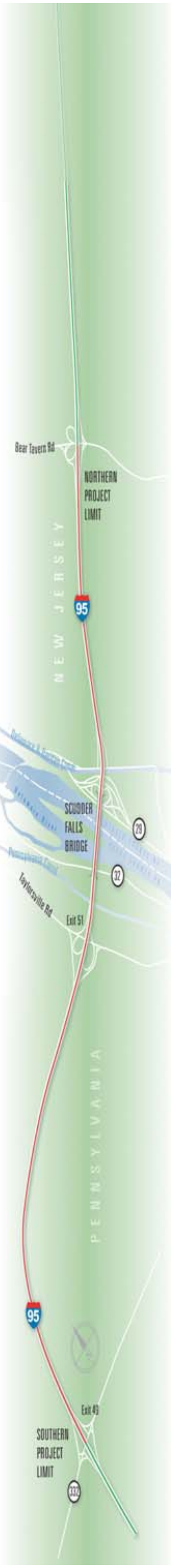

Prepared for:

Delaware River Joint Toll Bridge Commission

"Preserving Our Past, Enhancing Our Future"

Scudder Falls Bridge Traffic Diversion Study

REVISED FINAL REPORT

Contract C-502A-2C,
Capital Project No. 0809A

September 8, 2010
Updated May 11, 2011

Prepared by:
Jacobs Engineering Group, Inc.

Under Contract with:

AECOM

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AECOM

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May 11, 2011

Mr. George G. Alexandridis, P.E.
Chief Engineer
Delaware River Joint Toll Bridge Commission
Administration Building
110 Wood Street
Morrisville, PA 19067

RE: Task Order Assignment C-502A-2C
DMC Tolling Strategy Development and Implementation Support Services for the I-95/SFB Project
Scudder Falls Bridge Traffic Diversion Study Revised Final Report

Dear Mr. Alexandridis,

AECOM is hereby transmitting under this cover letter ten (10) copies of the revised final report for the study and analysis of the traffic diversions associated with tolling of the new Scudder Falls Bridge. This report entitled Scudder Falls Bridge Traffic Diversion Study was prepared by Jacobs Engineering Group, Inc. who was retained by AECOM to conduct this analysis. AECOM worked closely with Jacobs during the course of this analysis and the overall study. The original study report was completed and submitted as final on September 8, 2010. Subsequent to that date the report was forwarded to the Transportation Agencies (FHWA, PennDOT and NJDOT) for their review in conjunction with the review of the Addendum to the Environmental Assessment (EA). During this review a number of questions were raised regarding the methodology used to develop the traffic diversion volumes. This revised final report provides additional information and clarification to the overall methodology used by the AECOM team in this study. The traffic volume tables in the appendix section of the report have also been updated to reflect consistency in the overall traffic volume information that is being presented in the various SFB Project documents including the EA Addendum and the Point of Access (POA) Study Report.

The revisions to the original report include the following:

- Sources have been provided under each table shown in the report
- Language has been added to state that the numbers shown in the report may be rounded
- Language has been added regarding the DVRPC traffic volume information that was used to help estimate the effects of widening
- An explanation on toll elasticity has been added
- Language has been added on the estimated fees to be charged in addition to the toll
- Traffic Diversion Volumes have been added for all of the tolling scenarios
- An appendix section has been added to the report to help clarify and provide additional information on the overall methodology used in developing the traffic diversion volumes

AECOM has prepared the following Executive Summary that provides a brief summary of the purpose and overall findings from this study:

Executive Summary

The Delaware River Joint Toll Bridge Commission (DRJTBC) is planning to replace the existing Scudder Falls Bridge, which carries I-95 over the Delaware River between Pennsylvania and New Jersey. Presently, there are no tolls on the existing Scudder Falls Bridge. Tolls will be implemented on the replacement bridge, and will be collected in the southbound direction using a cashless system. The cashless toll system will have the ability to read EZ Pass transponders and will also capture license plate numbers so a toll invoice can be sent to the vehicle's owner. This type of toll system does not require the construction of a toll plaza and can capture the necessary tolling data while vehicles travel at highway speeds. The northbound direction will continue to be free of tolls, consistent with other river crossings in the area.

Purpose of Traffic Diversion Study

When tolls are introduced to a facility for the first time, it is expected that some drivers will divert to alternate locations to avoid paying the toll. It is also expected that the Scudder Falls Bridge Replacement Project, which includes a new, widened Scudder Falls Bridge, will attract additional traffic from the other river crossings, mitigating some of the effects of diversions due to tolling. To gain an understanding of the potential impacts of the traffic diversions on the local roadways and adjacent river crossings, the DRJTBC commissioned a study to forecast the volume of traffic that would divert from the Scudder Falls Bridge to alternate locations once tolls are implemented. The adjacent river crossings evaluated as part of this study included Washington Crossing Toll Supported Bridge to the north, and Calhoun Street Toll Supported Bridge, Lower Trenton Toll Supported Bridge and Trenton-Morrisville (Route 1) Toll Bridge to the south.

The resulting volumes were compared to the capacity of the existing roadway network in the region surrounding the Scudder Falls Bridge in order to evaluate the ability of these roadways to handle any increased volumes. The volume of traffic expected to divert to adjacent river crossings was also forecasted and compared to existing traffic volumes at those facilities.

The estimated traffic diversion was developed for the build year (2015) and future year 2030, assumed both a low toll scenario ($1 for passenger vehicles) and a high toll scenario ($3 for passenger vehicles) for the Scudder Falls Bridge. The truck toll for both scenarios was assumed to be $4 per axle for each truck. The diverted volumes for these scenarios were compared to traffic volumes projected to occur on the existing Scudder Falls Bridge without a toll.

Impacts for Most Likely Toll Scenario

The study examined the scenario of a "low toll" fee structure in which a $1 passenger vehicle toll would be implemented. As previously indicated the volumes generated under this "low toll" scenario were compared to volumes predicted to occur on the existing Scudder Falls Bridge with no toll for the build year (2015) and year 2030.

The results of the analysis show that, during the peak hour, the volume of traffic using the newly completed Scudder Falls Bridge will not be appreciably different than the volume of traffic that would use the existing bridge without a toll. In fact, the new Scudder Falls Bridge is expected to see a slight increase of 47 cars during the peak hour while the adjacent river crossings will each see a slight decrease in volume during the peak hour for the $1 toll scenario in the year 2015. A similar result is obtained for the peak hour in the year 2030 under the $1 toll scenario.

The reasons for these results may not be obvious at first glance. However, upon further examination, including observations of traffic conditions at alternative crossings, it is apparent that additional traffic will be attracted to using the newly completed Scudder Falls Bridge due to the combined improvements (additional travel lanes, safer ramp entrance and exit conditions) and the unacceptable travel delays associated with utilizing the alternative crossings. In essence the study reveals that motorists, who are already experiencing delays at these alternates, will be willing to pay a relatively modest toll in exchange for the reduced travel times and increased safety which will be provided by the new Scudder Falls Bridge.

The $1 toll is consistent with the Commission's policy of charging a toll rate at a particular facility that is equal to or close to that charged at adjacent facilities in the same region (the proposed $1 toll being just slightly higher than the existing $0.75 toll charged at the Rte 1 facility). Therefore the diversion analysis associated with a $1 toll is considered to be the most likely scenario, and should be given the greatest emphasis in terms of identifying impacts to surrounding roadways and alternative crossings.

Impacts of "High Toll" Scenario

Consistent with industry best practices, and in order to examine the sensitivity of traffic diversion due to various tolling rates, the study also analyzed diversion patterns associated with a "high toll' scenario ($3 for passenger vehicles).

The high toll scenario models the condition that would exist if tolls for passenger vehicles on the new Scudder Falls Bridge were elevated to a level that is four times greater than the existing passenger toll at the Trenton-Morrisville (Route 1) bridge, the nearest alternate toll crossing. It should be noted that a disparity in tolls of this magnitude is not in keeping with the Commission's current tolling policy which seeks to maintain similar toll rates across all facilities or across bridges that service regional customers.

The analysis of the traffic volumes for the peak hour of the build year 2015 reveals that a $3 toll for passenger vehicles on the new Scudder Falls Bridge would divert 259 vehicles to the nearby Commission-owned river crossings (Washington Crossing to the north, and Calhoun Street, Lower Trenton and Trenton-Morrisville (Route 1) to the south). The majority of these vehicles (144) will divert to the Rte 1 Toll Bridge.

However, in 2030, the analysis showed that traffic will migrate to the Scudder Falls Bridge and away from the other river crossings, resulting in an increase in peak hour traffic at the Scudder Falls Bridge compared to the no-build, no-toll condition. This counter intuitive result is because the peak hour drivers who diverted from the bridge to avoid the $3 toll in 2015 will return to using the Scudder Falls Bridge as the other river crossings and approach roadways grow more congested.

Impacts to Regional Roads

The impacts to surrounding roadways were evaluated by comparing the "volume-to-capacity" ratios for the no-build/no-toll condition to those for the condition with a new tolled Scudder Falls Bridge. Volume-to-capacity ratios are a measure of how close a roadway or bridge comes to its capacity – as the ratio increases the road or bridge experiences increased congestion, with a ratio of 1.0 meaning that the road or bridge is being used to its maximum capacity.

The results of the diversion analysis demonstrate that there is no negative impact to alternative crossings and approach roadways for the "low toll" scenarios in both 2015 and 2030 and the "high toll" scenario for 2030. This is because, as previously discussed, traffic for these scenarios will actually divert away from alternative crossings and approach roadways and to the new Scudder Falls Bridge.

The study did consider the impacts to alternative crossings and approach roadways due to the modest diversion of traffic in 2015 for the high toll scenario. The study found that for this one scenario, the small diversion of traffic has minimal impact on volume-to-capacity ratios; in the majority of instances, the v/c ratio experiences no increase with the most significant increase determined to be 0.08.

Impacts during Non-Peak Periods of the Day

The analysis also included a comparison of annual average daily traffic (AADT) on the Scudder Falls Bridge and adjacent river crossings within the study area. AADT is a measure of how much traffic occurs over an entire 24 hour period (not just the peak hour). As anticipated, the study revealed that the one-way AADT on the new Scudder Falls Bridge, in the toll direction, will decrease when tolls are imposed when compared to the no-build, no-toll condition. This result was expected, since motorists traveling during non-peak periods do not face the same delays at alternative crossings as those that occur during peak periods. Because of this a higher number of non-peak travelers will choose to avoid paying a toll when offered the alternative.

The study reveals that the daily diversion totals predicted are relatively small compared to the total volume of traffic on a particular facility. For example, the 253 vehicles that are expected to divert to the Calhoun Street Bridge over the course of a day (for the 2015 low-toll scenario in the westbound direction) represents 2.5% of the total westbound volume of traffic that uses this bridge over a 24 hour period(similar results occur across other roads and alternative bridges). The study further revealed that the majority of daily traffic diverting from the Scudder Falls Bridge (56%) are motorists who will divert to the Rte 1 Toll Bridge. This finding demonstrates that these same motorists are currently diverting to the Scudder Falls Bridge solely to avoid paying the toll at Rte 1 (a diversion pattern that will be eliminated through tolling of the Scudder Falls Bridge).

It is important to note that true congestion can only be quantified by comparing volume-to-capacity ratios during peak commuter periods. In other words the small increase in volume predicted over the course of a day – all of which occurs during non-peak periods for the low toll scenario - will not result in the worst congestion along roadways and at alternative crossings (the most significant congestion only exists during peak travel periods).

Conclusion

The overall findings of this study indicate that the traffic diversions resulting from the tolling of the new Scudder Falls Bridge will cause minimal traffic impacts to the adjacent roadways and bridge crossings within the region during both peak and non-peak periods.

For the most critical operational period (the peak hour),there is actually a small reduction in traffic on alternative crossings for the most likely toll scenario, and only a small increase in traffic in 2015 for the highly unlikely high-toll scenario. In both toll scenarios and during all periods of the day, the impact of tolling in terms of congestion (as measured by volume-to-capacity ratios for roadways and bridges) remains at or very close to current levels. These rational findings are a result of the limited capacity of alternative crossings and the significant operational and safety improvements associated with a new Scudder Falls Bridge

Please contact me at (215) 399-4344 if you should have any questions or need any additional information regarding this study report.

Yours sincerely,

AECOM

Daniel G. Faust (RLR)

Daniel G. Faust, P.E.
Project Principal

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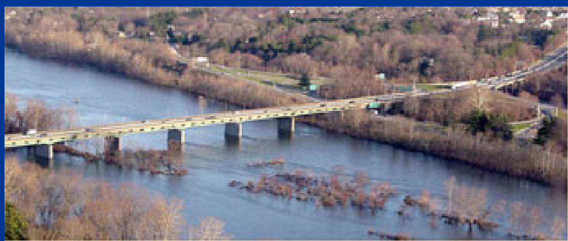
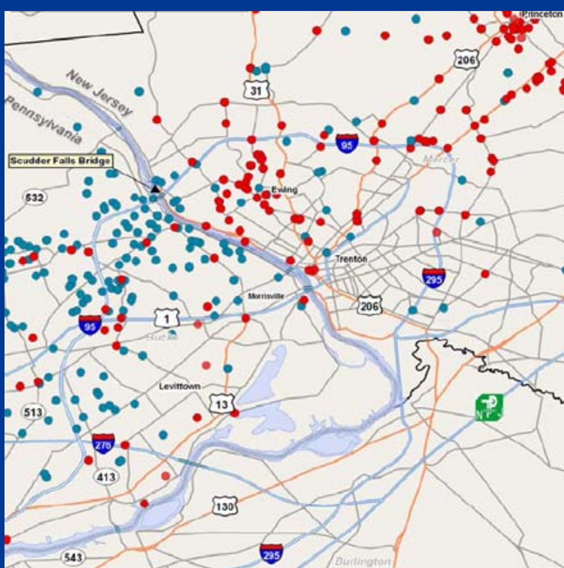


Submitted to:

AECOM

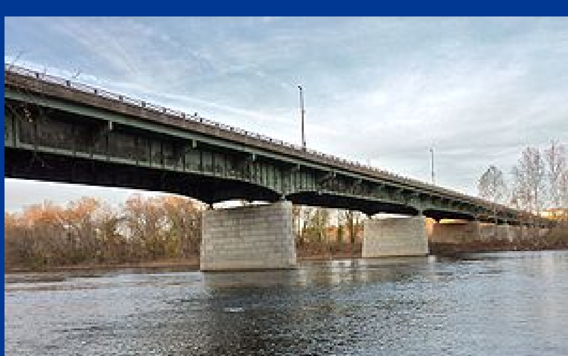
Delaware River Joint Toll Bridge Commission



Scudder Falls Bridge Traffic Diversion Study

DRJTBC Contract # C-502A-2C

FINAL REPORT



September 8, 2010

Updated May 11, 2011

Submitted by:

Jacobs Engineering Group Inc.
5 Penn Plaza, 18th Floor
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NAI Surface Transportation Consultancy
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office 1.212.944.2000
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May 11, 2011

Richard Rash
CPMC/DMC Project Director
AECOM
516 East State Street
Trenton, NJ 08609

Subject C-502A-2C Scudder Falls Bridge Traffic Diversion Study
September 8, 2010 Final Report, Revised May 11, 2011

Dear Rich,

In the attached report, Jacobs is pleased to provide traffic diversion estimates for the Delaware River Joint Toll Bridge Commission's (DRJTBC's) Scudder Falls Bridge. In this study, we have estimated the amount of net traffic diversion caused by both widening (as part of the Replacement Project) and tolling the Scudder Falls Bridge. We understand that these results will be used to determine the environmental impacts to local roadways and nearby river crossings associated with the tolling of the Scudder Falls Bridge.

As indicated in our approved scope of work, we prepared daily and peak hour diversion estimates for the years 2015 and 2030 for two different passenger car toll scenarios: a Low Toll of $1.00 and a High Toll of $3.00 (trucks are charged $4.00 per axle for each scenario). We estimated how much traffic would reroute, and to where it would reroute – including other Delaware River crossings and local streets – for each analysis year and toll scenario.

In order to develop our diversion estimates, we utilized three main sources of information:

- Jacobs' 2009 Traffic and Revenue Study, where we had estimated toll diversion percentages for the two toll levels, and conducted an origin-destination survey of Scudder Falls Bridge customers that would allow us to predict diversion routes
- the North Jersey Regional Transportation Traffic Model, which we modified in order to estimate effects of the Scudder Falls tolling on the other Delaware River crossings
- DVRPC's September 2004 Interstate 95 / Scudder Falls Bridge Traffic Study for the EA, which used their travel simulation models to determine the amount of new traffic attracted by the widened bridge in the Scudder Falls Bridge Replacement Project.

The general steps taken to produce traffic diversion results were:

- Collecting and compiling bridge and roadway traffic data
- Running and testing the NJRTM-E model to determine diversions to other river crossings
- Estimating volumes for the No Build/No Toll and Build/No Toll conditions
- Estimating volumes as well as diverted traffic volumes and routes for the Build/Low Toll and Build/High Toll scenarios
- Determination of volume-to-capacity ratios for each condition on roadway links negatively impacted by the toll diversion

It is Jacobs' opinion that the estimates of traffic provided herein are reasonable and that they have been prepared using acceptable methods. It is important to note that we have only included in our diversion estimates the roadways that are estimated to gain an additional 100 trips or more per day, or 10 trips or more in the peak hour (i.e., at least one car every six minutes). Others were not included because we believe the added volume is small and insignificant to the level of service of the roadway.

Our last report was distributed on September 8, 2010. Due to comments from PennDOT, NJDOT, and FHWA, we have made the following additions which appear in this May 11th version:

- Sources under each table, and text stating that numbers may be rounded
- Discussion on DVRPC volumes used to help estimate effects of widening (Pg 11). These effects of widening the road were in the Point of Access Study (POA), and we were advised to stay consistent between the Diversion Study and POA.
- Explanation of toll elasticity (Pg 11-12)
- Text on fees charged in addition to tolls (Pg 12)
- Diversion volume tables for the 2015 High Toll, 2030 Low Toll, and 2030 High Toll scenarios (Tables 11, 12 & 13, Pg 15)
- A mention that additional information could be found in the Appendix

In the appendix there have been revisions to:

- The 2010 Volume on I-95 n/of Rt 1 in PA. Data from new sources prompted us to change this.
- The Estimated Diversion Volume maps (due to our re-estimation of the effects of widening, to be consistent with the POA and the '04 DVRPC Study)
- The Estimated Volumes on Affected Roadways (changes throughout, to maintain consistency with the POA)
- The Estimated Volume-to-Capacity Ratios on Affected Roadways (calculated from the revised volume tables)

If you have any questions, please contact me by email at richard.gobeille@jacobs.com, or by phone at 212-944-2000 x 6202.

Sincerely,

Richard J. Gobeille, P.E.
National Unit Manager
NAI Surface Transportation Consultancy
Jacobs Engineering Group, Inc.

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EXECUTIVE SUMMARY

The Delaware River Joint Toll Bridge Commission (DRJTBC) is proposing to toll the Scudder Falls Replacement Bridge and collect tolls in the southbound direction only. The system being proposed is an all-electronic cashless toll collection system that will collect tolls via E-ZPass or video license plate capture. As part of the tolling process, it is necessary to determine the amount of traffic that will divert to other roadways and bridge crossings once tolls are implemented on the Scudder Falls Replacement Bridge. The Scudder Falls Replacement Project, which includes widening of the bridge and part of I-95, will also attract new vehicles to the bridge when it is completed. A Traffic Diversion Study has therefore been performed to determine the net amount of diverted traffic for both the build year of 2015 and the design year of 2030, compared to a No Build/No Toll condition. The results of this study will be used to determine the impacts to the current Environmental Assessment Document associated with the tolling of the Scudder Falls Replacement Bridge.

Jacobs Engineering, as a sub-consultant to AECOM, has been tasked with preparing a Traffic Diversion Study for the Scudder Falls Bridge Replacement Project and for determining the share of traffic that will be diverted away from the new Scudder Falls Bridge to other roadways and bridge crossings. Diversion estimates were developed for the build year (2015) and the design year (2030). The study compares the Build/Low Toll ($1.00 toll per passenger vehicle) and the Build/High Toll ($3.00 toll per passenger vehicle) scenarios to the No Build/No Toll condition (no Replacement Bridge and no toll). The truck toll for both the Low Toll and High Toll scenarios was kept constant at $4.00 per axle per truck, as consistent with Jacobs' 2009 Traffic and Revenue Study. For these various tolling scenarios, the toll at the existing Trenton – Morrisville Toll Bridge was kept constant at its current toll rate of $0.75 for passenger vehicles and the variable axle-based rate for trucks. In order to develop the traffic diversion numbers and the percentages of toll-diverted traffic for these various tolling scenarios, Jacobs utilized the North Jersey Regional Transportation Traffic Model in combination with traffic diversion estimates developed in Jacobs'2009 Study and the origin – destination survey results from that study. Additionally, Jacobs used results from the September 2004 Interstate 95 / Scudder Falls Bridge Traffic Study, conducted by the Delaware Valley Regional Planning Commission (DVRPC) to determine the amount of new traffic attracted by the Scudder Falls Replacement Bridge, and where this traffic is entering and exiting I-95.

Jacobs developed both daily and peak hour toll diversion estimate percentages for the Low Toll and High Toll scenarios for this study. Results are summarized in Table 1. Note that these results include *both* the traffic effects of widening and tolling the Scudder Falls Bridge, and should be compared to the No Build / No Toll condition.

Table 1: Net Traffic Changes* on the Scudder Falls Bridge

Toll Scenario	Daily	Peak Hour
2015 Low Toll	-7%	1%
2015 High Toll	-19%	-6%
2030 Low Toll	-6%	5%
2030 High Toll	-16%	1%

**Due to both widening (Replacement Project) and tolling*
Note: Some numbers may be rounded
Source: Jacobs

The results show that 7 percent of the daily traffic will be diverted away from the Scudder Falls Replacement Bridge with the Low Toll scenario and approximately 19 percent of the daily traffic will divert away from the bridge with the High Toll scenario in the year 2015, compared to the No Build / No Toll condition. This result demonstrates that the higher the toll rate the more likely it is for traffic to divert away from the Scudder Falls Replacement Bridge. Similarly, the results show that for the year 2030, approximately 6 percent of the daily traffic will be diverted away from the Scudder Falls Bridge with the Low Toll scenario and approximately 16 percent of the daily traffic will divert with the High Toll scenario. These overall results indicate that as traffic increases between 2015 and 2030, some of the traffic that had been diverting away from the Scudder Falls Bridge will go back to using the Scudder Falls Bridge crossing as nearby river crossings become more congested.

The results for the peak hour traffic diversions indicate that the Scudder Falls Replacement Bridge will actually *gain* a small amount of traffic during the 5:00 PM to 6:00 PM peak hour for some of the scenarios analyzed. This is reasonable due to additional capacity provided by the Replacement Project, the heavy congestion that is currently experienced on the adjacent river crossings during peak periods, and the fact that diverting to the adjacent river crossings (Washington Crossing Toll-Supported Bridge and the Calhoun Street Toll-Supported Bridge in particular) could greatly increase the motorist's trip time. During the peak hour there will be approximately a one percent gain in Scudder Falls Bridge traffic under the Low Toll scenario in the year 2015, and about a 6 percent loss in traffic under the High Toll scenario for that same year. About a 5 percent gain in peak hour traffic is expected on the Scudder Falls Bridge under the Low Toll scenario in the year 2030 and approximately a one percent gain is estimated under the High Toll scenario for that same year. As was the case for the daily traffic diversions, as the overall traffic increases between the years 2015 and 2030, peak hour drivers who once diverted from the Scudder Falls Bridge are more likely to return to the Scudder Falls Bridge as it provides increased time savings over nearby river crossings.

The study results also indicate – as shown in Table 2 – that the greatest percentage of traffic diverting away from the Scudder Falls Bridge – 56 percent – will divert to the Trenton – Morrisville Toll Bridge. A majority of this diverting traffic is most likely the result of traffic that used the existing Scudder Falls Bridge to avoid the toll at the Trenton – Morrisville Toll Bridge and now finds no reason to do so. In addition, an estimated 12 percent of the diverted vehicles either decide not to make the trip across the Delaware River, divert to a crossing outside the area, or leave the area roadways altogether. Approximately 19 percent of diverting traffic is expected to use the Washington Crossing Toll Supported Bridge, 11 percent is estimated to move to the Calhoun Street Toll Supported Bridge and about two percent is expected to move to the Lower Trenton Toll Supported Bridge. During the peak hour for toll scenarios that estimate a *gain* in Scudder Falls Bridge traffic, these same percentages apply, but as a loss in traffic on the other bridges. For example, when the Scudder Falls Bridge is expected to have a one percent increase in traffic during the peak hour due to widening and tolling (as it does with the 2015 Low Toll scenario), 56 percent of this gain is expected to come from the Trenton-Morrisville Toll Bridge.

Table 2: Split of Traffic Diversions to (or from) Other Crossings

Bridge	Percent of Scudder Falls Traffic Diversion (or Traffic Gain)
Washington Crossing	19%
Calhoun St	11%
Lower Trenton	2%
Trenton-Morrisville (Toll)	56%
Diverted Elsewhere/Trips not Made	12%
Total	100%

Note: Some numbers may be rounded
Source: Jacobs

The overall findings of this study indicate that the traffic diversions resulting from the tolling and replacement of the Scudder Falls Bridge will result in minimal traffic impacts to the adjacent roadways and bridge crossings within the network during the most critical operational period – the peak hour – where our analysis shows a slight *gain* in Scudder Falls Bridge traffic when it is both replaced and tolled, with the exception of 2015 with the High Toll condition, where there is a 6 percent traffic loss. A small gain in peak hour traffic on the Scudder Falls Replacement Bridge means that there is a slight traffic *reduction* on the other area bridges during this time period compared to a No Build/No Toll condition. The changes in traffic on the Scudder Falls Bridge and the other bridges during this critical peak hour are further illustrated later in this report in Figure 4 and Figure 5, while changes to the peak hour volume-to-capacity ratio on each bridge and affected roadway are presented along with the final diversion results in the Appendix. Additional information on the study methodology can also be found in the Appendix.

1 INTRODUCTION

As part of its I-95 / Scudder Falls Bridge Replacement Project, the Delaware River Joint Toll Bridge Commission ("DRJTBC or "the Commission") is proposing tolls on the Scudder Falls Bridge, which is currently a toll-supported (non-tolled) bridge. Jacobs was retained by the Commission, as a sub-consultant to AECOM, to determine diversion routes and estimate diverted traffic volumes due to the Replacement Project and tolling of the Scudder Falls Bridge. Results of this study, presented in the Appendix, will be used to support the NEPA process in terms of any environmental effects that may result from changes in traffic.

Tolling existing facilities, in general, causes traffic to divert to other roadways; however, widening of the Scudder Falls Bridge - as part of the Replacement Project - is also expected to attract traffic to the bridge from other crossings. This diversion study determines the net traffic changes resulting from both the widening (Replacement Project) and tolling of Scudder Falls Bridge.

Jacobs completed a Level 2[1] Traffic and Revenue ("T&R") Study for the Scudder Falls Bridge in early 2009 which estimated average daily traffic and annual toll revenue levels for two different sets of toll rates. Findings from this T&R study were the main contributor to this traffic diversion study in terms of toll diversion percentages and diversion routes. Regional models and DVRPC's September 2004 Study – which determined the traffic effects of the Replacement Project (without tolls) - were also employed in this analysis.

Jacobs developed diversion estimates for both the peak hour and total daily traffic, for the years 2015 and 2030, using two different passenger car toll levels: a Low Toll of $1.00 and a High Toll of $3.00. For diversion routes which are expected to experience heavier traffic volumes due to Scudder Falls Bridge tolling, we were asked to provide volumes for the "before tolling" No Build and Build conditions and the "after tolling" Build condition for the two toll levels.

2 STUDY BASIS AND GENERAL APPROACH

This diversion analysis is based on the following:

- Two different toll levels - $1.00 and $3.00 – were used on the Scudder Falls Bridge for all future years. The toll rate at the Trenton-Morrisville Bridge will remain the same as today (e.g., $0.75 for passenger cars) for future years of the analysis. These toll rates are consistent with those in the 2009 T&R Study Jacobs completed for DRJTBC.

[1] Below investment grade, but above feasibility-level

- Similar to other DRJTBC toll bridges, tolling would be in the Pennsylvania-bound direction only, and would be all-electronic ("AET"), meaning that tolls would be collected via E-ZPass or video license plate capture.
- The Scudder Falls Bridge and I-95 will be widened as planned to three lanes per direction (plus auxiliary lanes on the bridge) from NJ Route 29 to PA Route 332 by 2015.
- The "No Build/No Toll" condition was used as our base. The diversion results for each toll scenario are the difference between the Build/Toll scenario and the No Build/No Toll, therefore we are including the rerouting of traffic caused both by widening the Scudder Falls Bridge/I-95 (attracted trips) and by tolling the bridge (toll diverted trips). We refer to the combined effect as "diversion" throughout this report.

The general study approach was to use existing data and travel demand models to estimate diversion routes and volumes. Total daily diversions off of the Scudder Falls Bridge due to tolling came from Jacobs' 2009 study. The routes and diverted volumes on each were developed from Jacobs' origin-destination ("O-D") surveys performed as part of the 2009 Study, combined with estimates from regional models.

In the 2009 Study, Jacobs had conducted a Travel Behavior Survey for four weeks in November/December 2008, where variable message signs on the Scudder Falls Bridge approaches directed customers to a website where they were asked questions about their last trip across the bridge, including their origin and destination. We mapped the origin and destination locations (shown in Figure 2 and Figure 3, later in this report), providing valuable insight into people's travel routes and the concentration of trips on each route.

Regional models are deemed to be valuable tools in the forecasting process because they incorporate zonal demographic information that estimates the number of trips generated by an area, and roadway attributes such as speed, facility type and number of lanes which determine route choice. Two regional models cover the Scudder Falls Bridge area: the DVRPC (Delaware Valley Regional Planning Commission) model and the NJRTM-E (North Jersey Regional Transportation Model-Enhanced). The NJRTM-E model was chosen because it was the most readily available; Jacobs currently owns a copy of the NJRTM-E and our modelers are familiar with the mechanics of the model. The NJRTM-E covers a large region from southern New York State to southern New Jersey and eastern Pennsylvania. It has been calibrated to traffic on a region-wide basis, most specifically to the NJ area for which it was intended. Jacobs tested the model with various toll penalties on the Scudder Falls Bridge in order to calibrate to the total diversion determined in our earlier T&R Study. Once this was achieved, we were able to view the model-assigned diversions of trips to Delaware River crossings north and south of the Scudder Falls Bridge, and determine the number of trips no longer made due to the Scudder Falls Bridge toll. By running the models separately by time of day, we were also able to determine the difference between peak and daily diversion. When we combined these factors with our O-D survey results, which reflected actual trip patterns, we were able to develop estimates of peak hour and daily diversion on affected roadway links.

In addition, some information from DVRPC's September 2004 Interstate 95 / Scudder Falls Bridge Traffic Study was used to develop our results. While we had only estimated future *annual* background growth rates in our T&R study, the DVRPC Study had used its models to also estimate future growth in *peak hour* traffic, which we incorporated into our analysis. DVRPC had also run its models for both the Build (i.e., with a widened I-95 and Scudder Falls Bridge) and No Build conditions, without tolls on the Scudder Falls Bridge. We used the percent difference in model-assigned traffic on the bridge, and volume differences on roadways connecting into I-95, to develop Build/No Toll volumes from our No Build/No Toll volumes.

In general, the steps taken to produce diversion results were:

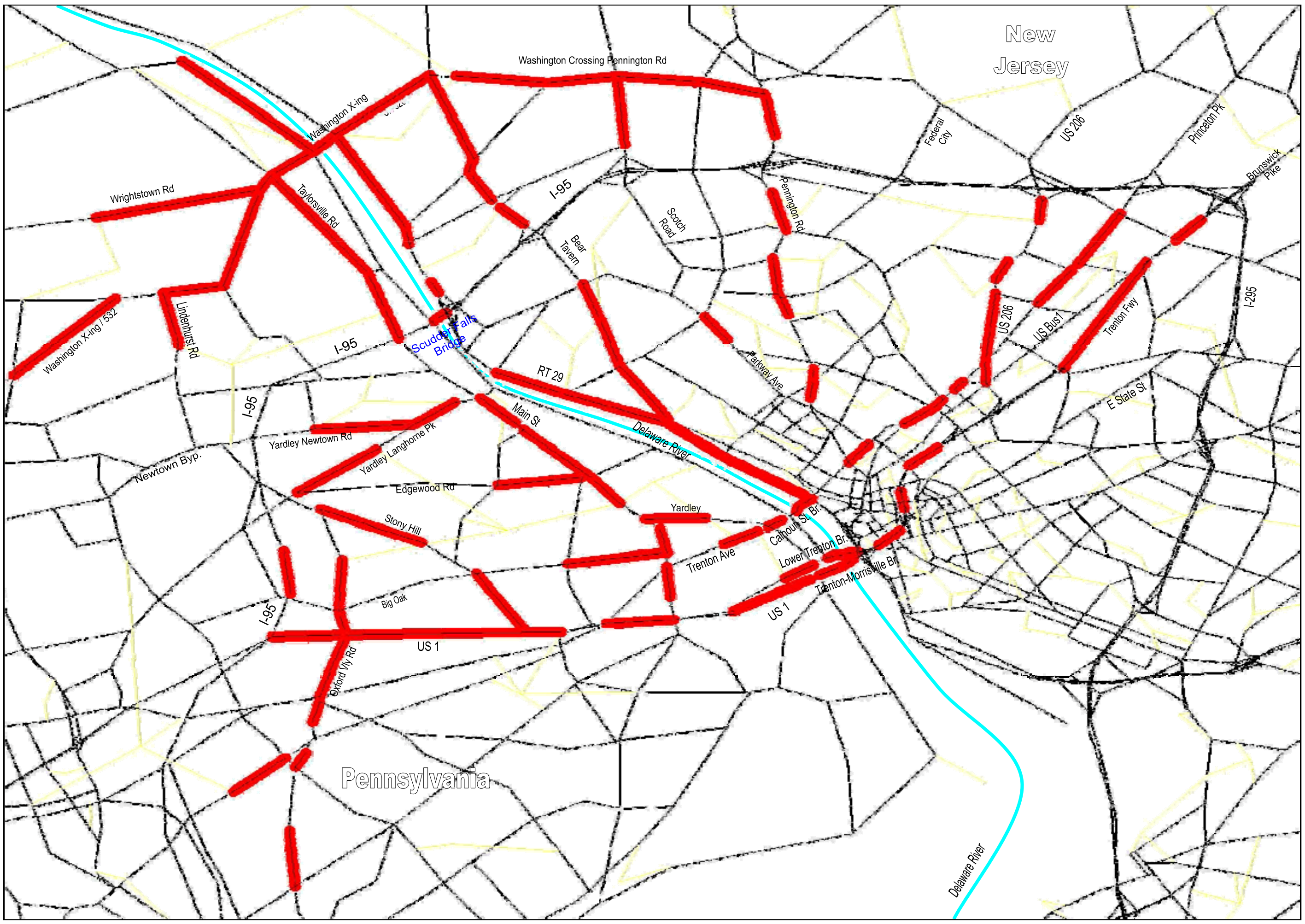
- Collecting and compiling bridge and roadway traffic data
- Running and testing the NJRTM-E model
- Estimating volumes for the No Build/No Toll and Build/No Toll conditions
- Estimating volumes as well as diverted traffic volumes and routes for the Build/Low Toll and Build/High Toll scenarios
- Determination of volume-to-capacity ratios for each condition on roadway links negatively impacted by the toll diversion

3 DATA COLLECTION AND COMPILATION

3.1 CURRENT AADT AND HOURLY VOLUMES

Recent average annual daily traffic (AADT) and hourly volumes on roadways and bridges considered to be affected by the toll diversion were obtained from DVRPC and the DRJTBC. Some of these counts were two-way totals, and some were by direction. Additional count and AADT data was obtained through PennDOT and NJDOT. Available count data for those roadway links impacted by diversion were put onto a model network. Figure 1 highlights these links in red.

Figure 1: Count Data Locations for Affected Roadway Links



All of the DRJTBC bridges from the Washington Crossing Toll-Supported Bridge to the Trenton-Morrisville Route 1 Toll Bridge are expected to be impacted from the Scudder Falls Bridge toll diversion. The AADT and Pennsylvania-bound peak hour (5:00-6:00 PM) counts on these bridges are shown in Table 3. Tables in the Appendix show the 2010 volumes on all roadway links expected to have additional future traffic due to toll diversion.

Table 3: 2010 Volumes, DRJTBC Bridges in Scudder Falls Area

Bridge	2-Direction AADT	PA-Bound AADT	PA-Bound 5-6 PM Volume
Washington Crossing	6,900	3,899	763
Scudder Falls	*57,100*	*30,500*	*4,324*
Calhoun St	18,400	9,258	908
Lower Trenton	18,100	13,409	1,169
Trenton-Morrisville (Toll)	50,700	20,953	3,163

Note: Some numbers may be rounded
Source: 2010 DRJTBC Traffic Counts

3.2 WASHINGTON CROSSING OBSERVATIONS

The Washington Crossing Bridge and the Calhoun Street Bridge are the two closest bridges north and south, respectively, to the Scudder Falls Bridge. Each of these bridges is small (one lane per direction) and because they are competitors to the Scudder Falls Bridge, they are expected to experience some changes in traffic due to the widening and tolling of the Scudder Falls Bridge. While the Calhoun Street Bridge is currently closed for repairs, we conducted field observations at the Washington Crossing Bridge during the peak hour. Details and photos of observed traffic are presented in the Appendix.

From these observations, it is apparent that the existing geometry of the Washington Crossing Bridge combined with the traffic signal on the east end and the stop sign on the west end caused slow traffic during the PM peak hour. Backup through the nearest intersection – New Jersey Route 29 – was observed to occur during five or fewer signal cycles during the hour.

4 NJRTM-E MODEL RUNS AND TESTING

The North Jersey Transportation Planning Authority's (NJTPA's) North Jersey Regional Transportation Model – Enhanced (NJRTM-E) is a regional planning model covering a large area from southern New York State to southern New Jersey and eastern Pennsylvania, including Bucks county. As stated previously, the NJRTM-E model was used to supplement results of Jacobs' 2009 T&R Study to estimate diversion routes and volumes.

Because the model did not have the Scudder Falls Bridge designated as a toll facility, it was necessary for Jacobs to add a tolling element to make it suitable for the purposes of this study. The amount of toll-diverted volume had already been estimated in Jacobs' previous T&R work; we calibrated the model to this toll diversion with the use of time penalties on the Scudder Falls Bridge. Time penalties are widely used in regional modeling to represent tolling.

4.1 SENSITIVITY TESTING

It was necessary to perform sensitivity testing with the NJRTM-E in order to determine the appropriate factors to apply to the model to recreate the toll diversion estimated in Jacobs' 2009 Study.

A subarea of the NJRTM-E was created to simplify the sensitivity process; this was simply a smaller extraction of the NJRTM-E that allowed for quicker model run times. The subarea model maintained all characteristics of the parent model, including link speeds and capacities, and O-D information.

Similar to many other regional models, the actual monetary cost of the toll is not a model input in the NJRTM-E. The 'cost' to vehicles traveling in the model can be reduced to time, and the toll to drivers can be represented by penalizing certain traffic movements with a time penalty, typically referred to in travel demand modeling as a 'turn penalty'. Turn penalties are typically reserved for depicting locations where making specific turning movements may be more difficult than represented in a coarse, regional travel demand model; in this case, they were utilized to simulate the monetary penalty that drivers would experience by crossing the newly tolled Scudder Falls Bridge.

A series of traffic assignments were performed in the subarea model with varying turn penalties applied separately to cars and trucks. The toll diversion for each assignment was recorded and compared to the percent diversions estimated in Jacobs' 2009 Study. The final, successful combination of turning penalties for cars and trucks was added to the larger NJRTM-E's turn penalty file for further application.

4.2 DAILY AND TIME-OF-DAY MODEL RUNS

With a set of turning penalties in place for the model that calibrated to the toll diversions in Jacobs' 2009 Study, it was possible to run the NJRTM-E for a daily assignment.

The highway network and origin-destination ("O-D") tables in the NJRTM-E exist in four pieces representing four time periods during the average annual weekday. These periods are:

AM Peak	(6:00am-9:00am)
Midday	(9:00am-3:00pm)
PM Peak	(3:00pm-6:00pm)
Night	(6:00pm-6:00am)

For purposes of the diversion analysis, the four time period networks and O-D tables were combined into a single daily trip table.

Jacobs was asked to provide diversion results for the years 2015 and 2030. The current version of the NJRTM-E did not have data for 2015; this was created by applying linear interpolation to 2010 and 2020 origin-destination tables to create a 2015 table. Traffic assignments were then performed for the years 2010, 2015, and 2030. The years 2015 and 2030 were each run with and without the toll on the Scudder Falls Bridge for the No Build condition. The tolled and non-tolled versions of each year's assignment were compared to determine toll diversion routes and volumes estimated by the NJRTM-E. While Jacobs' O-D surveys provided the best information on trip patterns on local roads, the NJRTM-E was used to estimate the diversions to the bridges north and south of the Scudder Falls Bridge due to tolling, and to estimate the percent of trips that are no longer in the area, either because they divert to facilities outside the area or are no longer made.

The NJRTM-E model was also run once with the time of day split out. This provided useful information about peak period versus daily diversions (detailed later in this report in Table 8 and Table 9).

5 DIVERSION ESTIMATES

We estimated diversion routes and volumes based on our previous T&R work, the NJRTM-E model runs, O-D survey results from our previous study, and factors developed from DVRPC's September 2004 I-95 / Scudder Falls Bridge Traffic Study. This section explains how each was used, and presents the route diversions and volumes.

5.1 VOLUMES WITH A NON-TOLLED SCUDDER FALLS BRIDGE

In order to develop future year diversions it was first necessary to estimate future year volumes without tolls. First, using estimated background growth rates, we developed volumes for a No Build/No Toll scenario. Then, using factors from DVRPC's Study, we calculated the traffic for a Build/No Toll scenario, which assumes that the I-95 / Scudder Falls Bridge Replacement Project, which includes widening of the roadway and bridge, has been completed.

In Jacobs' 2009 T&R Study, background growth rates through 2018 - the end of the forecast period - had been determined by first correlating historic traffic growth with the national Gross Domestic Product (GDP) and Industrial Production Index (IPI), then using *Blue Chip Economic Indicators* forecasts of GDP and IPI to predict future traffic growth. We have extrapolated this growth through the year 2030. Table 4 shows the estimated background growth rates in daily traffic and the average annual percent change (AAPC).

Table 4: Scudder Falls Estimated Future Growth Rates in Daily Traffic, No Build/No Toll

Year	Growth Over 2010	AAPC from 2010	Growth Over 2015	AAPC from 2015	No Build/ No Toll AADT
2010					30,500
2015	5.8%	1.2%			32,266
2030	21.1%	1.1%	14.5%	1.0%	36,936

Note: Some numbers may be rounded
Source: Jacobs

Since Jacobs had only produced traffic on a daily basis for our 2009 T&R Study, not peak hour, we used information from DVRPC's 2004 Study to estimate peak hour (5:00 to 6:00 PM) growth rates. DVRPC had used their travel simulation models to develop their forecasts. As seen in Table 5, the peak hour growth between 2010 and 2015 was estimated to be the same as daily growth (1.2 percent annually), while after 2015 the peak hour growth slows to about 0.5 percent annually.

Table 5: Scudder Falls Estimated Future Growth Rates in Peak Hour Traffic, No Build/No Toll

Year	Growth Over 2010	AAPC from 2010	Growth Over 2015	AAPC from 2015	No Build/ No Toll Pk Hr Vol
2010					4,324
2015	5.8%	1.2%			4,574
2030	13.2%	0.7%	7.0%	0.5%	4,895

Note: Some numbers may be rounded
Sources: DVRPC, "Interstate 95 / Scudder Falls Bridge Traffic Study", September 2004; Jacobs

As a next step, we developed volumes for the Build/No Toll condition. According to DVRPC's 2004 Study, when the widening occurs, daily traffic is expected to increase by 12 percent in 2015 and by 11 percent in 2030 on the Scudder Falls Bridge. DVRPC had estimated about the same percentage growth in the peak and daily numbers when compared to the No Build condition. Jacobs applied these factors to the No Build to estimate the Build traffic volumes shown in Table 6.

Table 6: Scudder Falls Bridge Build vs. No Build Traffic

Year	No Build/ No Toll Traffic	DVRPC- Estimated Change in Traffic Due to Widening	Change in Traffic	BUILD/ No Toll Traffic
Daily (AADT)				
2015	32,266	12%	3,748	36,014
2030	36,936	11%	4,031	40,967
Peak Hour				
2015	4,574	12%	530	5,104
2030	4,895	11%	532	5,427

Note: Some numbers may be rounded
Sources: DVRPC, "Interstate 95 / Scudder Falls Bridge Traffic Study", September 2004; Jacobs

Of course, most of the traffic attracted to the widened Scudder Falls Bridge will have diverted from another bridge in the area, but there will also be some newly-formed trips. To determine the changes in trip patterns due to "attraction" by the widened bridge, Jacobs utilized DVRPC's 2004 Study. The study reveals that widening I-95 and the Scudder Falls Bridge will cause small increases in peak hour traffic (and larger increases in daily traffic) on routes feeding into I-95; the traffic is shifting over from alternative river crossing routes. While the DVRPC study did not analyze routes that will have reduced traffic due to the I-95/Scudder Falls widening, it is logical that the parallel routes and bridges will experience traffic loss, and that the split of diverted traffic to these parallel routes would be similar to the split of attracted traffic coming from the parallel routes. Trip origins and destinations from Jacobs' 2008 surveys of Scudder Falls Bridge customers were used in combination with the DVRPC Build vs. No Build volumes to estimate traffic shifts throughout the area due to widening I-95 and the Scudder Falls Bridge. The methodology of utilizing O-D data to estimate traffic diversion is further discussed in pages 16-19.

5.2 DAILY DIVERSION OFF SCUDDER FALLS BRIDGE

In Jacobs' 2009 Study, we estimated average daily traffic and annual toll revenue levels for two different sets of toll rates. In developing these results, Jacobs used O-D data we collected in a 2008 online survey of the Scudder Falls Bridge users to help determine the number of current drivers that would likely leave the facility at a toll rate of $1.00 for passenger cars (17 percent diversion) and $4.00 per axle for trucks (33 percent diversion). Then, a "toll elasticity factor" was applied to estimate diversion for a higher toll rate of $3.00 for passenger cars.

"Toll elasticity" is the reaction of traffic to a higher toll rate. It is defined as the percent change in traffic divided by the percent change in tolls. Generally for toll facilities in the northeast, it ranges from -0.08 to -0.15 for cars. A factor of -0.08 was chosen for Scudder Falls because the major alternative routes are tolled and collection is all-electronic, so traffic is less likely to shift from a toll increase than on an average toll facility. With a -0.08 elasticity factor and a 200 percent increase in tolls ($1.00 to $3.00) traffic would decrease by 16 percent. Assuming as a base the 83 percent of current trips are retained with a $1.00 toll, and deducting 16 percent, 70 percent of trips are retained on the Scudder Falls Bridge with a $3.00 toll compared to the toll free case; 30 percent divert.

Like other all-electronic toll facilities, additional fees are charged for non-E-ZPass vehicles – those who are identified and billed through video license plate capture – in order to cover the additional operational costs for these transactions. These fees, estimated at $1.75 per transaction for registered video customers and $3.50 for unregistered customers, have been considered in addition to the toll rates when determining toll diversion. Roughly 20 percent of trips are expected to be billed through video license plate capture and pay extra fees. The vast majority of these will be infrequent and long-distance customers whose behavior is much less likely to be affected by toll prices and fees than regular users.

Table 7 shows our estimated percentages of diversion off the Scudder Falls Bridge for the two different sets of toll rates for the 2010 Pro Forma condition. Note that the 2010 AADT estimated in Jacobs' 2009 Study has been replaced with the actual 2010 AADT of 30,500.

Table 7: Scudder Falls Estimated Toll Diversion Based on Jacobs' 2009 Study, 2010 Pennsylvania-bound AADT

				2010	2010 Pro Forma*	
Toll Scenario	Car Diversion %	Truck Diversion %	Overall Diversion %	AADT Before Tolling	AADT After Tolling	Diverted Daily AADT
Low Toll Case: $1.00 car, $4.00 per Axle Truck	17%	33%	18%	30,500	24,876	5,624
High Toll Case: $3.00 car, $4.00 per Axle Truck	30%	33%	30%	30,500	21,268	9,232

* No Build, with tolls
Note: Some numbers may be rounded
Sources: Jacobs, "Long Term Traffic & Revenue Report", March 2009; 2010 DRJTBC Traffic Counts

Jacobs' percent diversion in the 2009 Study represented only diversion away from the Scudder Falls Bridge due to tolling and did not include an increase in traffic attracted to the Scudder Falls Bridge due to a wider I-95 and wider Scudder Falls Bridge. We believe that the toll-diverted volume would not be appreciably different if we were to base it on the Build scenario. In the 2009 Study, we had applied 19 percent and 30 percent diversion to the 2015 No Build AADT of 32,266, calculating to 5,980 and 9,773 diversions for the Low and High Toll Case, respectively. We have estimated a Build / No Toll AADT of 36,014 for 2015; the Low Toll and High Toll diversions of 5,980 and 9,773 calculate to about 17 percent and 27 percent diversion off of the bridge, respectively, when compared to the Build/No Toll volume.

NJRTM-E models were used to help determine how the percent diversion might change in the later years of our analysis. Applying the time penalty (to represent tolling, as described on page 9) to the Scudder Falls Bridge for each model year yields a smaller percent diversion in 2030 than it does in 2015. This is because, as the area roadways become more and more congested, drivers are more likely to stay on the less crowded toll road. Table 8 shows the estimated future No Build / No Toll and Build / No Toll daily volumes on the Scudder Falls

Bridge, the changes in traffic due to widening and tolling, and the estimated traffic for the Build conditions with each toll scenario. Daily traffic on the Scudder Falls Bridge is expected to decrease by 6 to 7 percent for the Low Toll scenario, compared to the future No Build condition. With High Tolls, bridge traffic is expected to decrease 16 to 19 percent from the future No Build condition.

Table 8: Scudder Falls Estimated Traffic and Diversion, 2015 and 2030 Pennsylvania-bound AADT

Toll Scenario	No Build/ No Toll Vol	Build/ No Toll Vol	Traffic Change due to Widening		Traffic Change due to Tolling		Net Traffic Change		Build/Toll Volume
2015 Low Toll	32,266	36,014	3,748	12%	(5,980)	-17%	(2,233)	-7%	30,033
2015 High Toll	32,266	36,014	3,748	12%	(9,773)	-27%	(6,025)	-19%	26,241
2030 Low Toll	36,936	40,967	4,031	11%	(6,274)	-15%	(2,243)	-6%	34,693
2030 High Toll	36,936	40,967	4,031	11%	(9,889)	-24%	(5,858)	-16%	31,078

Note: Some numbers may be rounded
Sources: DVRPC, "Interstate 95 / Scudder Falls Bridge Traffic Study", September 2004; Jacobs, "Long Term Traffic & Revenue Report", March 2009

5.3 PEAK HOUR SCUDDER FALLS TRAFFIC DIVERSION

Developing peak hour diversions was not a part of Jacobs' 2009 T&R Study, however, it is apparent that a smaller percentage of traffic would divert during the peak than the off-peak due to tolling because:

- Peak trips tend to be necessary trips, such as work trips, where arriving on time is important, so drivers are generally more likely to pay a toll
- Drivers are more willing to pay a toll for a faster trip if there is congestion, which exists mainly in peak hours, on the alternate routes

The peak hour at Scudder Falls Bridge Pennsylvania-bound is 5:00 PM to 6:00 PM. Using the NJRTM-E time-of-day models, and applying the same penalty representing tolls (as discussed earlier in this report) to the peaks and off-peaks, we were able to estimate what peak period diversion would be in comparison to daily diversion. The estimated peak hour traffic and diversions are shown in Table 9. The table includes the future No Build / No Toll and Build / No Toll peak hour volumes on the Scudder Falls Bridge, the changes in traffic due to widening and tolling, and the estimated peak hour traffic for the Build conditions for each of the two toll scenarios. Note that the net traffic change on the Scudder Falls Bridge is *positive* for both years with the Low Toll case and in 2030 with High Tolls. This means that the amount of traffic being attracted by the new, widened bridge is greater than the amount diverted due to tolling. In 2015 with the High Toll scenario, peak hour toll diversion is greater than traffic attraction due to the widening, resulting in an estimated loss of about 6 percent.

Table 9: Scudder Falls Estimated Traffic and Diversion, 2015 and 2030 Pennsylvania-bound Peak Hour

Toll Scenario	No Build/ No Toll Vol	Build/ No Toll Vol	Traffic Change due to Widening		Traffic Change due to Tolling		Net Traffic Change		Build/Toll Traffic
2015 Low Toll	4,574	5,104	530	12%	(483)	-9%	47	1%	4,621
2015 High Toll	4,574	5,104	530	12%	(789)	-15%	(259)	-6%	4,315
2030 Low Toll	4,895	5,427	532	11%	(301)	-6%	231	5%	5,126
2030 High Toll	4,895	5,427	532	11%	(474)	-9%	58	1%	4,953

Note: Some numbers may be rounded
Sources: DVRPC, "Interstate 95 / Scudder Falls Bridge Traffic Study", September 2004; Jacobs, "Long Term Traffic & Revenue Report", March 2009

5.4 USE OF NJRTM-E FOR ESTIMATED DIVERSION TO OTHER BRIDGES

As stated earlier, the NJRTM-E did not have a high enough level of detail to be used alone for diversion estimates on local streets. Like other regional models, it works best for "big picture" traffic estimates, therefore, it was used to estimate the number of vehicles diverting to bridges north and south of Scudder Falls. Table 10 shows, for the 2015 Low Toll model run, the model-estimated daily diversions due to the addition of tolls at the Scudder Falls Bridge. While the total toll diversions to bridges to the north and total diversions to bridges to the south appeared reasonable, the model placed far too many trips on the Lower Trenton Bridge, and too few on the Calhoun Street and Trenton-Morrisville bridges (as suggested by Jacobs' O-D survey results and current congestion levels on the Lower Trenton Bridge). Jacobs manually reapportioned the trips to the three southern bridges based on origin and destination locations of current Scudder Falls Bridge customers (seen later in this report, in Figure 2 and Figure 3).

The toll diversions were then factored up to match Jacobs' total diverted vehicles for this scenario due to tolling alone - 5,980 - estimated using the toll diversion rate in the earlier T&R study. The diversion volumes were then factored to the total estimated diversion of 2,233 vehicles - as shown earlier in Table 8 – representing both the effects of toll diversion *and* attraction to the Scudder Falls Bridge due to the widening. As seen in Table 10, the majority of traffic – an estimated 56 percent of the traffic diverted off the Scudder Falls Bridge – is expected to reroute to the Trenton-Morrisville Bridge. About 12 percent of trips are expected to disappear from the area. Some of these trips are diverted outside the area, and some trips are no longer made.

Table 10: Estimated Daily Diversions to Other Bridges, 2015 Low Toll Scenario

Bridge	Unadjusted Toll Diversions: Model-Estimated Diversions	Unadjusted Toll Diversions: Total Diverted to North	Unadjusted Toll Diversions: Total Diverted to South	Unadjusted Toll Diversions: Reapportioned Bridge Volumes	**Percent of Diverted Traffic**	Adjusted Diversions: Factored to Match Jacobs' SFB *Toll* Diversion Estimate	**Adjusted Diversions: Factored to Match Jacobs' SFB TOTAL Diversion Estimate**
Washington Crossing	929	929		929	**19%**	1144	**427**
Scudder Falls (Toll)	*-4855*			*-4855*	**-100%**	*-5980*	***-2233***
Calhoun St	289		3322	550 (1)	**11%**	677	**253**
Lower Trenton	2587			100 (1)	**2%**	123	**46**
Trenton-Morrisville (Toll)	446			2700 (1)	**56%**	3326	**1242**
Diverted Elsewhere/Trips not Made	604			576 (2)	**12%**	710	**265**

(1) Rounded estimates
(2) Difference between Scudder Falls Bridge toll diversion (4855) and sum of estimated diversions to other area bridges (929+550+100+2700=4279)

Note: Some numbers may be rounded
Source: Jacobs

The share of traffic diverted to each bridge - and the percent diverted elsewhere - was assumed to be similar among the two analysis years and two toll scenarios. The following three tables show how these splits were applied to the 2015 High Toll and 2030 Low Toll and High Toll scenarios.

Table 11: Estimated Daily Diversions to Other Bridges, 2015 High Toll Scenario

Bridge	Percent of Diverted Traffic	Adjusted Diversions: Factored to Match Jacobs' SFB *Toll* Diversion Estimate	Adjusted Diversions: Factored to Match Jacobs' SFB TOTAL Diversion Estimate
Washington Crossing	**19%**	1870	**1153**
Scudder Falls (Toll)	**-100%**	*-9773*	***-6025***
Calhoun St	**11%**	1106	**682**
Lower Trenton	**2%**	201	**124**
Trenton-Morrisville (Toll)	**56%**	5436	**3351**
Diverted Elsewhere/Trips not Made	**12%**	1160	**715**

Note: Some numbers may be rounded
Source: Jacobs

Table 12: Estimated Daily Diversions to Other Bridges, 2030 Low Toll Scenario

Bridge	Percent of Diverted Traffic	Adjusted Diversions: Factored to Match Jacobs' SFB *Toll* Diversion Estimate	Adjusted Diversions: Factored to Match Jacobs' SFB TOTAL Diversion Estimate
Washington Crossing	**19%**	1200	**429**
Scudder Falls (Toll)	**-100%**	*-6274*	***-2243***
Calhoun St	**11%**	710	**254**
Lower Trenton	**2%**	129	**46**
Trenton-Morrisville (Toll)	**56%**	3490	**1248**
Diverted Elsewhere/Trips not Made	**12%**	745	**266**

Note: Some numbers may be rounded
Source: Jacobs

Table 13: Estimated Daily Diversions to Other Bridges, 2030 High Toll Scenario

Bridge	Percent of Diverted Traffic	Adjusted Diversions: Factored to Match Jacobs' SFB *Toll* Diversion Estimate	Adjusted Diversions: Factored to Match Jacobs' SFB TOTAL Diversion Estimate
Washington Crossing	**19%**	1892	**1121**
Scudder Falls (Toll)	**-100%**	*-9889*	***-5858***
Calhoun St	**11%**	1120	**663**
Lower Trenton	**2%**	203	**120**
Trenton-Morrisville (Toll)	**56%**	5500	**3258**
Diverted Elsewhere/Trips not Made	**12%**	1174	**696**

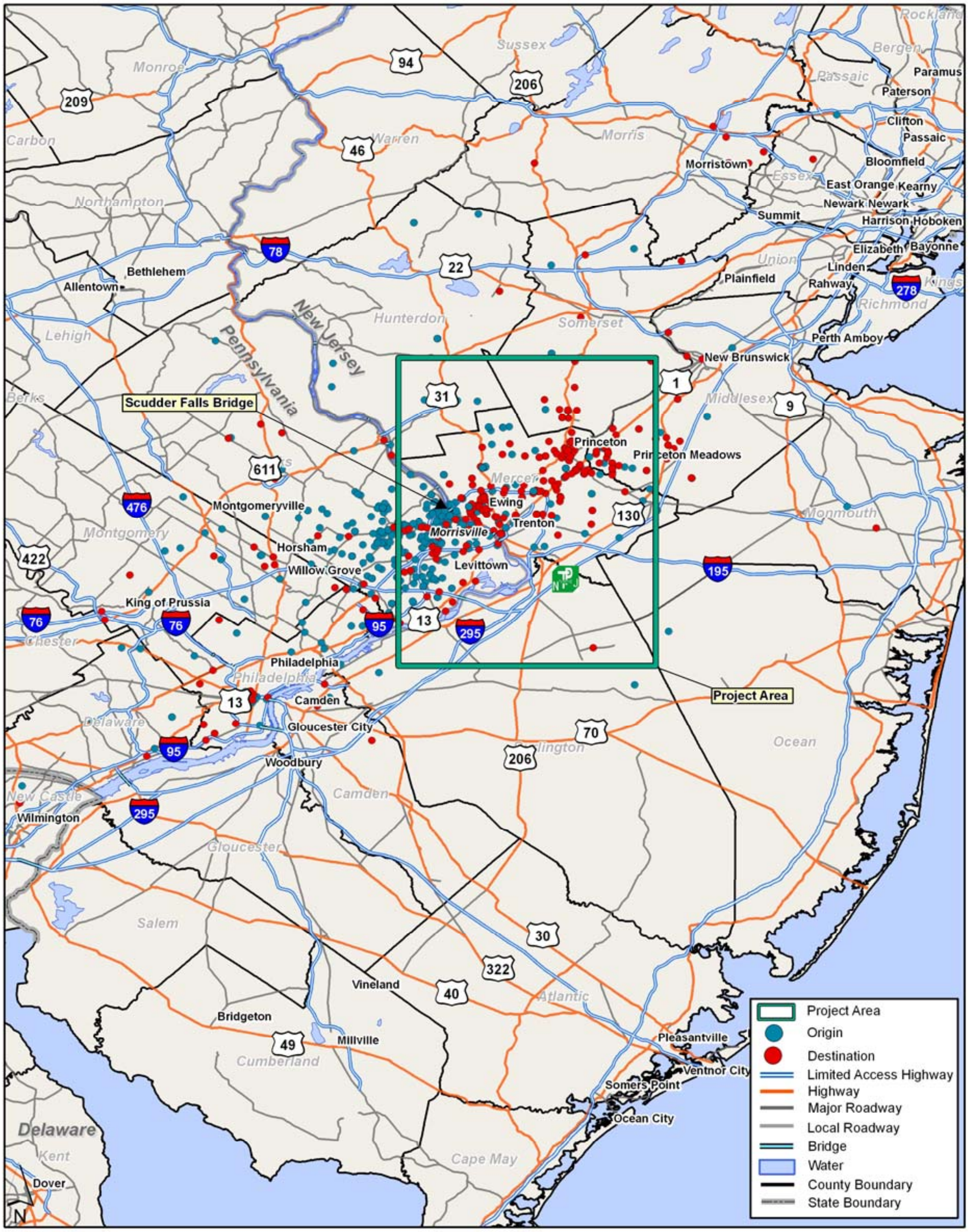
Note: Some numbers may be rounded
Source: Jacobs

5.5 ESTIMATING DIVERSION VOLUMES AND ROUTES

Jacobs had received some 450 responses for its survey of Scudder Falls Bridge customers which took place from 11/6/08 to 12/2/08. The customers' stated origins and destinations are mapped in Figure 2 and Figure 3. The location and concentration of origin and destination points helped us to estimate, for each affected bridge, how traffic diverted to that bridge would travel now that these vehicles were no longer using the Scudder Falls Bridge.

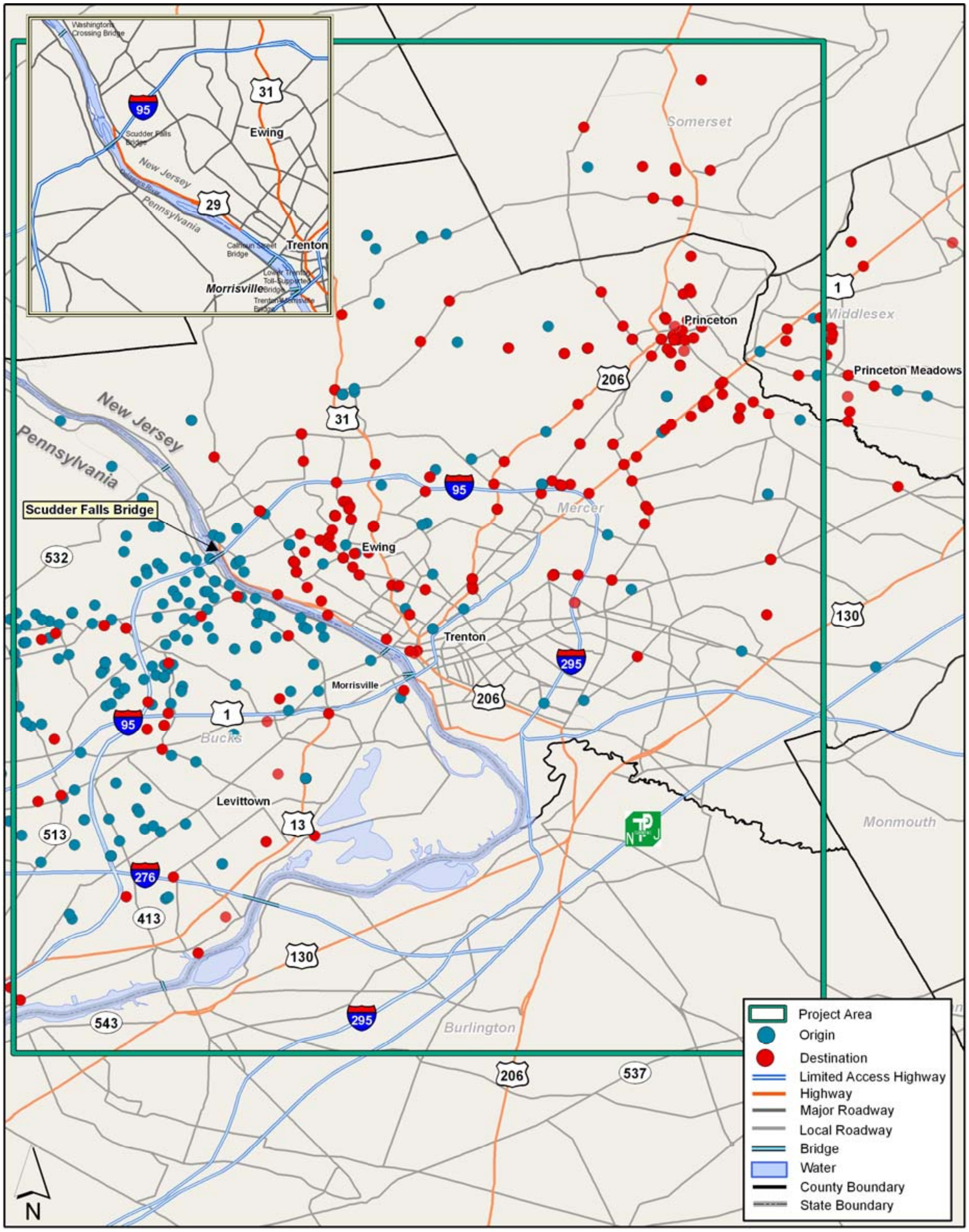
As seen in the figures, there are high concentrations of trip ends in Princeton, NJ, nearby along US 1, and in the Ewing, NJ area just east of the Scudder Falls Bridge. On the Pennsylvania side, the highest concentrations of trip ends are in the Yardley area just south of the Scudder Falls Bridge and the Newtown area west of I-95, with a slightly smaller concentration along I-95 south of US 1. There are very few trip ends in Trenton and Morrisville, because travelers to and from these two locations are not Scudder Falls Bridge customers; instead they use the Calhoun Street Bridge, the Trenton-Morrisville (Route 1) Toll Bridge, or the Lower Trenton Bridge.

Figure 2: Origins and Destinations of Scudder Falls Bridge Users Regionwide, November 2008 Survey



Source: Jacobs, "Long Term Traffic & Revenue Report", March 2009

Figure 3: Origins and Destinations of Scudder Falls Bridge Users, Scudder Falls Area, November 2008 Survey



Source: Jacobs, "Long Term Traffic & Revenue Report", March 2009

Jacobs used a manual tracing process to estimate how the diverted traffic would split among the various roadways after crossing a bridge. At each decision point, or node, we would ask ourselves:

- What percentage of the traffic would likely continue straight?
- What percentage would likely turn left?
- What percentage would likely turn right?
- What percentage would likely disappear (i.e., end their trip at that point)?

Of course, we also considered that where a trip returned to its pre-tolling route, it was no longer a diverted volume. For example, a trip from Princeton to Washington, DC that previously took I-95 and the Scudder Falls bridge but now moved to Route 1 would have been on I-95 in Pennsylvania south of Route 1 before Scudder Falls tolling, and would still be on I-95 south of Route 1 after tolling, resulting in no net increase in volume on that portion of their route.

Our estimates, as previously stated, were based on the location and concentration of trip ends along each roadway, from the O-D survey. To further help in our routing decisions, we "virtually drove" each of the roadways using Google Maps' Aerial and Street View features to visualize the characteristics of each road, including number of lanes and adjacent development. The NJRTM-E also contained useful information on facility type and number of lanes.

Because there was little difference in the NJRTM-E network between the two analysis years, we factored the 2015 Low Toll diversion results to estimate diversion routes and volumes for the 2030 Low Toll scenario. Low Toll diversion results were also factored to represent diversions for the High Toll scenario for each of the two years. Earlier in this report we presented the total peak hour diversions off of Scudder Falls; we used the same factoring process to estimate the routings and volumes of the peak hour traffic for each of the scenarios.

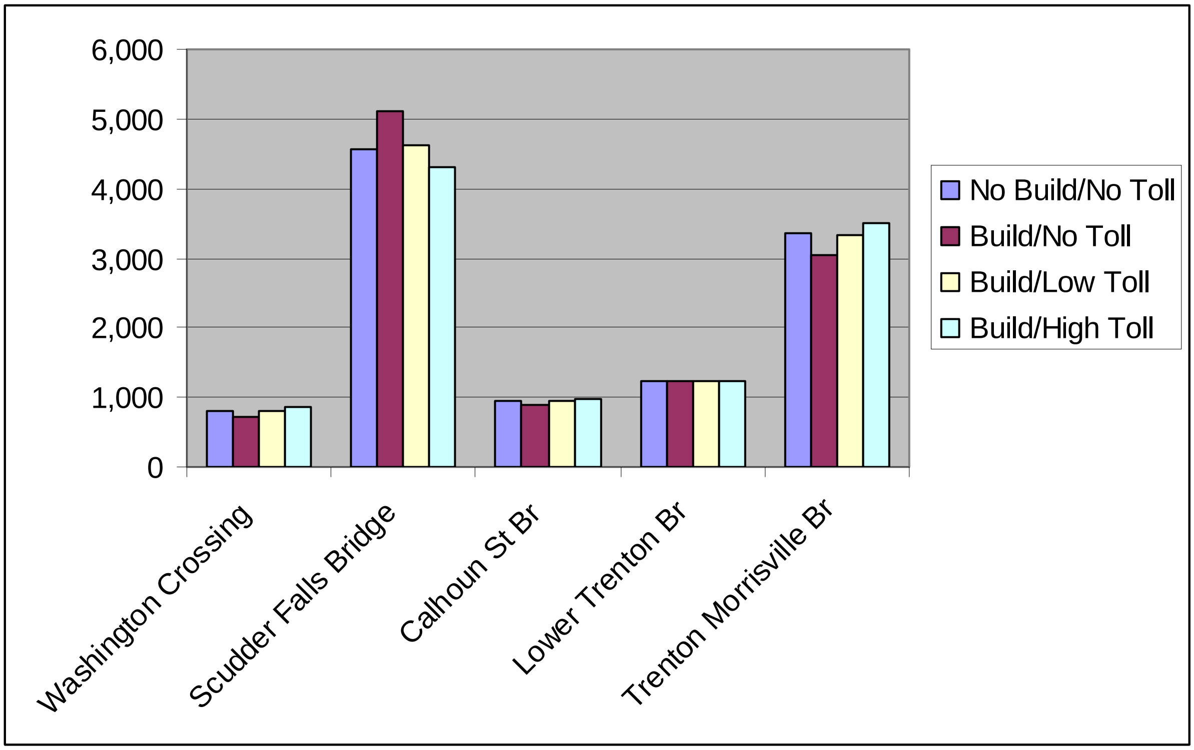
Results for 2015 and 2030, Low Toll and High Toll, AADT and peak hour are presented on model diagrams in the Appendix. These numbers represent the difference between each Build/Toll scenario and the No Build/No Toll condition; therefore, they include both the effects of the widening of the Scudder Falls Bridge and the addition of tolls. All changes to volumes on the Delaware River crossings have been shown on these diagrams; however, for purposes of this report, diversions to any other roadway which are less than 100 vehicles in a full day or less than 10 vehicles during the peak hour are deemed insignificant and have not been shown. Note that during the peak hours for some scenarios, widening the Scudder Falls Bridge is estimated to attract more traffic than is diverted due to tolling, so the net diversion is less than zero.

6 DETERMINATION OF "BEFORE TOLLING" AND "AFTER TOLLING" VOLUMES

For environmental impact, we do not only need to determine the additional traffic on routes; it is also necessary to look at overall roadway volumes for each scenario. On the roadway links negatively impacted by the toll diversion, we have estimated the volumes before and after tolling based on the traffic counts and estimated background growth, traffic changes due to the I-95/Scudder Falls Bridge widening project, and diversion estimates, as discussed previously in this report.

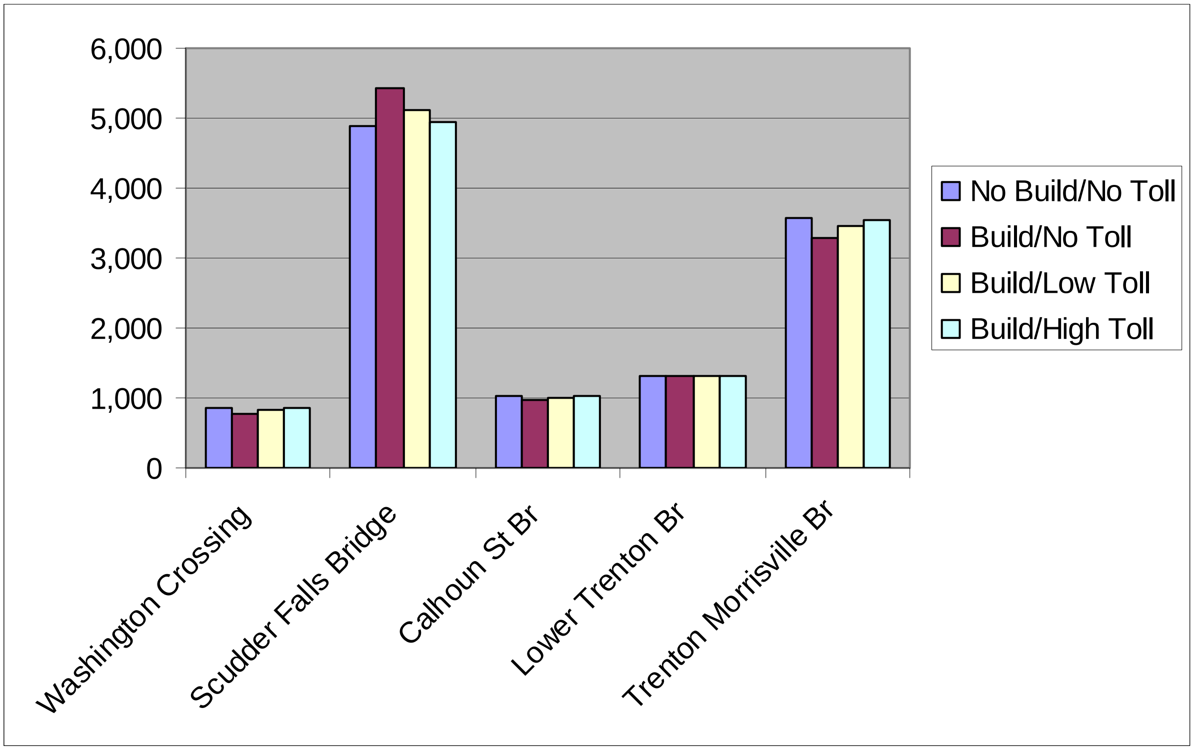
Results, contained in the Appendix, include 2010 AADTs and peak hour counts, estimated volumes for the 2015 and 2030 No Build/No Toll, Build/No Toll, Build/Low Toll and Build/High Toll scenarios. The Low and High Toll conditions are simply the No Build/No Toll volumes plus the diversion. The “1-Way” volumes represent the direction with increased traffic due to toll diversion. Estimated Pennsylvania-bound peak hour volumes for the four conditions are also shown in Figure 4 and Figure 5. Volume to capacity ratios (V/Cs) have also been included in the Appendix for the peak hour in the direction affected by the toll diversion. It is expected that these results will be used for environmental analyses, including traffic impact / LOS analyses and noise analysis.

Figure 4: Estimated Pennsylvania-Bound Peak Hour Bridge Volumes, 2015



Source: Jacobs

Figure 5: Estimated Pennsylvania-Bound Peak Hour Bridge Volumes, 2030



Source: Jacobs

7 CONSIDERATIONS IN THE PREPARATION OF THIS REPORT

It is Jacobs' opinion that the estimates of traffic provided herein are reasonable and that they have been prepared using acceptable methods. However, it is important to note the following considerations:

- This report presents the results of Jacobs' consideration of the information available as of the date hereof and the application of our experience and professional judgment to that information.
- Existing counts obtained from DRJTBC, DVRPC, Pennsylvania DOT and NJDOT were used in estimating future traffic on affected links, and were considered to be accurate.
- The NJRTM-E has not been calibrated to actual volumes on local streets throughout the Scudder Falls Bridge area. It was used to determine major movements, such as traffic diverting north versus south of the bridge, and peak versus daily diversions.
- The process of estimating diversions based on the concentration and location of origins and destinations from our November 2008 travel surveys, supplemented with the use of the NJRTM-E and DVRPC's 2004 Study results, was a robust method of obtaining results for this study.
- In reality, there are far more roadways that will be affected by Scudder Falls tolling than what we have shown; we have not included them because we believe the added volume is small and insignificant to the level of service of the roadway. We have only included roadways that will gain an additional 100 trips or more per day, or 10 trips or more in the peak hour (i.e., at least one car every six minutes).

- The traffic estimates will be subject to future economic and social conditions, demographic developments and regional transportation construction activities that cannot be predicted with certainty.
- Outside of I-95 and the Scudder Falls Bridge, and the connection of I-95 to the PA Turnpike, no major changes to the roadway network were assumed that would have an impact on Scudder Falls Bridge diversions between now and 2030.

In Jacobs' opinion, these assumptions provide a reasonable basis for the traffic diversion estimates.

APPENDIX

2010 Volumes

Location	2010 Counts			
	2-WAY AADT	1-WAY AADT	2-WAY PEAK HOUR	1-WAY PEAK HOUR
CROSSINGS				
Scudder Falls Bridge (Westbound)	58,482	30,500	6,190	4,324
Washington Crossing (Westbound)	6,958	3,899	917	763
Calhoun St Br (Westbound)	18,729	9,258	1,370	908
Lower Trenton Br (Westbound)	18,096	13,409	1,442	1,169
Trenton Morrisville Br (Westbound)	54,591	20,953	5,081	3,163
PA LOCATIONS				
Washington Crossing Rd/Rt 532 (Westbound)				
s/o Wrightstown Rd	4,235	2,373	398	331
bet Dolingtown Rd & Lindenhurst Rd	9,948	5,574	974	810
w/o Lindenhurst	7,901	4,427	741	617
Taylorsville Rd (southbound)				
s/o Rt 532	11,000	5,711	1,156	640
Wrightstown Rd (Westbound)				
w/o Rt 532	2,106	1,180	206	171
Lindenhurst Rd (Southbound)				
s/o Wash Xing Rd/532	6,480	3,134	536	210
River Rd / Rt 32 (Northbound)				
n/o Wash Xing	3,429	1,649	315	141
US 13/Main St (Northbound)				
n/o Edgewood Rd	11,000	5,418	915	545
s/o Edgewood Rd	7,700	3,792	641	381
n/o Big Oak	7,053	3,474	587	349
bet US 1 & Trenton Av	12,477	6,145	1,176	618
Edgewood Rd				
bet Makefield & Oxford Valley	7,602	3,801	729	380
Yardley Langhorne Pike (Westbound)				
e/o Edgewood Rd	3,700	1,850	340	185
e/o Main St	8,000	4,000	736	400
Yardley Morrisville Rd (Northbound)				
n/o Calhoun St	4,000	1,977	293	194
Trenton Ave (Westbound)				
w/o Yardley Morrisville	16,269	8,042	1,278	789
Big Oak Rd (Westbound)				
w/o US 13	6,579	3,290	513	329
Stony Hill Rd (Westbound)				
bet US 1 & Big Oak	8,500	4,250	782	425
US 1 (West/Southbound)				
bet US 13 & W Bridge St	64,000	31,936	5,248	3,449
bet US 13 & Trenton Av	55,000	27,005	4,235	2,349
w/o Stony Hill Rd	55,000	27,005	4,235	2,349
e/o I-95	71,000	34,861	5,467	3,033
Rt 332 (Westbound)				
bet Creamery Rd & W Afton Ave	6,100	3,050	561	305
Oxford Valley Rd (Northbound)				
n/o US 1	30,271	15,179	1,309	1,131
n/o Big Oak	11,522	5,778	498	430
Bristol Oxford Valley Rd (Southbound)				
bet US 1 and Lincoln Hwy	32,995	12,007	2,648	830
bet Lincoln Hwy & Trenton Rd	10,000	3,639	849	252
s/o Woodbourne Rd	12,486	4,544	1,060	314
Trenton Rd (Westbound)				
w/o Woodbourne Rd	14,000	7,084	1,064	574
I-95 (Northbound)				
n/o US 1	59,200	28,580	5,688	2,697

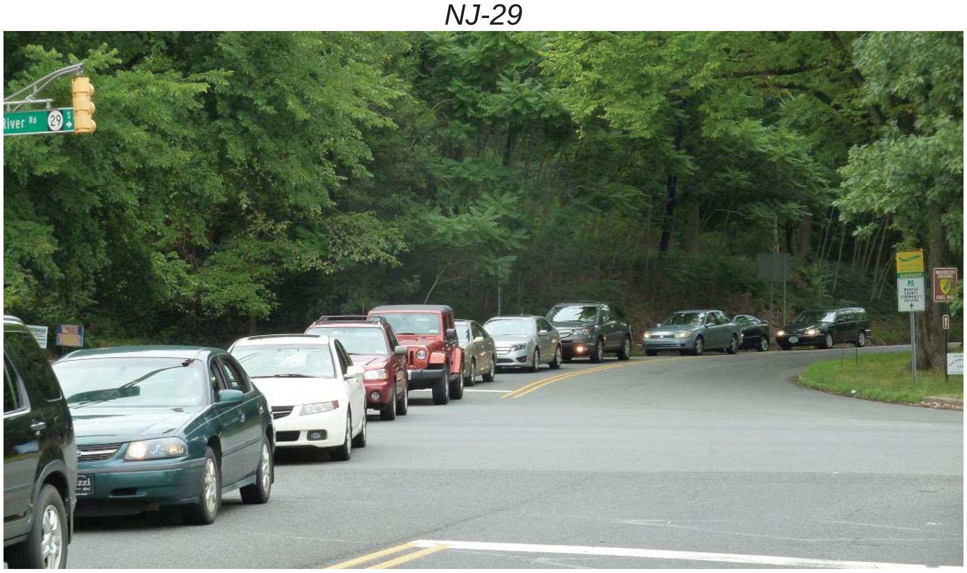
Location	2010 Counts			
	2-WAY AADT	1-WAY AADT	2-WAY PEAK HOUR	1-WAY PEAK HOUR
NJ LOCATIONS				
Rt 29 (Northbound)				
s/o CR 546	12,100	6,006	1,040	698
n/o I-95	15,249	7,534	1,191	819
CR 546/Washington Crossing Rd (Westbound)				
bet Rt 29 & Bear Tavern Rd	7,454	4,177	876	817
w/o Bear Tavern Rd	8,668	4,857	1,016	951
e/o Scotch Rd	7,466	4,184	822	819
Scotch Rd (Northbound)				
n/o I-95	15,474	7,792	1,991	505
Bear Tavern Rd (Northbound)				
s/o CR 546	7,822	4,161	882	420
at Jacobs Creek Rd	8,280	4,405	910	445
Bear Tavern Rd / Grand Ave (Southbound)				
s/o W Upper Ferry Rd	8,914	4,172	712	309
Rt 29 (Southbound)				
s/o Lower Ferry Rd	18,352	9,633	1,678	708
s/of Sullivan Way	28,615	14,156	2,664	1,254
bet. Parkside Ave & Calhoun St	41,004	19,478	3,658	1,798
Sullivan Way (Southbound)				
s/o Lower Ferry Rd	7,933	3,944	659	240
Parkway Ave/Rt 634 Southbound)				
bet Scotch Rd & Olden Av	23,301	10,574	1,680	750
Pennington Rd (Northbound)				
n/o I-95	31,438	18,147	2,451	1,255
Pennington Rd / Rt 31 (southbound)				
s/o I-95	17,708	8,657	1,476	722
bet. Carlton Ave & Theresa St	12,764	6,453	1,049	534
n/o N Olden Ave / 622	10,425	5,256	865	435
n/o Calhoun St	8,085	4,059	680	337
US 206 / Lawrenceville Rd (Southbound)				
s/o I-95	19,210	9,426	1,533	767
s/o Eggert Crossing Rd	16,071	8,036	1,281	603
s/o Princeton Pike	9,944	5,397	667	365
Princeton Pike (Southbound)				
s/of Franklin Corner Rd	22,087	11,133	1,673	831
bet Darrah Ln & Gainsboro Rd	8,432	4,250	737	319
Princeton Ave (Southbound)				
s/o Rt 622	12,949	6,697	959	514
Brunswick Pike / US 1 (Southbound)				
s/o I-95	52,539	26,256	4,006	2,042
Trenton Fwy / US 1 (Southbound)				
bet Brunswick Pike & Whitehead Rd	42,691	20,730	3,528	1,795
bet Whitehead Rd & Strawberry St	44,605	20,445	3,630	1,755
s/o US Strawberry St	46,518	20,160	3,731	1,715

Washington Crossing Bridge Observations

Washington Crossing Observations

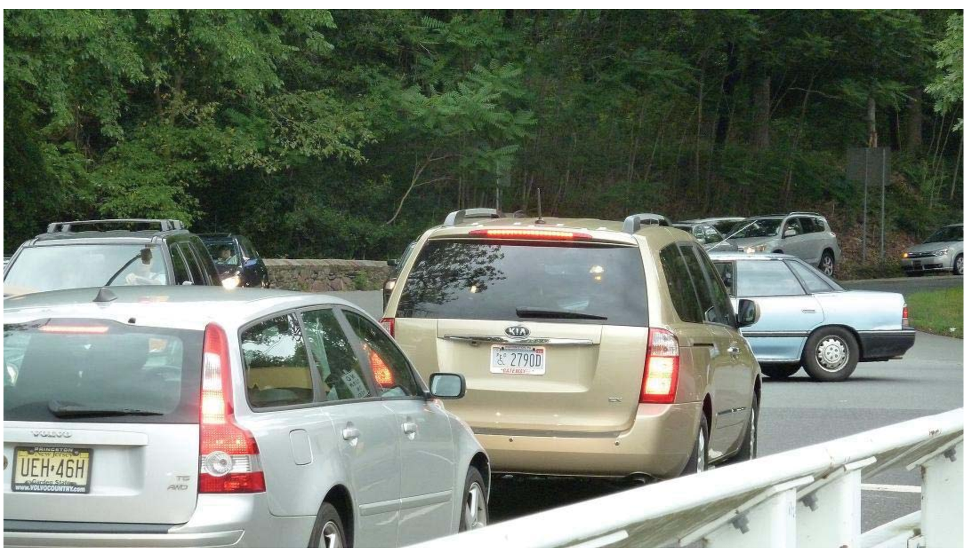
On July 14, 2010, Jacobs staff conducted field observations at the Washington Crossing Bridge during the PM peak hour (5:00 PM to 6:00 PM). A traffic signal is located near the New Jersey end of the bridge at the intersection of NJ-29. From the observation, most of the Pennsylvania-bound traffic on the bridge came straight through the intersection on County Route 546 (Washington Crossing Pennington Rd). For most of the PM peak hour, vehicles from both directions along NJ-29 had no trouble turning right or left towards the bridge; only during several cycles of the traffic signal (fewer than five) during the observation period vehicles were unable to cross NJ-29 to reach the bridge as the queue had backed up from the bridge through the Route 546 and NJ-29 intersection. Once during the observation NJ-29 southbound traffic was impeded by a vehicle turning left from NJ-29 northbound that was unable to clear the intersection due to the queue backup. Although some of the traffic backup could be attributed to the stop sign at Route 32 in Pennsylvania, it was mostly due to the existing narrow condition of the bridge causing New Jersey-bound traffic to travel too close to (and sometimes across) the centerline. The following photographs depict the worst case conditions observed during the PM peak hour at the Washington Crossing Bridge.

PA-bound queue on the Washington Crossing Bridge backing up to the intersection of NJ-29



Traffic as a result of the queue back-up (Note the orange Jeep from the previous photo)

NJ-29 SB traffic impeded by left turn from NJ-29 NB on to Washington Crossing Bridge



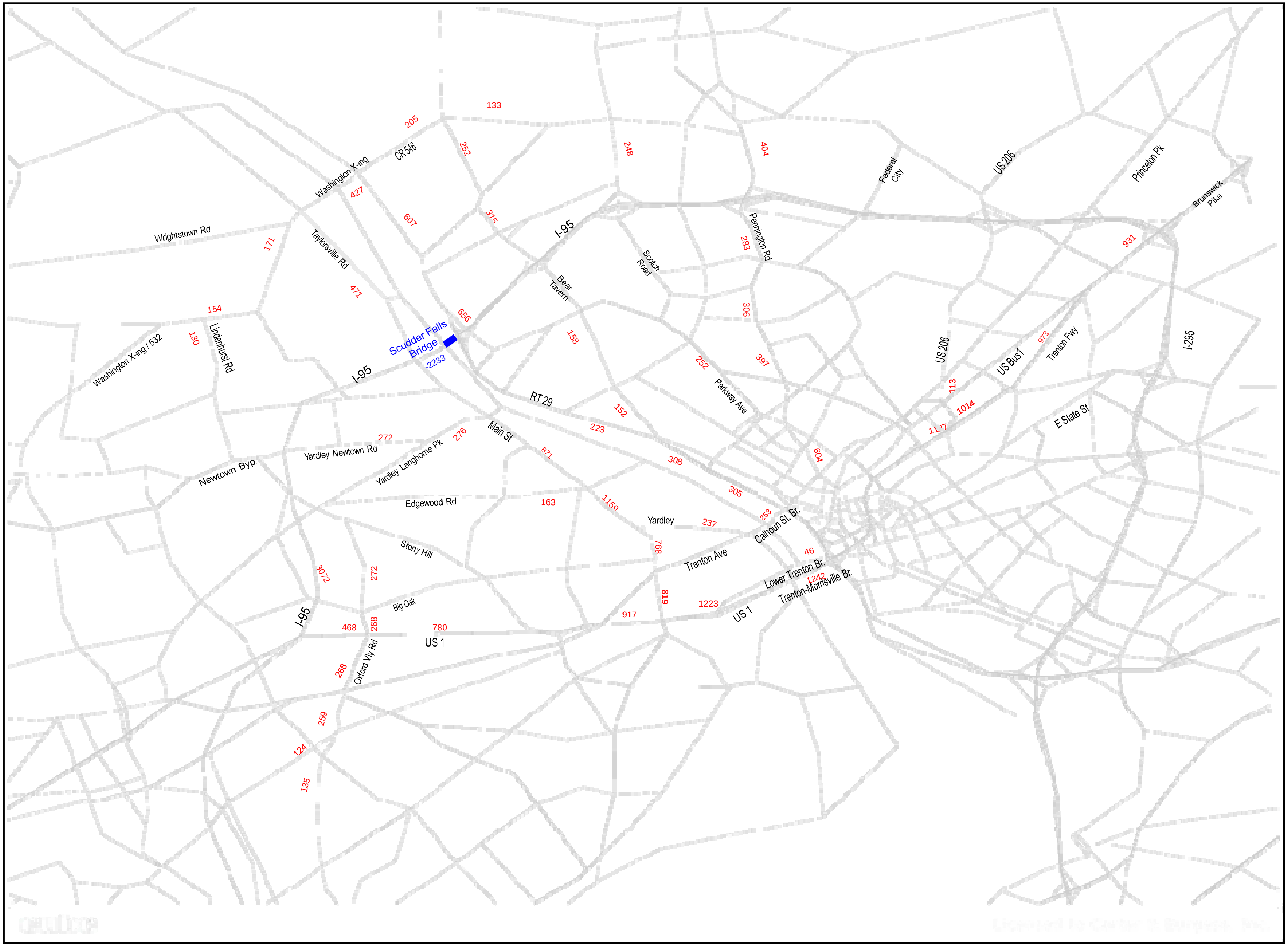
PA-bound traffic stopped due to NJ-bound traffic traveling too close to the centerline

Some of the stoppage can be attributed to the stop sign at Route 32 in PA

Estimated Diversion Volumes

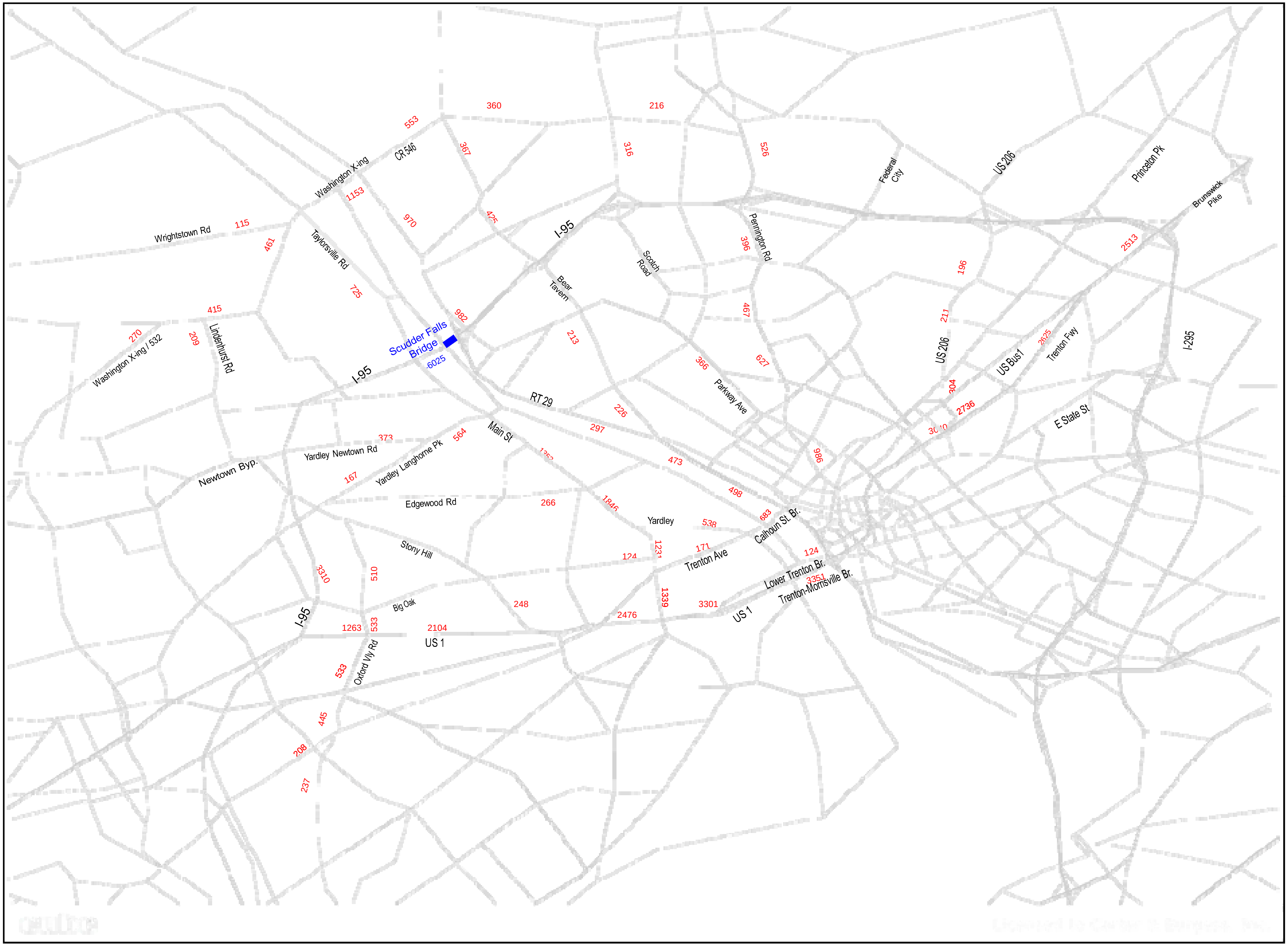
Scudder Falls Diversion - Build/Toll Traffic Minus No Build/No Toll Traffic

2015 Daily, Low Toll
5/5/2011



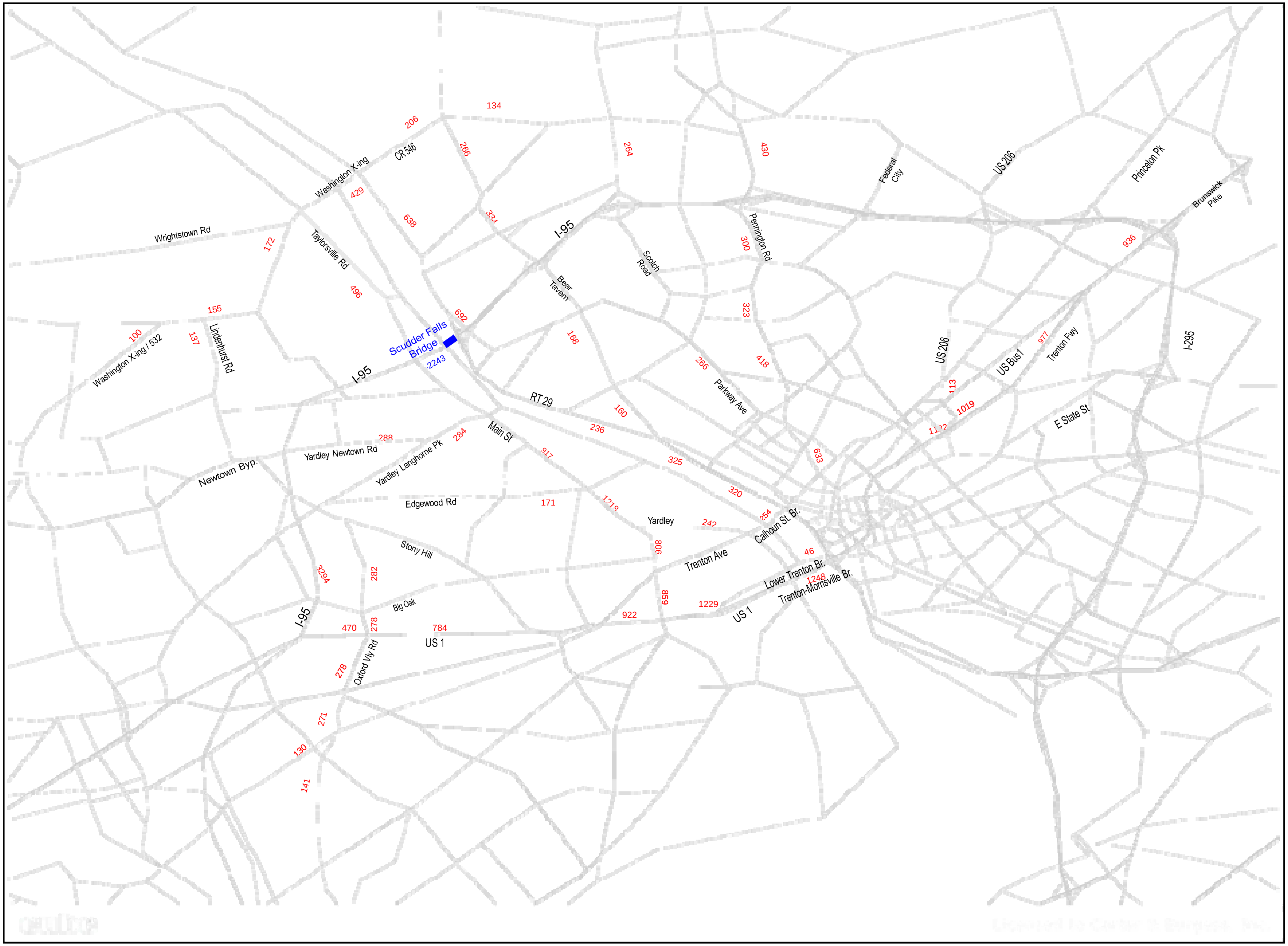
Scudder Falls Diversion - Build/Toll Traffic Minus No Build/No Toll Traffic

2015 Daily, High Toll
5/5/2011



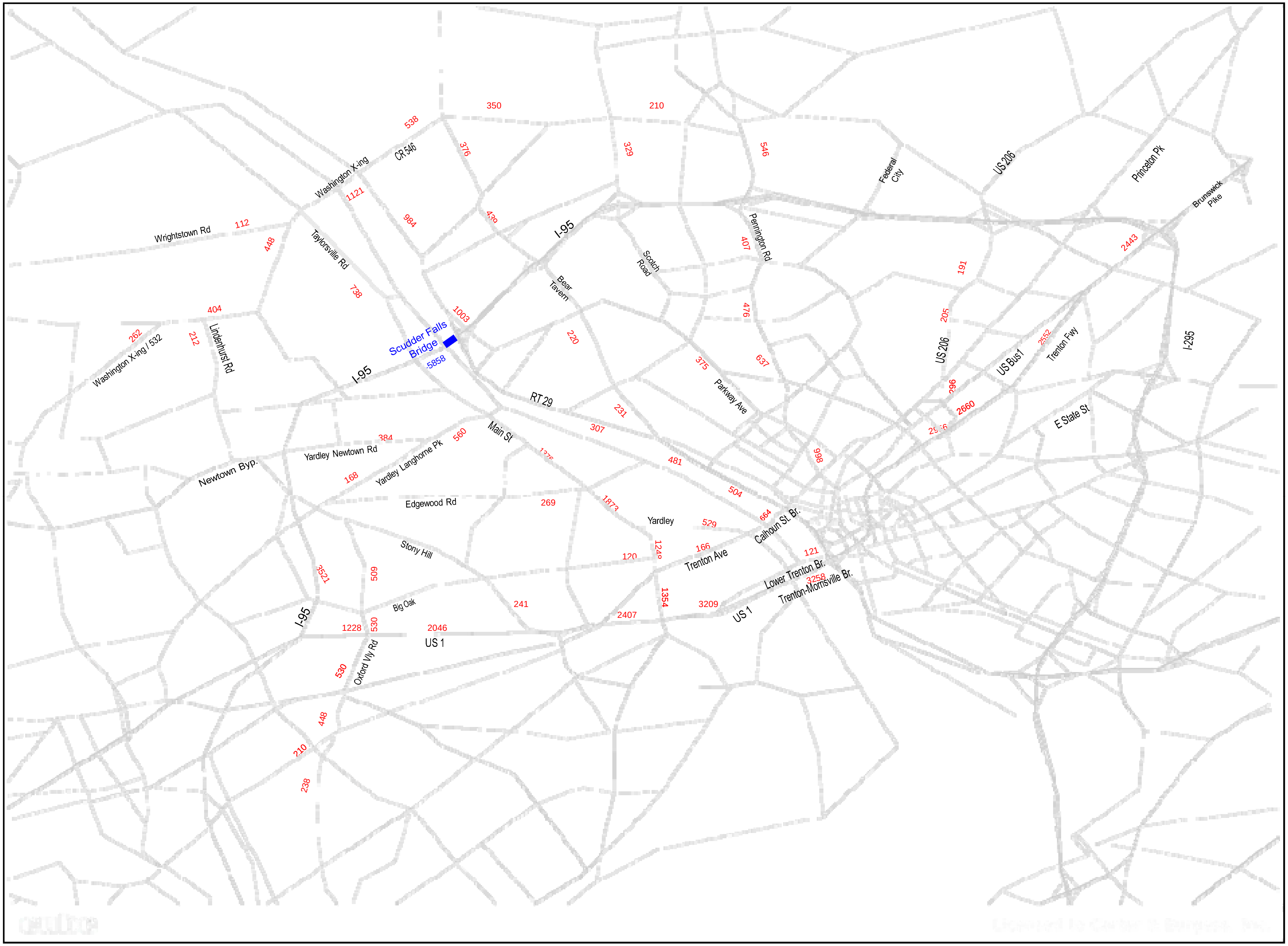
Scudder Falls Diversion - Build/Toll Traffic Minus No Build/No Toll Traffic

2030 Daily, Low Toll
5/5/2011



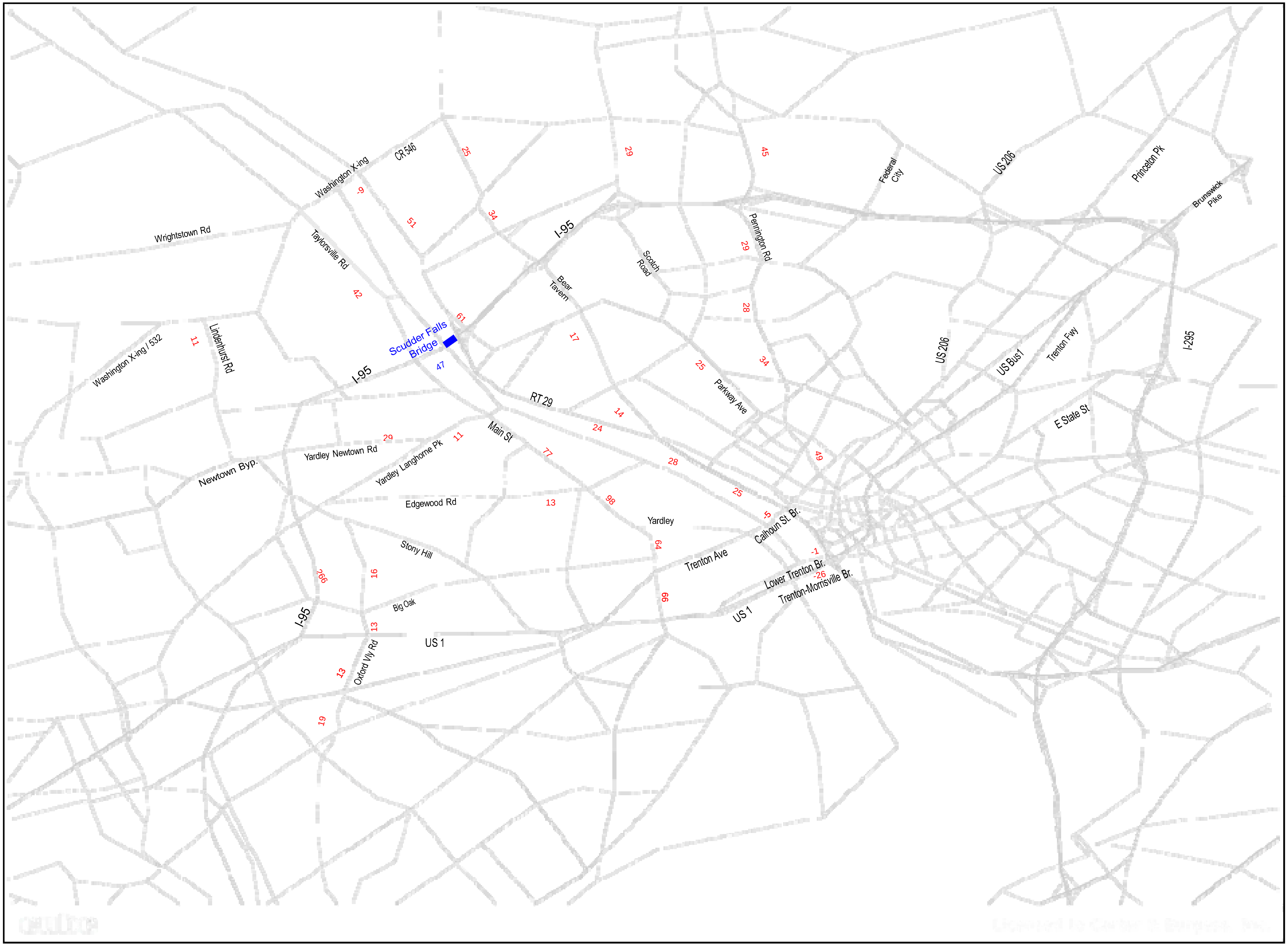
Scudder Falls Diversion - Build/Toll Traffic Minus No Build/No Toll Traffic

2030 Daily, High Toll
5/5/2011



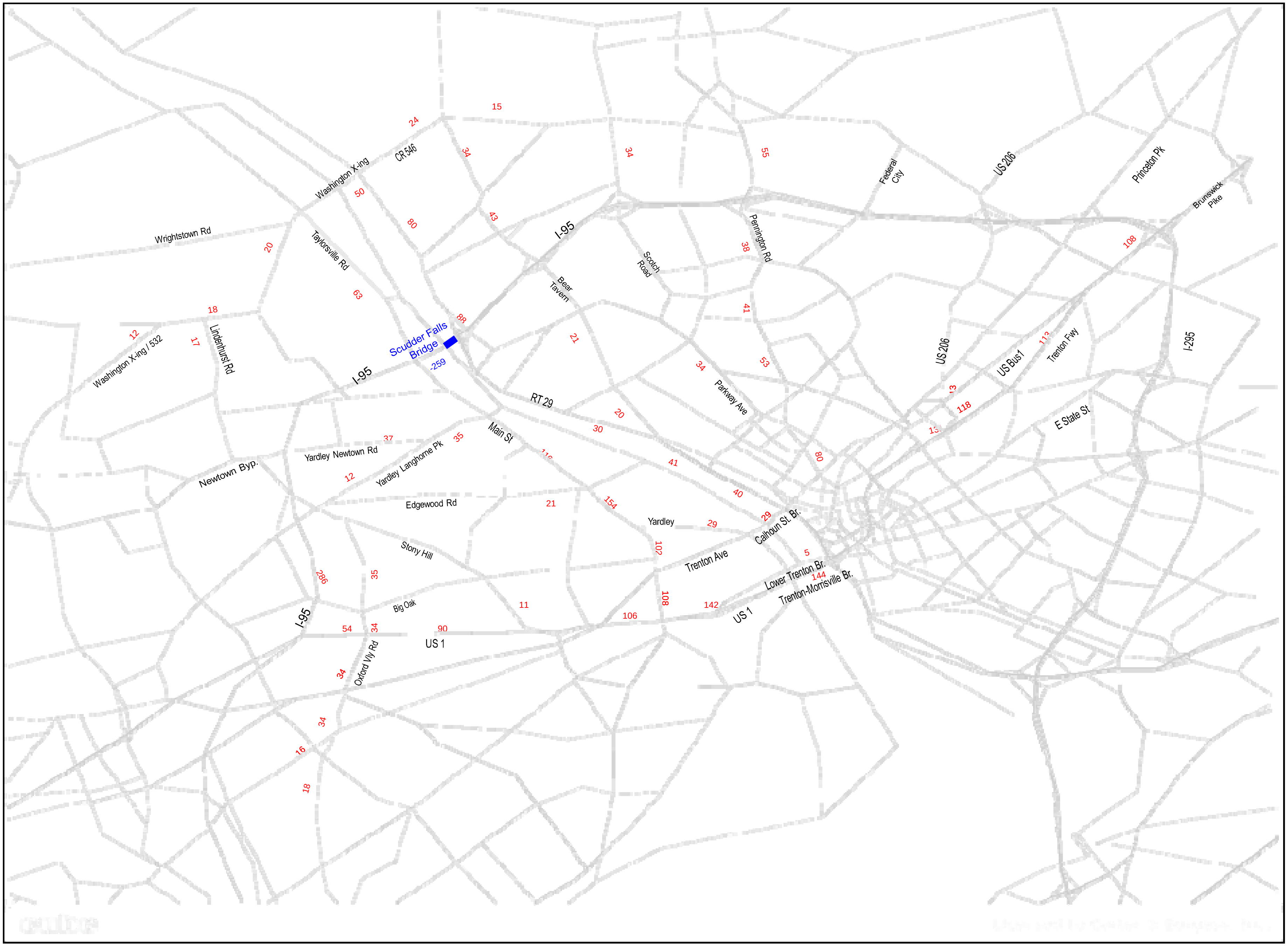
Scudder Falls Diversion - Build/Toll Traffic Minus No Build/No Toll Traffic

2015 Peak Hour, Low Toll
5/5/2011



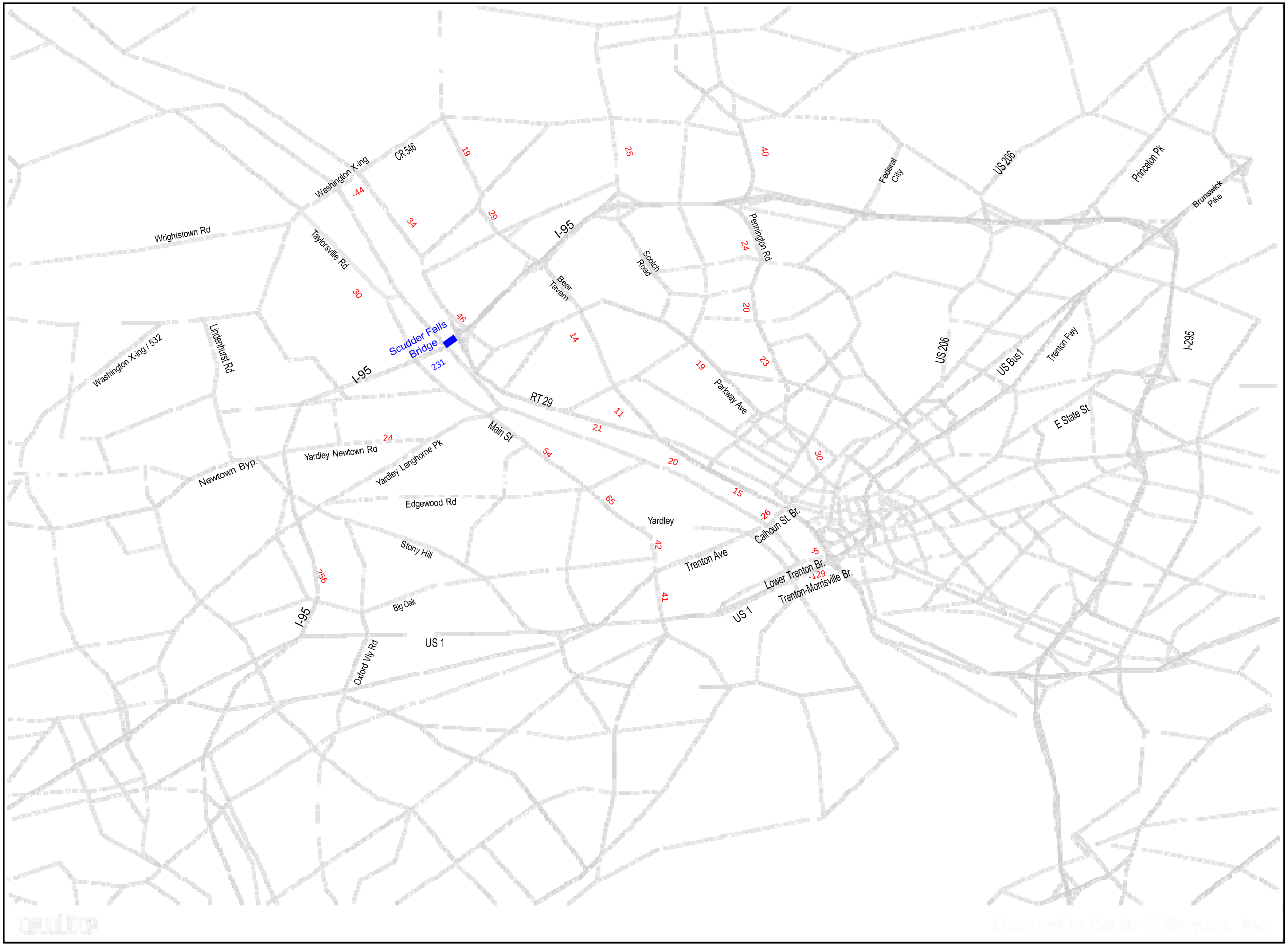
Scudder Falls Diversion - Build/Toll Traffic Minus No Build/No Toll Traffic

2015 Peak Hour, High Toll
5/5/2011



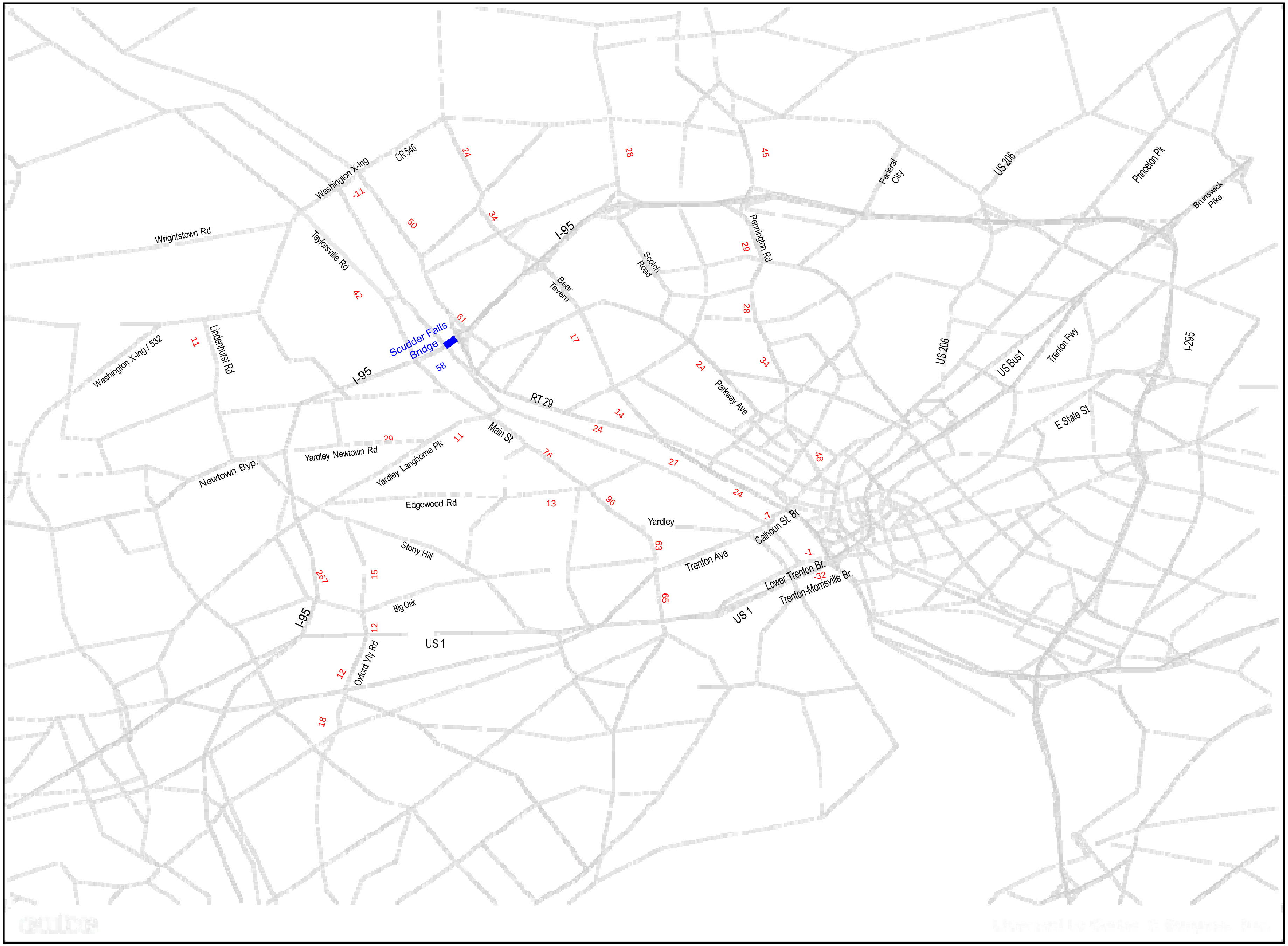
Scudder Falls Diversion - Build/Toll Traffic Minus No Build/No Toll Traffic

2030 Peak Hour, Low Toll
5/5/2011



Scudder Falls Diversion - Build/Toll Traffic Minus No Build/No Toll Traffic

2030 Peak Hour, High Toll
5/5/2011



Estimated Volumes on Affected Roadways for:

- **No Build / No Toll**
- **Build / No Toll**
- **Build / Low Toll**
- **Build / High Toll**

Location	2015 - No Build/NoToll				2015 - Build/No Toll				2015 - Build/Low Toll				2015 - Build/High Toll			
	2-WAY AADT	1-WAY AADT	2-WAY PEAK HOUR	1-WAY PEAK HOUR	2-WAY AADT	1-WAY AADT	2-WAY PEAK HOUR	1-WAY PEAK HOUR	2-WAY AADT	1-WAY AADT	2-WAY PEAK HOUR	1-WAY PEAK HOUR	2-WAY AADT	1-WAY AADT	2-WAY PEAK HOUR	1-WAY PEAK HOUR
CROSSINGS																
Scudder Falls Bridge (Westbound)	**61,868**	**32,266**	**6,608**	**4,574**	**69,248**	**36,014**	**7,384**	**5,104**	**63,267**	**30,033**	**6,901**	**4,621**	**59,475**	**26,241**	**6,595**	**4,315**
Washington Crossing (Westbound)	7,361	4,125	979	807	5,949	3,408	831	706	7,093	4,552	923	798	7,819	5,278	982	857
Calhoun St Br (Westbound)	19,813	9,794	1,463	961	18,977	9,369	1,375	901	19,655	10,047	1,429	955	20,084	10,477	1,464	990
Lower Trenton Br (Westbound)	19,144	14,185	1,539	1,237	18,992	14,108	1,523	1,226	19,115	14,231	1,533	1,236	19,193	14,309	1,540	1,242
Trenton Morrisville Br (Westbound)	57,752	22,166	5,424	3,346	53,648	20,082	4,993	3,052	56,974	23,408	5,262	3,320	59,082	25,517	5,432	3,490
PA LOCATIONS																
Washington Crossing Rd/Rt 532 (Westbound)																
s/o Wrightstown Rd	4,480	2,511	425	350	3,915	2,224	366	310	4,373	2,681	402	347	4,663	2,972	426	370
bet Dolingtown Rd & Lindenhurst Rd	10,524	5,897	1,040	857	10,016	5,639	986	821	10,428	6,051	1,020	854	10,689	6,312	1,041	875
w/o Lindenhurst	8,358	4,684	791	652	8,028	4,516	756	629	8,296	4,784	778	650	8,466	4,954	792	664
Taylorsville Rd (southbound)																
s/o Rt 532	11,637	6,042	1,234	677	12,111	6,112	1,271	687	11,614	6,513	1,231	719	11,299	6,767	1,206	739
Wrightstown Rd (Westbound)																
w/o Rt 532	2,228	1,248	220	181	2,087	1,177	205	171	2,201	1,291	214	180	2,274	1,364	220	186
Lindenhurst Rd (Southbound)																
s/o Wash Xing Rd/532	6,855	3,315	572	222	6,969	3,322	580	223	7,092	3,446	590	233	7,171	3,524	597	239
River Rd / Rt 32 (Northbound)																
n/o Wash Xing	3,628	1,744	336	149	3,557	1,708	329	144	3,614	1,766	333	149	3,650	1,802	336	152
US 13/Main St (Northbound)																
n/o Edgewood Rd	11,637	5,731	977	576	12,102	5,844	1,017	592	12,442	6,603	1,045	653	12,658	7,084	1,062	692
s/o Edgewood Rd	8,146	4,012	684	403	8,456	4,087	711	414	9,241	5,171	774	501	9,738	5,858	814	557
n/o Big Oak	7,461	3,675	627	369	7,616	3,712	640	375	8,167	4,442	684	434	8,516	4,905	713	471
bet US 1 & Trenton Av	13,199	6,501	1,255	654	13,199	6,501	1,255	654	14,019	7,320	1,322	720	14,538	7,839	1,363	762
Edgewood Rd (Westbound)																
bet Makefield & Oxford Valley	8,042	4,021	778	402	8,042	4,021	778	402	8,205	4,184	791	415	8,308	4,287	800	424
Yardley Langhorne Pike (Westbound)																
e/o Edgewood Rd	3,914	1,957	363	196	3,884	1,938	360	193	3,997	2,052	369	202	4,070	2,124	375	208
e/o Main St	8,463	4,232	786	423	8,122	4,052	749	398	8,577	4,507	786	435	8,866	4,796	809	458
Yardley Morrisville Rd (Northbound)																
n/o Calhoun St	4,232	2,092	312	205	3,894	1,855	272	172	4,369	2,329	310	210	4,669	2,629	335	234
Trenton Ave (Westbound)																
w/o Yardley Morrisville	17,211	8,508	1,364	834	17,002	8,401	1,342	819	17,171	8,571	1,356	833	17,279	8,678	1,365	842
Big Oak Rd (Westbound)																
w/o US 13	6,960	3,480	548	348	6,808	3,403	532	337	6,931	3,526	542	347	7,009	3,604	548	353
Stony Hill Rd (Westbound)																
bet US 1 & Big Oak	8,992	4,496	835	450	8,689	4,342	803	428	8,935	4,588	823	448	9,090	4,744	835	460
US 1 (West/Southbound)																
bet US 13 & W Bridge St	67,706	33,785	5,603	3,649	63,662	31,732	5,178	3,359	66,939	35,008	5,442	3,623	69,017	37,086	5,610	3,791
bet US 13 & Trenton Av	58,184	28,569	4,521	2,485	55,152	27,029	4,203	2,268	57,609	29,486	4,401	2,466	59,168	31,044	4,527	2,592
w/o Stony Hill Rd	58,184	28,569	4,521	2,485	55,607	27,260	4,250	2,300	57,696	29,348	4,419	2,469	59,020	30,673	4,526	2,576
e/o I-95	75,111	36,879	5,836	3,209	73,819	36,094	5,691	3,098	74,952	37,347	5,783	3,199	75,671	38,142	5,841	3,263
Rt 332 (Westbound)																
bet Creamery Rd & W Afton Ave	6,453	3,227	599	323	6,656	3,339	621	339	6,696	3,498	624	351	6,721	3,599	626	360
Oxford Valley Rd (Northbound)																
n/o US 1	32,024	16,058	1,397	1,196	31,725	15,908	1,366	1,175	32,143	16,326	1,400	1,209	32,408	16,591	1,421	1,230
n/o Big Oak	12,189	6,112	532	455	11,980	6,008	510	441	12,356	6,384	540	471	12,595	6,622	560	490
Bristol Oxford Valley Rd (Southbound)																
bet US 1 and Lincoln Hwy	34,905	12,702	2,827	878	34,832	12,665	2,819	873	35,249	13,083	2,853	907	35,514	13,348	2,874	928
bet Lincoln Hwy & Trenton Rd	10,579	3,850	906	266	10,512	3,816	899	261	10,805	4,109	923	285	10,990	4,294	938	300
s/o Woodbourne Rd	13,209	4,807	1,132	332	13,157	4,781	1,126	329	13,318	4,942	1,139	342	13,420	5,044	1,147	350
Trenton Rd (Westbound)																
w/o Woodbourne Rd	14,811	7,494	1,136	607	14,796	7,487	1,134	606	14,927	7,618	1,145	617	15,011	7,702	1,152	623
I-95 (Northbound)																
n/o US 1	62,628	30,478	6,072	2,853	69,016	33,173	6,597	3,089	65,961	33,549	6,338	3,119	63,978	33,788	6,174	3,139

Location	2015 - No Build/NoToll				2015 - Build/No Toll				2015 - Build/Low Toll				2015 - Build/High Toll			
	2-WAY AADT	1-WAY AADT	2-WAY PEAK HOUR	1-WAY PEAK HOUR	2-WAY AADT	1-WAY AADT	2-WAY PEAK HOUR	1-WAY PEAK HOUR	2-WAY AADT	1-WAY AADT	2-WAY PEAK HOUR	1-WAY PEAK HOUR	2-WAY AADT	1-WAY AADT	2-WAY PEAK HOUR	1-WAY PEAK HOUR
NJ LOCATIONS																
Rt 29 (Northbound)																
s/o CR 546	12,801	6,354	1,110	738	12,909	6,389	1,120	743	13,482	6,961	1,166	790	13,844	7,324	1,196	819
n/o I-95	16,132	7,970	1,271	866	16,567	8,111	1,311	886	17,082	8,626	1,353	928	17,409	8,953	1,379	954
CR 546/Washington Crossing Rd (Westbound)																
bet Rt 29 & Bear Tavern Rd	7,886	4,419	935	865	7,208	4,075	864	816	7,757	4,624	908	860	8,105	4,972	936	889
w/o Bear Tavern Rd	9,170	5,138	1,085	1,006	8,729	4,915	1,038	974	9,086	5,272	1,067	1,003	9,313	5,498	1,085	1,021
e/o Scotch Rd	7,898	4,426	878	866	7,634	4,292	850	847	7,848	4,506	867	864	7,984	4,642	878	875
Scotch Rd (Northbound)																
n/o I-95	16,370	8,243	2,126	534	16,626	8,384	2,153	554	16,703	8,491	2,159	563	16,752	8,559	2,163	568
Bear Tavern Rd (Northbound)																
s/o CR 546	8,275	4,402	942	445	8,345	4,473	952	455	8,527	4,654	966	469	8,642	4,769	975	478
at Jacobs Creek Rd	8,759	4,660	971	471	9,015	4,801	999	491	9,159	4,975	1,011	505	9,250	5,085	1,018	513
Bear Tavern Rd / Grand Ave (Southbound)																
s/o W Upper Ferry Rd	9,430	4,413	760	327	9,730	4,484	786	337	9,758	4,571	788	344	9,775	4,627	789	348
Rt 29 (Southbound)																
s/o Lower Ferry Rd	19,415	10,191	1,791	749	20,247	10,296	1,855	764	19,825	10,413	1,821	773	19,558	10,488	1,800	779
s/of Sullivan Way	30,272	14,976	2,844	1,327	30,684	15,025	2,876	1,334	30,525	15,284	2,863	1,354	30,423	15,448	2,854	1,368
bet. Parkside Ave & Calhoun St	43,378	20,606	3,905	1,902	43,378	20,606	3,905	1,902	43,384	20,911	3,906	1,927	43,388	21,104	3,906	1,942
Sullivan Way (Southbound)																
s/o Lower Ferry Rd	8,392	4,172	704	254	8,542	4,208	716	259	8,599	4,324	721	268	8,635	4,398	724	274
Parkway Ave/Rt 634 Southbound)																
bet Scotch Rd & Olden Av	24,650	11,186	1,794	793	24,789	11,257	1,808	803	24,940	11,438	1,820	818	25,036	11,553	1,828	827
Pennington Rd (Northbound)																
n/o I-95	33,258	19,198	2,617	1,328	33,681	19,409	2,661	1,358	33,814	19,602	2,672	1,373	33,898	19,724	2,678	1,383
Pennington Rd / Rt 31 (southbound)																
s/o I-95	18,733	9,158	1,576	764	18,945	9,264	1,598	779	18,883	9,441	1,593	793	18,844	9,554	1,590	802
bet. Carlton Ave & Theresa St	13,503	6,827	1,120	565	13,609	6,879	1,131	572	13,683	7,133	1,137	593	13,730	7,294	1,141	606
n/o N Olden Ave / 622	11,028	5,560	923	461	11,099	5,595	930	466	11,401	5,958	955	495	11,593	6,187	970	513
n/o Calhoun St	8,553	4,294	726	356	8,553	4,294	726	356	9,157	4,897	775	405	9,539	5,280	806	436
US 206 / Lawrenceville Rd (Southbound)																
s/o I-95	20,322	9,972	1,637	811	20,082	9,850	1,611	794	20,277	10,044	1,627	810	20,400	10,168	1,637	820
s/o Eggert Crossing Rd	17,001	8,501	1,368	638	16,743	8,369	1,340	619	16,952	8,579	1,357	636	17,085	8,712	1,368	647
s/o Princeton Pike	10,520	5,709	712	386	10,147	5,520	673	359	10,449	5,822	697	384	10,640	6,014	713	399
Princeton Pike (Southbound)																
s/of Franklin Corner Rd	23,366	11,778	1,786	879	23,262	11,725	1,775	872	23,346	11,809	1,782	878	23,399	11,862	1,786	883
bet Darrah Ln & Gainsboro Rd	8,920	4,496	787	337	8,807	4,439	775	329	8,899	4,531	782	336	8,957	4,589	787	341
Princeton Ave (Southbound)																
s/o Rt 622	13,699	7,085	1,024	544	13,615	7,042	1,015	538	13,683	7,110	1,020	543	13,726	7,153	1,024	547
Brunswick Pike / US 1 (Southbound)																
s/o I-95	55,581	27,776	4,277	2,160	52,503	26,213	3,953	1,939	54,997	28,707	4,155	2,141	56,579	30,289	4,282	2,268
Trenton Fwy / US 1 (Southbound)																
bet Brunswick Pike & Whitehead Rd	45,163	21,930	3,766	1,899	41,948	20,298	3,429	1,668	44,553	22,903	3,639	1,878	46,205	24,555	3,772	2,012
bet Whitehead Rd & Strawberry St	47,187	21,629	3,875	1,857	43,835	19,927	3,523	1,616	46,551	22,643	3,742	1,835	48,274	24,365	3,881	1,974
s/o US Strawberry St	49,211	21,327	3,983	1,814	45,487	19,436	3,592	1,547	48,505	22,454	3,835	1,791	50,419	24,368	3,990	1,945

Location	2030 - No Build/NoToll				2030 - Build/No Toll				2030 - Build/Low Toll				2030 - Build/High Toll			
	2-WAY AADT	1-WAY AADT	2-WAY PEAK HOUR	1-WAY PEAK HOUR	2-WAY AADT	1-WAY AADT	2-WAY PEAK HOUR	1-WAY PEAK HOUR	2-WAY AADT	1-WAY AADT	2-WAY PEAK HOUR	1-WAY PEAK HOUR	2-WAY AADT	1-WAY AADT	2-WAY PEAK HOUR	1-WAY PEAK HOUR
CROSSINGS																
Scudder Falls Bridge (Westbound)	**70,823**	**36,936**	**7,529**	**4,895**	**78,690**	**40,967**	**8,377**	**5,427**	**72,415**	**34,693**	**8,076**	**5,126**	**68,801**	**31,078**	**7,903**	**4,953**
Washington Crossing (Westbound)	8,426	4,722	1,115	864	6,921	3,950	953	762	8,121	5,151	1,011	819	8,813	5,843	1,044	853
Calhoun St Br (Westbound)	22,681	11,212	1,666	1,028	21,790	10,755	1,570	968	22,501	11,466	1,604	1,002	22,910	11,875	1,624	1,021
Lower Trenton Br (Westbound)	21,915	16,239	1,754	1,323	21,752	16,155	1,736	1,312	21,882	16,285	1,743	1,319	21,956	16,359	1,746	1,322
Trenton Morrisville Br (Westbound)	66,111	25,374	6,180	3,581	61,735	23,133	5,708	3,285	65,225	26,622	5,875	3,452	67,235	28,632	5,972	3,548
PA LOCATIONS																
Washington Crossing Rd/Rt 532 (Westbound)																
s/o Wrightstown Rd	5,129	2,874	484	375	4,526	2,565	419	334	5,007	3,046	442	357	5,283	3,322	455	370
bet Dolingtown Rd & Lindenhurst Rd	12,047	6,751	1,185	917	11,505	6,473	1,126	881	11,937	6,905	1,147	902	12,186	7,154	1,159	913
w/o Lindenhurst	9,568	5,362	901	698	9,216	5,181	863	674	9,497	5,462	877	688	9,659	5,624	885	695
Taylorsville Rd (southbound)																
s/o Rt 532	13,321	6,916	1,406	724	13,823	6,992	1,451	734	13,302	7,412	1,426	754	13,002	7,654	1,412	766
Wrightstown Rd (Westbound)																
w/o Rt 532	2,550	1,429	251	194	2,400	1,352	234	184	2,520	1,472	240	190	2,589	1,541	243	193
Lindenhurst Rd (Southbound)																
s/o Wash Xing Rd/532	7,847	3,795	652	238	7,967	3,803	662	239	8,097	3,932	668	245	8,172	4,007	672	248
River Rd / Rt 32 (Northbound)																
n/o Wash Xing	4,153	1,997	383	160	4,077	1,958	375	155	4,137	2,018	378	157	4,172	2,053	380	159
US 13/Main St (Northbound)																
n/o Edgewood Rd	13,321	6,561	1,113	617	13,733	6,682	1,153	633	14,089	7,478	1,170	671	14,295	7,936	1,180	693
s/o Edgewood Rd	9,325	4,593	779	432	9,599	4,673	806	442	10,423	5,810	845	497	10,897	6,466	868	528
n/o Big Oak	8,541	4,207	714	395	8,678	4,247	727	401	9,256	5,013	755	437	9,589	5,454	771	458
bet US 1 & Trenton Av	15,110	7,442	1,430	699	15,110	7,442	1,430	699	15,969	8,301	1,472	741	16,464	8,796	1,495	764
Edgewood Rd (Westbound)																
bet Makefield & Oxford Valley	9,206	4,603	887	430	9,206	4,603	887	430	9,377	4,774	895	438	9,475	4,872	900	443
Yardley Langhorne Pike (Westbound)																
e/o Edgewood Rd	4,481	2,240	414	209	4,448	2,220	410	207	4,567	2,340	416	212	4,636	2,408	419	216
e/o Main St	9,688	4,844	895	453	9,324	4,651	856	427	9,802	5,129	879	450	10,077	5,404	892	463
Yardley Morrisville Rd (Northbound)																
n/o Calhoun St	4,844	2,394	356	220	4,440	2,139	310	186	4,937	2,637	334	210	5,224	2,923	347	223
Trenton Ave (Westbound)																
w/o Yardley Morrisville	19,702	9,739	1,554	893	19,479	9,625	1,530	878	19,657	9,803	1,539	886	19,759	9,905	1,544	891
Big Oak Rd (Westbound)																
w/o US 13	7,967	3,984	624	372	7,806	3,901	607	361	7,935	4,030	613	368	8,009	4,104	616	371
Stony Hill Rd (Westbound)																
bet US 1 & Big Oak	10,294	5,147	951	481	9,970	4,981	916	459	10,228	5,239	929	472	10,377	5,388	936	479
US 1 (West/Southbound)																
bet US 13 & W Bridge St	77,505	38,675	6,383	3,905	73,195	36,466	5,918	3,613	76,632	39,904	6,083	3,778	78,613	41,884	6,178	3,873
bet US 13 & Trenton Av	66,606	32,703	5,151	2,660	63,373	31,047	4,802	2,441	65,951	33,625	4,926	2,565	67,437	35,111	4,997	2,636
w/o Stony Hill Rd	66,606	32,703	5,151	2,660	63,858	31,295	4,855	2,474	66,049	33,487	4,960	2,579	67,312	34,749	5,020	2,639
e/o I-95	85,982	42,217	6,649	3,433	84,602	41,372	6,494	3,322	85,791	42,687	6,551	3,385	86,476	43,445	6,584	3,421
Rt 332 (Westbound)																
bet Creamery Rd & W Afton Ave	7,387	3,694	683	345	7,604	3,815	706	361	7,646	3,982	708	369	7,670	4,078	710	374
Oxford Valley Rd (Northbound)																
n/o US 1	36,659	18,382	1,592	1,280	36,337	18,221	1,558	1,259	36,776	18,660	1,579	1,280	37,028	18,912	1,591	1,292
n/o Big Oak	13,953	6,997	606	487	13,729	6,884	582	473	14,123	7,279	601	491	14,350	7,506	612	502
Bristol Oxford Valley Rd (Southbound)																
bet US 1 and Lincoln Hwy	39,957	14,541	3,221	940	39,878	14,501	3,212	934	40,316	14,939	3,233	955	40,569	15,192	3,245	967
bet Lincoln Hwy & Trenton Rd	12,110	4,407	1,033	285	12,038	4,371	1,025	280	12,345	4,678	1,040	295	12,522	4,855	1,048	303
s/o Woodbourne Rd	15,121	5,502	1,289	356	15,065	5,475	1,283	352	15,234	5,643	1,291	360	15,331	5,741	1,296	365
Trenton Rd (Westbound)																
w/o Woodbourne Rd	16,954	8,579	1,294	650	16,938	8,571	1,292	649	17,076	8,709	1,299	655	17,156	8,788	1,303	659
I-95 (Northbound)																
n/o US 1	71,700	35,500	6,918	3,053	78,500	38,400	7,527	3,290	75,294	38,794	7,365	3,309	73,402	39,021	7,273	3,320

Location	2030 - No Build/NoToll				2030 - Build/No Toll				2030 - Build/Low Toll				2030 - Build/High Toll			
	2-WAY AADT	1-WAY AADT	2-WAY PEAK HOUR	1-WAY PEAK HOUR	2-WAY AADT	1-WAY AADT	2-WAY PEAK HOUR	1-WAY PEAK HOUR	2-WAY AADT	1-WAY AADT	2-WAY PEAK HOUR	1-WAY PEAK HOUR	2-WAY AADT	1-WAY AADT	2-WAY PEAK HOUR	1-WAY PEAK HOUR
NJ LOCATIONS																
Rt 29 (Northbound)																
s/o CR 546	14,653	7,273	1,265	790	14,752	7,311	1,275	795	15,352	7,912	1,304	824	15,698	8,257	1,320	840
n/o I-95	18,467	9,124	1,449	927	18,861	9,275	1,489	947	19,401	9,816	1,514	973	19,713	10,127	1,529	988
CR 546/Washington Crossing Rd (Westbound)																
bet Rt 29 & Bear Tavern Rd	9,027	5,058	1,065	925	8,304	4,688	988	876	8,881	5,264	1,015	904	9,213	5,596	1,031	920
w/o Bear Tavern Rd	10,497	5,882	1,236	1,076	10,027	5,642	1,185	1,044	10,402	6,016	1,203	1,062	10,618	6,232	1,213	1,073
e/o Scotch Rd	9,041	5,066	1,000	927	8,760	4,922	969	908	8,984	5,147	980	919	9,114	5,276	986	925
Scotch Rd (Northbound)																
n/o I-95	18,739	9,436	2,422	572	19,012	9,588	2,452	592	19,093	9,700	2,455	597	19,140	9,765	2,458	600
Bear Tavern Rd (Northbound)																
s/o CR 546	9,473	5,039	1,073	476	9,548	5,115	1,083	486	9,739	5,305	1,092	495	9,848	5,415	1,097	500
at Jacobs Creek Rd	10,027	5,334	1,107	504	10,300	5,486	1,137	524	10,451	5,668	1,144	532	10,538	5,773	1,148	537
Bear Tavern Rd / Grand Ave (Southbound)																
s/o W Upper Ferry Rd	10,795	5,052	866	349	11,113	5,128	896	359	11,142	5,220	897	364	11,159	5,272	898	366
Rt 29 (Southbound)																
s/o Lower Ferry Rd	22,225	11,666	2,041	801	23,105	11,779	2,119	816	22,664	11,902	2,098	822	22,409	11,973	2,086	826
s/of Sullivan Way	34,653	17,143	3,240	1,420	35,090	17,196	3,279	1,427	34,922	17,468	3,271	1,440	34,826	17,624	3,266	1,447
bet. Parkside Ave & Calhoun St	49,656	23,588	4,449	2,035	49,656	23,588	4,449	2,035	49,663	23,908	4,449	2,051	49,666	24,092	4,450	2,060
Sullivan Way (Southbound)																
s/o Lower Ferry Rd	9,607	4,776	802	272	9,766	4,814	817	277	9,826	4,936	819	283	9,860	5,007	821	286
Parkway Ave/Rt 634 Southbound)																
bet Scotch Rd & Olden Av	28,218	12,805	2,043	849	28,366	12,881	2,059	859	28,524	13,071	2,067	868	28,616	13,180	2,071	873
Pennington Rd (Northbound)																
n/o I-95	38,072	21,976	2,981	1,421	38,527	22,204	3,030	1,451	38,666	22,406	3,036	1,460	38,747	22,522	3,040	1,466
Pennington Rd / Rt 31 (southbound)																
s/o I-95	21,445	10,484	1,795	817	21,672	10,597	1,820	832	21,607	10,784	1,816	841	21,570	10,891	1,815	846
bet. Carlton Ave & Theresa St	15,457	7,815	1,276	605	15,571	7,872	1,288	612	15,649	8,137	1,292	625	15,694	8,291	1,294	632
n/o N Olden Ave / 622	12,624	6,365	1,051	493	12,700	6,403	1,060	498	13,017	6,783	1,075	516	13,200	7,002	1,084	527
n/o Calhoun St	9,791	4,915	827	381	9,791	4,915	827	381	10,424	5,548	857	412	10,789	5,913	875	429
US 206 / Lawrenceville Rd (Southbound)																
s/o I-95	23,264	11,415	1,865	868	23,008	11,284	1,837	851	23,212	11,488	1,847	861	23,329	11,606	1,852	866
s/o Eggert Crossing Rd	19,462	9,731	1,558	682	19,186	9,590	1,528	664	19,406	9,810	1,539	674	19,533	9,936	1,545	680
s/o Princeton Pike	12,042	6,536	811	413	11,645	6,332	768	386	11,962	6,649	784	402	12,144	6,831	792	410
Princeton Pike (Southbound)																
s/of Franklin Corner Rd	26,748	13,482	2,035	941	26,638	13,426	2,023	933	26,725	13,514	2,027	937	26,776	13,564	2,030	940
bet Darrah Ln & Gainsboro Rd	10,211	5,147	896	361	10,090	5,085	883	353	10,187	5,182	888	357	10,242	5,237	891	360
Princeton Ave (Southbound)																
s/o Rt 622	15,681	8,110	1,166	582	15,592	8,065	1,157	576	15,663	8,136	1,160	579	15,704	8,177	1,162	581
Brunswick Pike / US 1 (Southbound)																
s/o I-95	63,626	31,796	4,872	2,312	60,344	30,115	4,519	2,090	62,961	32,732	4,644	2,215	64,469	34,240	4,716	2,287
Trenton Fwy / US 1 (Southbound)																
bet Brunswick Pike & Whitehead Rd	51,699	25,104	4,291	2,032	48,272	23,348	3,922	1,800	51,006	26,082	4,053	1,931	52,580	27,656	4,128	2,007
bet Whitehead Rd & Strawberry St	54,017	24,759	4,414	1,987	50,444	22,928	4,029	1,745	53,293	25,778	4,166	1,882	54,935	27,420	4,245	1,960
s/o US Strawberry St	56,334	24,414	4,538	1,941	52,364	22,380	4,110	1,673	55,530	25,546	4,262	1,825	57,354	27,370	4,349	1,912

Estimated Volume-to-Capacity Ratios on Affected Roadways for:

- **No Build / No Toll**
- **Build / No Toll**
- **Build / Low Toll**
- **Build / High Toll**

Location	2015 Peak Hour Volume-to-Capacity* Ratios				2030 Peak Hour Volume-to-Capacity* Ratios			
	No Build/No Toll	Build/No Toll	Build/Low Toll	Build/High Toll	No Build/No Toll	Build/No Toll	Build/Low Toll	Build/High Toll
CROSSINGS								
Scudder Falls Bridge (Westbound)	**0.95**	**0.61**	**0.55**	**0.51**	**1.02**	**0.65**	**0.61**	**0.59**
Washington Crossing (Westbound)	**0.95**	0.83	**0.94**	**1.01**	**1.02**	0.90	**0.96**	**1.00**
Calhoun St Br (Westbound)	0.87	0.82	0.87	0.90	**0.93**	0.88	**0.91**	**0.93**
Lower Trenton Br (Westbound)	0.88	0.88	0.88	0.89	**0.95**	**0.94**	**0.94**	**0.94**
Trenton Morrisville Br (Westbound)	0.84	0.76	0.83	0.87	0.90	0.82	0.86	0.89
PA LOCATIONS								
Washington Crossing Rd/Rt 532 (Westbound)								
s/o Wrightstown Rd	0.18	0.16	0.18	0.19	0.20	0.18	0.19	0.19
bet Dolingtown Rd & Lindenhurst Rd	0.45	0.43	0.45	0.46	0.48	0.46	0.47	0.48
w/o Lindenhurst	0.34	0.33	0.34	0.35	0.37	0.35	0.36	0.37
Taylorsville Rd (southbound)								
s/o Rt 532	0.36	0.36	0.38	0.39	0.38	0.39	0.40	0.40
Wrightstown Rd (Westbound)								
w/o Rt 532	0.10	0.09	0.09	0.10	0.10	0.10	0.10	0.10
Lindenhurst Rd (Southbound)								
s/o Wash Xing Rd/532	0.12	0.12	0.12	0.13	0.13	0.13	0.13	0.13
River Rd / Rt 32 (Northbound)								
n/o Wash Xing	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
US 13/Main St (Northbound)								
n/o Edgewood Rd	0.30	0.31	0.34	0.36	0.32	0.33	0.35	0.36
s/o Edgewood Rd	0.21	0.22	0.26	0.29	0.23	0.23	0.26	0.28
n/o Big Oak	0.19	0.20	0.23	0.25	0.21	0.21	0.23	0.24
bet US 1 & Trenton Av	0.34	0.34	0.38	0.40	0.37	0.37	0.39	0.40
Edgewood Rd								
bet Makefield & Oxford Valley	0.21	0.21	0.22	0.22	0.23	0.23	0.23	0.23
Yardley Langhorne Pike (Westbound)								
e/o Edgewood Rd	0.10	0.10	0.11	0.11	0.11	0.11	0.11	0.11
e/o Main St	0.22	0.21	0.23	0.24	0.24	0.22	0.24	0.24
Yardley Morrisville Rd (Northbound)								
n/o Calhoun St	0.11	0.09	0.11	0.12	0.12	0.10	0.11	0.12
Trenton Ave (Westbound)								
w/o Yardley Morrisville	0.23	0.23	0.23	0.23	0.25	0.24	0.25	0.25
Big Oak Rd (Westbound)								
w/o US 13	0.18	0.18	0.18	0.19	0.20	0.19	0.19	0.20
Stony Hill Rd (Westbound)								
bet US 1 & Big Oak	0.24	0.23	0.24	0.24	0.25	0.24	0.25	0.25
US 1 (West/Southbound)								
bet US 13 & W Bridge St	0.41	0.38	0.41	0.43	0.44	0.41	0.43	0.44
bet US 13 & Trenton Av	0.56	0.52	0.56	0.59	0.60	0.55	0.58	0.60
w/o Stony Hill Rd	0.56	0.52	0.56	0.59	0.60	0.56	0.59	0.60
e/o I-95	0.73	0.70	0.73	0.74	0.78	0.75	0.77	0.78
Rt 332 (Westbound)								
bet Creamery Rd & W Afton Ave	0.17	0.18	0.18	0.19	0.18	0.19	0.19	0.20
Oxford Valley Rd (Northbound)								
n/o US 1	0.34	0.33	0.34	0.35	0.36	0.36	0.36	0.37
n/o Big Oak	0.24	0.23	0.25	0.26	0.26	0.25	0.26	0.26
Bristol Oxford Valley Rd (Southbound)								
bet US 1 and Lincoln Hwy	0.23	0.23	0.24	0.24	0.25	0.25	0.25	0.25
bet Lincoln Hwy & Trenton Rd	0.14	0.14	0.15	0.16	0.15	0.15	0.16	0.16
s/o Woodbourne Rd	0.17	0.17	0.18	0.18	0.19	0.19	0.19	0.19
Trenton Rd (Westbound)								
w/o Woodbourne Rd	0.32	0.32	0.32	0.33	0.34	0.34	0.34	0.35
I-95 (Northbound)								
n/o US 1	0.59	0.64	0.65	0.65	0.64	0.69	0.69	0.69

Location	2015 Peak Hour Volume-to-Capacity* Ratios				2030 Peak Hour Volume-to-Capacity* Ratios			
	No Build/No Toll	Build/No Toll	Build/Low Toll	Build/High Toll	No Build/No Toll	Build/No Toll	Build/Low Toll	Build/High Toll
NJ LOCATIONS								
Rt 29 (Northbound)								
s/o CR 546	0.39	0.39	0.42	0.43	0.42	0.42	0.43	0.44
n/o I-95	0.46	0.47	0.49	0.50	0.49	0.50	0.51	0.52
CR 546/Washington Crossing Rd (Westbound)								
bet Rt 29 & Bear Tavern Rd	0.46	0.43	0.45	0.47	0.49	0.46	0.48	0.48
w/o Bear Tavern Rd	0.53	0.51	0.53	0.54	0.57	0.55	0.56	0.56
e/o Scotch Rd	0.46	0.45	0.45	0.46	0.49	0.48	0.48	0.49
Scotch Rd (Northbound)								
n/o I-95	0.28	0.29	0.30	0.30	0.30	0.31	0.31	0.32
Bear Tavern Rd (Northbound)								
s/o CR 546	0.23	0.24	0.25	0.25	0.25	0.26	0.26	0.26
at Jacobs Creek Rd	0.25	0.26	0.27	0.27	0.27	0.28	0.28	0.28
Bear Tavern Rd / Grand Ave (Southbound)								
s/o W Upper Ferry Rd	0.17	0.18	0.18	0.18	0.18	0.19	0.19	0.19
Rt 29 (Southbound)								
s/o Lower Ferry Rd	0.20	0.20	0.20	0.21	0.21	0.21	0.22	0.22
s/of Sullivan Way	0.35	0.35	0.36	0.36	0.37	0.38	0.38	0.38
bet. Parkside Ave & Calhoun St	0.53	0.53	0.54	0.54	0.57	0.57	0.57	0.57
Sullivan Way (Southbound)								
s/o Lower Ferry Rd	0.13	0.14	0.14	0.14	0.14	0.15	0.15	0.15
Parkway Ave/Rt 634 Southbound)								
bet Scotch Rd & Olden Av	0.21	0.21	0.22	0.22	0.22	0.23	0.23	0.23
Pennington Rd (Northbound)								
n/o I-95	0.35	0.36	0.36	0.36	0.37	0.38	0.38	0.39
Pennington Rd / Rt 31 (southbound)								
s/o I-95	0.20	0.20	0.21	0.21	0.22	0.22	0.22	0.22
bet. Carlton Ave & Theresa St	0.15	0.15	0.16	0.16	0.16	0.16	0.16	0.17
n/o N Olden Ave / 622	0.13	0.13	0.14	0.14	0.14	0.14	0.14	0.15
n/o Calhoun St	0.20	0.20	0.23	0.24	0.21	0.21	0.23	0.24
US 206 / Lawrenceville Rd (Southbound)								
s/o I-95	0.43	0.42	0.43	0.43	0.46	0.45	0.45	0.46
s/o Eggert Crossing Rd	0.34	0.33	0.33	0.34	0.36	0.35	0.35	0.36
s/o Princeton Pike	0.21	0.20	0.21	0.22	0.23	0.21	0.22	0.23
Princeton Pike (Southbound)								
s/of Franklin Corner Rd	0.46	0.46	0.46	0.46	0.50	0.49	0.49	0.49
bet Darrah Ln & Gainsboro Rd	0.18	0.17	0.18	0.18	0.19	0.19	0.19	0.19
Princeton Ave (Southbound)								
s/o Rt 622	0.15	0.15	0.15	0.15	0.16	0.16	0.16	0.16
Brunswick Pike / US 1 (Southbound)								
s/o I-95	0.38	0.34	0.38	0.40	0.41	0.37	0.39	0.40
Trenton Fwy / US 1 (Southbound)								
bet Brunswick Pike & Whitehead Rd	0.43	0.38	0.43	0.46	0.46	0.41	0.44	0.46
bet Whitehead Rd & Strawberry St	0.52	0.45	0.51	0.55	0.55	0.48	0.52	0.54
s/o US Strawberry St	0.45	0.39	0.45	0.49	0.49	0.42	0.46	0.48

Legend
below 0.50
0.50 to 0.74
0.75 to 0.89
0.90 or higher

* Jacobs estimated BRIDGE capacities based on current peak volume and congestion levels. The other roadway segment hourly capacities come directly from the NJRTM-E models, and are based on facility type, area type (e.g., urban or rural), and the number of lanes. Any constraints to the non-bridge roadway capacities such as traffic controls, weaving movements, and roadway width are not considered in the models.

Appendix Section

Clarification For Rational and Methodology Used in Report

APPENDIX SECTION TO THE SCUDDER FALLS BRIDGE
TRAFFIC DIVERSION STUDY REPORT
CLARIFICATION FOR RATIONAL AND METHODOLOGY USED IN REPORT

The purpose of this Appendix Section to the Traffic Diversion Study Report is to provide clarification as to the rational and methodology used in developing the traffic diversion volumes for the tolling of the Scudder Falls Bridge and to address general questions that have been raised regarding the study subsequent to the issuance of the Final Traffic Diversion Study Report that was dated September 8, 2010. This appendix is comprised of three (3) sections; Section I includes additional information that is intended to clarify and/or further explain key elements of the report; Section II includes general questions that have been raised since the report was finalized on September 8, 2010 and responses to those questions and; Section III that includes a summary of the assumptions and the basis for the information used in the Traffic Diversion Study Report along with the flowchart of the methodology used by Jacobs.

The following information is provided to clarify and/or further explain key elements of the report:

I. An explanation as to how the 17% and 30% traffic diversion was calculated for passenger cars, with $1.00 and $3.00 tolls, respectively.

A. ***In reviewing the origin-destination survey results, the trips were grouped into three categories:***
   1) ***Those with an origin/destination near the Scudder Falls bridge (35% of origins and 13% of total destinations were in this category)***
   2) ***Those with an origin/destination between the Scudder Falls bridge and an alternative bridge (13% of origins & 29% of destinations)***
   3) ***Other trips, which were typically longer-distance trips (51% of origins & 57% of destinations)***

B. ***The assumed trip diversion off of the Scudder Falls Bridge - with a $1.00 toll - for each of the categories was:***
   1) ***5% (most of the loss is trips not made)***
   2) ***50% (many of these trips would switch to the alternate route)***
   3) ***10% (longer distance trips are less frequent and less likely to divert)***

Multiplying the trip splits in (A) by the diversions in (B), we get 13% of trips diverted based on their origin and 21% diverted based on their destination. Since every trip has both an origin and destination, we took the average of these two, arriving at 17% diversion (83% of trips staying on Scudder Falls).

For the $3.00 toll, we applied a toll elasticity factor to the $1.00 results.

Toll elasticity is defined as the change in traffic based on the change in toll rate (% change in traffic / % change in tolls). Jacobs has worked on numerous toll projects in the Northeast and has found this number to generally be in the range of -0.08 to -0.15 for passenger cars. We chose -0.08 for the Scudder Falls Bridge because most of the alternative routes are tolled and are not nearby, so traffic is less likely to shift from a toll increase than on facilities with closer, free alternatives.

An elasticity of -0.08 means that for a 100% increase in tolls (a doubling), the traffic decreases 8%. Likewise, for a 200% increase in tolls ($1.00 to $3.00) traffic would decrease by 16%. Assuming as a base the 83% of current trips retained with a $1.00 toll, and deducting 16%, we get 70% trip retention on Scudder Falls with a $3 toll compared to the toll free case, or 30% diversion.

II. The following describes how toll diversion was estimated:

Jacobs had estimated 17% daily toll diversion using estimates derived from the Scudder Falls Bridge Origin-Destination (O-D) survey results. This was determined by grouping the O-D data and estimating the likelihood of remaining on the SFB based on travel time savings, traveler value of time, and characteristics of customers.

Origins and destinations on each side of the river were grouped into "Superzones":
(1) O-Ds near the SFB, including Yardley, Newtown, and Ewing
(2) O-Ds that have good access to alternative routes, such as Princeton, Trenton, and Langhorne
(3) O-Ds from places further out, which are more likely to be infrequent trips

One reason a driver would choose a toll route over a free route is time savings; in effect, time equals money. There is no one standard to determine how much a minute or ten minutes is worth monetarily; however in the toll forecasting industry good rule of thumb is that the value of time (VOT) is 33% to 60% of the median household income divided by 2080 (hours worked per year). A road with more commuters – who value their time higher than someone making a discretionary trip – should use a higher percent of the household income. Based on engineering judgment and experience, fifty percent was used for this study.

For this area we determined that $1.00 is the equivalent of 3-4 minutes travel time savings, as calculated below.

	Median HH Income	Hourly	Driving VOT (50% of hourly)	$1.00 Time Savings Equivalent (mins)
Bucks Co., PA	$ 74,111	$ 35.63	$ 17.82	3.4
Mercer Co., NJ	$ 71,167	$ 34.21	$ 17.11	3.5

What this tells us is that the average regular customer in this area will choose to use the SFB for a $1.00 toll if it saved them at least 3.5 minutes.

Travel time savings is not the only consideration; we also have to consider other characteristics such as trip purpose, frequency and length and well as method of payment. Long-distance travelers are typically infrequent customers who, since they will only be taking the toll bridge occasionally, are less likely to seek an alternate route. They are also less likely to be commuters; commuters value their time more than most other travelers because they are on a schedule, and commuters are the most familiar with alternate routes. Even though there may be time savings on another route, long-distance and infrequent travelers are likely to stay with the route they know best.

The following table presents how the 17% diversion was calculated using estimated diversions for each of the Superzones. Also shown are travel time comparisons (for an average hour of the day, on the SFB versus the alternative route) for common trips in each group.

Superzone	% of O-D Results in this Group	Common Trip(s) From	Common Trip(s) To	Alternate Bridge	Travel Time (Mins) SFB	Travel Time (Mins) Alt Bridge	SFB Time Savings	% of Daily Trips Likely to Remain on SFB
(1) Trips with Ends Close to SFB	25%	Ewing, NJ	Yardley, PA	Calhoun St	13	18	5	95%
		Ewing, NJ	Newtown, PA	Wash Xing	19	25	6	
		Ewing, NJ	Wash Xing, PA	Wash Xing	15	21	6	
		Lawrenceville, NJ	Woodside, PA	Calhoun St	19	26	7	
		Lawrence Twp, NJ	Yardley, PA	Calhoun St	13	21	8	
(2) Trips with Good Alternate Routes	21%	Princeton, NJ	Newtown, PA	Wash Xing	41	40	-1	50%
		Princeton, NJ	Oxford Vly, PA	Rt 1	28	29	1	
		Princeton, NJ	Oxford Vly, PA	Lwr Trenton	28	31	3	
		Titusville, NJ	Yardley, PA	Wash Xing	11	13	2	
		Lawrence Twp, NJ	Oxford Vly, PA	Rt 1	19	23	4	
		Lawrence Twp, NJ	Oxford Vly, PA	Lwr Trenton	19	25	6	
		Princeton, NJ	Langhorne, PA	Rt 1	29	32	3	
		Princeton, NJ	Langhorne, PA	Lwr Trenton	29	35	6	
(3) Other Trips - Many Long Distance, Infrequent	54%	New Brunswick, NJ	Horsham, PA	Rt 1	62	63	1	90%
		New Brunswick, NJ	Horsham, PA	Lwr Trenton	62	66	4	
		Princeton Mdws, NJ	Philadelphia, PA	Rt 1	65	67	2	
		Princeton Mdws, NJ	Philadelphia, PA	Lwr Trenton	65	70	5	
		Montgmy Twp, NJ	King of Prussia PA	Rt 1	72	78	6	
		Montgmy Twp, NJ	King of Prussia PA	Lwr Trenton	72	81	9	

(Shaded box) = Tolled ($0.75) alternate route

(1) 25% x 95%
plus
(2) 21% x 50%
plus
(3) 54% x 90%
=

% Remaining on SFB: 83%
% Diverting: 17%

All the trips in Superzone 1 will experience enough time savings (>3.5 mins.) to warrant paying a $1.00 toll, if you are to consider the typical VOT of this area. We assumed 95% of this group would remain on the SFB once it is tolled. Many of the 5% that divert will be discretionary trips no longer made across the river (such as shopping, where the driver could instead consolidate trips or choose a store on their own side of the river).

For many of the Superzone 2 trips, the best alternative route will be the Route 1 Toll Bridge. Many of these users currently use the SFB to avoid paying a toll at the Route 1 Bridge, and will return to Route 1 once the SFB is tolled. Other customers in this category have a trip end near a free bridge. Because most of these trips have an alternate route that adds only a few minutes to their travel time, we assumed that 50% would remain on the SFB when it is tolled, and 50% would divert.

Superzone 3 trips are longer than the other two groups of trips. Therefore, they are less likely to be commuter trips and more likely to be infrequent users. The Trenton-Morrisville (Rt. 1) Bridge is their major alternative, as it is easily accessible from both I-95 and Route 1 outside the area; however, it is also tolled (at the slightly lower current rate of $0.75). As a large portion of these users does not have knowledge of the alternative free bridges and connecting local roadway network, they are typically unlikely to use them. And, as shown in the table, using the Lower Trenton Bridge takes three minutes

more time than the Route 1 Bridge (in an average hour) and significantly more time than the Scudder Falls Bridge. Therefore it was assumed that 90% of these customers would remain on the SFB after it is tolled.

While we calculated toll diversion on a daily basis in the 2009 Traffic and Revenue Study, we utilized the NJRTM-E to determine what the peak diversion would be. We applied a time factor to the bridge that forces 17% of daily trips off in the year 2015; this factor resulted in 9% diversion during the peak hour. This makes sense because there is more delay on alternate routes during peaks. In effect, the model is telling us that there is nearly two times the average time savings on the SFB during the peak hour than there is for an average hour of the day.

Following are general questions that have been raised subsequent to the issuance of the Traffic Diversion Study Report dated September 8, 2010 and responses to those questions:

1) Why was a traffic model other than the model developed by the Delaware Valley Regional Planning Commission (DVRPC) used for this study and how was it used?

The DVRPC Model that was used for the original EA traffic study was no longer available and could not be used for the Traffic Diversion Study. The DVRPC informed the Commission that a new traffic model would have to be developed and calibrated for use on the project. The time necessary to develop and calibrate a new model would have adversely impacted the project schedule.

The NJRTM-E was readily available and covers the Scudder Falls area just as well as the DVRPC model. The NJRTM-E contained future year socioeconomic data which we did not change. Traffic diversion off of the Scudder Falls Bridge due to the imposition of tolling was estimated before we used the regional model, during Jacobs' 2009 study which included an O-D survey of the Scudder Falls Bridge. With the O-D survey results, we estimated diversion for the $1.00 passenger car toll scenario based on O-D pairs and what we estimated to be the likelihood that certain groups of origins and destinations would leave the bridge due to this toll. For the $3.00 passenger car toll scenario, we applied an elasticity factor of -0.08 (meaning that 8% of the traffic would leave the road when the toll is doubled) to factor up the diversion amount. The low and high toll rates resulted in 17% and 30% diversion for cars, respectively (pro forma 2010 AADT). Different time penalties were tested in the NJRTM-E model until these daily diversion rates were reached. Since it is a time-of-day model, it was able to give us peak period diversion also, applying the same time penalty to the peak period that we used for a full day. Since congestion is greater on alternate routes during peaks, there is a smaller percent diversion off of the Scudder Falls Bridge (roughly half the daily diversion rate in 2015, and roughly 40% the daily diversion rate in 2030).

It is acceptable practice to use a combination of regional models, and spreadsheet models, and survey data to estimate traffic. For this study a combination of the following was used:

- ***a spreadsheet model (estimating diversion percentages based on O-D pairs from the Survey)***
- ***the NJRTM-E model (applying a time penalty to represent the toll, used to estimate total diversions north and total diversions south of the SFB; also, to estimate peak vs. daily diversion and 2030 vs. 2015 diversion),***
- ***results from earlier DVRPC model runs (which estimate traffic attracted to the Scudder Falls Bridge due to widening alone)***
- ***the O-D results from the Jacobs 2009 Traffic and Revenue Study Report, looking at the location and concentration of origins and destinations, and visual observations of the characteristics of potential alternate routes, to manually distribute diverted traffic to each individual alternate route.***

A flowchart of the methodology that was used can be found at the back of this Appendix Section.

2) Using the North Jersey Regional Transportation Model-Enhanced (NJRTM-E), Bucks County is included near the periphery of the model area. A question was raised as to whether this model is best suited to consider the traffic diversions and associated socioeconomic impacts in Buck County. According to the model user guide, the NJRTM-E was specifically developed to serve the needs of NJTPA, NJ Transit, and NJDOT. The model development guide indicates that the NJRTM-E model has less than half the zones in Bucks County as does the DVRPC model. On page 123 of the model development guide in the discussion of trip attraction estimation, it is stated "Since a significant part of trips attracted to Sussex, Warren, Hunterdon, and Mercer could have origins outside of the surveyed region, such as Pennsylvania, districts in these counties were excluded from the regression analysis as well." How was the Pennsylvania data excluded from the model?

A regression analysis is typically used to see how well modeled data matches to actual data. NJTPA likely excluded Pennsylvania from their regression analysis because the model was developed mainly for use in Northern NJ, so it was not as much of a concern to match model results to actual data outside its region. That being said, the NJTPA obtained Bucks and Mercer County socioeconomic data from DVRPC and included it in the NJRTM-E.

We realize that the NJRTM-E does not have a high level of detail in the SFB area; neither does the DVRPC model. This is why we did not use either model to determine re-routings on local streets. Instead we only used the NJRTM-E for two specific purposes:

a) To determine what bridges across the Delaware River the traffic would divert to
b) To see how total peak diversion off of the SFB would compare to total daily diversion.

Total toll diversion volume (%) was estimated using a spreadsheet model in the 2009 Long Term Traffic & Revenue Study by Jacobs. For the 2010 Traffic Diversion Study, an impedance was added to the SFB in the NJRTM-E to replicate this percentage diversion. The model was run to see what bridges the traffic would divert to. Then, we manually reapportioned the trips among the Calhoun Street, the Route 1, and the Lower Trenton Bridges based upon the characteristics of the bridges including access to these bridges. For example, the model put a high volume of traffic on the Lower Trenton Bridge that physically could not get there due to the bridge approach roadway features and volumes.

3) The NJRTM-E model development guide also states that socioeconomic data was obtained from the DVRPC for the years 2000 and 2025 and interpolated for the year 2030. Given the societal and economic changes experienced since 2000, is the year 2000 data still accurate? Also, since some of the appendices (Appendix J, Appendix K, and Appendix L) in the model development guide do not include data for Bucks County, what information is available to verify whether Bucks County data is adequately included in the model?

It should first be noted that we did not use the NJRTM-E to determine future traffic. Instead we started from year 2010 actual traffic counts, and used correlations of IPI and GDP to historical traffic to estimate future traffic growth. We used factors from the DVRPC models to determine peak hour growth.

The NJRTM-E includes three counties from the DVRPC model: Bucks, Mercer, and Burlington, along with socioeconomic data from the DVRPC for these counties. Because the model was mainly developed for Northern NJ, the NJTPA chose to not include Bucks County results in Appendices J and L (eastern PA counties have been consolidated in Appendix K).

Year 2000 socioeconomic data is sufficiently accurate for traffic modeling purposes that were conducted, since it was existing data at the time. We do realize that traffic growth in recent years was slower than projected. It is not uncommon for actual traffic growth patterns to vary from the straight line projections for any given period of time. This was addressed in the Long Term Traffic and Revenue Report prepared by Jacobs, dated March 2009. The following text was taken from Section 3, entitled "Traffic and Revenue Forecasts" of the 2009 Report: The current local, national and global economic conditions are unparalleled in recent history. For this project, Jacobs has done extensive research in relevant historic and forecasted economic socio-parameters in order to make a viable estimate of future traffic and revenues. As a result of the current economic recession, Jacobs is forecasting a decline in tolled traffic for the short-term, with a return to 2007 levels not occurring until 2013. The improvements proposed under the Scudder Falls Bridge project are expected to last for many decades. Considering that traffic growth is expected to return once the recession is over, it is prudent to base the improvements on long-term traffic growth trends rather than the current traffic volumes which are lower than previously estimated. This temporary anomaly was related to the recent global recession and would delay the calendar year that the forecasted traffic volume would occur.

4. When will construction of the proposed project be completed? The design year for traffic analyses is typically 20 years from the opening day.

   In the 2009 Long Term Traffic & Revenue Study, it was assumed that 2011 would be the opening year. Now the planned opening year is 2014. We kept 2030 as an analysis year to be consistent with previous work including the 2004 DVRPC study. If the 20^th^ year is 2033 instead of 2030, traffic is expected to be, at most, 3% higher than 2030.

5. The results presented in the Traffic Diversion Study appear to differ from the results presented in the March, 2009 Long Term Traffic and Revenue Report. The Long Term Traffic and Revenue Report states that, "One-third of trucks are estimated to leave Scudder Falls Bridge when tolling begins; and 17 percent and 30 percent of cars, in the Low and High Cases respectively, would leave from the tolled direction. These numbers were approximated by looking at plots of the origin and destination points of customers who completed the online survey. It appeared that for a number of customers, the Trenton-Morrisville (Route 1) Toll Bridge was more convenient than or just as convenient as the Scudder Falls Bridge for their trip; therefore they were using the Scudder Falls Bridge simply because it was toll-free." Prior to using the results in the EA Addendum and the Conceptual Point of Access Report, clarify why the traffic diversion volumes and associated impacts on diversion routes are correct as discussed in the Traffic Diversion Study Report and the EA Addendum instead of the information presented in the 2009 Long Term Traffic and Revenue Report. The overall findings from the Scudder Falls Traffic Diversion Study indicate that the traffic diversions resulting from the tolling of the new Scudder Falls Bridge will cause minimal traffic impacts to the adjacent roadways and bridge crossings within the region during both peak and non-peak periods. The findings from the 2009 Long Term Traffic and Revenue Report offer contradictory information.

   The purpose of the 2009 Long Term Traffic and Revenue (T&R) Study was to estimate annual toll revenue. The purpose of the 2010 Traffic Diversion Study was to estimate impacts of the tolling and widening on area roadways during peak traffic hours. The SFB traffic losses due to tolling remain the same for both studies, but the 2010 Traffic Diversion Study has the added element of vehicular attractions due to widening of the Scudder Falls Bridge.

   The 12% attraction came from the DVRPC's 2004 I-95 / Scudder Falls Bridge Traffic Study, which is part of the EA, so it was included in the Traffic Diversion Study. To be revenue-conservative, we did not include an increase in traffic due to the widening in the 2009 T&R Study. Because the attraction of

traffic due to widening cancels out much of the traffic diversion due to tolling (for most scenarios tested, there is actually greater attraction than toll diversion during the PM peak hour), the overall impacts to local roads are minimal.

6. How was it determined that 12 percent of the traffic would be attracted to the Scudder Falls Bridge and why wasn't this discussed in the 2009 Long Term Traffic and Revenue Report?

   The purpose of the 2009 T&R Study was to estimate annual toll revenue. The purpose of the Traffic Diversion Study was to estimate impacts of the tolling and widening on area roadways during peak traffic periods. The SFB traffic losses due to tolling remain the same for both studies, but the Diversion Study has the added element of attractions due to widening.

   The 12% attraction came from the DVRPC's 2004 I-95 / Scudder Falls Bridge Traffic Study, which is part of the EA, so we included it in the Diversion Study. To be revenue-conservative, we did not include an increase in traffic due to widening in the 2009 T&R Study.

7. Specifically, how does the model account for the anticipated delays that will occur in the southbound lanes of I-95 where the lanes will merge from three lanes to two? What is the length of traffic queues that will occur in the PM peak hour from this merge? Will any improvements be constructed with the project to mitigate for any traffic delays following completion of the proposed project south of the project limits on I-95 or on diversion routes?

   The "worst case scenario" for additional traffic on I-95 is the 2030 low toll case where there will be 231 additional vehicles crossing the SFB during the PM Peak Hour. Judging by the location of the destination points in PA, about half will exit on or before Route 332, where I-95 drops from three lanes to two with the exit-only lane to Route 322. This means there will be about an additional 115 vehicles on I-95 SB south of Route 332, or less than 1 extra vehicle per lane per minute compared to the no build/no toll condition. This was not considered significant enough to impact the capacity of the 2-lane section of I-95 or cause traffic backups at this location.

8. How does the traffic diversion analysis for the project account for not only the toll amounts but also the proposed fees that are estimated to be up to $3.50 in addition to the base toll amount? Please provide information to verify that the toll variables used in the NJRTM-E accounted for both the cost of tolls and also the fees that will be charged to motorists. What are the values of the toll variables that are included in the NJRTM-E model?

   The NJRTM-E was not used to determine the amount of traffic that would divert off the SFB if it were tolled. Total toll diversion was estimated in the 2009 T&R Study using spreadsheet models. We based our estimates on data from the O-D survey and engineering judgment gained over our 20 years of toll forecasting. We included the administrative fees in our estimates. About 80% of vehicles are expected to have E-ZPass and will not pay a fee. The remaining 20% will be mostly long-distance and infrequent users who are less likely to seek an alternate route as they are not as aware of both the toll rate and potential alternate routes. In the NJRTM-E model we placed an impedance factor on the SFB to force the same % of traffic off the bridge that we had estimated in the 2009 T&R Study. The administrative fees along with the value of the toll were accounted for in the Traffic Diversion Study. It should be noted that regional traffic models, in our experience, have consistently been unable to accurately model impacts of all-electronic cashless tolling and administrative fees.

5) Why was the NJRTM-E model run with only a $1.00 toll and not a $3.00 toll?

It was not necessary to run both tolling scenarios because the $1.00 model run (with the necessary adjustments) gave us a good idea of how traffic would divert; though a $3.00 toll would have greater diversion we felt that it would have a similar distribution among the alternative paths.

While one might think that there is significantly more traffic diverted with the $3.00 toll than the $1.00 toll, when you consider that traffic is also attracted to the bridge due to widening, and there is less diversion during peak travel periods, the difference in the overall net diversion (tolling plus widening) between the two toll scenarios, during the most congested time of the day, is small. This is another reason why it was estimated that there would be no difference in the distribution of the diverted traffic between the two toll scenarios.

6) Traffic diversion should be estimated for the following four scenarios: existing conditions, no build conditions in 2030 (or appropriate future year), Build 2030 (or appropriate future year) with Toll and Build 2030 (or appropriate future year) without Toll.

Diversion isn't just for one single scenario. Diversion is one scenario compared to another. We have run all four of the scenarios listed above and show, in the report, the traffic volumes associated with each scenario. Diversion as shown in the "Estimated Diversion Volumes" section of the Appendix to the Traffic Diversion Study Report is Build/Toll minus No Build/No Toll, or the total effects of tolling plus widening. Diversions to any other roadway which are less than 100 vehicles in a full day or less than 10 vehicles during the peak hour are deemed insignificant and have not been shown.

Comparisons can be shown for the Build/No Toll vs. the No Build/No Toll as well as the Build/Toll vs. the Build/No Toll conditions to show how traffic would change between the different scenarios. It's important to note that the only real traffic diversions occur when comparing the Build/Toll to the No Build/No Toll, since this is what the road user will actually experience. The Build/No Toll condition will not occur since the new bridge will only be opened to traffic with a toll being implemented. The traffic volumes for the various river crossings and local roadways (for each alternative) are shown in the Traffic Diversion Study Report. The EA Addendum that is being prepared for the Scudder Falls Bridge Improvement Project will utilize this data to show the appropriate traffic volume comparisons.

7) Why doesn't the study compare the build/toll to the build/no toll conditions in order to truly assess the impacts of tolling? Shouldn't the estimated Diversion Volumes be based on this comparison? Similarly, why aren't the impacts to surrounding roadways based on the comparison of the volume-to-capacity ratios for the build/toll and build/no toll conditions?

Since there are no plans to build the new bridge without toll funding, we are considering the net traffic effects of tolling + building. Traffic volume and v/c ratio results have been provided for the No Build/No Toll, Build/No Toll, and the two Build/Toll scenarios in the Appendix section of the report. The effects of building the new and widened bridge without the effects of tolling can be seen by comparing the toll scenarios to the Build/No Toll column.

8) Some of the information contained in the tables does not appear to be correct. For example, Table 7 indicates an 18% overall diversion for the low toll case with a 2010 AADT before tolling of 30,500 which should result in 5,490 diverted daily AADT (2010), not 5,624 diverted daily AADT (2010). Why this discrepancy?

The reason for this is simply rounding. The 18% is actually 18.44%, and is based on traffic being 9% trucks and 91% cars (17% x 91% + 33% x 9% = 18.44% overall diversion). We can put a footnote below all tables that reads "Some numbers may be rounded".

9) The effect of the high toll seems to be underestimated. Wouldn't there be more diversions with the high toll?

Table 7 of the report shows that 17% of daily traffic diverts due to a $1.00 toll, and 30% of the traffic diverts due to a $3.00 toll. This represents a toll elasticity of -0.08, which was determined based on a review and comparison of actual data from other toll facilities in the northeastern U.S., such as:

- ***NH Turnpike -0.10***
- ***Dulles Toll Rd -0.15***
- ***Mass Pike: -0.12***
- ***MdTA toll facilities: -0.15***

A lower elasticity than those shown above was used for the Scudder Falls Bridge because it is a bridge (and has fewer nearby alternative routes than the toll roads listed) and because it will be an all-electronic operation. It has been proven that Electronic Toll Collection (ETC) transactions are less elastic to toll increases than cash transactions. This is further explained in the response to Comment No. 2 above.

Jacobs calibrated the NJRTM-E model to the percentage diversion that had already been estimated for the 2009 Long Term Traffic and Revenue Study (using spreadsheet models which group the O-D results and estimate retention for each group) by testing different time penalties until the diversion rate was matched.

Estimates made using data points (i.e., the O-D survey) outweigh results from a regional model that is not calibrated to traffic patterns in our specific area. While the NJRTM-E was a valuable tool in our study, and is calibrated to traffic on a region-wide scale, it has not been calibrated specifically to the SFB area and has limitations that make it impossible to use without significant post-processing. Some specific limitations of the model are:

- ***The zones on the Pennsylvania side are too large to be used in estimating local street volumes there***
- ***The SFB is close to the edge of the network so it may not handle external trips well (this is true of the DVRPC model too)***
- ***Traffic and delays at heavily congested "choke points" such as short bridges is not handled well in general by regional models because they do not take queuing into account***

10) There is quite a bit of discussion on the O-D survey, yet these results are not shown in the Appendix of the report. If information from the model is adjusted based on O-D information, where can this information be found?

The most important part of the O-D survey - and the only part of it that was used in the Diversion Study - is the origins and destinations portion shown in the two figures on pages 14 and 15. The concentration of these O and D points is what we used to adjust the results of the NJRTM-E model runs to better reflect actual trip patterns. There is discussion of the rest of the survey results in the 2009 Study report, which has been provided.

11) Data provided on page 11 either does not match that provided in Table 7, or is not included in the table, which makes it confusing. For example, Table 7 states that the low toll scenario would result in an 18% overall diversion, yet the text on page 11 states it would be 19%. There is also 2015 and 2030 information

in the text and not in the table, which makes it difficult to follow. Please make sure these are more consistent.

Table 7 is in 2010 numbers; the text on page 11 is explaining how the future year numbers in Table 8 were calculated. Jacobs' old model (2009 Long Term Traffic and Revenue Study Report) did not assume any traffic growth due to widening the SFB. The 2015 total diversion of 19%* was taken off of a smaller base number (a No Build-No Toll volume of 32,266), and calculated to 5,624 vehicles diverted. When the bridge volumes due to widening are grown (using estimates from DVRPC's 2004 I-95 / Scudder Falls Bridge Traffic Study) this total diversion of 5,624 vehicles is only 17% of the Build-No Toll volume.

- ∗ ***The 19% is actually 18.5% rounded. For the base year it was 18.44 % diversion (see response to #7) but there is greater truck growth than car growth predicted between 2010 and 2015, and trucks have a higher % (33%) diversion, so the diversion of TOTAL volume increases from 18.44 to 18.5%***

12) Regarding Table 8 and Table 9 - Where do the 2030 "traffic change due to tolling" numbers come from?

The traffic change due to tolling was first estimated in Jacobs' 2009 Long Term Traffic and Revenue Study by taking the O-D results and, for each O-D pair, estimating the likelihood that traffic would divert off the SFB for a $1.00 toll based on the proximity of the other crossings. This is how we calculated the 17% of passenger car diversions (18% of car+truck diversions). We then applied an elasticity factor 0f -0.08 to calculate a 30% diversion for the $3.00 car toll.

We applied a time penalty to the SFB link in the toll model to represent the toll for the year 2015. This is standard practice. We had to test several different time penalties in order to replicate the 17% and 30% AADT diversions for cars and 33% diversion for trucks. Once we figured out what this time penalty was, we applied the same penalty to the 2030 model, and saw that the model predicts a smaller diversion that year. This makes sense because as the area roadways become more and more congested, drivers are more likely to stay on the less crowded toll road.

By applying the same time penalty to the peak hour only, the model predicts a smaller percentage diversion during the peak hours than during the full day. This makes sense because alternate routes have more congestion during the peak hours, so motorists tend not to want to move to them as much. Therefore the traffic changes due to tolling in Table 9 (peak hour) are less than those in Table 8 (full day).

13) Regarding Table 10 – Although the text describes adjustments to the model for diverted traffic onto the Lower Trenton Bridge, it seems extreme to adjust the number from 2700 to 100 based on the explanation provided. Was there no way to adjust the model to account for the existing conditions on the Lower Trenton Bridge to better account for that?

There really was no better way to make these adjustments. We had to use engineering judgment in this case. Our engineering judgment included site visits to observe traffic patterns and traffic flow conditions during both the peak and off-peak periods at the alternate river crossings and various local roadways leading to those crossings.

In our experience with over a dozen regional models, we know that traffic models often overload volumes on a short "choke point" such as a bridge because they only take into account travel times on individual roadway links and do not account for queuing/backups/delays on the approaches to this "choke point". Regional models work better on a "macro" rather than a "micro" basis. We used the NJRTM-E to determine total traffic diverting to the north and total traffic diverting to the south. Traffic

diverting to the south was either going to the Calhoun Street, Lower Trenton, or Rt. 1 (Trenton-Morrisville) Bridge. The model put the vast majority of the traffic on the Lower Trenton Bridge. This does not make sense. The Calhoun Street Bridge is a narrow bridge that is at capacity for four to five hours a day in the Pennsylvania-bound direction with backups onto local Trenton streets. Furthermore, there are few O-D pairs (Figure 3/Pg 15) where this appears to be the reasonable choice of bridge for diversion from the SFB – these people would already be using the free Lower Trenton Bridge.

Therefore we wanted to reduce the diversion to the Lower Trenton Bridge to a minimal amount, without removing it entirely. We moved most of the 2600 vehicles to the Route 1 Bridge, and a smaller amount to the Calhoun St Bridge which has some unused capacity.

The employees of Jacobs' tolling group that performed this study have conducted traffic and revenue studies for many agencies throughout the United States leading to over $12B in bond sales; within each of these studies it has been standard practice (acceptable to the Rating Agencies) to use other available information and engineering judgment to post-process model results that do not adequately account for actual site conditions, physical constraints, or other variables which can only be ascertained and confirmed through field observations coupled with the application of sound traffic engineering principles.

14) What are the impacts to the local roads? What is the meaning of v/c ratios in describing the impacts to the local roads?

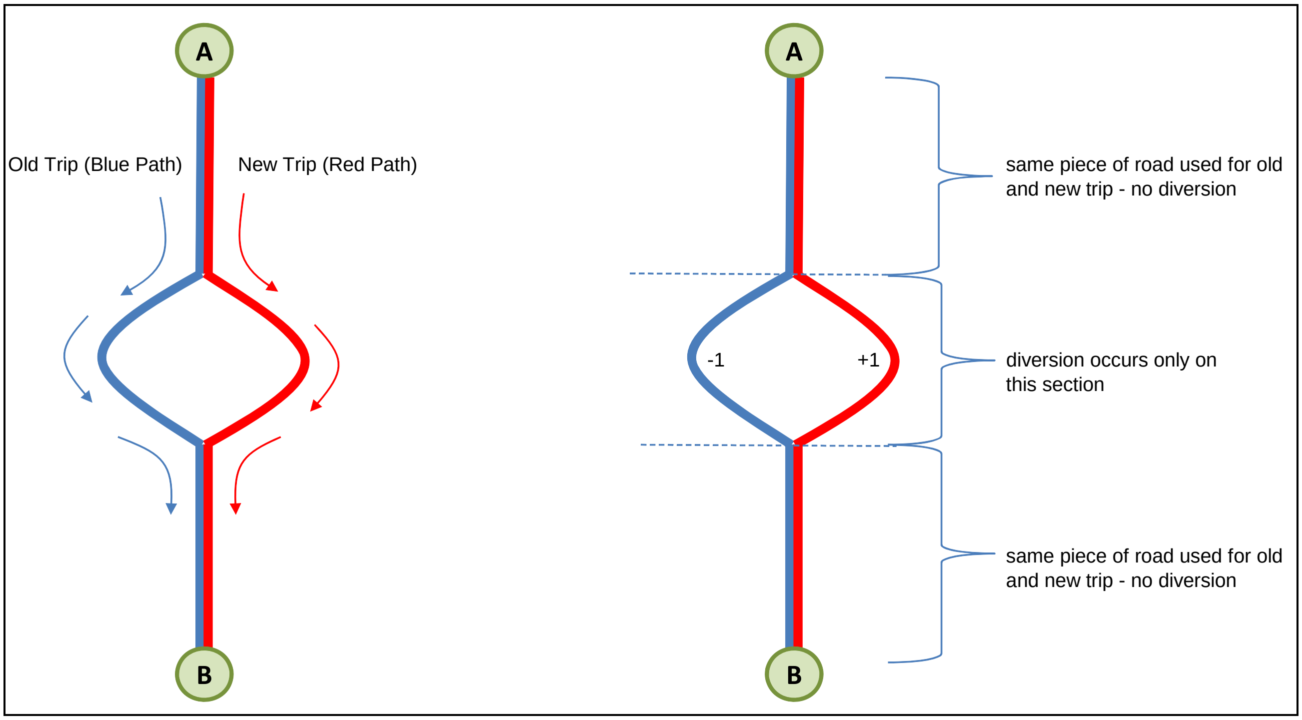
A change in the volume-to-capacity ratio is the only real way of determining and showing the impact to the local roads. A change in volume doesn't tell the full story, because 500 extra vehicles on a roadway with a capacity of 1000 has a much bigger impact than 500 extra vehicles on a roadway with a capacity of 10000.

In simple terms, a v/c ratio represents how "full" a roadway is. For example, a v/c of 0.53 means that a road is 53% full, and therefore has plenty of room for additional traffic. A v/c of 0.95 is 95% full and will experience delays. The v/c results shown in the Appendix section of the report show that there is, for nearly all scenarios and locations, a negligible change in v/c on alternate routes due to widening and tolling.

It is generally understood that when the v/c ratio for a roadway is less than 0.8, the roadway is considered to be functioning adequately. In the v/c results presented in the Appendix section of the report, the only roadway segments with a v/c ratio greater than 0.80, with the Build/Toll conditions, are the four alternate bridges. The worst impact is with 2015 High Toll Scenario, where the Washington Crossing v/c ratio increases from 0.95 to 1.01. The 2030 toll scenarios see slight improvements to the alternate bridges because more traffic is being attracted to the new Scudder Falls Bridge due to widening than is being diverted due to tolling.

15) Clarify how the traffic model considers the traffic being diverted to the Route 1 Bridge. Why is there a statement in the report that the traffic being diverted to the Route 1 Bridge (traffic that eventually makes its way to the Route 1/I-95 Interchange) is not considered diverted traffic?

This traffic is only considered diverted on that part of the trip for which a different route is used, not for the entire length of the trip. See the following graphic.



16) Was diversion to Route 295 looked at or considered?

It was considered diverted outside the area, however, we have only a few O-D pairs from our survey that show they would divert to that route; this suggests that the impact would be negligible. Also, I-295 is a higher capacity route where a few extra vehicles would not appear to cause any impacts.

17) How does the traffic model take into account the cost of the toll and what impact the cost of the toll has on delay and diversion?

The likelihood of diversion with the $1.00 toll was estimated from O-D results. A time penalty was put into the NJRTM-E model to represent this daily percentage diversion. Toll elasticity was used to estimate diversion with the $3.00 toll.

18) The actual monetary cost of the toll is not a model input in the NJRTM-E. The monetary cost has been reduced to a "time penalty" based on traffic movements. Is this method an accurate way to represent the toll?

It is standard practice to represent the toll in this manner. In our experience with more than a dozen regional traffic models, we have always used some form of time penalty (sometimes referred to as a "turn penalty" or "impedance") to represent a toll because there is a direct relationship between time and money. There is not actually time added to a person's trip if they use the toll facility. It is simply a way of diverting customers off the facility who are not willing to pay.

19) The NJRTM-E has toll values inserted on the links and uses a toll-diversion process during the highway assignment step. Why doesn't the process use the actual toll values?

The model has not been calibrated to the Scudder Falls Bridge traffic or traffic on other individual links in the SFB area, and the toll algorithm has also not been calibrated to this location. The model also does not have the ability to easily break out trips by whether they are E-ZPass or registered or unregistered license plate customers. Since we had already determined a composite percentage

diversion in our 2009 work, we added a time delay to the SFB, in the NJRTM-E, to force a certain amount of daily traffic off the road to see how much would divert to bridge crossings to the north or to the south.

20) What are the impacts to truck traffic?

One-third of the trucks were estimated to divert. These have been included in the overall diversion numbers in the report.

21) What impact does the traffic diversion have on Route I-295? This interstate route is parallel to I-95 and is an alternate route linking Philadelphia/South Jersey to Trenton/Central New Jersey.

Traffic diverted to I-295 was considered diverted outside the area; however, we have only a few O-D pairs from our survey that show traffic would divert to that route. This suggests that the impact would be negligible. Also, I-295 is a higher capacity route where a few extra vehicles added to the route would have a negligible impact.

22) A lot of the analysis was based on the O&D that was done. What is the statistical representation of surveys to users?

The number of distinct users of the Scudder Falls Bridge is roughly estimated at one million. With a margin of error of 5% and a confidence level of 95%, the recommended sample size is at least 384. We received 473 survey responses. 444 gave us the location of at least one trip end; 411 gave us both trip ends.

23) Will the traffic being diverted from the Scudder Falls Bridge to the Washington Crossing Bridge cause current users of the Washington Crossing Bridge to divert further north to New Hope/Lambertville which will affect more of the system?

Current users of the Washington Crossing Bridge diverting to the New Hope – Lambertville Toll Supported Bridge, with the addition of the new tolled Scudder Falls Bridge, were accounted for in the NJRTM-E model runs. The impact was determined to be negligible and therefore not included in the final results of our study.

In the Appendix section of the study report, there are maps showing the changes in volume due to the widening and tolling of the Scudder Falls Bridge. For purposes of simplicity we do not show diversions of less than 100 vehicles a day or less than 10 vehicles during the peak hour. However, in the tables that follow, we show the volumes at each location (including state, county and local roads) before and after the widening and tolling. The final part of the Appendix shows the volume-to-capacity (v/c) ratio for each of the roadway links, before and after the widening and tolling, which is a good determinant of traffic impact.

Assumptions and Basis of Information used in the Report

Sources of Information;

- Jacobs' 2009 Traffic and Revenue Study, where Jacobs had estimated toll diversion percentages for the two toll levels, and conducted an origin-destination survey of Scudder Falls Bridge customers that would allow us to predict diversion routes
- The North Jersey Regional Transportation Traffic Model, which was modified in order to estimate effects of the Scudder Falls Bridge tolling on the other Delaware River crossings
- The DVRPC September 2004 Interstate 95 / Scudder Falls Bridge Traffic Study for the EA, which used their travel simulation models to determine the amount of new traffic attracted by the widened bridge in the Scudder Falls Bridge Replacement Project.

Steps taken to produce the traffic diversion results;

- Collecting and compiling bridge and roadway traffic data
- Running and testing the NJRTM-E model to determine diversions to other river crossings
- Estimating volumes for the No Build/No Toll and Build/No Toll conditions
- Estimating volumes as well as diverted traffic volumes and routes for the Build/Low Toll and Build/High Toll scenarios
- Determination of volume-to-capacity ratios for each condition on roadway links negatively impacted by the toll diversion

Study Basis;

- Two different toll levels - $1.00 and $3.00 – were used on the Scudder Falls Bridge for all future years. The toll rate at the Trenton-Morrisville Bridge will remain the same as today (e.g., $0.75 for passenger cars) for future years of the analysis. These toll rates are consistent with those in the 2009 T&R Study Jacobs completed for the DRJTBC.
- Similar to other DRJTBC toll bridges, tolling would be in the Pennsylvania-bound direction only. Tolling would be all-electronic ("AET"), meaning that tolls would be collected via E-ZPass or video license plate capture.
- The Scudder Falls Bridge and I-95 will be widened as planned to three lanes per direction (plus auxiliary lanes on the bridge) from NJ Route 29 to PA Route 332 by 2015.
- The "No Build/No Toll" condition was used as the base. The diversion results for each toll scenario are the difference between the Build/Toll scenario and the No Build/No Toll. The diversion results include the rerouting of traffic caused both by widening the Scudder Falls Bridge/I-95 (attracted trips) and by tolling the bridge (toll diverted trips). The combined effect is referred to as "diversion" throughout the report.

Considerations used in the preparation of the report;

- The report presents the results of Jacobs' consideration of the information available as of the date of the report and the application of Jacobs' experience and professional judgment to that information.
- Existing counts obtained from DRJTBC, DVRPC, Pennsylvania DOT and NJDOT were used in estimating future traffic on affected links, and were considered to be accurate.
- The NJRTM-E has not been calibrated to actual volumes on local streets throughout the Scudder Falls Bridge area. It was used to determine major movements, such as traffic diverting north versus south of the bridge, and peak versus daily diversions.
- The process of estimating diversions based on the concentration and location of origins and destinations from the Jacobs November 2008 travel surveys, supplemented with the use of the NJRTM-E and DVRPC's 2004 Study results, was a robust method of obtaining results for this study.

- In reality, there are far more roadways that will be affected by Scudder Falls tolling than what was shown in the report; we have not included them because we believe the added volume is small and insignificant to the level of service of the roadway. We have only included roadways that will gain an additional 100 trips or more per day, or 10 trips or more in the peak hour (i.e., at least one car every six minutes).
- The traffic estimates will be subject to future economic and social conditions, demographic developments and regional transportation construction activities that cannot be predicted with certainty.
- Outside of I-95 and the Scudder Falls Bridge, and the connection of I-95 to the PA Turnpike, no major changes to the roadway network were assumed that would have an impact on Scudder Falls Bridge diversions between now and 2030.

APPENDIX B
SFB Traffic Diversion Study