
**NYS ROUTE 378 TROY-MENANDS BRIDGE OVER THE HUDSON
RIVER, RENSSELAER, AND ALBANY COUNTY
PIN 1045.18**

Attachment 3: Traffic Report

November 2023

Prepared for



**Department of
Transportation**

Prepared by



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1 Introduction

NYSDOT is using a Planning and Environment Linkages (PEL) approach to develop concept solutions to rehabilitate or replace the NYS Route 378 bridge crossing the Hudson River. The project will address the existing transportation needs of the bridge and the adjacent segments of the NYS Route 378 corridor. The intent of the project is to identify the potential sites suitable for the structure and corresponding highway, interchanges and intersections through a structure that has but is not limited to:

- Design life of 75 years
- standard lane widths and shoulders
- provides accommodations for transit, pedestrians and bicyclists.
- improves safety
- improves overall traffic conditions to reduce delay and provide acceptable levels of service.

WSP is providing traffic engineering services to Region 1 (R1) to support the concept development of the Troy-Menands Bridge. WSP conducted a traffic operational analysis of the existing conditions of the Troy-Menands Bridge, Route 378 corridor, and local streets within the study area. The traffic operational analysis evaluates the measures of effectiveness for existing conditions (2019), Estimated Time of Completion (ETC) (2025), ETC +20 (2045) and will identify any significant operational and safety deficiencies. The Future Build (2045) year traffic operations analysis will identify and prioritize improvements to increase safety, efficiency, and reliability.

The general project study area encompasses portions of the NY Route 378, NY Route 4, NY Route 136, and the local intersecting streets. The area is roughly bounded to the north by the Congress Street Bridge, west towards NY Route 32, east to NY Route 4, and to the south near I-90 and the Patroon Island Bridge.

2 Study Area

The traffic operational analysis study area extends approximately 2.0 miles along NY Route 378 from the NY Route 32 ramps in Menands, to the intersection with Mill Street/Burden Avenue in Troy. The traffic operational analysis extends to the local road intersections along Burden Avenue, Mill Street and NY Route 4 (see Figure 2-1). The traffic operational analysis will evaluate the traffic impacts in both the eastbound and westbound directions along Route 378 within the study area including Route 4 and Morrison Avenue.

The traffic study corridor is adjacent to several neighborhoods, Hudson Valley Community College, LaSalle Institute and Hudson Valley Plaza Shopping Mall. Roadway Inventory and Functional Classification for NY Route 378 can be found in Table 2-1.

**Figure 2-1:
NY Route 378 Study Area**



**Table 2-1:
NY Route 378 Roadway Inventory and Functional Classification**

HIGHWAY SEGMENT	LENGTH (MILES)	NHS	STATE HIGHWAY NO.	CLASSIFICATION
From RT 32 to I-787	1.3	Yes	9112	Urban Minor Arterial
From I-787 to Mill Street/Burden Avenue	0.7	Yes	9112	Urban Principal Arterial

2.1 PRIMARY STUDY AREA

The primary study area of this traffic analysis will focus on the NY Route 378 mainline highway segments and the corresponding exit/off and entrance/on ramps located throughout the approximate 2.0 miles between Menands and Troy. See Table 2-2 for details.

**Table 2-2:
NY Route 378 Interchanges**

INTERCHANGE #	NEAREST CROSS ROAD	INTERCHANGE TYPE: PARTIAL (P), FULL (F)	DIRECTION OF PARTIAL INTERCHANGE	COUNTY
NY 32	NY Route 32	F	-	Albany
7E/7W	I-787	F	-	Albany

2.2 SECONDARY STUDY AREA

In addition to the primary study area on NY Route 378, there are nine traffic signals and one roundabout within the secondary study area. These intersections are shown in Figure 2-2 and listed in Table 2-3.

**Figure 2-2:
Study Area Intersections**

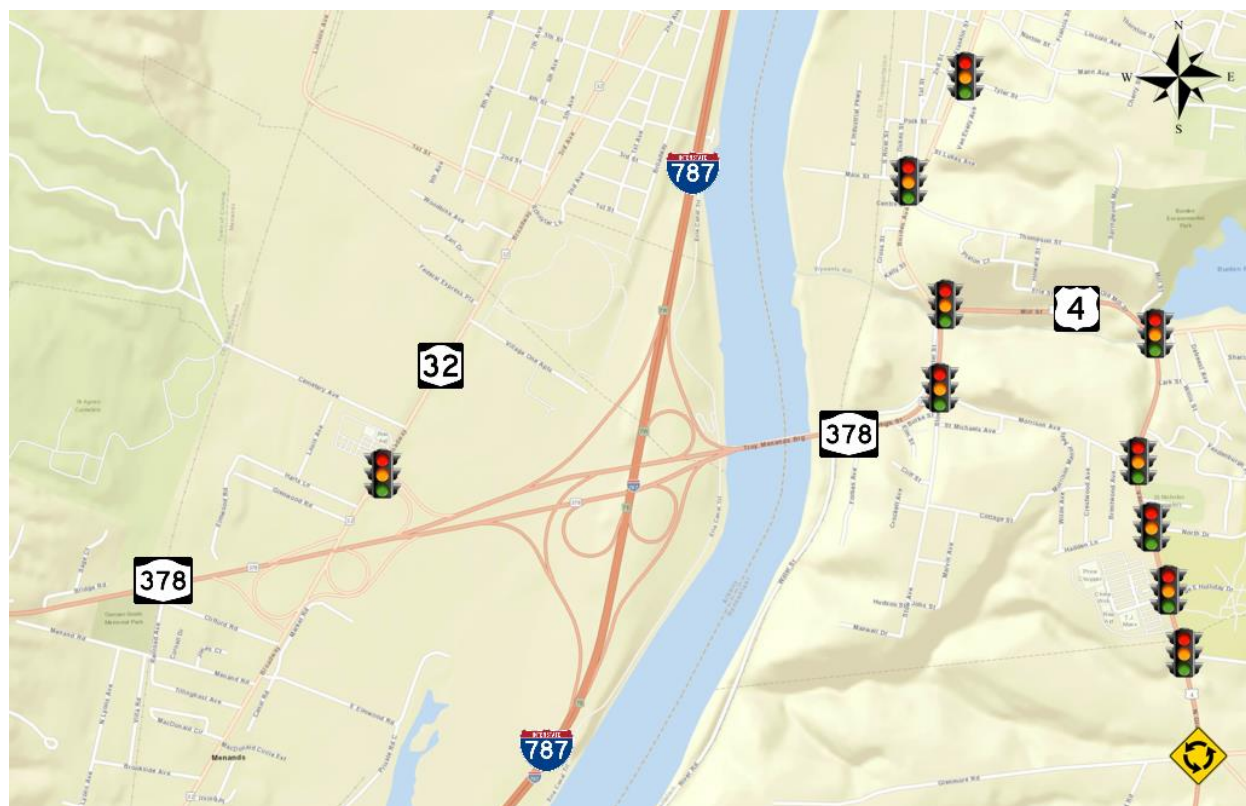


**Table 2-3
Intersections Analyzed within Study Area**

INTERSECTION	SIGNALIZATION *	TYPE OF CONTROL
High Street (NY Route 378) & Morrison Avenue	S	Fully Actuated
High Street (NY Router 378) & Burden Avenue/Mill Street (Route 4)	S	Fully Actuated
Burden Avenue (NY Route 4) & Main Street	S	Fully Actuated
Mill Street/Vandeburgh Avenue (NY Route 4) & Campbell Avenue	S	Fully Actuated
Vandeburgh Avenue (NY Route 4) & Morrison Avenue	S	Fully Actuated
Vandeburgh Avenue (NY Route 4) & North Drive	S	Fully Actuated
Vandeburgh Avenue (NY Route 4) & George E Halliday Drive	S	Fully Actuated
Vandeburgh Avenue (NY Route 4) & South Drive	S	Fully Actuated
Broadway (NYS Route 32) & NYS Route 378 WB Exit Ramp	S	Fully Actuated
Vandeburgh Ave/N.Greenbush Rd (NY Route 4) & Glenmore Rd (NY Route 136)	U	Roundabout

*Signalization is denoted by Signalized (S) or Unsignalized (U)

3 Data Collection

3.1 DATA COLLECTION APPROACH DUE TO COVID19

The consultant team met with NYSDOT Region 1 and the Main Office to discuss the approach for developing a baseline traffic volume dataset for the study area. NYSDOT raised concerns that using 2022 data would not provide a realistic representation of the Estimated Time of Completion (ETC) conditions due to the lower-than-normal use of roadways in the current post-COVID-19 pandemic environment. To account for this variation, it was decided that 2019 historical traffic volumes would be used for the baseline conditions and that historical information would be considered the baseline condition.

The existing traffic volume data set for the NYS Route 378 Troy-Menands Bridge over the Hudson River was developed using a combination of historical data. The sources of data included NYSDOT Short Counts, past reports in the study area including, and Supplemental Traffic Counts via turning movement counts at the secondary study area intersections.

3.2 HISTORICAL TRAFFIC VOLUME DATA

The NYSDOT short counts are a portable traffic counter program comprised of inventory counts taken on the Federal and State highway systems and county and town roads. Special counts, including ramp approach, and turning movement counts, are taken for specific State projects. All short counts provide data in 15-minute intervals and require a minimum of seventy-two (72) continuous hours of valid data. A minimum of fifty (50) continuous hourly intervals of data is required if using video-based data collection. Figure 3-1 and Table 3-1 shows the short counts used to develop the existing traffic volume data set. A summary of the short counts used can be found in Attachment 3-1.

Figure 3-1:
NYSDOT Short Count Locations

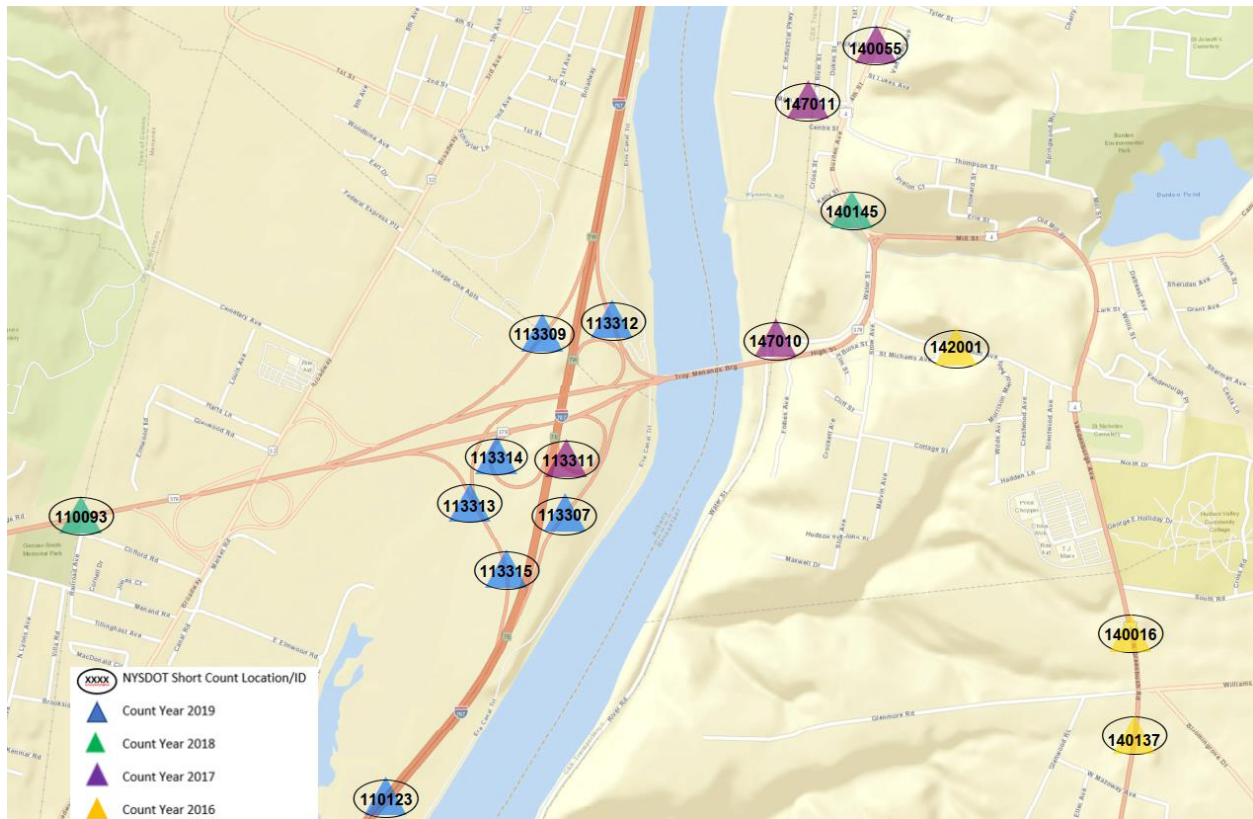


**Table 3-1:
NYSDOT Short Count Information**

NAME	DESCRIPTION	DIRECTION	NYSDOT STATION NUMBER
NYS Route 378	From ACC RT 787I to Albany County Line	East	11_0129
NYS Route 378	From ACC RT 787I to Albany County Line	West	11_0129
I787	From EXIT 6 Over to RT 378 EB OVER	North	11_0123
I787	From EXIT 6 Over to RT 378 EB OVER	South	11_0123
I787 Exit 7	From I-787 NB (Off) to NY378 Menands Rd EB	East	11_3307
Menands Road	From RT 378 JCT to RT 32 Under	East	11_0093
Menands Road	From RT 378 JCT to RT 32 Under	West	11_0093
I787 Exit 7 Alb	From NY378 Menands Rd WB to Merge Ramp NY378 EB	South	11_3313
I787 Exit 7 Alb	From Merge Ramp NY 378 Menands Rd WB to I787 SB	South	11_3315
I787 Exit 7 Alb	From I-787 SB (OFF) to NY378 Menands Rd EB	East	11_3314
I787 Exit 7 Alb	From NY378 Menands Rd EB to I787 NB (ON)	North	11_3311
I787 Exit 7 Alb	From I787 NB (Off) to NY378 Menands Rd WB	West	11_3312
US4	From RT 136 JCT to City of Troy	North	14_0016
US4	From RT 136 JCT to City of Troy	South	14_0016
North Greenbush	From RT 136 JCT to RT 66 Wynantskill End RT 150	North	14_0137
North Greenbush	From RT 136 JCT to RT 66 Wynantskill End RT 150	South	14_0137
US4	4 th Street from 1 st to 3 rd Street	North	14_0055
US4	4 th Street from 1 st to 3 rd Street	South	14_0055
Morrison Ave	From Burden Ave to Vandenburg Ave	East	14_2001
Morrison Ave	From Burden Ave to Vandenburg Ave	West	14_2001

3.3 SUPPLEMENTAL TURNING MOVEMENT COUNTS (TMC)

NYSDOT Traffic Data Viewer (TDV) did not have any historical information for turning movement counts at the intersections in the study area. Supplemental turning movement counts were performed at the secondary study area intersections. These counts were performed to understand the turning movement proportions at each approach of the study area intersections.

Turning movement counts (TMCs) were collected in the fall of 2022 during the Weekday AM, and PM peak hour time periods. TMCs were performed at the following intersections:

- High Street (NY Route 378) & Morrison Avenue
- High Street (NY Route 378) & Burden Avenue/Mill Street (Route 4)
- Burden Avenue (NY Route 4) & Main Street
- Mill Street/Vandenburg Avenue (NY Route 4) & Campbell Avenue
- Vandenburg Avenue (NY Route 4) & Morrison Avenue
- Vandenburg Avenue (NY Route 4) & North Drive
- Vandenburg Avenue (NY Route 4) & George E Halliday Drive
- Vandenburg Avenue (NY Route 4) & South Drive
- Vandenburg Avenue/North Greenbush Road (NY Route 4) & Glenmore Road (NY Route 136)

See Attachment 3-2 for summary TMC's for the study area intersections during the peak hour periods.

3.4 DEVELOPMENT OF EXISTING TRAFFIC VOLUME DATA SET

Accurate traffic volume estimations are critical to allow the appropriate design of the geometric features of roadway improvements to meet or exceed current and future traffic demands for a reasonable period. The most commonly accepted traffic volume criteria for designing a facility's capacity is the Design Hour Volume, typically referred to as the (traffic volume in the) "30th highest hour" (within a 12-month period). The 30th highest hour infers that a facility adequately serves its physical capacity and will only be exceeded for 29 hours out of the total 8,760 hours in the design year. The 30th highest hour is based on the concept that designs are not done to the absolute highest traffic hour of the entire year but to design to meet most of the facility's needs. AADT's and DHV's using the NYSDOT short count data and NYSDOT Traffic Data Viewer were developed for the study area (Table 3-2). Using the methodology and historical information presented in Section 3.1 through 3.3 a 2019 existing traffic volume data set was established for the AM and PM peak hours for the study area. The peak hours used for the traffic operational analysis of the NYS Route 378 Troy Menands Bridge and associated interchanges and intersections in the study area are as follows:

- AM Peak Hour 7:30 – 8:30
- PM Peak Hour 4:30 – 5:30

Table 3-2:
Average Annual Daily Traffic and Design Hour Volume

NAME	DESCRIPTION	AADT	DHV
NYS Route 378	Menands Road	33,443	1,804
I787	From EXIT 6 Over to RT 378 EB OVER	93,841	8,952
I787 Exit 7	From I-787 NB (Off) to NY378 Menands Rd EB	9,233	1,187
Menands Road	From RT 378 JCT to RT 32 Under	11,791	1,161
I787 Exit 7 Alb	From NY378 Menands Rd WB to Merge Ramp NY378 EB	6,650	807
I787 Exit 7 Alb	From Merge Ramp NY 378 Menands Rd WB to I787 SB	10,475	1,099
I787 Exit 7 Alb	From I-787 SB (OFF) to NY378 Menands Rd EB	5,072	537
I787 Exit 7 Alb	From NY378 Menands Rd EB to I787 NB (ON)	2,102	254
I787 Exit 7 Alb	From I787 NB (Off) to NY378 Menands Rd WB	3,641	361
US4	From RT 136 JCT to City of Troy	18,760	1,589
North Greenbush	From RT 136 JCT to RT 66 Wynantskill End RT 150	11,807	1,216
US4	4 th Street from 1 st to 3 rd Street	12,411	1,246
Morrison Ave	From Burden Ave to Vandenburg Ave	19,088	1,565

See Attachment 3-3 for detailed traffic flow maps for the study area during the peak hour periods.

Other traffic data that was calculated from the NYSDOT short counts and TDV was the daily truck percentages, directional distribution of traffic volume and peak hour factors along mainline NYS Route 378 (see Table 3-3 through Table 3-5). This traffic data will be used in the traffic operational analysis of the study area.

Table 3-3:
Daily Truck Percentages

LOCATION	% OF PEAK HOUR TRUCKS	% DAILY TRUCKS
NYS Route 378 WB	4% AM, 4% PM	4.0%
NYS Route 378 EB	5% AM, 3% PM	4.0%

**Table 3-4:
Directional Distribution of Volume**

LOCATION	AM	PM
NYS Route 378 WB	49%	51%
NYS Route 378 EB	37%	63%

**Table 3-5:
Peak Hour Factors - Mainline**

LOCATION	AM	PM
NYS Route 378 WB	0.89	0.88
NYS Route 378 EB	0.91	0.93

3.5 SPEEDS

The posted speed limit on the mainline NYS Route 378 within the study area is 40 miles per hour and 30 miles per hour on over the Troy Menands Bridge. Table 3-6 lists the advisory speeds on ramps along the NYS Route 378 within the study area. Ramps that do not appear in this table do not have a posted advisory speed.

**Table 3-6:
Ramp Advisory Speed**

RAMP	ADVISORY SPEED (MPH)
NYS Route 378 EB Off Ramp to NYS Route 32 SB	30 mph
NYS Route 32 SB Off Ramp to NYS Route 378 EB	25 mph
NYS Route 378 EB Off Ramp to NYS Route 32 NB	25 mph
NYS Route 378 EB Off Ramp to I787 SB	35 mph
NYS Route 378 EB Off Ramp to I787 NB	25 mph
I787 SB Exit 7E to NYS Route 378 EB	25 mph
NYS Route 378 EB Off Ramp to I787 NB	15 mph
I787 NB Exit 7E to NYS Route 378 EB	50 mph to 30 mph
NYS Route 378 WB Off Ramp to I787 NB	30 mph
I787 NB Exit 7W to NYS Route 378 WB	20 mph
I787 SB Exit 7W to NYS Route 378 WB	50 mph to
NYS Route 378 WB to NYS Route 32 NB	35 mph
NYS Route 32 NB Off Ramp to NYS Route 378 WB	25 mph

3.5.1 Spot Speed Study

As a part of the data collection effort for the project, free flow speeds were determined using a spot speed survey. Spot speed surveys were performed for the NYS Route 378 mainline in both the eastbound and westbound directions east of the Troy Menands Bridge between 10:00 AM and 11:00 PM on one typical weekday. A random sample of speeds was collected for each location by using a handheld radar device. In each sample, speeds were noted separately for passenger vehicles, trucks, and buses. These samples were taken while standing on the Troy Menands Bridge, adjacent to approaching traffic, and were recorded for around 15 minutes during free flow traffic conditions. This equated to approximately 50 speed samples in each direction. A summary of the findings of 50th and 85th percentile speeds measured for the NYS Route 378 mainline can be found in Table 3-7. Detailed sample speed distribution is provided in the Appendix 4.

**Table 3-7:
NYS Route 378 Mainline Speed Summary**

LOCATION	DIRECTION	50TH PERCENTILE SPEED (MPH)	85TH PERCENTILE SPEED (MPH)
East of Troy Menands Bridge	Eastbound	44.5	48.5
	Westbound	43.8	47.9

Note: Data collected between 11:00 AM and 12:00 PM on Wednesday, October 12, 2022.

Sample spot speeds were also collected in both directions of NYS Route 4 (Mill Street) using the same method as the NYS Route 378 mainline. These samples were taken while standing on the side of the road adjacent to approaching traffic and were recorded for around 15 minutes during free flow traffic conditions between 10:00 AM and 11:00 AM on one typical weekday. A summary of the findings of 50th and 85th percentile speeds for NYS Route 4 eastbound and westbound can be found in Table 3-8. Detailed sample speed distribution is provided in the Appendix 4.

**Table 3-8:
NYS Route 4 Speed Summary**

LOCATION	DIRECTION	50TH PERCENTILE SPEED (MPH)	85TH PERCENTILE SPEED (MPH)
Between Burden Avenue and Erie Street	Eastbound	34.9	38.5
	Westbound	34.2	38.7

Note: Data collected between 10:00 AM and 11:00 AM on Wednesday, October 12, 2022.

The current posted speed limit on the NYS Route 378 in the study area is 40 mph and drops to 30 mph over the Troy Menands Bridge. The results of the spot speed study indicate an 85th percentile speed is nearly 50 mph.

The current posted speed limit on NYS Route 4 is 30 mph and the results of the spot speed study indicate an 85th percentile speed of roughly 40 mph.

3.6 TRAVEL TIME STUDY

The main objective of collecting travel time and delay data is establishing a database of current roadway operating conditions throughout the NYS Route 378 and NYS Route 4 study area. The travel time and delay data will be used to identify the extent and location of traffic congestion and specific problem areas located throughout the study area. The data will estimate the overall average travel time it takes to traverse the certain routes in the study area. The data will also serve as a base to calibrate travel demand forecasting and microsimulation traffic models. There were no historical data for travel times throughout the study area. Existing travel time runs routes were performed on October 12, 2022. The average travel times are listed in Table 3-9 and average travel speeds in Table 3-10.

**Table 3-9:
Average Travel Times**

ROUTE	DESCRIPTION	AM (MM:SS)	PM (MM:SS)
NYS Route 378 EB	West of NYS Route 32 to NYS Route 4 (at Main Street)	02:20	02:26
NYS Route 378 EB	West of NYS Route 32 to NYS Route 4 (at Glenmore Road)	02:12	01:41
NYS Route 378 WB	NYS Route 4 (at Main Street) to West of NYS Route 32	02:54	04:04
NYS Route 378 WB	NYS Route 4 (at Glenmore Road) to West of NYS Route 32	06:34	06:48

**Table 3-10:
Average Travel Speeds**

ROUTE	DESCRIPTION	AM (MPH)	PM (MPH)
NYS Route 378 EB	West of NYS Route 32 to NYS Route 4 (at Main Street)	25.6	41.6
NYS Route 378 EB	West of NYS Route 32 to NYS Route 4 (at Glenmore Road)	23.5	22.5
NYS Route 378 WB	NYS Route 4 (at Main Street) to West of NYS Route 32	12.0	36.7
NYS Route 378 WB	NYS Route 4 (at Glenmore Road) to West of NYS Route 32	29.9	28.5

3.7 QUEUE MEASUREMENTS

Google maps traffic layer will be used to obtain historical typical traffic for the study area during the weekday AM and PM peak hours. The lengths of the slow-moving traffic in Figure 3-2 and Figure 3-3 will be measured and used as an average queue length from traffic model calibration measures of effectiveness.

**Figure 3-2:
Google Maps Typical Traffic Weekday AM**

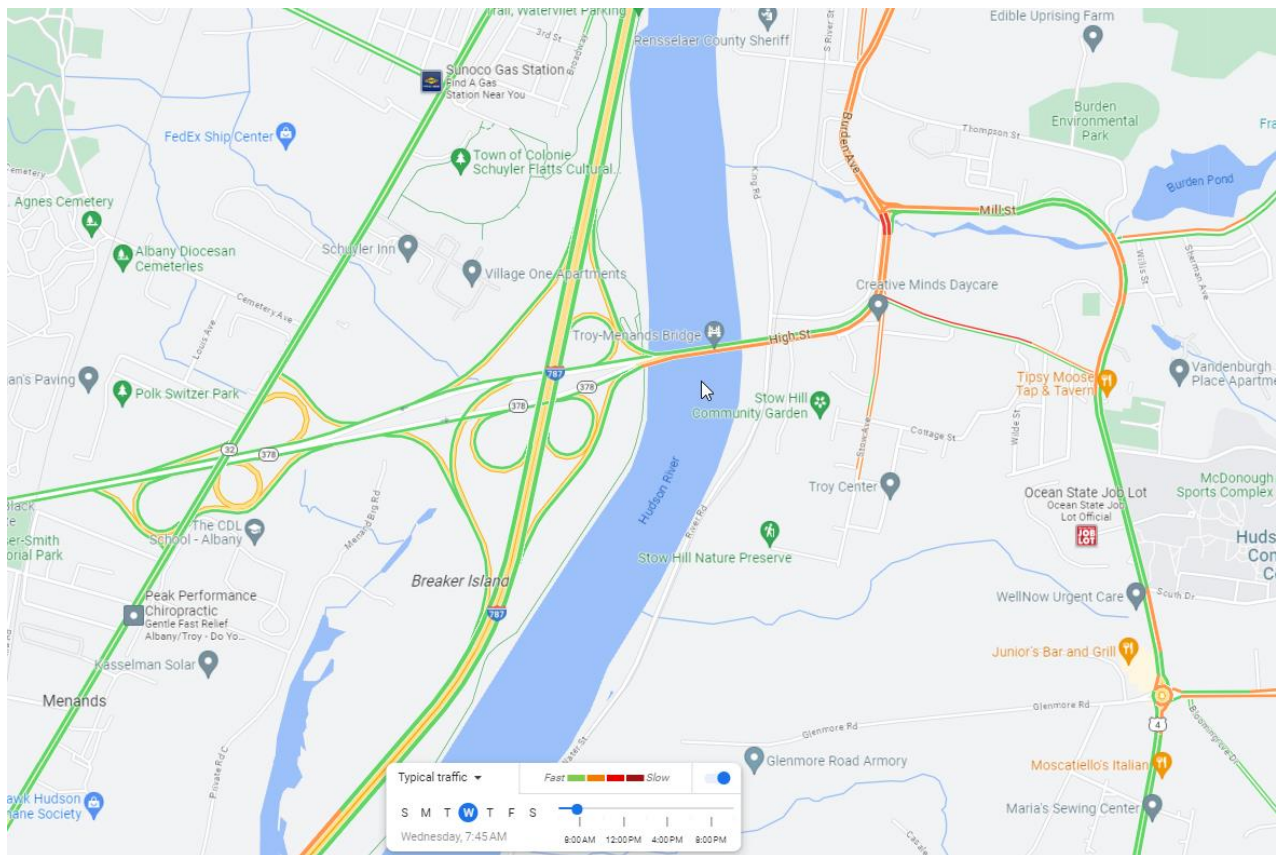
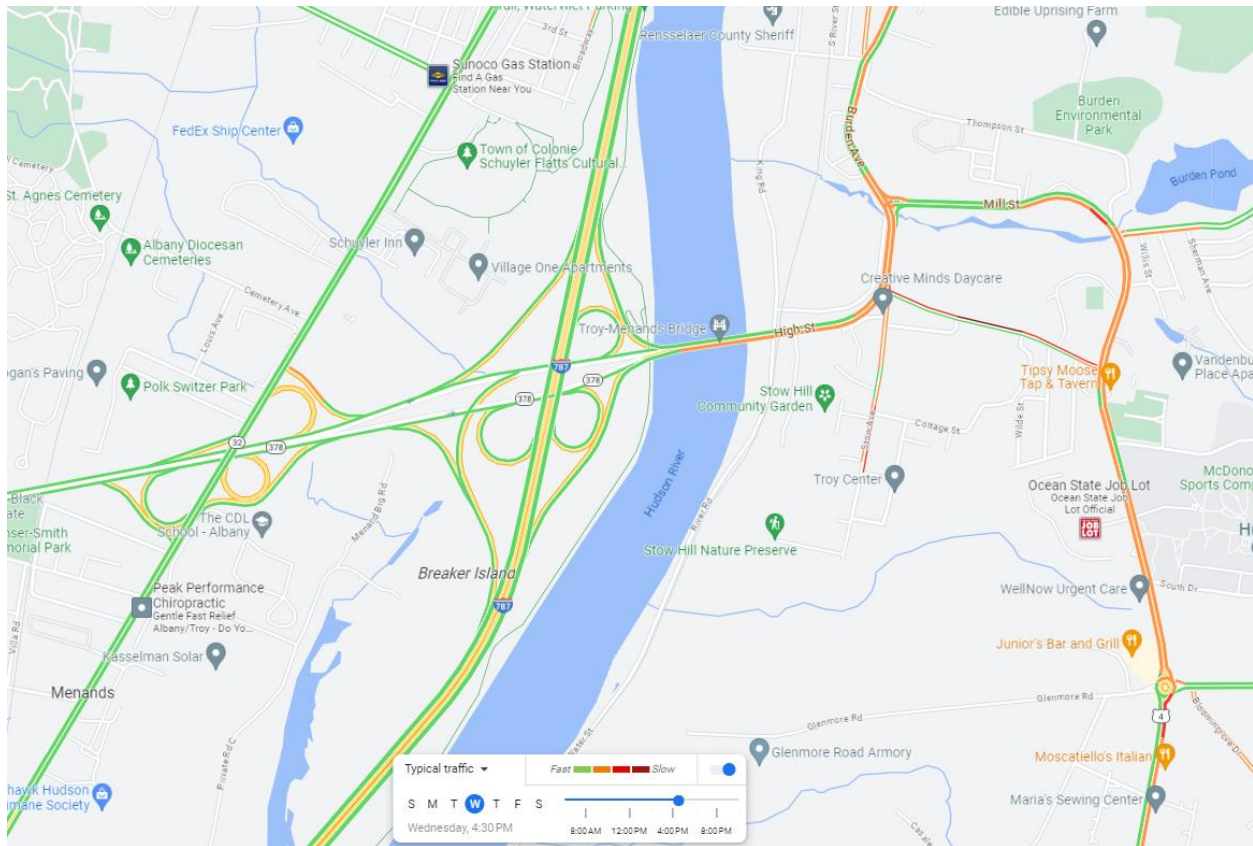


Figure 3-3:
Google Maps Typical Traffic Weekday PM



3.8 SIGNAL TIMINGS

Official traffic signal timing plans were obtained from NYSDOT and the City of Troy to include in the traffic operational analysis of the study area. The traffic signal timings can be found in Attachment 3-5. In general, the traffic signal systems are consistent with the National Manual on Uniform Traffic Control Devices.

- High Street (NY Route 378) & Morrison Avenue – A fully actuated and isolated signal with leading green and protected left turn phase for WB NYS Route 378. NYS Route 378 EB to Morrison Avenue has a no right turn on red as well as a protected right turn phase onto Morrison Avenue.
- High Street (NYS Route 378) & Burden Avenue/Mill Street (Route 4) - A fully actuated and isolated signal. Burden Avenue/NYS Route 378 WB has a protected left turn phase onto NYS Route 4. The signal operates as a split phase for NYS Route 4 and Water Street.
- Burden Avenue (NY Route 4) & Main Street – A fully actuated and isolated signal. Burden Avenue operates as a split phase with First Street. Main Street and Winslow Avenue operate as a permitted phase.
- Mill Street/Vandenburg Avenue (NY Route 4) & Campbell Avenue – A fully actuated and isolated signal. Burden Avenue SB has a protected left turn phase.
- Vandenburg Avenue (NY Route 4) & Morrison Avenue - A fully actuated and coordinated closed loop signal. The signal is interconnected with the three signals located directly south of it (North Drive, George E Halliday Drive and South Drive). NY Route 4 has a leading protected left turn phase for NB and SB approaches.
- Vandenburg Avenue (NY Route 4) & North Drive - A fully actuated and coordinated closed loop signal. The signal is interconnected with the three signals (Morrison Avenue, George E Halliday Drive and South Drive). NY Route 4 has a leading protected left turn phase for NB and SB approaches.
- Vandenburg Avenue (NY Route 4) & George E Halliday Drive - A fully actuated and coordinated closed loop signal. The signal is interconnected with the three signals (Morrison Avenue, North Drive and South Drive). NY Route 4 has a leading protected left turn phase for NB and SB approaches.
- Vandenburg Avenue (NY Route 4) & South Drive - A fully actuated and coordinated closed loop signal. The signal is interconnected with the three signals (Morrison Avenue, North Drive and George E Halliday Drive). NY Route 4 has a leading protected left turn phase for NB and SB approaches.
- Broadway (NYS Route 32) & NYS Route 378 WB Exit Ramp – A fully actuated and isolated signal with two permitted phases.

4 Crash Analysis

See Attachment 3-6 for Crash Analysis summary report.

5 Traffic Operations Methodology and Calibration

5.1 VISSIM MICROSIMULATION ANALYSIS

This chapter documents the components of the microsimulation VISSIM model development and the calibration process for the NYS Route 378 traffic operations study area (study area) and provides a summary of validation results. One VISSIM model was created with two peak hour periods AM and PM existing traffic conditions (2019). The model was developed to better understand existing travel patterns and issues within the study area and will serve as the basis for modeling the future no-build traffic conditions and the future traffic improvements needed to meet mobility needs in this study area.

Microsimulation is a recognized approach for evaluating the operations of complex traffic movement areas, such as those found in the study area. Microsimulation is also often the most suitable technique to evaluate the effectiveness of alternative designs before their implementation. VISSIM is a microsimulation tool that models driving behavior, such as close-following and lane-changing, and allows other drivers within the model to interact with one another. VISSIM also provides several calibration parameters that allow the model to simulate “real world” conditions. VISSIM also has 3D visualization and recording capabilities which makes it easier to visualize alternative designs-and is helpful for the public during non-technical presentations. For these reasons, VISSIM was chosen as the capacity analysis tool to evaluate traffic conditions in the study area.

NYS Route 378, Morrison Avenue and NYS Route 4 experience congestion during the morning and evening commute. Stop-and-go traffic conditions are present in the morning and evening peak hours traveling eastbound on the Troy Menands Bridge due to the signalized intersection at Morrison Avenue. It is anticipated that by the year 2045, traffic congestion and delays will increase substantially across the Troy Menands Bridge (NYS Route 378). Increased delays would impact mobility in the area thus heightening the need for improvements along NYS Route 378 and the bridge’s touch down points across the Hudson River.

5.2 VISSIM MODEL DEVELOPMENT

Developing the existing AM and PM peak hour 2019 VISSIM base models requires the input of traffic volumes, static routing decisions, signal timings, and roadway geometry for the study area. In addition to traffic data, VISSIM model parameters and inputs are required. The parameters and inputs used in the VISSIM models are summarized below and in Table 5-1.

- Simulation parameters include the simulation seeding time which is based on the time required for the VISSIM model to reach equilibrium and be greater than the time it takes for the first vehicle to traverse the entire model. The simulation was run for the AM and PM peak hour (3600 seconds) with a simulation seeding time from zero to 900 seconds (15 minutes), and then data collection occurred from 900-4500 seconds.
- Vehicle Inputs were taken from the AM and PM peak hour (7:30-8:30 AM and 4:30-5:30 PM) balanced traffic flow maps found in Attachment 3-3. Vehicle Inputs control the number of vehicles generated into the VISSIM model.
- Static Routing Decisions were based on the turning movements, mainline, and ramp volumes from the existing 2019 peak hour balanced traffic flow maps. Static vehicle routes guide a set number of vehicles from the beginning of the route to the defined destination.
- Signal Timings were provided by NYSDOT and the City of Troy and applied to the study area intersections in the VISSIM models. Official Signal Timings can be found in Appendix E.
- Driver Behavior attributes for the mainline and corridor level operations were adjusted as needed in VISSIM, particularly for weaving, merging and diverging behaviors on mainline NYS Route 378. Driving behavior parameters control how the vehicles progress through the model.

- Simulation runs account for variance within the model. Ten simulation runs were conducted using random seeds, and the average of those runs will be reported operational analysis from the VISSIM models.

**Table 5-1:
VISSIM Model Parameters and Inputs**

PARAMETERS	
VISSIM Version	23-10
Simulation Resolution	10-time steps/second
Seeding Time	0-900 seconds
Recording Time	900-4500 seconds
Number of Runs	10
Intersection Turning Speed	Curve Speed Function
Route 17 and NYS Route Corridor Speeds	Posted speed limits input into Vehicle Compositions and speed decision points where needed
Heavy Vehicle Percentage	Based on Data in Chapter 3 of this report
Controller Type	Fully Actuated RBC controller
Signal Timings & Coordination	Based off official Signal Timings provided by NYSDOT and City of Troy
DRIVER BEHAVIORS	
Car Following Method	Wiedemann 99 (I787) Wiedemann 74 (NYS Route 378, NYS Route 4 & Local Roads)
Average Standstill Distance	4.92 ft (W99) 6.56 ft (W74)
Additive Part of Safety Distance	2.00 (W74)
Multiplicative Part of Safety Distance	3.00 (W74)
Look Ahead Distance	0-821.21 ft (W99 & W74)
Waiting Time Before Diffusion	60 seconds (W99 & W74)
Minimum Headway	1.64 ft (W99 & W74)
Safety Distance Reduction Factor	0.60 (W99 & W74)
Cooperative Lane Change	No (W99) Yes (W74)

Source: WSP VISSIM 2019 Base Model

The VISSIM model study area includes the signalized and roundabout intersections identified in Table 2-3. The model geometry consists of all roadway geometry as existed in the field at these locations in the Fall of 2022. The VISSIM network model was coded by tracing the roadway network over built in aerial Bing maps which served as the background provided by PTV VISSIM. Scale was verified on the aerials by matching known lane widths and distances in between intersections. The number of lanes, location of lane additions, drops, merge, diverge, weaving, and turn bay lengths were confirmed with Fall 2022 field visits. A figure of the base (existing) VISSIM model study area can be found in Figure 5-1.

Figure 5-1:
VISSIM model study area



5.3 CALIBRATION CRITERIA FOR BASE MODELS

The VISSIM base model calibration was performed in accordance with *FHWA's Traffic Analysis Toolbox Volume III* latest criteria. The overall goal of the calibration process is to obtain the closest match between the VISSIM Measures of Effectiveness (MOEs) and the real-world field data and observations. VISSIM outputs will be compared to field data to determine if the output is within acceptable levels. Calibration is an iterative process in which selected input parameters are adjusted to produce results that are reasonably consistent with the field data measured values. For this analysis the MOEs of volumes, travel times and queue observations were used as targeted values for the VISSIM calibration. The calibration process uses a "trial and error" iterative approach by adjusting one variable at a time to best match model outputs to measured field data. Base models will initially be run using the default values and then will be adjusted until targets are reached.

The main calibration criteria that were used for the base models is for the link/roadway volumes to have a GEH (Geoffrey E. Havers) statistic less than five. In addition, 85% of the volumes in the traffic model should have a GEH less than five. The GEH statistic is calculated by using the following formula:

$$GEH = \sqrt{\frac{2(Output\ Volume - Input\ Volume)^2}{Output\ Volume + Input\ Volume}}$$

The GEH statistic compares the hourly simulated volumes to the model input volumes. If the calculated GEH is less than five the base model or given link/roadway can be considered a good match between simulated and input hourly volumes.

Secondary calibration criteria that were used was for the base model travel times to be within 15% or one minute of field data or and for queue lengths to visually/numerically match what was observed in the field or be within 20% of the field data. See Table 5-2 and Table 5-3 for a summary of the calibration criteria.

**Table 5-2:
Travel Time Calibration Criteria**

TRAVEL TIME SEGMENTS	DIFFERENCE (SIMULATED TT VS FIELD DATA TT)	TARGET
NYS Route 378	Within +/- 1 minute	Routes with field data travel times < 7 minutes
NYS Route 4		
Local Roads	Within +/- 15%	Routes with field data travel times > 7 minutes

**Table 5-3:
Queue Length Calibration Criteria**

QUEUE LENGTHS	DIFFERENCE (SIMULATED QUEUE LENGTH VS FIELD DATA QUEUE LENGTH)	TARGET
NYS Route 378	Within 20%	Visually and numerically match
Morrison Avenue		

5.4 VALIDATION FOR BASE MODELS

Once the base model calibration for the AM and PM peak hours was completed, average model output statistics based on 10 simulation runs were collected for comparison to the actual volume, travel time, and queue observations. Each simulation run used a random seed number and was set to 4500 seconds, with data being collected from 900-4500 seconds to represent the AM (7:30-8:30) and PM (4:30-5:30) peak hours.

Using the calibration criteria stated in the previous section the base model outputs were compared to collected field data. Traffic volumes, travel times and queues were examined and validated based on the criteria listed in 5.3.

All of the traffic volume results from the base AM and PM peak hour models were within the target calibration ranges compared to the existing traffic volumes. Table 5-4 and Table 5-5 provides the detailed volume validation summary.

**Table 5-4:
Validation - Traffic Volumes – AM Peak Hour**

ROADWAY SEGMENT/LINK	ACTUAL VOLUMES	SIMULATED VOLUMES	GEH	DOES GEH MEET VALIDATION/TARGET CRITERIA
High Street NB @ Morrison Ave	1708	1714	0.1	Yes – GEH < 5
Morrison Ave EB @ Vandenburg Ave	1087	1133	1.4	Yes – GEH < 5
Vandenburg Ave NB @ Morrison Ave	722	695	1.0	Yes – GEH < 5
Vandenburg Ave SB @ Morrison Ave	476	485	0.4	Yes – GEH < 5
Vandenburg Ave NB @ Campbell Ave	306	308	0.1	Yes – GEH < 5
Vandenburg Ave NB @ North Dr	706	704	0.1	Yes – GEH < 5

ROADWAY SEGMENT/LINK	ACTUAL VOLUMES	SIMULATED VOLUMES	GEH	DOES GEH MEET VALIDATION/TARGET CRITERIA
Vandenburg Ave SB @ GEH Dr	1144	1167	0.7	Yes – GEH < 5
Vandenburg Ave NB @ GEH Dr	874	870	0.1	Yes – GEH < 5
Vandenburg Ave SB @ South Dr	932	954	0.7	Yes – GEH < 5
Vandenburg Ave NB @ South Dr	903	906	0.1	Yes – GEH < 5
N Greenbush Ave SB @ Glenmore Rd	702	719	0.6	Yes – GEH < 5
Morrison Ave WB @ High St	512	456	2.5	Yes – GEH < 5
Rt 378 WB Off Ramp to I-787 NB	366	349	0.9	Yes – GEH < 5
Rte 378 WB After Rte 32 SB Off Ramp	883	866	0.6	Yes – GEH < 5
Rte 378 EB Start Section	479	479	0.0	Yes – GEH < 5
I-787 SB Start Section	6239	6239	0.0	Yes – GEH < 5
I-787 NB After Rte 378 WB Off Ramp	3046	3010	0.7	Yes – GEH < 5
Rte 32 SB Start Section	704	704	0.0	Yes – GEH < 5
Rte 32 SB After Rte 378 EB Off Ramp	213	210	0.2	Yes – GEH < 5
Rte 378 WB Bridge	1678	1582	2.4	Yes – GEH < 5
Rte 378 EB Bridge	1708	1718	0.2	Yes – GEH < 5
Rte 32 NB Start Section	285	285	0.0	Yes – GEH < 5
Rte 32 NB End Section	736	727	0.3	Yes – GEH < 5

Source: WSP VISSIM Model – Existing/Base AM Scenario

Table 5-5:
Validation - Traffic Volumes – PM Peak Hour

ROADWAY SEGMENT/LINK	ACTUAL VOLUMES	SIMULATED VOLUMES	GEH	DOES GEH MEET VALIDATION/TARGET CRITERIA
High Street NB @ Morrison Ave	2485	2372	2.3	Yes – GEH < 5
Morrison Ave EB @ Vandenburg Ave	935	902	1.1	Yes – GEH < 5
Vandenburg Ave NB @ Morrison Ave	949	914	1.1	Yes – GEH < 5
Vandenburg Ave SB @ Morrison Ave	343	351	0.4	Yes – GEH < 5
Vandenburg Ave NB @ Campbell Ave	603	585	0.7	Yes – GEH < 5
Vandenburg Ave NB @ North Dr	881	866	0.5	Yes – GEH < 5
Vandenburg Ave SB @ GEH Dr	1047	1027	0.6	Yes – GEH < 5
Vandenburg Ave NB @ GEH Dr	964	946	0.6	Yes – GEH < 5
Vandenburg Ave SB @ South Dr	931	917	0.5	Yes – GEH < 5
Vandenburg Ave NB @ South Dr	905	886	0.6	Yes – GEH < 5
N Greenbush Ave SB @ Glenmore Rd	872	860	0.4	Yes – GEH < 5
Morrison Ave WB @ High St	523	463	2.7	Yes – GEH < 5
Rt 378 WB Off Ramp to I-787 NB	616	582	1.4	Yes – GEH < 5
Rte 378 WB After Rte 32 SB Off Ramp	574	562	0.5	Yes – GEH < 5
Rte 378 EB Start Section	891	891	0.0	Yes – GEH < 5
I-787 SB Start Section	3196	3196	0.0	Yes – GEH < 5
I-787 NB After Rte 378 WB Off Ramp	5750	5599	2.0	Yes – GEH < 5
Rte 32 SB Start Section	944	944	0.0	Yes – GEH < 5
Rte 32 SB After Rte 378 EB Off Ramp	193	188	0.4	Yes – GEH < 5
Rte 378 WB Bridge	1487	1410	2.0	Yes – GEH < 5
Rte 378 EB Bridge	2485	2423	1.3	Yes – GEH < 5

ROADWAY SEGMENT/LINK	ACTUAL VOLUMES	SIMULATED VOLUMES	GEH	DOES GEH MEET VALIDATION/TARGET CRITERIA
Rte 32 NB Start Section	692	692	0.0	Yes – GEH < 5
Rte 32 NB End Section	1281	1267	0.4	Yes – GEH < 5

Source: WSP VISSIM Model – Existing/Base PM Scenario

All of the simulated traffic volume results from the existing 2019 base AM and PM peak hour models were within the target calibration ranges compared to the existing traffic volumes. 100% of the link/roadways within both base models' volumes have a GEH < 5.

**Table 5-6:
Validation – Travel Times – AM Peak Hour**

TRAVEL TIME SECTION	SIMULATED TRAVEL TIME (MM:SS)	FIELD TRAVEL TIME (MM:SS)	% DIFFERENCE	DOES VALUE MEET VALIDATION/TARGET CRITERIA?
Route 378 EB - Bridge to Past Morrison Ave	01:40	02:20	-28%	Yes - within 1 minute
Rt 4 SB - Morrison Ave to N Greenbush Rd	01:53	02:12	-15%	Yes – within 15%
Burden Ave NB - Morrison Ave to 4th St	02:13	02:35	-14%	Yes – within 15%
Route 378 EB - model start to bridge	01:30	01:31	-1%	Yes – within 15%
Route 378 WB - Bridge to model end	01:46	02:04	-15%	Yes – within 15%
Start of model to end of Bridge EB	02:08	02:01	5%	Yes – within 15%
End of Bridge EB to Main St	03:22	02:58	14%	Yes – within 15%
End of Bridge EB to Route 4 Roundabout SB	04:12	06:30	-36%	No – over 1 minute
End of Bridge EB to North Dr	02:47	04:32	-39%	No – over 1 minute

Source: WSP VISSIM Model – Existing/Base AM Scenario

**Table 5-7:
Validation – Travel Times – PM Peak Hour**

TRAVEL TIME SECTION	SIMULATED TRAVEL TIME (MM:SS)	FIELD TRAVEL TIME (MM:SS)	% DIFFERENCE	DOES VALUE MEET VALIDATION/TARGET CRITERIA?
Route 378 EB - Bridge to Past Morrison Ave	01:35	01:30	6%	Yes – within 15%
Rt 4 SB - Morrison Ave to N Greenbush Rd	02:15	02:38	-15%	Yes – within 15%
Burden Ave NB - Morrison Ave to 4th St	01:55	01:41	13%	Yes – within 15%
Route 378 EB - model start to bridge	01:38	01:06	48%	Yes – within 1 minute
Route 378 WB - Bridge to model end	01:42	01:42	0%	Yes – within 15%
Start of model to end of Bridge EB	02:35	02:08	20%	Yes – within 1 minute
End of Bridge EB to Main St	02:58	03:28	-14%	Yes – within 15%
End of Bridge EB to Route 4 Roundabout SB	04:23	05:36	-21%	No – over 1 minute
End of Bridge EB to North Dr	02:56	04:22	-33%	No – over 1 minute

Source: WSP VISSIM Model – Existing/Base PM Scenario

Most travel time results from the existing/base AM and PM peak hour models are within the target calibration ranges of 15% or one minute. Overall, the average of all model simulated travel times are within 15% of field data in both the existing/base AM and PM peak hour models.

**Table 5-8:
Validation – Queue Length – AM Peak Hour**

SEGMENT	SIMULATED QUEUE LENGTH (FT)	FIELD DATA QUEUE LENGTH (FT)	DOES DIFFERENCE MEET VALIDATION/TARGET CRITERIA
NYS Route 378 EB	1,314	1,500	Yes within 20%
Morrison Avenue WB	2372	2,100	Yes within 20%

Source: WSP VISSIM Model – Existing/Base AM Scenario

**Table 5-9:
Validation – Queue Length – PM Peak Hour**

SEGMENT	SIMULATED QUEUE LENGTH (FT)	FIELD DATA QUEUE LENGTH (FT)	DOES DIFFERENCE MEET VALIDATION/TARGET CRITERIA
NYS Route 378 EB	2,387	2,350	Yes within 20%
Morrison Avenue WB	2,295	2,100	Yes within 20%

Source: WSP VISSIM Model – Existing/Base PM Scenario

All the simulated queue results reported from the existing 2019 base AM and PM peak hour models were within the target calibration ranges compared to the existing traffic volumes.

A visual inspection of the simulated model queues matched the historical google maps typical traffic as well as field data collected in the Fall of 2022.

5.5 CONCLUSION

Based on the results obtained from the VISSIM base models and their comparison with field data for all the calibration measures listed in this Chapter, the WSP team concludes that the models are reasonably calibrated to the standards and guidelines established by FHWA and, therefore, these models can be used as base models to develop future conditions for this project.

6 Existing 2019 Conditions Traffic Operations Analysis Results

Measures of effectiveness (MOEs) summarized in the tables below from the VISSIM model include levels of service (LOS), microsimulation delay, average travel times, queue lengths, density, and average speed.

Node evaluation will be used to determine specific data from the intersections within the study area. The node evaluation feature will be used to report LOS, vehicle (microsimulation) delay, and total vehicles processed through the intersection during AM and PM peak hours. LOS in VISSIM is comparable to the LOS defined in the Highway Capacity Manual (HCM). HCM LOS is based on control delay and stopped delay that is directly attributable to the traffic control devices. VISSIM LOS directly measures the total vehicle delay, consisting of control delay, stopped delay, and other delays incurred, such as vehicles slowing down for turning movements. The LOS in VISSIM is comparable to the LOS defined in the HCM. Microsimulation delay has been translated to the same levels of service used by the HCM methodology.

A summary of the overall intersection delay for the study area intersections is shown in Table 6-1 and Table 6-2. The intersection analysis results show that signalized intersection at High Street and Morrison Avenue currently operates at unacceptable LOS (E or F) during both peak hour periods. In addition, the roundabout at NYS Route 4 and NYS Route 136 operates at an unacceptable LOS in the PM peak hour period. The overall vehicle delay and LOS reported, takes into account the delay, weighted by traffic volumes, experienced by all lane groups at the intersection. It should be noted that while the intersections are showing acceptable LOS (D or better), multiple approaches, or lane groups at the intersections have unacceptable LOS E and F. The full outputs/results of the existing 2019 AM and PM existing/base VISSIM model can be found in Attachment 3-7.

Table 6-3 through Table 6-8 summarize existing travel times, queue lengths, densities, and speeds that will be used to compare to future no-build and build conditions under different options. Determining the existing LOS and other MOEs throughout the study area will help identify areas of congestion that have insufficient capacity, which will provide insight into solutions that will alleviate the traffic operations breakdown in flow. All existing conditions traffic operations analysis results are shown in Attachment 3-7.

**Table 6-1:
Existing 2019 –AM Peak Hour – Intersection LOS**

INTERSECTION	LOS	VEHICLE DELAY (S)	VEHICLE PROCESSED
High Street (NY Route 378) & Morrison Avenue	E*	60.0	2,282
High Street (NY Route 378) & Burden Avenue/Mill Street (Route 4)	C	31.7	1,892
Burden Avenue (NY Route 4) & Main Street	B	18.3	1,134
Mill Street/Vandenburgh Avenue (NY Route 4) & Campbell Avenue	C	29.2	1,346
Vandenburgh Avenue (NY Route 4) & Morrison Avenue	C	31.5	863
Vandenburgh Avenue (NY Route 4) & North Drive	B	12.0	1,027
Vandenburgh Avenue (NY Route 4) & George E Halliday Drive	B	11.2	1,310
Vandenburgh Avenue (NY Route 4) & South Drive	A	8.0	1,253
Vandenburgh Avenue/North Greenbush Road (NY Route 4) & Glenmore Road (NY Route 136)	B	9.8	2,381

*Unacceptable LOS

**Table 6-2:
Existing 2019 –PM Peak Hour – Intersection LOS**

INTERSECTION	LOS	VEHICLE DELAY (S)	VEHICLE PROCESSED
High Street (NY Route 378) & Morrison Avenue	E	62.0	2,426
High Street (NY Route 378) & Burden Avenue/Mill Street (Route 4)	C	20.3	2,232
Burden Avenue (NY Route 4) & Main Street	C	21.3	1,452
Mill Street/Vandenburgh Avenue (NY Route 4) & Campbell Avenue	B	16.9	1,602
Vandenburgh Avenue (NY Route 4) & Morrison Avenue	C	28.8	2,189
Vandenburgh Avenue (NY Route 4) & North Drive	A	9.6	2,063
Vandenburgh Avenue (NY Route 4) & George E Halliday Drive	B	17.8	2,337
Vandenburgh Avenue (NY Route 4) & South Drive	A	5.9	1,990
Vandenburgh Avenue/North Greenbush Road (NY Route 4) & Glenmore Road (NY Route 136)	E*	40.4	2,079

*Unacceptable LOS

**Table 6-3:
Existing 2019 –AM Peak Hour – Travel Times**

TRAVEL TIME SECTION	TIME (MM:SS)	VEHICLES	DISTANCE (FT)
Route 378 EB - Bridge to Past Morrison Ave	01:40	582	2,641
Rt 4 SB - Morrison Ave to N Greenbush Rd	01:53	445	3,657
Burden Ave NB - Morrison Ave to 4th St	02:13	158	1,996
Route 378 EB - model start to bridge	01:30	190	6,880
Route 378 WB - Bridge to model end	01:46	340	7,150
Start of model to end of Bridge EB	02:08	191	8,258
End of Bridge EB to Main St	03:22	156	3,380
End of Bridge EB to Route 4 Roundabout SB	04:12	345	6,754
End of Bridge EB to North Dr	02:47	1,163	4,106

**Table 6-4:
Existing 2019 –PM Peak Hour – Travel Times**

TRAVEL TIME SECTION	TIME (MM:SS)	VEHICLES	DISTANCE (FT)
Route 378 EB - Bridge to Past Morrison Ave	02:15	1005	2,624
Rt 4 SB - Morrison Ave to N Greenbush Rd	01:55	286	3,657
Burden Ave NB - Morrison Ave to 4th St	01:38	305	1,984
Route 378 EB - model start to bridge	01:35	393	6,883
Route 378 WB - Bridge to model end	01:42	138	7,187
Start of model to end of Bridge EB	02:35	391	8,261
End of Bridge EB to Main St	02:58	305	3,393
End of Bridge EB to Route 4 Roundabout SB	04:23	232	6,718
End of Bridge EB to North Dr	02:56	892	4,084

**Table 6-5:
Existing 2019 –AM Peak Hour – Queue Lengths**

SEGMENT	QUEUE LENGTH (FT)	MAX QUEUE LENGTH (FT)	QUEUE STOPS
NYS Route 378 EB	155.4	1,314.0	384
Morrison Avenue WB	1546.6	2,372.1	1,555

**Table 6-6:
Existing 2019 –PM Peak Hour – Queue Lengths**

SEGMENT	QUEUE LENGTH (FT)	MAX QUEUE LENGTH (FT)	QUEUE STOPS
NYS Route 378 EB	1828.8	2,439.3	4,182
Morrison Avenue WB	1608.1	2,345.5	1,599

**Table 6-7:
Existing 2019 –AM Peak Hour – Link Density**

LOCATION	VOLUMES	DENSITY (PC/MI/LN)	AVERAGE SPEED (MPH)
NYS Route 378 EB – Bridge Basic Segment	1,718	40.6	21.4
NYS Route 378 WB – Bridge Basic Segment	1,583	30.1	26.2

**Table 6-8:
Existing 2019 –PM Peak Hour – Link Density**

LOCATION	VOLUMES	DENSITY (PC/MI/LN)	AVERAGE SPEED (MPH)
NYS Route 378 EB – Bridge Basic Segment	2,418	87.7	14.1
NYS Route 378 WB – Bridge Basic Segment	1,410	22.5	31.4

The traffic operational analysis for the study area during the typical existing weekday AM and PM peak hours showed that the eastbound direction of travel of Route 378 experiences significant delays and long queue lengths that often extend back to Interstate 787 northbound exit ramp due to the signalized intersection at Morrison Avenue. The demand exceeds the capacity at this intersection, and vehicles cannot be processed in a timely manner.

7 Future 2025 No-Build Conditions Traffic Operations Analysis Results

LOS analyses were completed for future no-build conditions at Estimated Time of Completion (ETC) (2025). The results are summarized below. Overall, the no-build LOS analysis results are consistent in that delays and queues are anticipated to increase over time given the projected growth in traffic compared to 2019 existing conditions.

Future growth rates for the no-build conditions were determined using Capital Region Transportation Council's STEP model performed by CRTC staff. The STEP model stands for a "Systematic Transportation Evaluation and Planning Model". It is a macro, regional-level model that uses PTV Visum software and includes the counties of Albany, Rensselaer, Saratoga, and Schenectady. The STEP model of the network includes all Federal Aid eligible roadways and some higher-order local roadways. The STEP model assumes that drivers have perfect knowledge of all potential routes and will always choose the shortest (time) route. Trips in the STEP model are generated and projected into future years using population and employment projections from the Capital District Regional Planning Commission and U.S. census data.

Background growth in the STEP model includes general regional growth, but not specific to any developments. CRTC confirmed that the growth rates produced from their VISUM STEP model is consistent with observed regional peak hour traffic volumes and Vehicle Miles Traveled (VMT) growth, for pre-COVID 19 conditions.

CRTC provided the following annual background growth rates for the study area as 0.40% per year until 2025 for the AM peak hour and 0.45% for the PM peak hour which corresponds to a 1.027% and 1.024% growth rates. These growth rates were applied to existing traffic flows in the study area to develop the No-Build 2025 traffic volumes. Detailed traffic flow maps of the no-build 2025 volumes can be found in Attachment 3-3. There are no known proposed developments in the study area that would impact the no-build volumes.

A summary of the overall intersection delay for the study area intersections is shown in Table 7-1 and Table 7-2. The intersection analysis results show that signalized intersection at High Street and Morrison Avenue currently operates at unacceptable LOS (E or F) during both peak hour periods. The signalized intersection at High Street and Mill Street will now operate at unacceptable LOS during the PM peak hour. In addition, the roundabout at NYS Route 4 and NYS Route 136 operates at an unacceptable LOS in the PM peak hour period. The overall vehicle delay and LOS reported, takes into account the delay, weighted by traffic volumes, experienced by all lane groups at the intersection. It should be noted that while the intersections are showing acceptable LOS (D or better), multiple approaches, or lane groups at the intersections have unacceptable LOS E and F. The full outputs/results of the no-build 2025 AM and PM VISSIM model can be found in Attachment 3-7.

Table 6-3 through Table 6-8 summarize no-build 2025 travel times, queue lengths, densities, and speeds that will be used to compare to future build conditions under different options. Determining the no build 2025 LOS and other MOEs throughout the study area will help identify areas of congestion that have insufficient capacity, which will provide insight into solutions that will alleviate the traffic operations breakdown in flow. All existing conditions traffic operations analysis results are shown in Attachment 3-7.

The traffic operational analysis for the study area during the no-build 2025 AM and PM peak hours showed that the eastbound direction of travel of Route 378 experiences a slight increase, when compared to existing 2019 conditions, in delays and long queue lengths in addition to decrease in average speed.

**Table 7-1:
No-Build 2025 –AM Peak Hour – Intersection LOS**

INTERSECTION	LOS	VEHICLE DELAY (S)	VEHICLE PROCESSED
High Street (NY Route 378) & Morrison Avenue	E*	61.3	3,397
High Street (NY Route 378) & Burden Avenue/Mill Street (Route 4)	C	31.8	1,984
Burden Avenue (NY Route 4) & Main Street	B	18.6	983
Mill Street/Vandenburg Avenue (NY Route 4) & Campbell Avenue	D	35.0	1,598
Vandenburg Avenue (NY Route 4) & Morrison Avenue	D	43.7	2,298
Vandenburg Avenue (NY Route 4) & North Drive	B	16.1	2,237
Vandenburg Avenue (NY Route 4) & George E Halliday Drive	B	11.9	2,225
Vandenburg Avenue (NY Route 4) & South Drive	A	8.7	2,014
Vandenburg Avenue/North Greenbush Road (NY Route 4) & Glenmore Road (NY Route 136)	B	11.2	1,843

*Unacceptable LOS

**Table 7-2:
No-Build 2025 – PM Peak Hour – Intersection LOS**

INTERSECTION	LOS	VEHICLE DELAY (S)	VEHICLE PROCESSED
High Street (NY Route 378) & Morrison Avenue	F*	97.3	3,418
High Street (NY Route 378) & Burden Avenue/Mill Street (Route 4)	E*	77.1	2,025
Burden Avenue (NY Route 4) & Main Street	B	20.4	1,324
Mill Street/Vandenburg Avenue (NY Route 4) & Campbell Avenue	B	16.2	1,502
Vandenburg Avenue (NY Route 4) & Morrison Avenue	C	33.6	2,021
Vandenburg Avenue (NY Route 4) & North Drive	B	16.6	1,927
Vandenburg Avenue (NY Route 4) & George E Halliday Drive	B	19.1	2,227
Vandenburg Avenue (NY Route 4) & South Drive	A	6.0	1,919
Vandenburg Avenue/North Greenbush Road (NY Route 4) & Glenmore Road (NY Route 136)	E*	42.9	2,034

*Unacceptable LOS

**Table 7-3:
No-Build 2025 – AM Peak Hour – Travel Times**

TRAVEL TIME SECTION	TIME (MM:SS)	VEHICLES	DISTANCE (FT)
Route 378 EB - Bridge to Past Morrison Ave	01:43	596	2641
Rt 4 SB - Morrison Ave to N Greenbush Rd	01:54	442	3657
Burden Ave NB - Morrison Ave to 4th St	02:13	159	1996
Route 378 EB - model start to bridge	01:30	196	6880
Route 378 WB - Bridge to model end	01:46	346	7150
Start of model to end of Bridge EB	02:12	196	8258
End of Bridge EB to Main St	03:23	158	3380
End of Bridge EB to Route 4 Roundabout SB	04:21	348	6754
End of Bridge EB to North Dr	02:56	1196	4106

**Table 7-4:
No-Build 2025 – PM Peak Hour – Travel Times**

TRAVEL TIME SECTION	TIME (MM:SS)	VEHICLES	DISTANCE (FT)
Route 378 EB - Bridge to Past Morrison Ave	05:28	818	2624
Rt 4 SB - Morrison Ave to N Greenbush Rd	01:52	243	3657
Burden Ave NB - Morrison Ave to 4th St	03:49	227	1984
Route 378 EB - model start to bridge	03:57	363	6883
Route 378 WB - Bridge to model end	01:51	144	7187
Start of model to end of Bridge EB	05:25	364	8261
End of Bridge EB to Main St	07:31	228	3393
End of Bridge EB to Route 4 Roundabout SB	04:32	189	6718
End of Bridge EB to North Dr	03:09	741	4084

**Table 7-5:
No-Build 2025 – AM Peak Hour – Queue Lengths**

SEGMENT	QUEUE LENGTH (FT)	MAX QUEUE LENGTH (FT)	QUEUE STOPS
NYS Route 378 EB	235	1606	564
Morrison Avenue WB	1644	2404	1624

**Table 7-6:
No-Build 2025 – PM Peak Hour – Queue Lengths**

SEGMENT	QUEUE LENGTH (FT)	MAX QUEUE LENGTH (FT)	QUEUE STOPS
NYS Route 378 EB	1828.8	2439.3	4182
Morrison Avenue WB	1608.1	2345.5	1599

**Table 7-7:
No-Build 2025 – AM Peak Hour – Link Density**

LOCATION	VOLUMES	DENSITY (PC/MI/LN)	AVERAGE SPEED (MPH)
NYS Route 378 EB – Bridge Basic Segment	1,758	45.4	19.8
NYS Route 378 WB – Bridge Basic Segment	1,602	30.5	26.3

**Table 7-8:
No-Build 2025 – PM Peak Hour – Link Density**

LOCATION	VOLUMES	DENSITY (PC/MI/LN)	AVERAGE SPEED (MPH)
NYS Route 378 EB – Bridge Basic Segment	1,986	101.1	9.9
NYS Route 378 WB – Bridge Basic Segment	1,405	26.7	26.3

8 Future 2045 No-Build Conditions Traffic Operations Analysis Results

LOS analyses were completed for future no-build conditions at Estimated Time of Completion (ETC) (2025). The results are summarized below. Overall, the no-build 2045 LOS analysis results are consistent in that delays and queues are anticipated to increase over time given the projected growth in traffic compared to no-build 2025 conditions.

Future growth rates for the no-build conditions were determined using Capital Region Transportation Council's (CRTC) STEP model performed by CRTC staff. The STEP model stands for a "Systematic Transportation Evaluation and Planning Model". It is a macro, regional-level model that uses PTV Visum software and includes the counties of Albany, Rensselaer, Saratoga, and Schenectady. The STEP model of the network includes all Federal Aid eligible roadways and some higher-order local roadways. The STEP model assumes that drivers have perfect knowledge of all potential routes and will always choose the shortest (time) route. Trips in the STEP model are generated and projected into future years using population and employment projections from the Capital District Regional Planning Commission and U.S. census data.

Background growth in the STEP model includes general regional growth, but not specific to any developments. CRTC confirmed that the growth rates produced from their VISUM STEP model is consistent with observed regional peak hour traffic volumes and Vehicle Miles Traveled (VMT) growth, for pre-COVID 19 conditions.

CRTC provided the following annual background growth rates for the study area from 2025 to 2045 as 0.10% per year for the AM peak hour and 0.08% for the PM peak hour which corresponds to a 1.020% and 1.016% growth rates. These growth rates were applied to the ETC 2025 no-build traffic flows in the study area to develop the No-Build 2045 traffic volumes. Detailed traffic flow maps of the no-build 2045 volumes can be found in Attachment 3-3. There are no known proposed developments in the study area that would impact the no-build volumes.

A summary of the overall intersection delay for the study area intersections is shown in Table 8-1 and Table 7-2. The intersection analysis results show that signalized intersection at High Street and Morrison Avenue and High Street and Mill Street will continue to operate at unacceptable LOS (E or F) during both peak hour periods. In addition, the roundabout at NYS Route 4 and NYS Route 136 will continue to operate at an unacceptable LOS in the PM peak hour period. The overall vehicle delay and LOS reported, takes into account the delay, weighted by traffic volumes, experienced by all lane groups at the intersection. It should be noted that while the intersections are showing acceptable LOS (D or better), multiple approaches, or lane groups at the intersections have unacceptable LOS E and F. The full outputs/results of the no-build 2045 AM and PM VISSIM model can be found in Attachment 3-7.

Table 6-3 through Table 6-8 summarize no-build 2045 travel times, queue lengths, densities, and speeds that will be used to compare to the build conditions under different options. Determining the no-build 2045 LOS and other MOEs throughout the study area will help identify areas of congestion that have insufficient capacity, which will provide insight into solutions that will alleviate the traffic operations breakdown in flow. All no-build 2045 conditions traffic operations analysis results are shown in Attachment 3-7.

The traffic operational analysis for the study area during the no-build 2045 weekday AM and PM peak hours showed that the eastbound direction of travel of Route 378 experiences a slight increase, when compared to no-build 2025 conditions, in delays and long queue lengths and a decrease in average speeds.

**Table 8-1:
No-Build 2045 –AM Peak Hour – Intersection LOS**

INTERSECTION	LOS	VEHICLE DELAY (S)	VEHICLE PROCESSED
High Street (NY Route 378) & Morrison Avenue	E*	65.1	3,432
High Street (NY Route 378) & Burden Avenue/Mill Street (Route 4)	C	31.6	2,004
Burden Avenue (NY Route 4) & Main Street	B	19.1	998
Mill Street/Vandenburgh Avenue (NY Route 4) & Campbell Avenue	D	41.8	1,616
Vandenburgh Avenue (NY Route 4) & Morrison Avenue	D	49.1	2,317
Vandenburgh Avenue (NY Route 4) & North Drive	B	21.2	2,260
Vandenburgh Avenue (NY Route 4) & George E Halliday Drive	B	12.9	2,255
Vandenburgh Avenue (NY Route 4) & South Drive	A	8.5	2,045
Vandenburgh Avenue/North Greenbush Road (NY Route 4) & Glenmore Road (NY Route 136)	B	11.5	1,873

*Unacceptable LOS

**Table 8-2:
No-Build 2045 – PM Peak Hour – Intersection LOS**

INTERSECTION	LOS	VEHICLE DELAY (S)	VEHICLE PROCESSED
High Street (NY Route 378) & Morrison Avenue	F*	96.0	3,440
High Street (NY Route 378) & Burden Avenue/Mill Street (Route 4)	E*	78.1	2,048
Burden Avenue (NY Route 4) & Main Street	C	20.8	1,339
Mill Street/Vandenburgh Avenue (NY Route 4) & Campbell Avenue	B	16.6	1,512
Vandenburgh Avenue (NY Route 4) & Morrison Avenue	D	38.6	2,018
Vandenburgh Avenue (NY Route 4) & North Drive	C	21.0	1,925
Vandenburgh Avenue (NY Route 4) & George E Halliday Drive	B	20.4	2,244
Vandenburgh Avenue (NY Route 4) & South Drive	A	5.9	1,934
Vandenburgh Avenue/North Greenbush Road (NY Route 4) & Glenmore Road (NY Route 136)	E*	45.5	2,053

*Unacceptable LOS

**Table 8-3:
No-Build 2045 – AM Peak Hour – Travel Times**

TRAVEL TIME SECTION	TIME (MM:SS)	VEHICLES	DISTANCE (FT)
Route 378 EB - Bridge to Past Burden/Mill	01:50	600	2627
Rt 4 SB - Morrison Ave to N Greenbush Rd	01:54	447	3657
Burden Ave NB - Morrison Ave to 4th St	02:11	161	1996
Route 378 EB - model start to bridge	01:31	197	6880
Route 378 WB - Bridge to model end	01:46	349	7163
Start of model to end of Bridge EB	02:23	198	8265
End of Bridge EB to Main St	03:20	161	3367
End of Bridge EB to Route 4 Roundabout SB	04:30	353	6748
End of Bridge EB to North Dr	03:04	1212	4107

**Table 8-4:
No-Build 2045 – PM Peak Hour – Travel Times**

TRAVEL TIME SECTION	TIME (MM:SS)	VEHICLES	DISTANCE (FT)
Route 378 EB - Bridge to Past Burden/Mill	05:20	825	2620
Rt 4 SB - Morrison Ave to N Greenbush Rd	01:53	249	3657
Burden Ave NB - Morrison Ave to 4th St	03:48	234	1974
Route 378 EB - model start to bridge	04:28	367	6894
Route 378 WB - Bridge to model end	01:52	142	7196
Start of model to end of Bridge EB	05:57	366	8272
End of Bridge EB to Main St	07:24	235	3322
End of Bridge EB to Route 4 Roundabout SB	04:34	195	6749
End of Bridge EB to North Dr	03:13	742	4097

**Table 8-5:
No-Build 2045 – AM Peak Hour – Queue Lengths**

SEGMENT	QUEUE LENGTH (FT)	MAX QUEUE LENGTH (FT)	QUEUE STOPS
NYS Route 378 EB	460	2000	1017
Morrison Avenue WB	1772	2422	1721

**Table 8-6:
No-Build 2045 – PM Peak Hour – Queue Lengths**

SEGMENT	QUEUE LENGTH (FT)	MAX QUEUE LENGTH (FT)	QUEUE STOPS
NYS Route 378 EB	1918.3	2439.6	4456
Morrison Avenue WB	1681.3	2383.0	1649

**Table 8-7:
No-Build 2045 – AM Peak Hour – Link Density**

LOCATION	VOLUMES	DENSITY (PC/MI/LN)	AVERAGE SPEED (MPH)
NYS Route 378 EB – Bridge Basic Segment	1,784	55.7	16.4
NYS Route 378 WB – Bridge Basic Segment	1,616	30.8	26.3

**Table 8-8:
No-Build 2045 – PM Peak Hour – Link Density**

LOCATION	VOLUMES	DENSITY (PC/MI/LN)	AVERAGE SPEED (MPH)
NYS Route 378 EB – Bridge Basic Segment	1,981	101.7	9.9
NYS Route 378 WB – Bridge Basic Segment	1,421	27.1	26.2

9 Future 2025 and 2045 Build Conditions Traffic Operational Analysis

This chapter provides a summary description of the traffic operations analysis of the transportation concepts developed for the Troy Menands Bridge. For the traffic operations analysis, the nine concepts developed and discussed in the Project Scoping/PEL Report were grouped together based on the concept's similar locations, travel patterns, and touch-down points. Concepts one through three were all grouped together based on being reconstructed in the same location with nearly the same alignment and the same touch-down point of Morrison Avenue. Concept four was grouped by itself as it was the only concept that was relocated to the north with a touch-down point of Mill Street. Concepts five and six were grouped together because they were relocated to touch-down points south of Troy Menand's Bridge's current location. Concepts seven and eight were grouped together because they provided the option to split traffic to the north or the south after crossing the Hudson River. Concept Nine was grouped by itself as it was the only concept that relocated the bridge to the south via a different interchange on Interstate 787.

For the traffic operational analysis, each concept will have a reconstructed interchange with Interstate 787. For this study's traffic operational analysis, a Single Point Urban Interchange (SPUI) was evaluated under each concept. The SPUI at the interchange of Interstate 787 (I-787) and NY Route 378 is a grade-separated design where all the I-787 ramps begin or end at a single signalized intersection on NY Route 378. The right turns from I-787 ramps are made at unsignalized intersections or merges to NY Route 378. The SPUI would accommodate pedestrians and bicyclists using marked crosswalks to safely cross the freeway ramps. The SPUI would not provide crosswalks across NY Route 378, pedestrians and bicyclists would have to use the nearest marked crosswalk. Figure 9-1 shows the geometry of the SPUI in Concept Four. A double roundabout (aka peanut roundabout or barbell roundabout) was also considered for this interchange reconstruction. If the study progresses to preliminary engineering, this interchange configuration should be considered with updated existing traffic volumes and forecasted traffic volumes.

**Figure 9-1:
VISSIM SPUI Geometry**



Evaluating the traffic operational conditions of nine concepts was determined to not be feasible for this study, and it was determined that one concept would be selected from each grouping because it would be representative of each concept's traffic operational conditions. Concepts three, four, six, and seven were chosen as the concepts to be evaluated for a capacity analysis. Concept nine was not chosen as there was no existing traffic data collected at this location. Table 9-1 summarizes the concepts and their groupings for traffic analysis.

**Table 9-1:
Concept Grouping for Traffic Operational Analysis**

GROUPING DESCRIPTION	CONCEPTS	CONCEPT TO MODEL
Same Location as current	1,2,3	3
Relocated to the North	4	4
Relocated to the South	5,6	6
Splitting traffic to the North and South	7,8	7
I-787 Interchange Relocation	9	-

9.1 FORECASTING FUTURE BUILD TRAFFIC VOLUMES

Concepts three, four, six, and seven were each modeled in the CRTC's STEP model to forecast future build traffic volumes. It should be noted that in the STEP model, the Hudson River crossings operate as a system, meaning that changes to one crossings alignment will have an impact on the other crossings. The other Hudson River crossings are the Collar City Bridge, Green Island Bridge, Congress Street Bridge, and Patroon Island Bridge. CRTC's STEP model suggests that the more drastic changes to the Troy Menands Bridge alignment, the more drastic the shift in travel patterns across the system of bridges. The following section describes the observations for the results of each concept in the STEP model and how traffic volumes were modified to evaluate traffic operational analysis under the concepts. CRTC's STEP model results of the traffic forecasts for Future Build Concepts can be found in Attachment 3-8.

9.1.1 Concept Three

Concept Three is largely the same as the current Troy Menands Bridge as the alignment has the same touch-down points and therefore travel patterns and traffic volume changes are nominal.

9.1.2 Concept Four

Concept Four would relocate the Troy Menands Bridge alignment to the north and would have a flyover to Mill Street to the North while providing ramp connections to High Street and Burden Avenue via a single-lane roundabout. The STEP model suggests that traffic volumes would decrease to the greatest extent on the system at the Congress Street Bridge. The weekday AM commuter peak hour would increase traffic volumes on the Troy Menands Bridge in the westbound direction and the weekday PM commuter peak hour would increase both westbound and eastbound traffic volumes.

9.1.3 Concept Six

Concept Six would relocate the Troy Menands Bridge alignment to the south of its current alignment and would provide a direct connection to the existing roundabout at Route 136 and Route 4. The STEP model suggests that traffic volumes would decrease to the greatest extent on the system at the Patroon Island Bridge. The STEP model also suggests that the rest of the system would all have increased traffic on each of the bridges. The weekday AM and PM commuter peak hours would increase traffic volumes on the Troy Menands Bridge in both directions.

9.1.4 Concept Seven

Concept Seven would relocate the Troy Menands Bridge alignment to the south of its current alignment and would provide direction connections to both Morrison Avenue and to the existing roundabout at Route 136 and Route 4. The STEP model suggests that traffic volumes would decrease to the greatest extent on the system at the Patroon Island Bridge. The weekday AM and PM commuter peak hours would increase traffic volumes on the Troy Menands Bridge in both directions. Overall, when compared to the other Concepts the STEP model has the greatest increase in traffic in both directions on the Troy Menands Bridge under Concept seven.

9.2 FUTURE TRAFFIC OPERATIONAL ANALYSIS RESULTS

Under the forecasted future build traffic volumes, a capacity analysis was completed for Concepts three, four, six, and seven. Concepts three and four showed the most significant improvements to the traffic operating conditions under ETC+ 20 during both the weekday AM and PM commuter peak hours through decreased travel times, delays, and queue lengths in the study area. Concepts six and seven were not able to efficiently process the increase in traffic volumes that the STEP model suggests through two-lane roundabouts which caused significant queues and delays. The results for the capacity analysis under future build conditions at ETC and ETC+20 can be found in Attachment 3-7.

10 Conclusion

The focus of this traffic report was to determine the existing conditions for the NYS Route 378 study area and identify the current (2019) and expected (2045 No-Build) safety and operational deficiencies. Through the existing and expected analysis conducted, the following safety and operational deficiencies have been identified:

Safety – Summarizing the results of the Crash Analysis performed in Attachment 3-4 of this report, the NYS Route 378 Corridor identified the accident severity for Fatal/Injury crashes is significantly higher than the statewide average for similar facilities. The traffic report includes proposed improvements that may improve safety and reduce the number of these crashes. These proposed improvements and their potential impact on crashes are as follows:

- Pavement resurfacing can lead to better friction between the road surface and car tires which may reduce the wet road crash rate. A crash modification factor of 0.858 is listed by the Crash Modification Factors (CMF) Clearinghouse for pavement resurfacing.
- Flattening horizontal curvature along the mainline of Route 378 can improve sight distance, provide an opportunity to increase the distance to roadside hazards, and reduce the severity of roadway departure crashes such as those categorized as Fixed Object.
- Widening lanes on the Troy-Menands Bridge can provide more comfort for drivers and may reduce Overtaking and Sideswipe crashes. A CMF of 0.986 is associated with widening the lanes from the existing 10' width to a standard 12' width on an urban principal arterial with a posted speed limit of 30mph.
- Installing roadway lighting along the mainline of Route 378 can improve driver visibility and awareness, potentially reducing Fixed Object and Animal crashes. A CMF of 0.74 is associated with the installation of lighting.
- Installing advance warning signage, including year-round and seasonal VMS messaging and public outreach, would help to reduce the number of Rear End and Animal crashes.
- Local intersections within the study area could benefit from the conversion to a modern multilane roundabout. A CMF of 0.79 is associated with conversion from a signalized intersection into a roundabout, reducing all crash types by 21%.
- Local intersections within the study area could benefit from Adaptive Signal Control. A CMF of 0.83 is associated with the implementation Adaptive Signal Control, reducing all crash types by 21%

Operational – A VISSIM microsimulation traffic operational analysis was performed at the study area roadways and intersections using the projected 2025 and 2045 volumes from the CRTC's STEP model for Concepts 3, 4, 6, and 7. Concept 9 was not modeled due to the altered travel patterns and impacts to regional traffic caused by the southern location of the bridge crossing. The following high-level conclusions can be drawn from the microsimulation traffic analysis:

- Concepts 3 and 4 showed the most significant improvements to the traffic operating conditions under ETC+20 during both the weekday AM and PM peak hours through decreased travel times, delays, and queue lengths in the study area. Concepts 3 and 4 are expected to reduce queue lengths and the stop and go conditions that currently exist on NYS Route 378 that will increase safety by reducing the number of conflicts between slow-speed and high-speed vehicles.
- Concepts 6 and 7 were not able to efficiently process the increase in traffic volumes generated by the southern bridge locations. Significant queues and delays would occur at the connections to the regional roadway network.