyses, the model estimates the river crossing choices that travelers would make in response to time, cost and distance, and as part of that assignment process projects the likely diversions that would result due to changes in tolls.

Only selected components of the model (i.e., the highway assignment module) were run for the diversion analyses. This approach conservatively assumes that all auto and truck vehicle trips occurring in the revised Baseline would make the same highway trips they made before the TZB tolls were adjusted. The highway assignment module estimates the number of vehicle trips that would shift their route with the introduction of the TZB toll adjustment. This approach therefore takes no credit for the likely diversions of some of these drivers to other modes (transit, carpool), for trips that would no longer be made or that might shift to other time periods (when congestion is less and tolls are often lower).

**RESULTS OF THE DIVERSION ANALYSIS**

The model’s estimate of traffic diversions was analyzed to assess the potential impacts at the other River crossings. Table 1 shows the amount of traffic that was estimated to divert to the parallel crossings in the weekday AM peak, assuming as a worst case scenario that the tolls on the TZB would be no more than the approved PANYNJ tolls in 2017.

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**Table 1: Preliminary Estimate of AM Period and Peak Hours Eastbound Diversion Due to TZB Toll Adjustment (vehicles)**

	<b>AM Peak Period (6-10am)<sup>1</sup></b>	<b>AM Peak Hour (7-8am)<sup>1</sup></b>
<i>Tappan Zee Bridge</i>	-2,300	-620
<i>George Washington Bridge</i>	+1,400	+380
<i>Lincoln Tunnel</i>	+200	+50
<i>Holland Tunnel</i>	+100	+30
<i>Bear Mountain Bridge</i>	+300	+80
<i>Newburgh-Beacon Bridge</i>	+300	+80

<sup>1</sup> Numbers rounded

Related diversion figures in the eastbound direction for all analyzed Hudson River Crossings in the full 4-hour AM (6-10AM) and PM (4-8PM) peak periods, the 6-hour Midday period (10AM-4PM) and the Nighttime period (8PM-6AM) are also included in Appendix A of this memo. The estimated daily diversion of 11,700 vehicles from the Tappan Zee is also approximately 8% of the average daily two-way traffic.

Approximately 7,400 vehicles (4% of which are trucks) are projected to cross the TZB in the AM Peak hour in 2017. Of these, approximately 620 vehicles or 8% of total eastbound volumes would divert from the TZB due to the analyzed toll adjustments. As noted, it is possible that some of these diverting AM Peak travelers would transfer to other modes (transit and/or car pool) or time periods or would cancel some trips rather than diverting to other crossings. Of the assumed diverted traffic, the only crossing receiving over 100 vehicles per hour (vph) would be the approximately 380 vph that would divert to the GWB. In considering the potential impact of this diversion at the GWB, it must be remembered that there are multiple ways that eastbound traffic can approach the GWB, with traffic on each approach spread over multiple lanes. The potential impact of diverted traffic at any one location is projected to be small. For example:

- About one-third of the diverted traffic (about 115 vehicles per hour, or 60 vehicles per hour per lane) could likely approach the GWB via the Palisades Interstate Parkway.
- Less than half (about 170 vehicles per hour, or 60 vehicles per hour per lane) could approach via NJ Route 4 (coming from NJ Route 17).
- About one fourth (about 90 vehicles per hour, or 15 vehicles per hour per lane) would approach via I-95 (coming from the NJ Turnpike and I-80).

Overall, the diverted volumes to the GWB would be very small in comparison to the amount of traffic using the GWB – approximately 3.5% of the 11,000 eastbound vehicles projected on the GWB in the AM peak hour in 2017. This diversion would in fact be well below the typical day-to-day variation in traffic volumes. As noted, the diversion of some of the drivers to other modes or time periods alone would further reduce the diversion numbers shown in Table 1 above. For example, rather than diverting to other crossings, some travelers faced with this toll adjustment could choose to continue using the TZB

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and take advantage of the substantial carpool discount (for cars with 3 or more occupants), which is only 10% of the cash toll for cars.

**PROJECTED CHANGE IN REGIONAL VMT**

Using the BPM model and its air quality post-processor, daily vehicle miles of travel (VMT) for 2017 were calculated for conditions with and without the proposed TZB toll adjustment. The toll adjustment assumed a worst-case scenario, with TZB tolls assumed to be no more than the approved PANYNJ tolls in 2017. As indicated in Table 2:

- Overall total VMT for the NYMTC region would decrease slightly, by approximately 120,000 VMT, or 0.06%.
- New York County would experience the largest increase in daily VMT (approximately 0.2%) due to the proposed toll adjustment. This change is consistent with the projected minor shift in trans-Hudson traffic from the TZB to the GWB. For similar reasons, Westchester and Rockland Counties collectively would experience a daily VMT decrease of approximately 0.5% due to the TZB toll adjustment.

*Table 2: Estimated Change in 2017 Daily Vehicle Miles of Travel  
 due to TZB Toll Adjustments  
 2017 Daily Vehicle Miles of Travel (Thousands)*

<i>County</i>	<i>No Toll Adjustment</i>	<i>With Toll Adjustment</i>	<i>Change</i>	<i>% Change</i>
<i>New York</i>	<i>13,373</i>	<i>13,397</i>	<i>24</i>	<i>0.18%</i>
<i>Queens</i>	<i>28,725</i>	<i>28,723</i>	<i>-2</i>	<i>-0.01%</i>
<i>Bronx</i>	<i>11,958</i>	<i>11,953</i>	<i>-6</i>	<i>-0.05%</i>
<i>Kings</i>	<i>18,061</i>	<i>18,066</i>	<i>6</i>	<i>0.03%</i>
<i>Richmond</i>	<i>7,049</i>	<i>7,055</i>	<i>5</i>	<i>0.08%</i>
<b><i>Subtotal</i></b>	<b><i>79,167</i></b>	<b><i>79,194</i></b>	<b><i>27</i></b>	<b><i>0.03%</i></b>
<i>Nassau</i>	<i>37,181</i>	<i>37,186</i>	<i>5</i>	<i>0.01%</i>
<i>Suffolk</i>	<i>46,364</i>	<i>46,367</i>	<i>4</i>	<i>0.01%</i>
<b><i>Subtotal</i></b>	<b><i>83,545</i></b>	<b><i>83,553</i></b>	<b><i>8</i></b>	<b><i>0.01%</i></b>
<i>Westchester</i>	<i>27,383</i>	<i>27,286</i>	<i>-97</i>	<i>-0.35%</i>
<i>Rockland</i>	<i>9,164</i>	<i>9,073</i>	<i>-91</i>	<i>-0.99%</i>
<i>Putnam</i>	<i>7,674</i>	<i>7,706</i>	<i>32</i>	<i>0.42%</i>
<b><i>Subtotal</i></b>	<b><i>44,221</i></b>	<b><i>44,065</i></b>	<b><i>-156</i></b>	<b><i>-0.35%</i></b>
<b><i>NYMTC Region Total</i></b>	<b><i>206,933</i></b>	<b><i>206,812</i></b>	<b><i>-120</i></b>	<b><i>-0.06%</i></b>

## Diversion Analysis For TZB Toll Adjustments

### Summary of Results

#### **SUMMARY**

- BPM forecasts indicate that a worst-case scenario in which TZB tolls would be adjusted to no more than those approved for PANYNJ crossings in 2017 would result in the diversion of approximately 620 AM peak hour vehicles from the TZB to other Hudson River crossings.
- This is a very conservative estimate as it does not take into account travelers considering other modes, times of travel or trip reduction strategies, which would reduce these diversion estimates further.
- The BPM forecasts that approximately 380 of these TZB-diverted vehicles would utilize the George Washington Bridge. Considering the overall volumes on the bridge and the myriad approaches to that crossing, the impacts on any one approach or overall bridge operations are projected to be minimal.
- Projected estimates of the change in daily VMT in the NYMTC region indicate a very small (0.06%) decrease in regional VMT would result from the analyzed worst-case TZB toll adjustment.

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**APPENDIX A**  
**PROJECTED CHANGE IN EASTBOUND VOLUMES ON**  
**SELECTED HUDSON RIVER CROSSINGS DUE TO PROPOSED TZB TOLL ADJUSTMENTS**

**Table A-1: Year 2017 No-Build Average Weekday Volumes on Selected Hudson River Crossings [1]**

Bridges	2017 N2					2017 N3				
	AM	MD	PM	NT	Daily	AM	MD	PM	NT	Daily
HOLLAND TUNNEL EB	13,400	15,190	8,710	9,830	47,130	13,500	15,270	8,790	9,890	47,450
BEAR MOUNTAIN BRIDGE EB	5,660	6,120	5,210	2,670	19,660	5,950	6,450	5,500	2,890	20,790
NEWBURGH BEACON BRIDGE - EB	12,980	13,500	8,880	9,230	44,590	13,230	13,750	9,000	9,650	45,600
TAPPAN ZEE BRIDGE EB	24,260	23,190	15,360	11,710	74,520	21,930	19,910	13,060	7,960	62,860
LINCOLN TUNNEL - EB	19,390	21,370	9,820	12,950	63,530	19,540	21,630	9,890	13,020	64,080
G WASHINGTON BRIDGE - EB	45,350	53,130	36,960	27,080	162,520	46,770	55,440	38,650	30,080	170,930
<b>TOTAL</b>	<b>121,040</b>	<b>132,500</b>	<b>84,940</b>	<b>73,470</b>	<b>411,950</b>	<b>120,920</b>	<b>132,450</b>	<b>84,890</b>	<b>73,490</b>	<b>411,710</b>

**Table A-2: Change in Year 2017 No-Build Average Weekday Volumes on Selected Hudson River Crossings [2]**

Bridges	Volume Change: 2017 N2				
	AM	MD	PM	NT	Daily
HOLLAND TUNNEL EB	100	100	100	100	400
BEAR MOUNTAIN BRIDGE EB	300	300	300	200	1,100
NEWBURGH BEACON BRIDGE - EB	300	300	100	400	1,100
TAPPAN ZEE BRIDGE EB	(2,300)	(3,300)	(2,300)	(3,800)	(11,700)
LINCOLN TUNNEL - EB	200	300	100	100	700
G WASHINGTON BRIDGE - EB	1,400	2,300	1,700	3,000	8,400
<b>TOTAL</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>

AM: AM Peak Period                      6AM - 10AM  
MD: Midday Peak Period                10AM - 4PM  
PM: PM Peak Period                      4PM - 8PM  
NT: Nighttime Period                    8PM - 6AM

[1] 2017 N2 = Revised No-Build with adjusted tolls on PANYNJ crossings and TZB tolls unchanged. 2017 N3 = adjusted tolls on both PANYNJ crossings and TZB.

[2] Numbers rounded to nearest 100. Daily totals represent summary of rounded values.