

WILLIAMSVILLE TOLL BARRIER IMPROVEMENT PROJECT

New York State Thruway, Interstate 90 Between Interchanges 48A and 50 FHWA-NY-EIS-06-10 D



Draft DR/DEIS

Appendix B Toll Barrier Capacity Analysis



US Department of Transportation
Federal Highway
Administration



New York State Thruway Authority

DRAFT DESIGN REPORT/ ENVIRONMENTAL IMPACT STATEMENT

NEW YORK STATE THRUWAY AUTHORITY
WILLIAMSVILLE TOLL BARRIER IMPROVEMENT PROJECT
NYSTA CONTRACT NO. D212607

**DRAFT DESIGN REPORT/DRAFT ENVIRONMENTAL IMPACT STATEMENT
APPENDIX B – TOLL BARRIER CAPACITY ANALYSIS**

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I. INTRODUCTION

The New York State Thruway Authority (NYSTA) and the Federal Highway Administration (FHWA), in cooperation with the New York State Department of Transportation (NYSDOT), are preparing an Environmental Impact Statement (EIS) to study the development of a modern mainline toll barrier on the New York State Thruway, Interstate 90, to the northeast of the Buffalo metropolitan area. The project is intended to provide a facility capable of efficiently accommodating present and future traffic volumes, and is necessitated by capacity deficiencies and operational concerns at the existing Williamsville Toll Barrier.

The toll barrier capacity analysis uses projected traffic volumes as a basis for sizing proposed plazas, refer to **Appendix A - Traffic Impact Study**. The analysis assumed separate Express Electronic Toll Collection (E-ZPass) lanes would be constructed in addition to standard (manual) eastbound ticket entry and westbound payment exit toll plaza lanes at a relocated mainline toll barrier. Separate E-ZPass lanes allows at-speed collection of tolls for E-ZPass users and provides environmental and travel time benefits because of the ability to process tolls without stopping the vehicles. The analysis assumed retention of the low speed E-ZPass toll collection in addition to a flat rate toll collection for the entering and exiting toll plaza lanes at the Exit 49 toll barrier.

II. METHODOLOGY

A. GENERAL

In order to determine the number of lanes required for a future toll plaza, a capacity analysis is required. Projected traffic volumes throughout the period between Estimated Time of Completion (ETC) and ETC + 20 are analyzed using identified vehicle processing rates to determine plaza capacity. E-ZPass penetration rates are also projected for the same period to determine what portion of the projected traffic is processed by both the E-ZPass and manual lanes. Anticipated queuing impacts of each toll plaza configuration are also identified. This information is then summarized to determine the number of lanes required for the toll plaza design and development of the EIS.

The toll plaza capacity analysis was initially completed assuming an ETC of 2004. Based on those results, development of the Improvement Alternative and the Relocation Alternative siting study were progressed. These evaluations have concluded that the Improvement Alternative is not feasible and the Relocation Alternative sites located west of Interchange 49 are among the least suitable sites in the study corridor. Consequently, toll barrier development between Interchanges 49 and 50 has not been evaluated further, and updates to the capacity analysis for that segment are not warranted. Because the Relocation Alternative is a feasible alternative and the most suitable sites

are located between Interchanges 48A and 49, the capacity analysis for that segment has been revised to reflect an updated ETC of 2008.

A queue analysis is provided to identify the impacts queuing has on the plaza configuration recommended. Queuing vehicles are defined as those vehicles waiting to enter the toll booth area. It does not include the vehicle at the toll booth.

B. PROCESSING RATES DETERMINATION

The analysis uses vehicle processing rates to determine lane capacities. The processing rate for a vehicle through the toll plaza is defined as the time it takes a vehicle to enter the plaza, collect a ticket or pay the toll, and exit the toll plaza lane. The processing rate is used to determine vehicle through-put at the various toll plaza lanes and is also used in the queuing operations analysis.

In order to proceed with analysis of toll barrier capacity, the average ticket dispensing/toll collection processing rate of various vehicle classifications is required. This processing rate information is used to determine the future operating conditions. For this capacity analysis the eastbound vehicles (entering the toll section) receive a ticket or use E-ZPass, while the westbound vehicles (exiting the toll section) pay tolls manually or use E-ZPass. In addition, the inclusion of a flat rate toll option at the Exit 49 toll barrier required the need to identify the processing rates for a manual flat rate collection, similar to that which occurs at the Ogden Street and Breckenridge toll barriers along the I-190 portion of the New York State Thruway. This processing rate would be different than the variable ticket based rate that currently occurs at the Exit 49 toll barrier.

Processing times used in the analysis are derived from field observations at the existing Williamsville Toll Barrier, Exit 49 Toll Barrier, 1-190 Ogden Street Toll Barrier, historical NYSTA data, and nationally identified toll plaza processing rates. Field observations were conducted at the existing Williamsville Toll Barrier facility and processing rates for 1,026 vehicles were collected during an evening peak traffic period. Field observations at the existing Exit 49 toll barrier facility were conducted and processing rates for 327 vehicles were collected during an evening peak period. Field observations were conducted at the Ogden Street toll barrier facility and processing rates for 619 vehicles were collected during the morning peak period. The observations were gathered for all vehicle classes for the types of toll lane operation and are summarized in the following

Table B-1:

**TABLE B-1
TOLL LANE PROCESSING RATES**

LANES	PROCESSING RATE (seconds/vehicle)	PROCESSING RATE (vehicles/hour)
WESTBOUND LANES		
<i>Manual Toll Lane</i>		
Average – Cars/Trucks/Busses	15.6	231
EASTBOUND LANES		
<i>Ticket Entry</i>		
Average – Cars/Trucks/Busses	5.6	644
E-ZPASS TOLL LANES		
<i>Mixed – Cars/Trucks/Busses</i>	4.4	825
HIGHWAY SPEED E-ZPASS		
<i>Mixed – Cars/Trucks/Busses</i>	2.4	1500
FLAT RATE TOLL		
<i>Mixed – Cars/Trucks/Busses</i>	6.0	600

Note: Processing rates for Westbound, Eastbound lanes and E-ZPass toll lanes are a rounded averaged rate from Parsons Brinckerhoff (PB) 3/31/00 count. Processing rates for Flat Rate Toll Lanes are a rounded average from PB 1/6/04 and 1/8/04 counts. Processing Rates for Highway Speed E-ZPass are from 1994 Survey of U.S. Toll Operators.

The observed processing rates, in vehicles per hour, compared conservatively to national toll plaza processing rates identified in a 1994 Survey of U.S. Toll Operators. See **Attachment B-1** for a summary of the observed processing rate information from the field counts taken 3/31/00, 1/6/04 and 1/8/04 and **Attachment B-2** for the 1994 Survey of U.S. Toll Operators findings.

C. LANE CAPACITY

Lane capacity is the maximum lane throughput and is measured in the number of vehicles that can pass through a toll lane in a given period of time. The identified processing rates are used to determine the eastbound and westbound manual (mixed use) mainline Exit 50 to 49A toll plaza, Exit 49 to 48A toll plaza and Exit 49 toll plaza lane capacities for the established vehicle mix. The capacity analysis uses the peak projected traffic volumes calculated for the toll barrier plazas throughout the projected analysis period (2008 through 2028). The projected volumes for each plaza are then compared to the through-put capacity of the lanes. The resulting calculations provide the number of lanes required to process the vehicles based on lane capacity. This number of lanes is

the minimum required assuming traffic arrives at the plaza at a constant rate and disperses to the lanes evenly.

D. QUEUE ANALYSIS

A queue analysis is required to determine the relative efficiency in which a proposed toll plaza will process vehicles. The efficiency is based on a number of factors including vehicle arrival factors and plaza geometry. After the lane capacity analysis is calculated for the plaza, a queue analysis is required to model the anticipated queues at the plaza for design traffic volumes. Although a plaza has the capacity to process the required number of vehicles projected during the peak hour, the associated traffic and plaza characteristics may create unacceptable queues. To calculate the size of the plaza necessary to maintain acceptable queues at the plaza, the analysis is completed for varying numbers of lanes.

Based on delays created for various highway system operations, an acceptable delay for design purposes is equated to no more than 55 seconds. This delay is equivalent to a Highway Capacity Manual Level of Service (LOS) "D". Based on previous research of multiple plaza facilities, it has been determined that for general toll barrier operation, the most efficient toll plaza throughput is achieved when there is a queue of eight vehicles. When comparing efficiency of toll operations and LOS, a range of queues are within the desired range for toll plaza operations.

For the manual ticket entry lanes and flat rate toll lanes (average processing rate = 6 seconds) a queue of eight cars is equivalent to approximately 48 seconds of delay. Assuming a LOS of "D" design criteria (35 - 55 seconds/vehicle delay), a maximum queue of 48 seconds approximately represents maximum desirable delay for this type of operation analysis. In order to achieve the desired LOS, an average queue length equating to 48 seconds of delay is used for this analysis. In order to provide acceptable delays at the toll barrier plazas during peak hour, a maximum queue of eight vehicles (8 x 6 = 48 seconds) represents the desired analysis threshold for ticket entry lanes (mainline eastbound) and flat rate manual payment lanes (Exit 49).

For the manual payment exit lanes (westbound mainline) a queue of eight cars is equivalent to approximately 128 seconds of delay (average processing rate = 16 seconds). This is significantly longer than 35 to 55 seconds/vehicle delay condition associated with a Level of Service "D" operation indicating that a queue of eight cards will cause unacceptable delays. In order to provide acceptable delays at the toll barrier plazas during peak hour, an average queue of three vehicles (3 x 16 = 48 seconds) to four vehicles (4 x 16 = 64) represents the desired analysis threshold for manual payment exit lanes.

E. PLAZA CAPACITY MODELING

Lane capacity modeling identifies the throughput of a lane based on processing rates and vehicle mix. It is assumed that the processing rates observed and the present vehicle mix will remain constant through the study period. The total traffic volume

processed is divided by the lane capacity to determine number of lanes required. This model provides the minimum number of lanes required for a given traffic volume.

The number of lanes required provides a baseline for the queue analysis modeling. Various numbers of manual (mixed use) toll plaza lanes are analyzed to determine the impacts that the number of lanes have on the anticipated queuing condition.

The forecasted queuing and operations analysis at the toll plazas are analyzed using an intersection based analysis program, SYNCHRO, with a SIMTRAFFIC component in a pre-timed signalized intersection format. Using the identified processing rates, a configuration is developed which represents the operation and number of lanes at the future toll plaza. This analysis procedure allows for the ability to identify the benefits of additional toll plaza lanes versus projected traffic operation impacts.

The eastbound and westbound toll plazas are analyzed as separate intersections to represent their respective independent traffic operations. Queuing information is obtained from the SIMTRAFFIC component of the SYNCHRO analysis program. Forecasted peak hour traffic volumes are modeled with SYNCHRO to determine average and maximum queuing information. The analysis is conducted for a range of potential toll plaza lanes.

Approaching vehicles are allowed to enter the intersection (manual lane plaza) on a minimal green phase in an overall cycle length based on the identified processing time. The intersection analysis is set up so that only one vehicle at a time is allowed to pass through each cycle. Approaching vehicles in the analysis are required to wait during the processing time before proceeding through the intersection (plaza). To accomplish this, the processing time is input in the analysis program as the red interval of a 2-phase signalized intersection. This arrangement, in combination with a very short green time of one (1) second, allows for the passage of only one vehicle at a time through the intersection, similar to a toll plaza operation.

An arrival factor is established for the model to represent conditions anticipated at the proposed plaza. As part of the operations analysis, an arrival factor assuming a moderately dense platoon of arriving vehicles is used. This arrival factor represents moderately dense groups of vehicles arriving at the toll plaza. This arrival factor is more conservative than assuming traffic approaches the plaza at a constant rate and accurately represents actual conditions. The queuing analysis assumed a storage length of 600 feet for all lanes in the toll plaza. Because the maximum acceptable queue established for this analysis represents a distance less than 200 feet, a minimum queue pavement length of 200 feet is recommended with an appropriate approach pavement taper section. Based on a queue pavement length of 200 feet and an intersection storage length of 600 feet, a minimum taper section of 400 feet is recommended to validate the model.

F. TRAFFIC VOLUMES

Two categories of traffic volumes have been established for the mainline toll barrier plaza analysis. For the mainline toll barrier plaza capacity evaluation, the traffic projections have been divided into standard and summer volumes. The standard volumes represent the peak hour volumes for the months of September through June. The summer volumes represent the peak hour volumes for the months of July and August. Based on historical trends, the traffic experienced at the existing Williamsville Toll Barrier varies significantly between these two periods. Traffic volumes for the standard months are fairly constant while the summer months experiencing significant increases in traffic volumes. This trend of seasonal traffic growth in the summer months is assumed to continue through the analysis period.

Traffic volumes at the Exit 49 toll barrier analysis are more consistent throughout the year as compared to the mainline traffic volumes. As a result, only one category of standard traffic volumes has been established for the Exit 49 toll barrier analysis. However, due to the commuter traffic patterns experienced at the Exit 49 toll barrier, separate AM and PM peak hour volumes were identified for use in the capacity analysis.

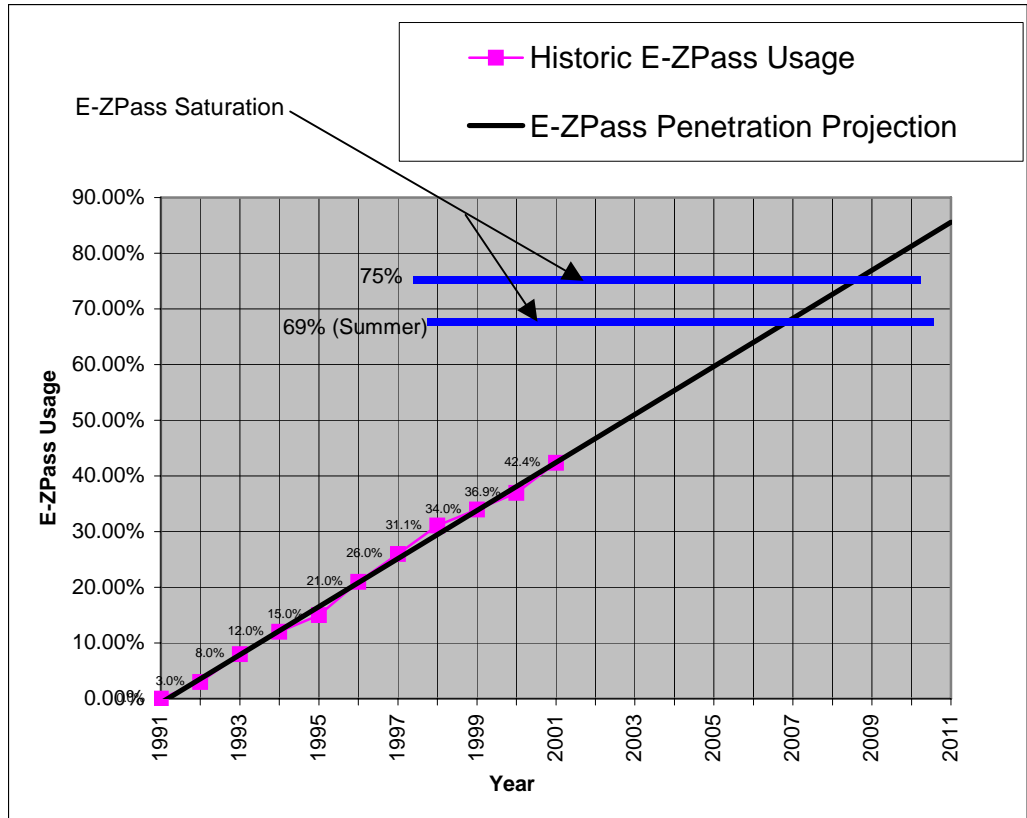
III. HIGHWAY SEGMENT EXIT 50 TO 49

A. E-ZPASS PENETRATION RATE PROJECTIONS

Historical E-ZPass usage is the basis for determining the E-ZPass penetration rates for the future year conditions under the Highway Segment Exit 50 to 49. Since incorporation of E-ZPass in 1993 into the NYSTA system, use has been steadily increasing at the various toll plaza facilities. E-ZPass usage at the existing Williamsville Toll Barrier has increased approximately linearly to its current penetration rate of over 42% during non-summer months. E-ZPass usage is highest amongst commuter and commercial traffic as compared to recreational traffic and occasional users. Forecast E-ZPass usage is anticipated to grow at existing rates until market saturation of E-ZPass occurs. Experience on the New York State Thruway in the metropolitan New York City area has found this saturation point to be approximately 80%. The NYSTA has determined that E-ZPass usage is highest in areas with a large volume of commuter traffic typical of the New York City area.

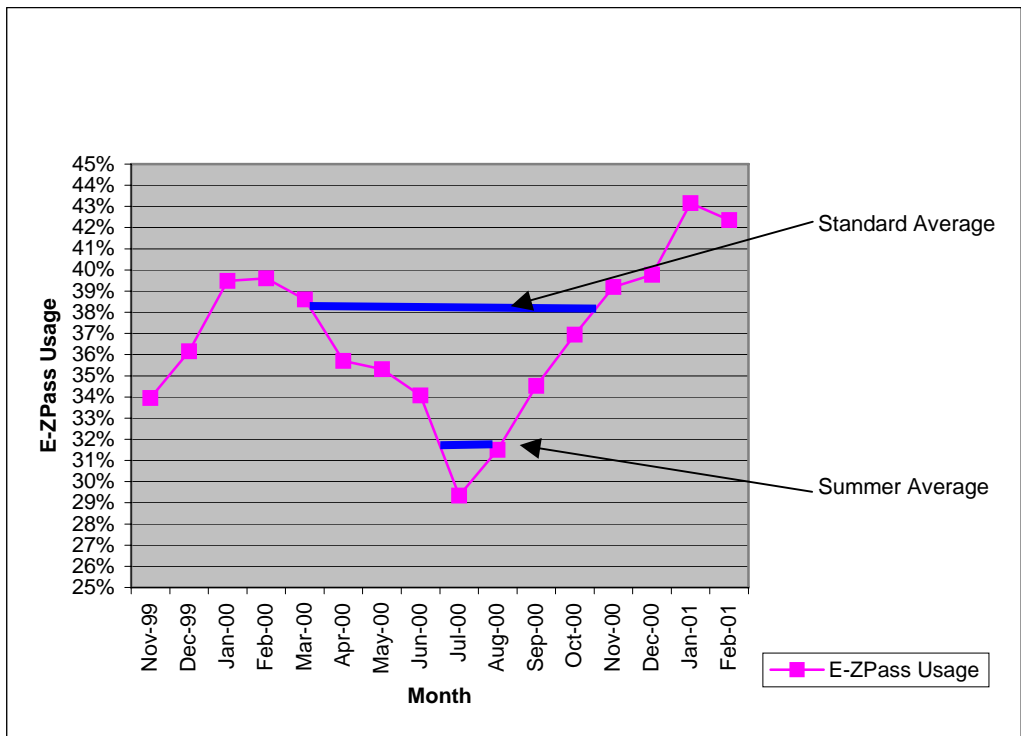
For the Highway Segment Exit 50 to 49, the market saturation point is assumed to be 75%. This is based on the location of the alternative between Exits 50 and 49 which experiences relatively moderate commuter traffic volumes. Based on existing linear growth, it would be anticipated that E-ZPass usage as a percent of overall traffic would be expected to increase until approximately the year 2008. At this point, the E-ZPass usage would reach market saturation and no longer increase. The assumed E-ZPass usage at the plaza facility under the Highway Segment Exit 50 to 49 is forecast to remain constant at the 75% mark after 2008. A graphic showing the historical E-ZPass usage and future year projections is shown in **Figure B-1**.

FIGURE B-1
HIGHWAY SEGMENT EXIT 50 TO 49 E-ZPASS PERCENTAGE RATE FORECAST



Based on historical data, E-ZPass penetration rates are at their lowest in summer months. The rate reduction is due to the increase in recreational traffic through the Williamsville Toll Barrier in the summer months. During the summer months E-ZPass usage as a percent of total traffic can be five to ten percent less than during non-summer months at the facility. As a result, an adjustment to the E-ZPass usage rate is factored into the projections for the traffic during this time frame. The historical data from the NYSTA indicates an average decrease in the E-ZPass penetration rates during the summer months of approximately 6.4 percentage points. A graphic showing the seasonal fluctuations in E-ZPass usage at the Williamsville Toll Barrier is shown in **Figure B-2**. The E-ZPass penetration rate assumed for the analysis of the Highway Segment Exit 50 to 49 was reduced to 69% for the July and August summer analysis period.

**FIGURE B-2
MONTHLY E-ZPASS VARIATION**



B. TRAFFIC PROJECTIONS

The two traffic categories (standard and summer) have been individually developed to project the peak hour design traffic volumes for both the express E-ZPass lanes and the manual lanes. Each category has been developed in five-year increments through the analysis period (2004 through 2024). The traffic volumes for the established time increments are adjusted based on the projected E-ZPass penetration rates to reflect the distribution of traffic to the different facilities (express E-ZPass and manual plaza). This information is presented in **Tables B-2 and B-3** to determine the maximum peak hour traffic volume at the individual plazas for the Highway Segment Exit 50 to 49.

The projected peak hour traffic volumes for a given year are divided into express E-ZPass and manual lanes with the use of the associated projected penetration rates for that year. The express E-ZPass lanes are assumed to carry the entire volume of traffic equipped with E-ZPass. The manual lanes are assumed to carry the remainder of traffic without E-ZPass capability plus 10% of the E-ZPass traffic. The manual traffic is adjusted to include this portion of E-ZPass traffic to account for potential users needing information, traveling out of classification (i.e., with a trailer), or a non-functional account (i.e., no funds in account). The plaza capacities assumptions allow for 10% of the E-ZPass equipped vehicles to use either the express E-ZPass lanes or the manual (mixed use) plaza to provide a factor of safety in the capacity analysis.

TABLE B-2
HIGHWAY SEGMENT EXIT 50 TO 49 TOLL PLAZA LANE REQUIREMENT ANALYSIS
STANDARD CONDITION (SEPTEMBER – JUNE)

YEAR	TRAVEL DIRECTION	PENETRATION E-ZPASS RATE	PEAK HOUR VOLUME	E-ZPASS HOUR VOLUME	10% E-ZPASS USING MANUAL	MANUAL PEAK HOUR VOLUME	CALCULATED MANUAL PEAK HOUR VOLUME
2004	EASTBOUND	55%	1817	999	100	818	918
	WESTBOUND	55%	1734	954	95	780	875
2009	EASTBOUND	75%	2036	1527	153	509	662
	WESTBOUND	75%	1944	1458	146	486	632
2014	EASTBOUND	75%	2256	1692	169	564	733
	WESTBOUND	75%	2153	1615	162	538	700
2019	EASTBOUND	75%	2476	1857	186	619	805
	WESTBOUND	75%	2363	1772	177	591	768
2024	EASTBOUND	75%	2695	2021	202	674	876
	WESTBOUND	75%	2572	1929	193	643	836
DESIGN VOLUME	EASTBOUND	EXPRESS E-ZPASS LANES (YEAR 2024)		2021	MANUAL LANES (YEAR 2004)		918
	WESTBOUND			1929			875

Source: Williamsville Toll Barrier Improvement Project, Appendix A: Traffic Impact Study - September 21, 2001.

Note: Assumed 10% of E-ZPass traffic may utilize manual (mixed use) plaza for analysis purposes.

TABLE B-3
HIGHWAY SEGMENT EXIT 50 TO 49 TOLL PLAZA LANE REQUIREMENT ANALYSIS
SUMMER CONDITION (JULY – AUGUST)

YEAR	TRAVEL DIRECTION	PENETRATION E-ZPASS RATE	PEAK HOUR VOLUME	E-ZPASS HOUR VOLUME	10% E-ZPASS USING MANUAL	MANUAL PEAK HOUR VOLUME	CALCULATED MANUAL PEAK HOUR VOLUME
2004	EASTBOUND	49%	2835	1389	139	1446	1585
	WESTBOUND	49%	2835	1389	139	1446	1585
2009	EASTBOUND	69%	3177	2192	219	985	1204
	WESTBOUND	69%	3177	2192	219	985	1204
2014	EASTBOUND	69%	3519	2428	243	1091	1334
	WESTBOUND	69%	3519	2428	243	1091	1334
2019	EASTBOUND	69%	3861	2664	266	1197	1463
	WESTBOUND	69%	3861	2664	266	1197	1463
2024	EASTBOUND	69%	4203	2900	290	1303	1593
	WESTBOUND	69%	4203	2900	290	1303	1593
DESIGN VOLUME	EASTBOUND	EXPRESS E-ZPASS LANES (YEAR 2024)		2900	MANUAL LANES (YEAR 2024)		1593
	WESTBOUND			2900			1593

Source: Williamsville Toll Barrier Improvement Project, Appendix A: Traffic Impact Study - September 21, 2001.

Note: Assumed 10% of E-ZPass traffic may utilize manual (mixed use) plaza for analysis purposes.

IV. HIGHWAY SEGMENT EXIT 49 TO 48A

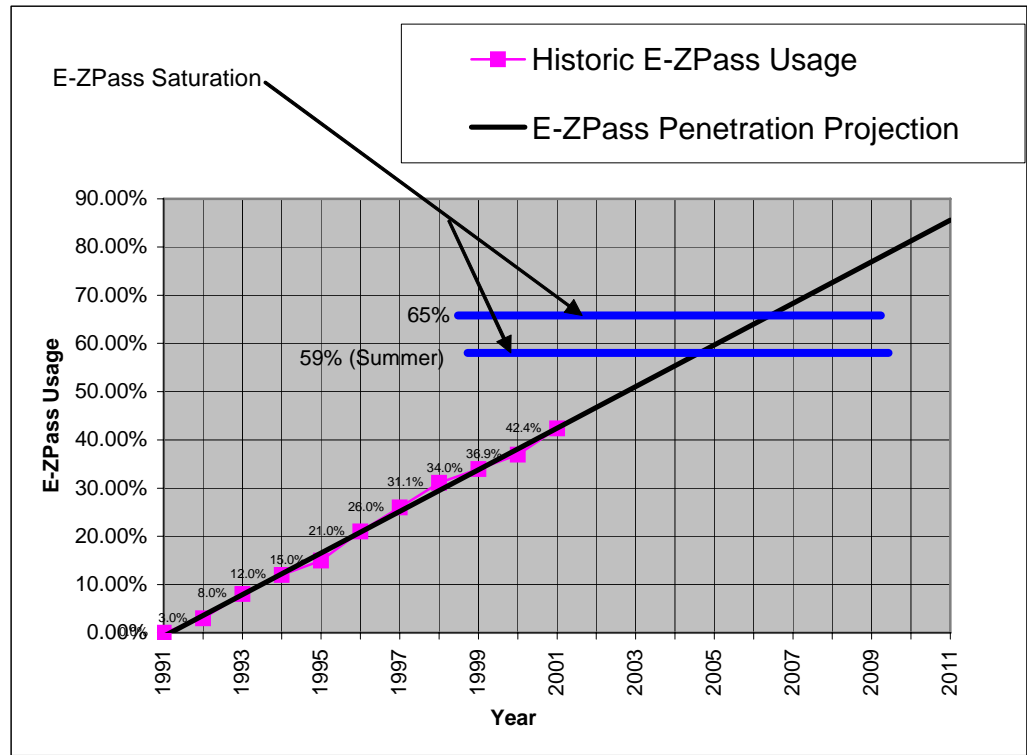
A. E-ZPASS PENETRATION RATE PROJECTIONS

Historical E-ZPass usage is the basis for determining the E-ZPass penetration rates for the future year conditions under the Highway Segment Exit 49 to 48A. Since incorporation of E-ZPass in 1993 into the NYSTA system, use has been steadily increasing at the various toll plaza facilities. E-ZPass usage at the existing Williamsville Toll Barrier has increased approximately linearly to a year 2001 penetration rate of over 42% during non-summer months. E-ZPass usage is highest amongst commuter and commercial traffic as compared to recreational traffic and occasional users. Forecast E-ZPass usage is anticipated to grow at existing rates until market saturation of E-ZPass occurs. Experience on the New York State Thruway in the metropolitan New York City area has found this saturation point to be approximately 80%. The NYSTA has determined that E-ZPass usage is highest in areas with a large volume of commuter traffic typical of the New York City area.

For the Highway Segment Exit 49 to 48A, the E-ZPass market saturation point at the toll barrier is assumed to be 65% for non-commercial vehicles. This penetration rate is based on the location of the alternative toll barrier between Exits 49 and 48A which experiences relatively low commuter traffic volumes. This assumed E-ZPass penetration rate is 10 percentage points lower than the rate identified for the Highway Segment Exit 50 to 49 due to the lower amounts of commuter traffic in this section of the Thruway. Based on existing linear growth, it would be anticipated that E-ZPass usage as a percent of overall traffic would be expected to increase until approximately the year 2007. At this point, the E-ZPass usage would reach the 65% market saturation rate and no longer increase. The assumed E-ZPass usage at the plaza facility under the Highway Segment Exit 49 to 48A would thus be forecast to increase through the year 2007 and then remain constant at the 65% mark. A graphic showing the historical E-ZPass usage and future year projections is shown in **Figure B-3**.

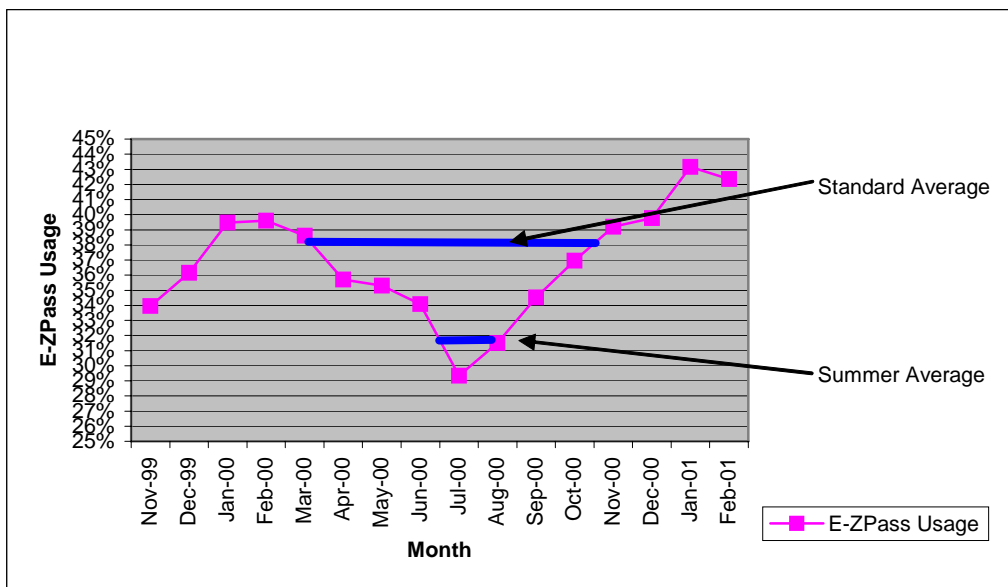
Regarding commercial vehicle E-ZPass penetration rates, direction from the NYSTA was used as a basis for truck traffic E-ZPass penetration rates. It is forecast that truck traffic usage of E-ZPass will be greater than that found in regular passenger vehicles. The basis for this includes the increased benefit of the travel time savings to commercial vehicles, the opportunity for company-wide E-ZPass agreements with the NYSTA by many of the larger shipping firms, and the associated accounting benefits gained by commercial vehicle firms that would make the use of E-ZPass greater in commercial vehicles as compared to the non-commuter passenger vehicle. The assumed commercial vehicle E-ZPass market saturation point at the toll barrier is assumed to be 75%.

FIGURE B-3
HIGHWAY SEGMENT EXIT 49 TO 48A E-ZPASS PERCENTAGE RATE FORECAST



E-ZPass usage as a percentage of the overall traffic at the Williamsville Toll Barrier fluctuates throughout the year as presented previously due to increases in recreation traffic. E-ZPass usage as a percent of total traffic can be five to ten percent less during standard non-summer months as compared to the summer peak period months of July and August. This fluctuation required an adjustment to the E-ZPass usage rate for the traffic for the Highway Segment Exit 49 to 48A for analysis representative of the summer period time frame. Historical data from the NYSTA indicates an average decrease in the E-ZPass penetration rates during the summer months of approximately 6.4 percentage points for the Highway Segment Exit 49 to 48A. A graphic showing the seasonal fluctuations in E-ZPass usage at the existing Williamsville Toll Barrier is shown in **Figure B-4**. The decrease in E-ZPass usage during the peak summer period is assumed to be mainly from non-commercial vehicles. As a result, the E-ZPass penetration rate assumed for the non-commercial vehicles analysis of the Highway Segment Exit 49 to 48A was reduced to 59% for the July and August summer analysis period. Commercial truck traffic E-ZPass penetration rates were assumed to remain the same for the summer period as compared to the standard condition.

FIGURE B-4
MONTHLY E-ZPASS VARIATION



In summary, the analysis assumed an E-ZPass penetration rate of 65% for the passenger vehicle standard traffic condition, September to May, and 59% for the passenger vehicle peak summer traffic period from July to August. Commercial vehicle E-ZPass penetration rates of 75% were assumed for both traffic conditions.

B. TRAFFIC PROJECTIONS

The two traffic categories (standard and summer) have been individually developed to determine the peak hour design traffic volumes for both the express E-ZPass lanes and the manual plazas along this highway segment also. Each category has been developed for the analysis period 2008 and 2028. The traffic volumes for the established analysis years are adjusted based on the projected E-ZPass penetration rates to reflect the distribution of traffic to the different facilities (express E-ZPass and manual plaza). This information is presented in **Tables B-4 and B-5** to determine the maximum peak hour traffic volume at the individual plazas for the Highway Segment Exit 49 to 48A.

The projected peak hour traffic volumes for a given year are divided into express E-ZPass and manual lanes with the use of the associated projected penetration rates for that year. The express E-ZPass lanes are assumed to carry the entire volume of traffic equipped with E-ZPass. The manual lanes are assumed to carry the remainder of traffic without E ZPass capability plus 10% of the E-ZPass traffic. The manual traffic is adjusted to include this portion of E-ZPass traffic to account for potential users needing information, traveling out of classification (i.e., with a trailer), or a non-functional account (i.e., no funds in account). The plaza capacities assumptions allow for 10% of the E-ZPass equipped vehicles to use either the express E-ZPass lanes or the manual (mixed use) plaza to provide a factor of safety in the capacity analysis.

**TABLE B-4
HIGHWAY SEGMENT EXIT 49 TO 48A TOLL PLAZA LANE VOLUMES
STANDARD CONDITION (SEPTEMBER – JUNE)**

YEAR	TRAVEL DIRECTION	PENETRATION E-ZPASS RATE*	PEAK HOUR VOLUME	E-ZPASS HOUR VOLUME	10% E-ZPASS USING MANUAL	MANUAL PEAK HOUR VOLUME	CALCULATED MANUAL PEAK HOUR VOLUME
2008	EASTBOUND	65%/75%	1820	1277	127	543	670
	WESTBOUND	65%/75%	1794	1259	126	535	661
2028	EASTBOUND	65%/75%	2621	1840	184	781	965
	WESTBOUND	65%/75%	2584	1814	181	770	951
DESIGN VOLUME	EASTBOUND	EXPRESS E-ZPASS LANES (YEAR 2028)		1840	MANUAL LANES (YEAR 2028)		965
	WESTBOUND			1814			951

Source: TVGA Toll Retention Alternative, Roadway Segment Traffic Volumes 12/15/04.

*Passenger Car/Commercial Vehicles

Note: Assumed 10% of E-ZPass traffic may utilize manual (mixed use) plaza for analysis purposes.

**TABLE B-5
HIGHWAY SEGMENT EXIT 49 TO 48A TOLL PLAZA LANE VOLUMES
SUMMER CONDITION (JULY – AUGUST)**

YEAR	TRAVEL DIRECTION	PENETRATION E-ZPASS RATE*	PEAK HOUR VOLUME	E-ZPASS HOUR VOLUME	10% E-ZPASS USING MANUAL	MANUAL PEAK HOUR VOLUME	CALCULATED MANUAL PEAK HOUR VOLUME
2008	EASTBOUND	59%/75%	2774	1824	182	950	1132
	WESTBOUND	59%/75%	2746	1806	181	940	1121
2028	EASTBOUND	59%/75%	3995	2627	263	1368	1631
	WESTBOUND	59%/75%	3955	2601	260	1354	1614
DESIGN VOLUME	EASTBOUND	EXPRESS E-ZPASS LANES (YEAR 2028)		2627	MANUAL LANES (YEAR 2028)		1631
	WESTBOUND			2601			1614

Source: TVGA Toll Retention Alternative, Roadway Segment Traffic Volumes 12/15/04.

*Passenger Car/Commercial Vehicles

Note: Assumed 10% of E-ZPass traffic may utilize manual (mixed use) plaza for analysis purposes.

V. HIGHWAY SEGMENT EXIT 49

A. E-ZPASS PENETRATION RATE PROJECTIONS

Historical E-ZPass usage is the basis for determining the E-ZPass penetration rates for the future year conditions for the Highway Segment Exit 49 analysis. This determination is similar to the methodology utilized in the Highway Segment Exit 50 to 49 data analysis. This analysis, as previously noted, identified that the E-ZPass usage at the existing Williamsville Toll Barrier has increased approximately linearly since it's incorporation on the NYSTA in 1993. E-ZPass usage is highest amongst commuter and commercial traffic as compared to recreational traffic and occasional users. Forecast E-ZPass usage is anticipated to grow at existing rates until market saturation of E-ZPass occurs. Experience on the New York State Thruway in the metropolitan New York City area has found this saturation point to be approximately 80%.

For the Highway Segment Exit 49, the E-ZPass market saturation point at the toll barrier is assumed to be 75%. This penetration rate is based on the location of the toll barrier between Exits 50 and 48A which experiences relatively moderate commuter traffic volumes. This assumed E-ZPass penetration rate is 10 percentage points higher than the rate assumed for the mainline toll barrier facility analysis for the Highway Segment Exit 49 to 48A due to the increased presence of commuter and commercial traffic using this exit of the Thruway. The increased amount of commuter traffic as compared to commercial traffic at this location negates the need for separate E-ZPass penetration rate assumptions for the different class of vehicles. The assumed saturation E-ZPass penetration rate is applicable to all vehicles utilizing the Highway Segment Exit 49 toll barrier facility.

As detailed for Highway Segment Exit 50 to 49, based on existing linear growth it would be anticipated that E-ZPass usage as a percent of overall traffic at Highway Segment Exit 49 would be expected to increase until approximately the year 2008. At this point, the E-ZPass usage would reach the 75% market saturation rate and no longer increase. The assumed E-ZPass usage at the plaza facility under the Highway Segment Exit 49 would thus be forecast to increase through the year 2008 and then remain constant at the 75% mark. A graphic showing the referenced historical E-ZPass usage and future year projections from the Highway Segment 50 to 49 analysis is shown in **Figure B-2**.

E-ZPass usage as a percentage of the overall traffic at the Highway Segment Exit 49 is not anticipated to fluctuate throughout the year as presented in the Highway Segment 49 to 48A analysis. This is a result of the higher commuter and commercial traffic usage of Highway Segment Exit 49 in combination with the traffic volumes at the Exit 49 toll barrier remaining more consistent throughout the year as compared to the mainline traffic volumes. As a result, only one E-ZPass penetration rate has been established for the Exit 49 toll barrier.

B. TRAFFIC PROJECTIONS

Traffic projections have been individually developed to determine the peak hour design traffic volumes for both the express E-ZPass lanes and the manual plazas at the Highway Segment Exit 49 toll barrier facility. The volumes have been developed for the AM and PM peak hour traffic period. Each category has been developed for the analysis periods 2008 and 2028. The traffic volumes for the exiting Exit 49 toll barrier analysis are adjusted based on the projected E-ZPass penetration rates to reflect the distribution of traffic to the different toll barrier lanes (low-speed E-ZPass and manual toll barrier lanes). This information is presented in **Tables B-6** to determine the maximum peak hour traffic volume at the plaza for the Highway Segment Exit 49.

The Highway Segment Exit 49 exiting traffic division between the one low-speed E-ZPass lane and the manual (mixed use) lanes is based on the previously noted penetration rates with a 50% split of E-ZPass traffic utilizing the available manual toll barrier lanes. This lane utilization by the exiting traffic is in response to the balancing of anticipated queuing between the low-speed E-ZPass lane and manual payment lanes.

**TABLE B-6
HIGHWAY SEGMENT EXIT 49 TOLL PLAZA LANE VOLUMES
AM & PM PEAK HOUR CONDITION**

YEAR	TRAVEL DIRECTION	PENETRATION E-ZPASS RATE	AM/PM PEAK HOUR VOLUME	AM/PM E-ZPASS HOUR VOLUME	AM/PM 50% E-ZPASS USING MANUAL	AM/PM MANUAL PEAK HOUR VOLUME	AM/PM CALCULATED MANUAL PEAK HOUR VOLUME
2008	EXITING	75%	1053/1274	790/956	395/478	263/318	658/796
	ENTERING	75%	1014/989	N/A*	N/A*	1014/989	1014/989
2028	EXITING	75%	1281/1550	961/1163	480/581	320/387	801/969
	ENTERING	75%	1235/1204	N/A*	N/A*	366	1235/1204
DESIGN VOLUME	EXITING	E-ZPASS LANES (YEAR 2028)		480/581	MANUAL LANES (YEAR 2028)		801/969
	ENTERING			N/A*			1235/1204

Source: TVGA Interchange 49 Ramp Volumes – AM & PM Peak Hours 9/30/05.

* - No dedicated low-speed E-ZPass lane for entering traffic at existing toll barrier.

Note: Assumed 50% of exiting E-ZPass traffic may utilize manual (mixed use) plaza for analysis purposes.

VI. PLAZA ANALYSIS RESULTS

A. EXIT 50 to 49 (ETC + 20)

A toll plaza lane requirement analysis was conducted for the Highway Segment Exit 50 to 49 using the identified projected year 2024 peak hour volumes and E-ZPass usage rates. This analysis was conducted with the peak hour volumes identified for both the standard traffic condition (September to June) and the summer traffic condition (July and August).

The analysis for Highway Segments Exit 50 to 49 identified that two lanes in the eastbound direction and two lanes in the westbound direction would adequately handle the forecast highway speed E-ZPass traffic. The two express E-ZPass lanes would adequately process the anticipated year 2024 traffic in both the standard and summer traffic conditions.

The manual toll booth lane analysis for the Highway Segment Exit 50 to 49 in the eastbound direction identified a minimum of two lanes under the standard traffic condition and three lanes under the summer condition would be required to process the projected 2024 demand. A queue analysis of the minimum required lanes indicated unacceptable queuing would occur with this number of lanes. Additional manual toll booth lanes were analyzed to reduce anticipated queuing to acceptable levels (as identified in Section II.D). This analysis identified that three lanes in the standard traffic condition and four lanes under the summer traffic condition would be required. Based on this analysis, four manual ticket lanes are required for the eastbound Highway Segment 49 to 48A plaza. The four lanes provide adequate operating conditions for the summer peak traffic condition and provide a reserve lane for the standard traffic condition to operate at an acceptable level.

In the westbound direction, the manual toll booth lane analysis for the Highway Segment Exit 50 to 49 identified a minimum of five lanes under the standard traffic condition and eight lanes under the summer traffic condition would be required to process the projected year 2024 traffic demand. A queue analysis of the minimum required lanes indicated unacceptable queuing would occur with this number of lanes in the summer traffic condition. A queuing analysis was then conducted with additional manual toll plaza lanes to identify the required number of toll plaza lanes to achieve acceptable queuing conditions. This analysis identified that five lanes under the standard traffic condition and nine to ten lanes under the summer traffic condition would be required. The nine lane toll plaza would be anticipated to have queuing only slightly greater than the identified three vehicle average requirement and would only be a condition which occurs at the peak hour during a two month period. Based on this, nine manual toll plaza lanes are recommended to be required for the westbound Highway Segment Exit 50 to 49 toll barrier plaza.

The plaza requirements to achieve acceptable capacity and queuing operations for Highway Segments Exit 50 to 49 for the year 2024 are summarized as follows:

- Express E-ZPass

- Two (2) Eastbound Lanes
- Two (2) Westbound Lanes
- Manual Toll Lanes
 - Four (4) Eastbound Manual/Ticket Lanes
 - Nine (9) Westbound Manual/Payment Lanes

A summary of the toll plaza lane requirement analysis and identified queuing conditions for the Highway Segment Exit 50 to 49 in the standard and summer traffic conditions is included in the [Attachment B-3](#).

B. EXIT 49 to 48A OPENING DAY (ETC)

A toll barrier lane requirement analysis was conducted for Highway Segment 49 to 48A (Relocation Alternative) under an initial 2008 (opening day) condition using the identified projected peak hour volumes and E-ZPass usage rates. This analysis was conducted with the peak hour volumes identified for both the standard traffic condition (September to June) and the summer traffic condition (July and August).

The analysis assumed that two lanes in the eastbound direction and two lanes in the westbound direction would be constructed to handle the forecasted highway speed E-ZPass traffic. The four express E-ZPass lanes were found to adequately process the anticipated year 2028 traffic in both the standard and summer traffic conditions and as such, would adequately process the lower 2008 traffic demands.

The manual toll booth lane analysis for the eastbound direction identified a minimum of two lanes under both the standard and summer traffic condition would be required to process the projected 2008 demand. A queue analysis of the minimum required lanes indicated unacceptable queuing would occur with this number of lanes. Additional manual toll booth lanes were analyzed to reduce anticipated queuing to acceptable levels (as identified in Section II.D Appendix B – Toll Barrier Capacity Analysis). This analysis identified that while two lanes would be acceptable under the standard conditions, three lanes would be required under the summer traffic condition. Based on this analysis, three manual ticket lanes are required for the eastbound Highway Segment Exit 49 to 48A toll barrier (Relocation Alternative). The three lanes provide adequate operating conditions for the summer peak traffic condition and provide a reserve lane for the standard traffic condition to operate at an acceptable level.

In the westbound direction, the manual toll booth lane analysis for the relocated barrier identified a minimum of three lanes under the standard traffic condition and five lanes under the summer traffic condition would be required to process the projected year 2008 traffic demand. A queue analysis of the minimum required lanes indicated unacceptable queuing would occur with this number of lanes in both the standard and summer traffic conditions. A queuing analysis was then conducted with additional manual toll lanes to identify the required number of lanes to achieve acceptable queuing conditions. This analysis identified that five lanes under the standard traffic condition and seven lanes under the summer traffic condition would be required. Based on this, seven manual toll

lanes are recommended for the westbound Highway Segment Exit 49 to 48A barrier for the initial opening day condition.

The requirements to achieve acceptable capacity and queuing operations for an opening day condition at the relocated toll barrier between highway segments 49 to 48A are summarized as follows:

- Express E-ZPass
 - Two (2) Eastbound Lanes
 - Two (2) Westbound Lanes
- Manual Toll Lanes
 - Three (3) Eastbound Manual/Ticket Lanes
 - Seven (7) Westbound Manual/Payment Lanes

A summary of the initial condition (opening day) toll lane requirement analysis and identified queuing conditions for the Highway Segment Exit 49 to 48A (Relocation Alternative) in the standard and summer traffic conditions is presented in **Attachment B-4**.

C. EXIT 49 to 48A FUTURE DESIGN CONDITION (ETC + 20)

A toll plaza lane requirement analysis was conducted for the Highway Segment Exit 49 to 48A for the future design condition (Relocation Alternative) using the identified projected peak hour volumes and E-ZPass usage rates for the year 2028. This analysis was conducted with the peak hour volumes identified for both the standard traffic condition (September to June) and the summer traffic condition (July and August).

The analysis identified that two lanes in the eastbound direction and two lanes in the westbound direction would adequately handle the forecast highway speed E-ZPass traffic. The two express E-ZPass lanes would adequately process the anticipated year 2028 traffic in both the standard and summer traffic conditions.

The manual toll booth lane analysis for both highway segments in the eastbound direction identified a minimum of two lanes under the standard traffic condition and three lanes under the summer condition would be required to process the projected 2028 demand. A queue analysis of the minimum required lanes indicated acceptable queuing would occur with this number of lanes. However, the analysis identified that in the summer condition the toll barrier operations with only two lanes would produce extensive queuing in the eastbound direction, a situation which could occur in the event of a single lane closure (as identified in Section II.D Appendix B – Toll Barrier Capacity Analysis). As a result, an additional manual toll booth lane was analyzed as part of the eastbound direction summer condition analysis in the event of a potential eastbound peak period toll barrier lane closure. This analysis confirmed that three lanes in the standard traffic condition and four lanes under the summer traffic condition would provide acceptable operating conditions at the toll barrier. The four lanes provide adequate operating conditions and a reserve lane for the summer peak traffic condition. This additional lane would also be available as a reserve lane for the standard traffic condition to operate at

an acceptable level. Based on this analysis, four manual ticket lanes are required for the eastbound Highway Segment Exit 49 to 48A toll barrier plaza.

In the westbound direction, the manual toll booth lane analysis for both highway segments identified a minimum of five lanes under the standard traffic condition and seven lanes under the summer traffic condition would be required to process the projected year 2028 traffic demand. A queue analysis of the minimum required lanes indicated unacceptable queuing would occur with this number of lanes in the summer traffic condition. A queuing analysis was then conducted with additional manual toll plaza lanes to identify the required number of toll plaza lanes to achieve acceptable queuing conditions. This analysis identified that seven lanes under the standard traffic condition and nine lanes under the summer traffic condition would be required. The nine lane toll plaza would be anticipated to have queuing approaching the identified four vehicle average requirement and would only be a condition which occurs at the peak hour during a two month period. Based on this, nine manual toll plaza lanes are recommended to be required for the westbound Highway Segment Exit 49 to 48A toll barrier plaza.

The plaza requirements to achieve acceptable capacity and queuing operations for both highway segments 50 to 49 and 49 to 48A are summarized as follows:

- Express E-ZPass
 - Two (2) Eastbound Lanes
 - Two (2) Westbound Lanes
- Manual Toll Lanes
 - Four (4) Eastbound Manual/Ticket Lanes
 - Nine (9) Westbound Manual/Payment Lanes

A summary of the toll plaza lane requirement analysis and identified queuing conditions for the Highway Segment Exit 49 to 48A in the standard and summer traffic conditions is included in the [Attachment B-4](#).

D. EXIT 49 OPENING DAY (ETC)

A toll barrier lane operations analysis was conducted for Highway Segment Exit 49 for the future design condition (Relocation Alternative) under an initial 2008 (opening day) scenario using the identified projected peak hour volumes and E-ZPass usage rates. This analysis was conducted with the peak hour volumes identified for the AM and PM peak hour traffic condition. The analysis included identification of anticipated queuing at the Exit 49 toll barrier facility assuming the existing lane configurations. The analysis was conducted to determine how the change in toll barrier plaza operations to a fixed fee collection coupled with the change in traffic volumes associated with the relocating of the mainline toll barrier facility to the Highway Segment Exit 49 to 48A would affect queues and delay at the plaza.

The analysis assumed that the toll barrier lane operations would remain consistent with the existing operations which consists of four (4) manual toll lanes (one reversible) and one low speed E-ZPass lanes for vehicles exiting the Thruway. The analysis assumed

collection of a flat rate toll in all manual lanes. It was assumed that E-ZPass could be utilized in all lanes at the toll plaza.

The manual toll booth lane analysis for the entering (westbound) direction identified a minimum of two lanes under the AM and PM peak traffic condition would be required to process the projected 2008 demand. As a result, the analysis conducted assumed the utilization of the existing entering manual toll lane and the use of the reversible manual toll lane (two lanes total) in the entering (westbound) direction. A queue analysis with the two available manual lanes indicated unacceptable queuing would occur with only two entering lanes (utilizing criteria identified in Section II.D Appendix B – Toll Barrier Capacity Analysis). Anticipated queues of vehicles would range from 22 to 33 vehicles per lane in the AM peak and 29 to 38 vehicles per lane in the PM peak with two entering lanes. The existing roadway approaching the toll barrier facility from Transit Road has space available for approximately 58 vehicles total before the queuing would impact Transit Road. As indicated, while the average queue can be accommodated by the available vehicle storage capacity, the maximum vehicle queue may exceed the available queuing area during the AM and PM peak periods in the year 2008.

In the exiting (eastbound) direction, the manual toll booth lane analysis for the toll barrier assumed the utilization of two manual lanes and one low-speed E-ZPass lane to process the projected year AM peak and PM peak 2008 traffic demand. A queue analysis with this lanes configuration indicated acceptable queuing would occur with this number of lanes in both the AM and PM peak traffic condition. The existing ramp approaches to the toll barrier facility have space for approximately 60 vehicles total before the queuing would impact the mainline Interstate 90 highway. The anticipated queuing of less than eight vehicles per lane would be readily accommodated by the available storage capacity in both the AM and PM peak periods in the year 2008.

A summary of the findings regarding the capacity and queuing operations for an opening day condition at the Highway Segment Exit 49 toll barrier facility are summarized as follows:

- Exiting (eastbound) Toll Lanes – Unacceptable Operations
 - Two (2) Manual Lanes
- Entering (westbound) Toll Lanes – Acceptable Operations
 - Two (2) Manual Lanes
 - One (1) Low-Speed E-ZPass Lanes

A summary of the 2008 initial condition (opening day) toll lane capacity analysis and identified queuing conditions for Highway Segment Exit 49 under the Relocation Alternative for the AM and PM peak traffic condition is presented in [Attachment B-5](#).

E. EXIT 49 FUTURE DESIGN CONDITION (ETC + 20)

A toll barrier lane operations analysis was conducted for Highway Segment Exit 49 for the future design condition (Relocation Alternative) under a 2028 (future design condition) scenario using the identified projected peak hour volumes and E-ZPass usage

rates. This analysis was conducted with the peak hour volumes identified for the AM and PM peak hour traffic condition. The analysis included identification of anticipated queuing at the Exit 49 toll barrier facility assuming the existing lane configurations. The analysis was conducted to determine how the change in toll barrier plaza operations to a fixed fee collection coupled with the change in traffic volumes associated with the relocating of the mainline toll barrier facility to the Highway Segment Exit 49 to 48A would affect queues and delay at the plaza.

The analysis assumed that the toll barrier lane operations would remain consistent with the existing operations which consists of four (4) manual toll lanes (one reversible) and one low speed E-ZPass lanes for vehicles exiting the Thruway. The analysis assumed collection of a flat rate toll in all manual lanes. It was assumed that E-ZPass could be utilized in all lanes at the toll plaza.

The manual toll booth lane analysis for the entering (westbound) direction identified a minimum of three lanes under the AM and PM peak traffic condition would be required to process the projected 2028 demand. Since three entering toll barrier lanes are not available, the analysis conducted assumed the maximum utilization of the existing entering manual toll lane and the use of the reversible manual toll lane (two lanes total) in the entering (westbound) direction. A queue analysis with the two available manual lanes indicated unacceptable queuing would occur with only the two entering lanes (utilizing criteria identified in Section II.D Appendix B – Toll Barrier Capacity Analysis). Anticipated queues of vehicles would range from 43 to 67 vehicles per lane in the AM peak and 52 to 79 vehicles per lane in the PM peak with two entering lanes. The existing roadway approaching the toll barrier facility from Transit Road has space available for approximately 58 vehicles total before the queuing would impact Transit Road. As indicated, the average and maximum vehicle queues would be anticipated to exceed the available queuing area during the AM and PM peak periods in the year 2028.

In the exiting (eastbound) direction, the manual toll booth lane analysis for the toll barrier assumed the utilization of two manual lanes and one low-speed E-ZPass lane to process the projected year AM peak and PM peak 2028 traffic demand. A queue analysis with this lanes configuration indicated acceptable queuing would occur at the two manual toll plaza lanes in both the AM and PM peak traffic condition. Acceptable queuing conditions would be anticipated at the low-speed E-ZPass lane in the AM peak period. The queue analysis for the low speed toll plaza lane indicated unacceptable queuing would occur in the PM peak traffic condition. Anticipated queues of vehicles would range from 14 to 17 vehicles per lane in the PM peak at the low speed E-ZPass lane. The existing ramp approaches to the toll barrier facility have space for approximately 60 vehicles total before the queuing would impact the mainline Interstate 90 highway. The anticipated queuing of less than eight vehicles per lane at the manual lanes combined with the anticipated low speed E-ZPass queuing vehicles would be anticipated to be accommodated by the available storage capacity in both the AM and PM peak periods in the year 2028.

A summary of the findings regarding the capacity and queuing operations for the future design condition at the Highway Segment Exit 49 toll barrier facility are summarized as follows:

- Exiting (eastbound) Toll Lanes – Unacceptable Operations
 - Two (2) Manual Lanes
- Entering (westbound) Toll Lanes
 - Two (2) Manual Lanes – Acceptable Operations
 - One (1) Low-Speed E-ZPass Lanes – Unacceptable Operations

A summary of the 2028 initial condition (opening day) toll lane capacity analysis and identified queuing conditions for Highway Segment Exit 49 under the Relocation Alternative for the AM and PM peak traffic condition is presented in [Attachment B-5](#).

ATTACHMENT B-1

Processing Rate Tables

**TABLE B-1-1
PROCESSING RATE TABLE FOR EXIT TOLL LANE**

DATE: March 31, 2000
BEGINNING TIME: 4:00 PM

LOCATION: Williamsville Toll Plaza
END TIME: 5:15 PM

PROCESSING RATE (SECONDS/VEHICLE)												TOTAL VOLUME	
LANE 7W - WB Manual	PASSENGER							SINGLE UNIT	TRACTOR TRAILER				TANDEM/OTHER
	22	9	11	14	11	19	22	30	13	18	28	30	273
	19	23	8	19	17	10	24	31	32	53	32		Rate Count 123
	11	15	28	25	19	15	11	20	36	56	36		
	13	31	9	6	24	18	23		26	30	50		
	19	21	15	35	18	27	18		29	35			
	11	27	7	13	12	12	13						
	16	12	16	16	13	20	11						
	20	14	12	20	20	16	21						
	15	35	8	11	21	11	12						
	10	10	12	15	10	15	8						
	13	20	54	22	21	20	12					Observation% 45%	
	33	16	15	13	20	16	19						
	13	9	7	10	14	14	9						
	13	14	14	14	14	7	70						
	13	9	8	21	9	12	14						
AVERAGE	17							27	34			30	
OVERALL AVERAGE												19	

NOTES:

The Rate Count is the number of vehicles observed at the given lane.

The Observation Percentage is the number of vehicles observed compared to the actual number of vehicles recorded at a given lane.

The Overall Average is the processing rate average for all the vehicles observed for the given lane.

**TABLE B-1-2
PROCESSING RATE TABLE FOR EXIT TOLL LANE**

PROCESSING RATE (SECONDS/VEHICLE)													TOTAL VOLUME
LANE 6W - WB Manual	PASSENGER							SINGLE UNIT	TRACTOR TRAILER			TANDEM/OTHER	
	18	17	17	15	17	21	17	21	44	48	31	21	303
	6	10	16	19	10	27	15		23	24	24	16	Rate Count 128
	19	17	10	16	20	5	13		31	50	32		
	8	19	9	18	8	8	18		25	41	32		
	16	19	8	11	6	9	13						
	12	9	9	7	9	12	20						
	9	15	14	11	11	17	18						
	9	21	13	10	12	14	10						
	10	10	13	52	7	21	11						
	28	11	11	8	3	10	10						
	10	26	8	10	7	7	12						
	10	16	9	12	5	9	19						
	7	7	16	13	5	19	6						
	58	23	8	5	15	11	8						
	7	29	9	10	11	8	12						
	10	13	29	16	10	16	8						
	7												
AVERAGE	13							21	34			19	
OVERALL AVERAGE												15	

NOTES:

The Rate Count is the number of vehicles observed at the given lane.

The Observation Percentage is the number of vehicles observed compared to the actual number of vehicles recorded at a given lane.

The Overall Average is the processing rate average for all the vehicles observed for the given lane.

**TABLE B-1-3
PROCESSING RATE TABLE FOR EXIT TOLL LANE**

PROCESSING RATE (SECONDS/VEHICLE)													TOTAL VOLUME
LANE 4W - WB Manual	PASSENGER							SINGLE UNIT	TRACTOR TRAILER			TANDEM/OTHER	
	12	40	20	15	10	20	43	14	23	32	37	42	Rate Count 127
	7	24	15	5	8	18	11	17	26	23		21	
	8	19	20	6	7	8	13	15					
	9	9	5	8	11	5	9	23					
	8	7	9	8	16	10	5	26					
	13	20	4	9	18	11	33	17					
	7	10	9	6	15	12	4						
	12	5	5	22	17	7	18						
	14	8	11	30	14	24	8						
	6	27	8	18	5	17	38						
	13	41	14	8	8	7	6						
	20	7	9	36	6	6	5						
	11	6	7	12	13	13	17						
	4	7	10	7	11	16	13						
	19	6	8	10	5	22	13						
	13	12	13	19	14	9	18						
AVERAGE	13							19	28			32	
OVERALL AVERAGE												14	

NOTES:

The Rate Count is the number of vehicles observed at the given lane.

The Observation Percentage is the number of vehicles observed compared to the actual number of vehicles recorded at a given lane.

The Overall Average is the processing rate average for all the vehicles observed for the given lane.

**TABLE B-1-4
PROCESSING RATE TABLE FOR ENTRY TOLL LANE**

PROCESSING RATE (SECONDS/VEHICLE)													TOTAL VOLUME
LANE 3W - EB Manual	PASSENGER							SINGLE UNIT	TRACTOR TRAILER			TANDEM/OTHER	
	4	5	5	5	5	6	5	5	29	12	17	26	628
	5	4	6	4	5	5	5	5	11	16			Rate Count 185
	4	7	5	5	6	5	5	10					
	4	6	5	5	6	6	6						
	4	9	5	10	4	5	3						
	5	5	5	6	4	6	6						
	6	5	6	5	5	4	5						
	5	5	5	5	5	4	9						
	6	5	4	5	4	6	5						
	9	5	7	5	4	5	5						
	5	9	5	6	4	4	5						
	5	4	5	5	5	5	5						
	6	6	5	6	6	4	6						
	6	5	5	5	5	5	5						
	4	5	5	5	10	5	5					Observation% 29%	
	6	4	21	5	6	5	6						
	5	4	7	5	6	5	5						
	6	6	7	4	5	4	7						
	4	7	6	4	6	4	12						
	5	5	5	5	4	8	6						
	4	6	5	4	4	3	6						
	5	5	5	5	5	6	5						
	8	6	5	5	5	5	5						
	6	6	4	5	5	3	5						
	6	4	5	4	6	6	6						
	7												
AVERAGE	5							7	17			26	
OVERALL AVERAGE												5	

NOTES:

The Rate Count is the number of vehicles observed at the given lane.

The Observation Percentage is the number of vehicles observed compared to the actual number of vehicles recorded at a given lane.

The Overall Average is the processing rate average for all the vehicles observed for the given lane.

**TABLE B-1-5
PROCESSING RATE TABLE FOR E-ZPASS ENTRY TOLL LANE**

PROCESSING RATE (SECONDS/VEHICLE)													TOTAL
LANE BE - EB E-ZPass	PASSENGER							SINGLE UNIT	TRACTOR TRAILER			TANDEM/OTHER	VOLUME
	2	2	4	2	3	2	3	3	4	8	9	5	463 Rate Count 174 Observation% 38%
	3	3	2	2	2	3	3	4	7	5	4	5	
	2	3	2	1	3	2	2	5	8	4	6	8	
	2	3	2	7	3	2	2	3	6	8	8	10	
	4	2	2	2	3	2	3	4	6	6	8	8	
	2	4	3	3	2	4	3	4	5	9	6	11	
	4	3	6	3	2	1	2		6	8	7	6	
	2	3	3	1	2	3	2		4	7	6		
	2	3	3	3	3	2	3		6	4	8		
	3	4	3	2	2	2	2		5	7	6		
	4	3	1	3	2	3	3		6	7	8		
	3	3	2	3	2	3	2		4	9	12		
	3	3	3	3	2	3	2		7	6	5		
	2	3	2	3	1	3	2		5	5	9		
	2	2	4	2	1	2	3		4	6	5		
	5	4	3	3	3	4	2		6	7	9		
									8				
AVERAGE	3							4	7			8	
OVERALL AVERAGE													5

NOTES:

The Rate Count is the number of vehicles observed at the given lane.

The Observation Percentage is the number of vehicles observed compared to the actual number of vehicles recorded at a given lane.

The Overall Average is the processing rate average for all the vehicles observed for the given lane.

**NEW YORK STATE THRUWAY AUTHORITY
 DESIGN OF THE RELOCATION OF THE WILLIAMSVILLE TOLL BARRIER
 NYSTA CONTRACT NO: D212607**

PROCESSING RATE TABLE

DATE: January 6, 2004

LOCATION: Exit 49

BEGINNING TIME: 4:30 PM

END TIME: 5:15 PM

VEHICLE CLASS (SECONDS/VEHICLE)													Ave Rate
LANE	PASSENGER							SINGLE UNIT	TRACTOR TRAILER			TANDEM/OTHER	
E-ZPASS	2	3	4	2	4	2	3	5	8	4			total sample 82
	2	2	2	4	3	3	4	4					
	3	3	3	2	3	3	2	5					
	2	3	2	2	3	2	2						
	3	2	2	2	2	2	2						
	2	3	3	2	2	3	2						
	2	2	2	2	2	2	2						
	2	2	2	2	2	2	2						
	2	2	2	2	2	2	2						
	3	3	3	2	2	2	2						
	3	3	3	3	4	4	5						
AVERAGE	2.48							4.66666667	6.00			0	
OVERALL AVERAGE													2.65

VEHICLE CLASS (SECONDS/VEHICLE)													Ave Rate
LANE	PASSENGER							SINGLE UNIT	TRACTOR TRAILER			TANDEM/OTHER	
Manual	8.5	4.7	5	3.5	2.4	3.6	15.3	2.6	5.7	5.7	4.9		total sample 126
	9.9	12.7	2.7	3.7	3.3	3.2	3.5	4.8	2.4	3.7	4.7		
	3	7.2	4.2	2.7	3.4	4.1	8.3		8.2	6.1	8.6		
	3.8	3.2	6	18.2	3.6	5.2	3.6		4.7	8.6	6.1		
	3.4	9	3.5	2.3	6.8	2.7	1.9		8.2				
	3	3.6	4.2	2.9	3	3.5	3.8						
	2.1	5.4	3.2	4.8	2.7	3.5	3.9						
	3.5	3.5	2.6	4.4	7.3	5.4	2.4						
	12.4	4.4	4.8	3.5	25.1	3.6	2						
	2.8	3.9	6.2	3.6	6.9	2.1	3.6						
	5.8	4.1	3.2	3.9	4	2.4	3.7						
	3.7	4.8	4.4	3.6	2.2	2.5	1.8						
	4.8	4.4	3.6	2.2	2.5	1.8	4.3						
	3.5	4	2.5	4	6.9	3.5	2.2						
	2.9	2.9	3.3	7.8	6.9	13.5	1.7						
	2.7	6.5	2	4.1	19.4	2.1							
AVERAGE	4.75							3.70	5.34			0	
OVERALL AVERAGE													5

NEW YORK STATE THRUWAY AUTHORITY
 DESIGN OF THE RELOCATION OF THE WILLIAMSVILLE TOLL BARRIER
 NYSTA CONTRACT NO: D212607

PROCESSING RATE TABLE

VEHICLE CLASS (SECONDS/VEHICLE)													Ave. Rate
LANE	PASSENGER							SINGLE UNIT	TRACTOR TRAILER			TANDEM/OTHER	
Manual	2.7	2.5	5.4	29	4.6	21	7.8	14	10	8.9	9.8	18.5	total sample 119
	3	2.4	7.9	25.6	3.6	3.4	13.9	25.8	7.4	9	10		
	5	3	9	3.4	10.7	8	6	4.9	9.5	14.7	55.7		
	3.6	5.7	2.2	2.6	3.4	4.2	2.4						
	3.2	5.4	6.3	2.8	2.6	3	2.5						
	5.4	13.2	14	10	4.5	2	11.8						
	3.8	10.5	5	4.4	8.5	4.7	5						
	3.7	9.8	20.8	6.7	3.8	3.8	8.4						
	5.8	6.9	5	16.8	13.9	4	3.1						
	7.3	4.1	5.8	7.3	13	6.9	4.1						
	14.4	5.4	3.5	5.5	4.4	10.7	3						
	15.4	6.3	10.2	3.6	12.2	7.8	5.6						
	7.3	14	18	9.4	4.8	3.9	4.7						
	3.7	6.2	3.9	5.8	7.8	6.3	4.8						
	3.8	17.1	4.3	13.4	5.6	4.4	19.2						
	16.1												
AVERAGE	7.40							14.90	6.12			18.50	
OVERALL AVERAGE													8

**NEW YORK STATE THRUWAY AUTHORITY
DESIGN OF THE RELOCATION OF THE WILLIAMSVILLE TOLL BARRIER
NYSTA CONTRACT NO: D212607**

PROCESSING RATE TABLE

DATE: January 8, 2004

LOCATION: Ogden

BEGINNING TIME: 7:30 AM

END TIME: 8:30 AM

VEHICLE CLASS (SECONDS/VEHICLE)													Average Rate
LANE	PASSENGER							SINGLE UNIT	TRACTOR TRAILER			TANDEM/OTHER	
Manual	6	6.4	3.4	4.1	5.8	11.9	3.7	11.3	24.4	7.5	35.2	22.3	Total Survey 183
	3.7	4.7	3.3	7.2	4.4	4	4	12	36	17	22.4	15	
	3.5	4.2	4.3	4.3	7.8	4.8	4	4.8	8.9	21.1	25.3	10.1	
	8.4	4.9	5.4	5.3	3.6	5.6	4.8	7.9	29.6	6.3	22.9		
	4.2	7.6	7.6	3.9	3.3	12.2	2.5	6					
	11.8	4.1	6.3	3.8	3.2	5.6	5	38.6					
	8	6.3	3.8	4.1	22.8	3.6	4.6						
	5	6.2	6.5	8.9	4.9	4.2	6						
	4.1	13.7	7.7	5.3	3.9	4	4						
	4.8	3.4	4.8	4.6	4.8	4.8	3.8						
	8.5	7.9	6.8	4.6	7.6	3.3	5.3						
	5.2	3.8	4.7	4.4	4.2	4.7	4.8						
	5.7	7.9	6.5	4.3	4.1	3.5	5.8						
	5	4.6	4.4	3.5	4.4	4.9	6.3						
	4.8	3.5	7	9.5	25	4.2	4.7						
	3.8	4.5	8.6	4.6	4.2	8.6	3.1						
	4.8	4.5	4.1	12.7	4	6	6.7						
	7.4	4.5	4.5	6.8	4.3	5.5	17.2						
	4.3	4.4	3.5	6.3	3.1	3.4	4.4						
	4.4	4.1	4.1	19.4	3.9	6.2	4						
	5	11.6	6.1	4.6	4.8	6	3.8						
	9.9	3.9	5.3	4.6	3.4	4.4	6.7						
	4.1	3.6	7.4	5.6	4.7	7	4.6						
	7.7	5.3	5.7	5	6.8	39.1	3.7						
7.8	6.5	9.3	6.4	4.9									
AVERAGE	6							13.43333333	21			15.8	
OVERALL AVERAGE													8

**NEW YORK STATE THRUWAY AUTHORITY
 DESIGN OF THE RELOCATION OF THE WILLIAMSVILLE TOLL BARRIER
 NYSTA CONTRACT NO: D212607**

PROCESSING RATE TABLE

LANE	VEHICLE CLASS (SECONDS/VEHICLE)											TOTAL VOLUME
	PASSENGER						SINGLE UNIT	TRACTOR TRAILER			TANDEM/OTHER	
Manual	3.5	3.4	4.9	6.6	3.8	3.5	4.1	11.1	25	17.9	21	total sample 176
	6.2	4.6	4.7	5.2	4.8	6.3	5.5		11.3	25		
	4.8	22.2	4.4	7.8	4.8	4.7	6.2					
	7.7	5.4	4.8	3.6	4.1	7.6	3.9					
	4.3	5.4	5.7	5.1	4.5	3.8	7					
	5.2	5.3	4.5	4.7	7.1	4.4	4.5					
	6.8	4.8	5.2	7.3	8.4	4.6	4.5					
	6.1	5.6	4.5	4.9	5.4	4.9	4.3					
	4.9	7.6	6	4.7	9.7	4.5	17					
	4.9	20.6	3.9	7.2	3.7	6.1	4					
	4.2	5.6	6.5	4.8	4.1	5.3	4.9					
	6.9	4.7	5.6	7.5	5.5	3.9	5.2					
	7.3	4.5	5.4	4.5	5.9	9.7	4.9					
	7.7	4.3	6.5	5.2	7.5	4.4	5.2					
	4	4.7	8.1	10.1	4.9	4.5	5.5					
	5.7	4.9	7.7	5.4	4.6	4.5	5.4					
	5.1	8.4	6.8	5.6	15.7	3.7	4.8					
	7.2	5.9	4.7	7.1	7.5	5.2	3.8					
	6.6	3.8	4.4	4.3	5.2	6.7	4.9					
	3.8	4.5	4.3	5.1	4.4	6.2	4.1					
	4.5	4.8	4.9	4.8	5.1	4.3	5.8					
	4.9	5	5.1	6.7	4.1	5.9	5.3					
	5.1	6.2	4.3	5.5	4.7	4.1	4.7					
	5.3	4.4	25.8	5.3	4.4	6.6	4.6					
	4.9	4.6	4.5									
AVERAGE	6						11	20			0	
OVERALL AVERAGE												6

**NEW YORK STATE THRUWAY AUTHORITY
 DESIGN OF THE RELOCATION OF THE WILLIAMSVILLE TOLL BARRIER
 NYSTA CONTRACT NO: D212607**

PROCESSING RATE TABLE

LANE	VEHICLE CLASS (SECONDS/VEHICLE)											TOTAL VOLUME	
	PASSENGER							SINGLE UNIT	TRACTOR TRAILER				TANDEM/OTHER
Manual	4	5	4	4	3	3	5	12	32	16	19		total sample 260
	4	6	3	3	5	4	7	5	16	26	22		
	4	3	3	3	4	2	3	7	23	40	20		
	6	3	4	6	5	4	3	5	16	10	17		
	4	3	3	15	4	4	3		17	14	10		
	4	10	9	12	6	4	5		31				
	5	4	4	5	3	5	5						
	3	4	12	3	4	3	4						
	7	5	4	4	5	8	3						
	3	11	7	3	18	11	7						
	5	3	4	5	3	9	4						
	3	3	6	3	3	7	3						
	3	7	6	12	8	3	6						
	4	5	6	4	5	3	4						
	4	3	7	4	4	7	4						
	4	4	6	5	4	5	6						
	4	4	3	5	7	4	4						
	3	6	9	11	4	7	3						
	3	4	4	3	3	4	4						
	4	3	5	3	5	3	3						
	3	3	4	5	9	4	5						
	4	3	3	4	3	4	3						
	4	5	4	3	5	3	3						
	3	4	5	4	4	3	3						
	5	3	4	5	7	3	4						
	3	3	3	4	4	4	5						
	5	4	4	3	3	4	4						
	4	4	3	3	3	5	6						
	4	3	4	3	4	5	3						
	11	3	3	3	3	4	3						
	5	8	3	3	4	7	3						
	4	4	4	4	4	3	5						
	3	4	4	4	5	4	6						
3	3	4	3	4	6	7							
3	3												
AVERAGE	5							7	8			0	
OVERALL AVERAGE												6	

ATTACHMENT B-2

1994 Survey of U.S. Toll Operators

**TABLE B-2-1
1994 SURVEY OF U.S. TOLL OPERATORS**

Types of Toll Payment / Lanes	No. of Responses	Actual Data Range (Vehicles per hour per lane)	Average Value (Vehicles per hour per lane)
<i>Payment Method</i>			
Manual (Attended)	22	240-500	416
Private passenger vehicles	22	162-350	233
Commercial only	11	180-550	360
Mixed (<5% trucks/buses)	24		
ACM (Exact Change, Single Coin/Token)			
Private passenger vehicles	4	600-950	687
Mixed (<5% trucks/buses)	2	550	550
ACM (Multiple Coins/Token)			
Private passenger vehicles	22	450-925	627
Mixed (<5% trucks/buses)	2	550	550
Electronic Toll Collection			
Private passenger vehicles	4	850-1300	1154
Mixed (<5% trucks/buses)	2	500-1600	1050
Bar Code Reader with ACM (Single Coin/Token)			
Private passenger vehicles	1	550	
Commercial	1	550	
Mixed (<5% trucks/buses)	1	500	
Manual (Exact Change)			
Private passenger vehicles	2	203-393	315
Commercial	1	298	
Credit Card			
Commercial	1	425	
Ticket Entry			
Private passenger vehicles	5	327-750	587
Commercial only	4	159-700	382
Mixed (<5% trucks/buses)	4	425-600	506
Ticket (Manual Payment at Exit)			
Private passenger vehicles	2	325-350	338
Mixed (<5% trucks/buses)	2	275-465	370
<i>Special Lanes</i>			
Feeder with 2 or 3 Branch Lanes			
Private passenger vehicles	1	640-1975	
Tandem Lanes (Manual)			
Private passenger vehicles	2	500-540	520
Mixed (<5% trucks/buses)	1	520	
ETC Express/Lanes			
Private passenger vehicles	2	1200-1800	1500

ATTACHMENT B-3

Lane Requirement Analysis Highway Segment Exit 50 to 49

NYSTA
Williamsville Toll Plaza Analysis

Lane Requirement Analysis

Improvement Alternative

July to August

Manual and EZ Pass Lanes

I-90 Between Exit 49 & 50 w/New Plaza

Future DEMAND

	Eastbound	Westbound	Total
Projected Avg. Daily Exit Volume	-	-	0
Projected Peak Hour Exit Volume	4,203	4,203	8,406

2024 TVGA Seasonal Forecast revised on 5/07/2001

Williamsville Toll Plaza

Peak Hour Analysis

Toll Lane Requirements

High-Speed EZ Pass Traffic (unadjusted)

Vehicles Processed per EZ Pass Toll Lane

Rounded EZ Pass Toll Lane Requirement

Manual Toll Booth Traffic (w/10% of EZPass)

Vehicles Processed per Toll Lane

Calculated Toll Lane Requirement

Rounded Manual Toll Lane Requirement

	Eastbound	Westbound
EZ Pass Usage	EZ Pass Usage	EZ Pass Usage
69%	69%	
2900	2900	
1500	1500	
2	2	
1593	1593	
644	231	
2.47	6.90	
3	7	

Williamsville Toll Plaza

Peak Hour Analysis

Queuing Analysis

High-Speed EZ Pass Usage at **69%**

	Eastbound Manual Toll Plaza Lanes			Westbound Manual Toll Plaza Lanes		
	5	4	3	9	8	7
High-Speed EZ Pass Usage at 69%	1/7	2/7	20/27	2/5	4/10	8/16

Average Queue / Maximum Queue (vehicles)

Average Queue / Maximum Queue (vehicles)

NYSTA
Williamsville Toll Plaza Analysis

Lane Requirement Analysis

Improvement Alternative

September to June

Manual and EZ Pass Lanes

I-90 Between Exit 49 & 50 w/New Plaza

Future DEMAND

	Eastbound	Westbound	Total
Projected Avg. Daily Exit Volume	36,548	36,546	73,094
Projected Peak Hour Exit Volume	2,695	2,572	5,267

2024 TVGA Forecast No Action Alternative revised on 1/19/2001

Williamsville Toll Plaza

Peak Hour Analysis

Toll Lane Requirements

High-Speed EZ Pass Traffic (unadjusted)

Vehicles Processed per EZ Pass Toll Lane

Rounded EZ Pass Toll Lane Requirement

Manual Toll Booth Traffic (w/10% EZPass)

Vehicles Processed per Toll Lane

Calculated Toll Lane Requirement

Rounded Manual Toll Lane Requirement

	Eastbound	Westbound
EZ Pass Usage	EZ Pass Usage	EZ Pass Usage
	75%	75%
	2021	1929
	1500	1500
	2	2
	918	876
	644	231
	1.42	3.79
	2	4

Williamsville Toll Plaza

Peak Hour Analysis

Queuing Analysis

High-Speed EZ Pass Usage at 75%

	Eastbound Manual Toll Plaza Lanes			Westbound Manual Toll Plaza Lanes		
	4	3	2	6	5	4
	1/4	1/3	13/23	1/3	1/4	5/9

Average Queue / Maximum Queue (vehicles)

Average Queue / Maximum Queue (vehicles)

ATTACHMENT B-4

Lane Requirement Analysis Highway Segment Exit 49 to 48A

NYSTA
Williamsville Toll Plaza Analysis

Lane Requirement Analysis

Relocation Alternative

July to August (Summer)

Manual and EZ Pass Lanes

I-90 Between Exit 48A & 49 w/Relocation w/Toll Retention Alternative

Future 2008 DEMAND
with Truck Traffic Analysis

Eastbound	Westbound	Total
0	0	0
2,774	2,746	5,520

Projected Peak Hour Exit Volume

2008 TVGA 9/14/05 Peak Season Forecast

Williamsville Toll Plaza

Peak Hour Analysis

Toll Lane Requirements

High-Speed EZ Pass Traffic (adjusted)

Vehicles Processed per EZ Pass Toll Lane

Rounded EZ Pass Toll Lane Requirement

Manual Toll Booth Traffic (w/10% of EZPass)

Vehicles Processed per Toll Lane

Calculated Toll Lane Requirement

Rounded Manual Toll Lane Requirement

Eastbound	Westbound	90% Design Traffic	
		Eastbound	Westbound
EZ Pass Usage	EZ Pass Usage	EZ Pass Usage	EZ Pass Usage
59%/75%	59%/75%	59%/75%	59%/75%
1642	1625	1478	1463
1500	1500	1500	1500
2	2	1	1
1132	1121	1019	1009
644	231	644	231
1.76	4.86	1.58	4.37
2	5	2	5

Passenger Car/Truck

Williamsville Toll Plaza

Peak Hour Analysis

Queuing Analysis

(100% Traffic)

High-Speed EZ Pass Usage at **59/75%**

	Eastbound Manual Toll Plaza Lanes			Westbound Manual Toll Plaza Lanes		
	2	3	4	5	6	7
	10/14	3/4	3/4	5/9	5/8	4/5

Average Queue / Maximum Queue (vehicles)
 (Eight Vehicle Desirable Maximum)

Average Queue / Maximum Queue (vehicles)
 (Three/Four Vehicle Desirable Average)

NYSTA
Williamsville Toll Plaza Analysis

Lane Requirement Analysis

Relocation Alternative

July to August (Summer)

Manual and EZ Pass Lanes

I-90 Between Exit 48A & 49 w/Relocation w/Toll Retention Alternative

Future 2028 DEMAND
with Truck Traffic Analysis

Projected Peak Hour Exit Volume

2028 TVGA 9/14/05 Peak Season Forecast

Eastbound	Westbound	Total
0	0	0
3,995	3,955	7,950

Williamsville Toll Plaza

Peak Hour Analysis

Toll Lane Requirements

High-Speed EZ Pass Traffic (adjusted)

Vehicles Processed per EZ Pass Toll Lane

Rounded EZ Pass Toll Lane Requirement

Manual Toll Booth Traffic (w/10% of EZPass)

Vehicles Processed per Toll Lane

Calculated Toll Lane Requirement

Rounded Manual Toll Lane Requirement

Eastbound	Westbound	90% Design Traffic	
		Eastbound	Westbound
EZ Pass Usage	EZ Pass Usage	EZ Pass Usage	EZ Pass Usage
59%/75%	59%/75%	59%/75%	59%/75%
2364	2341	2128	2107
1500	1500	1500	1500
2	2	2	2
1631	1614	1468	1453
644	231	644	231
2.53	6.99	2.28	6.29
3	7	3	7

Passenger Car/Truck

Williamsville Toll Plaza

Peak Hour Analysis

Queuing Analysis

(100% Traffic)

High-Speed EZ Pass Usage at **59/75%**

	Eastbound Manual Toll Plaza Lanes			Westbound Manual Toll Plaza Lanes		
	2	3	4	7	8	9
High-Speed EZ Pass Usage at 59/75%	26/26	5/6	2/4	9/12	7/10	4/6

Average Queue / Maximum Queue (vehicles)
 (Eight Vehicle Desirable Maximum)

Average Queue / Maximum Queue (vehicles)
 (Three/Four Vehicle Desirable Average)

NYSTA
Williamsville Toll Plaza Analysis

Lane Requirement Analysis
Relocation w/Toll Retention Alternative
September to June
Manual and EZ Pass Lanes
 I-90 Between Exit 48A & 49 w/New Plaza

Future 2028 DEMAND

	Eastbound	Westbound	Total
Projected Avg. Daily Exit Volume			0
Projected Peak Hour Exit Volume	2,621	2,584	5,205

2028 TVGA Forecast Updated 12/15/2004

Williamsville Toll Plaza

Peak Hour Analysis

Toll Lane Requirements

High-Speed EZ Pass Traffic (adjusted)

Vehicles Processed per EZ Pass Toll Lane

Rounded EZ Pass Toll Lane Requirement

Manual Toll Booth Traffic (w/10% of EZPass)

Vehicles Processed per Toll Lane

Calculated Toll Lane Requirement

Rounded Manual Toll Lane Requirement

	Eastbound	Westbound	90% Design Traffic	
			Eastbound	Westbound
EZ Pass Usage	EZ Pass Usage	EZ Pass Usage	EZ Pass Usage	EZ Pass Usage
	65%/75%	65%/75%	65%/75%	65%/75%
	1656	1633	1490	1469
	1500	1500	1500	1500
	2	2	1	1
	965	951	869	856
	644	231	644	231
	1.50	4.12	1.35	3.71
	2	5	2	4

Passenger Car/Truck

Williamsville Toll Plaza

Peak Hour Analysis

Queuing Analysis

(100% Traffic)

High-Speed EZ Pass Usage at **65%/75%**

	Eastbound Manual Toll Plaza Lanes		Westbound Manual Toll Plaza Lanes	
	2	3		7
	4/6	3/4		4/5

Average Queue / Maximum Queue (vehicles)

Average Queue / Maximum Queue (vehicles)

ATTACHMENT B-5

Lane Requirement Analysis Highway Segment Exit 49

NYSTA
Williamsville Toll Plaza Analysis

Exit 49 Toll Plaza Analysis
Relocation Alternative w/Toll Retention

Manual and EZ Pass Lanes

2008 Conditions	AM PEAK			Exit	PM PEAK Enter	Total
	Exit	Enter	Total			
Projected Avg. Daily Exit Volume	-	-	-	-	-	-
Projected Peak Hour Exit Volume	1,053	1,014	2,067	1,274	989	2,263
<i>TVGA Interchange 49 Ramp Volumes - AM & PM Peak Hours (9/30/05)</i>						

2008 Volumes w/Existing PLAZA Configuration Analysis (w/Flat Rate)						
	Exit		Enter	Exit		Enter
Rounded Manual Toll Lane Requirement	2		2	2		2
Existing Plaza Configuration (Manual Lanes)	2		2	2		2
Rounded EZPass Toll Lane Requirement	1		n/a	1		n/a
Existing Plaza Configuration (EZPass Lanes)	1		1	1		1

Exit 49 Toll Plaza 2008 Peak Hour Analysis Delay & Queuing Analysis	AM PEAK			PM PEAK		
	Manual/EZPass Toll Plaza Lanes			Manual/EZPass Toll Plaza Lanes		
Existing Plaza Capacity	Exit		Enter	Exit		Enter
	2		2	2		2
EZ Pass Usage at 75% (From Exit 50 Projection) - Split 50% to Manual Lanes due to queue	4/5		22/33	4/8		29/38
	Low Speed EZPass Toll Plaza Lanes			Low Speed EZPass Toll Plaza Lanes		
	Exit			Exit		
	1			1		
	4/5			6/8		
<i>Analysis utilizes reversable lane in optimal direction</i>	Average Queue / Maximum Queue (vehicles) Delay(seconds)/Vehicle			Average Queue / Maximum Queue (vehicles) Delay(seconds)/Vehicle		

NYSTA
Williamsville Toll Plaza Analysis

Exit 49 Toll Plaza Analysis
Relocation Alternative w/Toll Retention

Manual and EZ Pass Lanes

2028 Conditions	AM PEAK			Exit	PM PEAK Enter	Total
	Exit	Enter	Total			
Projected Avg. Daily Exit Volume	-	-	-	-	-	-
Projected Peak Hour Exit Volume	1,281	1,235	2,516	1,550	1,204	2,754
<i>TVGA Interchange 49 Ramp Volumes - AM & PM Peak Hours (9/30/05)</i>						

2028 Volumes w/Existing PLAZA Configuration Analysis (w/Flat Rate)						
	Exit		Enter	Exit		Enter
Rounded Manual Toll Lane Requirement	2		3	2		3
Existing Plaza Configuration (Manual Lanes)	2		2	2		2
Rounded EZPass Toll Lane Requirement	1		0	1		1
Existing Plaza Configuration (EZPass Lanes)	1		1	1		1

Exit 49 Toll Plaza 2028 Peak Hour Analysis Delay & Queuing Analysis	AM PEAK			PM PEAK		
	Manual/EZPass Toll Plaza Lanes			Manual/EZPass Toll Plaza Lanes		
Existing Plaza Capacity	Exit		Enter	Exit		Enter
	2		2	2		2
EZ Pass Usage at 75% (From Exit 50 Projection) - Split 50% to Manual Lanes due to queue	5/7		43/67	9/12		52/79
	Low Speed EZPass Toll Plaza Lanes			Low Speed EZPass Toll Plaza Lanes		
	Exit			Exit		
	1			1		
	5/6			14/17		
Analysis utilizes reversable lane in optimal direction	Average Queue / Maximum Queue (vehicles) Delay(seconds)/Vehicle			Average Queue / Maximum Queue (vehicles) Delay(seconds)/Vehicle		