SCCOG Congestion Management Process Report - July 2017

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SCCOG Southeastern Connecticut Council of Governments

FINAL REPORT

for the

SCCOG Congestion Management Process

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1 INTRODUCTION

This 2017 Congestion Management Process (CMP) Report represents the Southeastern Connecticut Regional Council of Governments' (SCCOG) efforts to better understand the transportation system in the Greater New London area. This report takes a systematic approach to identify and address congested areas within the region. The CMP is used to monitor and evaluate transportation system performance and congestion management strategies in a regional context to make the best use of federal, state, and regional funding resources.

A CMP provides the framework for measuring system performance and managing congestion for a region. This report will establish a baseline for an ongoing process. Activities that are a part of the CMP include data collection for quantifying system performance, determination of causes of congestion, consideration of alternatives to reduce congestion, implementation of programs and projects, and ongoing assessment to determine effectiveness of strategies. Inherent within a CMP is the focus on operations and management strategies to address congestion, rather than capacity improvements.

The Moving Ahead for Progress in the 21st Century Act (MAP-21) and the Fixing America's Surface Transportation Act (FAST Act) require that CMPs be maintained for all Transportation Management Areas (TMAs) (urban areas with a population of at least 200,000), which includes the Greater New London area. In 2008, the Federal Highway Administration (FHWA) provided guidelines for implementing a CMP as part of the metropolitan planning process. This is the first iteration of a Congestion Management Process (CMP) for SCCOG.

The CMP for the SCCOG Region was developed using travel time and speed data collected as a performance measure. The report also utilizes volume-to-capacity (V/C) ratios for 2011 and projected to 2035. The projected 2035 V/C data is used in this report to identify potential congestion concerns in the future. However, future iterations of the CMP will utilize speed probe data sources to calculate annual hours of peak-hour excessive delay per capita, as per FHWA's latest notice of proposed rulemaking (NPRM) regarding system performance to measure congestion based on hours of delay rather than volume-to-capacity ratios. Thus, data is based on annual hours of peak-hour excessive delay per capita, measured in person-hours of total peak-hour excessive delay.

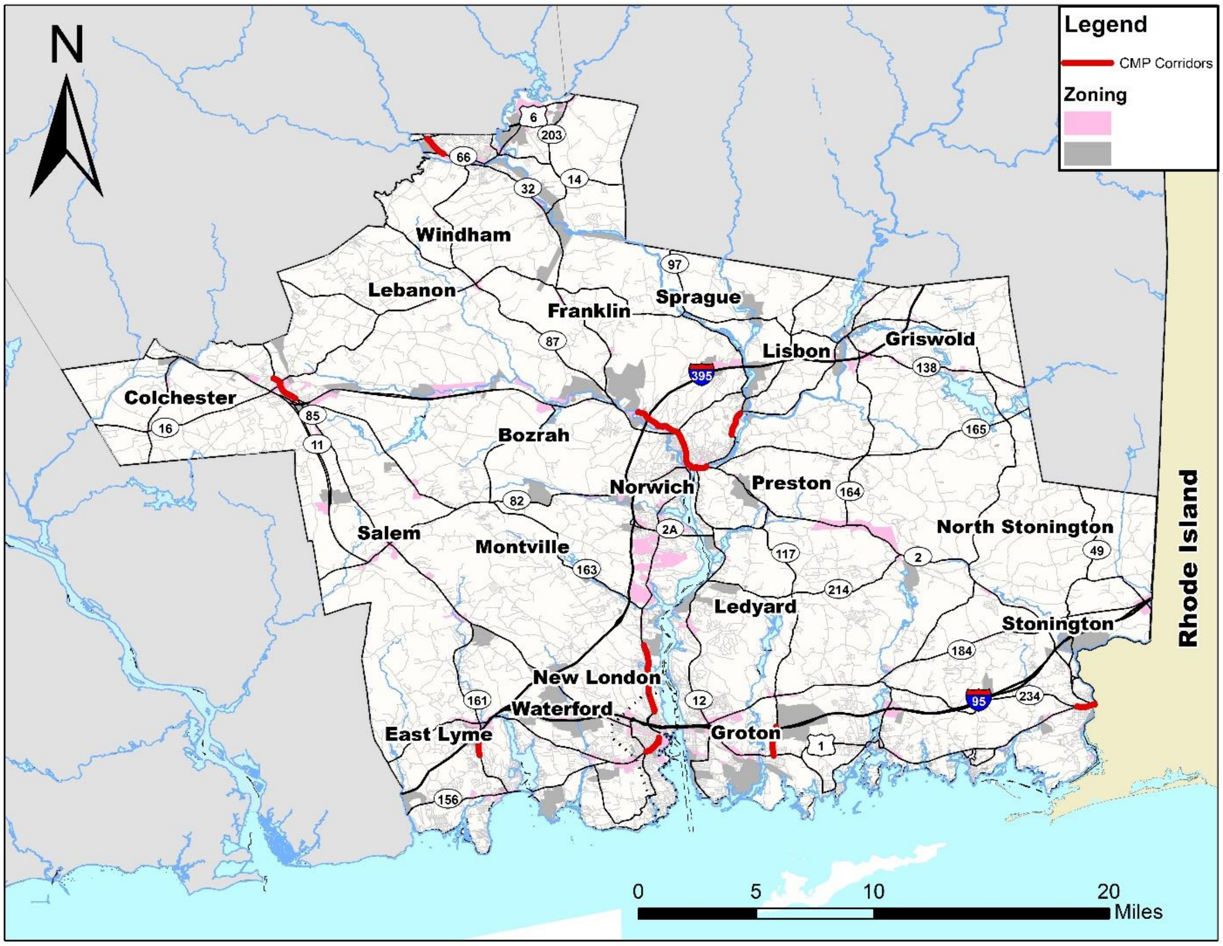
Congested corridors in the Southeastern TMA are well known and have been extensively documented. Travel patterns are relatively stable for the region and growth in vehicle miles traveled (VMT) has been constant in the past. The state is experiencing funding shortfalls, although large investments have been made in the area, including the improvement of the I-95 Interchange 74 at CT-161 and the safety improvements on I-95 from the Gold Star Bridge to the Rhode Island State Line. Additionally, several studies have been conducted focusing on the region's congested corridors, and improvement projects associated with these studies have been included in subsequent Transportation Improvement Programs (TIP). Based on the region's history of projects and programs, SCCOG has demonstrated that congestion management and the CMP are already at the forefront of the planning process for the region.

2 LAND USE AND CONGESTION IN SCCOG

Geological features such as the Thames River and the Long Island Sound have shaped settlement patterns in southeastern Connecticut. The Interstate Highway System has resulted in commercial and industrial expansion that drives demand for transportation and results in locations with frequent congestion. Proximity to the highway has resulted in expanding development, as is the case for Lisbon Landing, located at exit 84 off I-395 and other previously rural communities in the Southeastern TMA. This development pattern is encouraged by the growing tourism industry in the region. For example, Foxwoods and Mohegan Sun Casinos have each developed traffic volumes the size of a small city[1]. Previously rural communities have become major commercial destinations, resulting in traffic volumes that the current infrastructure was not designed to support.

The effect that land use has on transportation and congestion cannot be understated. The lack of centrality and density in the SCCOG Region exacerbates automobile dependency. Furthermore, the absence of transit-supportive walkable communities does not allow transit to be a truly viable option compared to vehicle ownership. Comprehensive regional planning, such as the Long Range Regional Transportation Plan FY 2015-2040 for Southeastern Connecticut, could direct new development into mixed use communities and encourage transit-supportive land use that would decrease the appeal of automobile use, particularly as vehicle congestion continues to grow. The implementation of these policies can be challenging in suburban communities as it calls into question the socio-spatial isolation that these types of living arrangements have provided for over two generations.

[1] According the SCCOG Long Range Plan developed that was adopted on April 15, 2015.



2.1 Zoning and Congestion

3 Congestion Management Objectives

The goals developed for this CMP have originated from those documented in current Long Range Transportation Plan for the SCCOG. The goals highlighted in this report are those that most directly relate to congestion management. The objectives include:

- Make wise use of available funding to bring the most benefit to the region through effective project prioritization and the identification of additional funding needs.
- Utilize a congestion management process in framing transportation decisions that assesses both transportation demand management (TDM) and transportation supply management (TSM) initiatives.
- Maintain, enhance, and upgrade the aging infrastructure in the region for all modes of transportation to ensure system safety and functionality.
- Preserve existing transportation resources to ensure that modes and service options are available for future operation.
- Promote enhancement and interconnection of alternative transportation modes to provide more transportation choices.

- Encourage interagency cooperation to effectively link transportation and land use planning to locate development in areas with infrastructure that is more able to support additional demand (i.e. Transit Oriented Developments, TODs).
- Work with member municipalities, state and federal agencies, and the transportation committee to develop regional solutions to transportation issues.
- Leverage federal policies and funding to improve accountability and effectiveness through all levels of government to plan for future growth.

4 AREA OF APPLICATION

The area of application for the CMP corresponds with the Southeastern Connecticut Transportation Management Area, which encompasses the entire SCCOG Region. This boundary encompasses 22 municipalities within the SCCOG. The municipalities in the SCCOG Region include Bozrah, Colchester, East Lyme, Franklin, Griswold, Borough of Jewett City, the City of Groton, the Town of Groton, Lebanon, Ledyard, Lisbon, Montville, New London, North Stonington, Norwich, Preston, Salem, Sprague, Stonington, Stonington Borough, Waterford, and Windham. According to the Connecticut State Data Center, in 2015 the Southeastern TMA municipalities had a total population of approximately 286,711. These towns are home to a diverse range of institutions, including universities, hospitals, and major corporations. The transportation network in the region includes highway, rail, bus, water, and air facilities.

5 SYSTEM OF INTEREST

5.1 Defining the Transportation Modes

The system coverage for the CMP includes all state roadways within the SCCOG Region (shown in Figure 1). This coverage is consistent with CTDOT's Congestion Management Process Congestion Screening and Monitoring data, which is the source for the V/C ratios referenced in this report. It is CTDOT's intention that future reports will include all facilities of functional classification "minor arterial" and above. However, that effort will require more extensive data collection programs to be initiated and more cooperation with municipalities. There are also plans to update the travel demand model for the SCCOG Region with information on transit facilities and usage. In future CMPs, it may be possible to include delay times for transit lines as an additional performance measure. As additional data becomes available and the system coverage fills in, the SCCOG CMP Report will be revised.

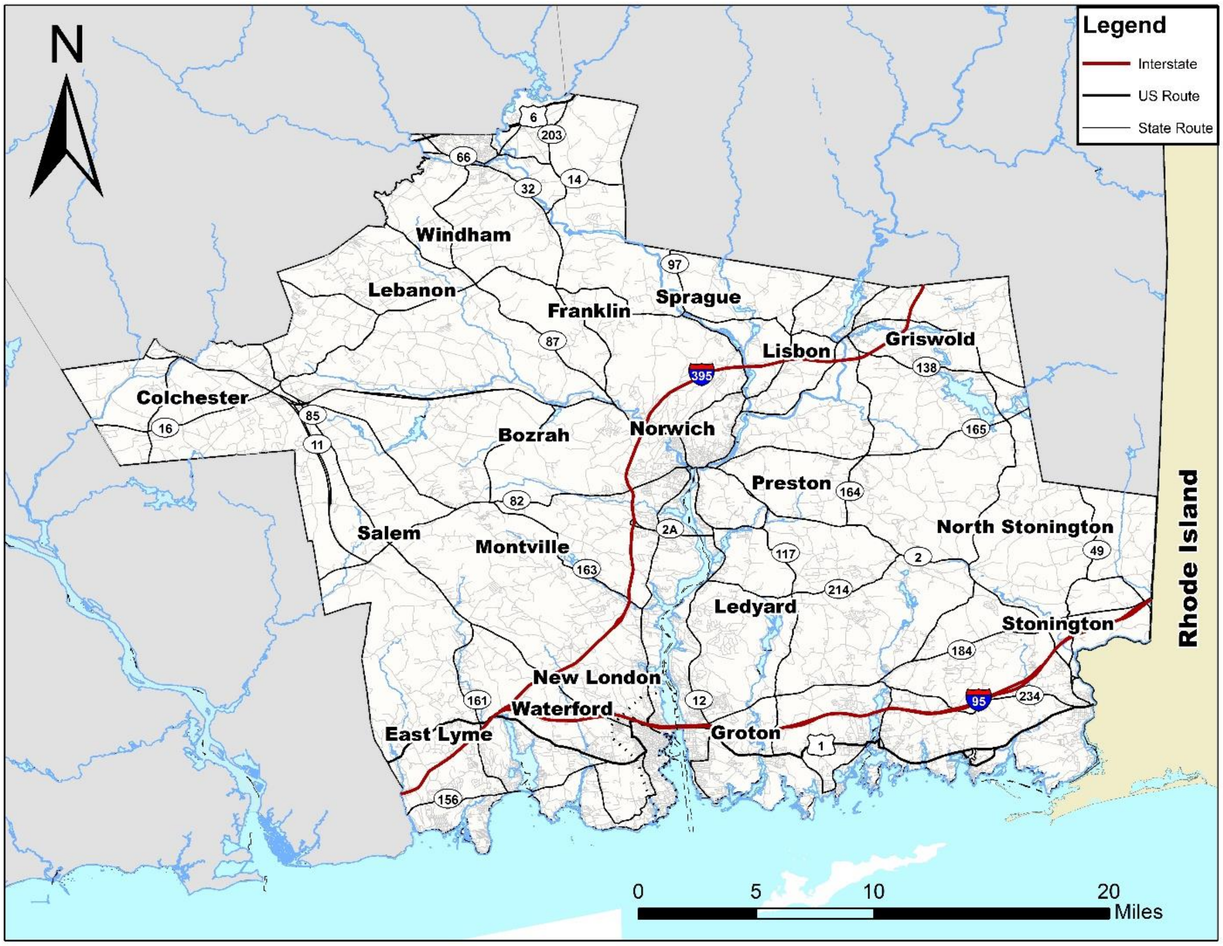


Figure 1: Roadway Network for SCCOG and Municipalities in Southeastern Transportation Management Area

6 System Performance

Congestion is increasing in the studied segments in the TMA; however, according to the US DOT, the vehicle miles traveled (VMT) per capita for the state have been slowly declining. This suggests that the overall network is losing traffic volume while existing traffic is becoming increasingly concentrated in key areas. While the automobile is the dominant mode of transportation throughout the state, Shore Line East commuter rail has reported record ridership and the bus service has been expanding. Using 2016 data from the Connecticut DOT Division of Roadway Information, approximately 2,803,144,885 VMT were estimated within the SCCOG region, a 5.98% decline from 2,981,417,455, the SCCOG VMT data from 2006. Considering nearly a decade of per capita VMT decline, standard growth projections based on assumptions of continually increasing VMT and population growth are no longer valid for the region and a downward revision may be necessary for future projections. Segments that comprise congested routes in the SCCOG region are identified in Section 6.3 of this report.

Vital infrastructure within the nation's freight network is located within the SCCOG Region; Interstate 95 is part of the interim National Highway Freight Network. According to the United States Department of Transportation (USDOT), Connecticut has some of the worst congestion and associated lowest truck speeds on the interstate network in the entire country. While Connecticut is used primarily as a pass-through state for freight, there continues to be heavy freight movement in SCCOG Region on state roads and Interstates. New London, as a seaport city, provides several freight origin and destination points as well as intermodal facilities for moving freight from rail and water to trucks.

From the CTDOT Statewide Freight Plan: TRANSEARCH® Freight Movements data, trucks in 2014 transported 198.7 million tons of the over 212.0 million tons of freight that traveled Connecticut's transportation network, accounting for $337.5 billion in value (92.4% of total freight value). Ports are Connecticut's second largest mode to transport freight, but only accounted for 9.8 million tons and $9.2 billion in value. The 2014 TRANSEARCH® Freight Movements data also suggests that more than 48 million tons of truck freight use Interstate 95 throughout the SCCOG Region. This freight serves Connecticut, but also includes destinations throughout the New England and the Mid-Atlantic regions, namely New York, Massachusetts, Pennsylvania, and New Jersey. This data highlights the importance of analyzing roadway congestion and the effect that delay has on freight mobility and conversely the effect that freight movement has on personal vehicle travel.

6.1 Performance Measures

Corridor performance has been evaluated using travel speeds and V/C ratios for the region's congested corridors. Travel time runs were conducted on specific corridors to determine travel speeds, using GPS-assisted data collection with GIS data processing. The travel time runs have been designed to ensure comparable results to future collected data (if applicable) in both collection technique and segment definition.

Travel time/speed data collected and processed within the GPS/GIS system can be summarized by road segments defined by the user, based upon travel patterns and road characteristics. The data summaries include information by segment on its limits, segment length, travel time, average speed, number of stops, and time below certain threshold speeds. For each road segment, the speed limit was used to represent a reasonable peak hour speed standard or goal considering posted speed limits, area characteristics, and road classification. A segment is considered congested when its average travel speed is below the speed limit for its corresponding facility type. In evaluating travel time and speed data, transportation performance is measured by comparing segment average speed with the speed limit of the segment, and congestion is defined as average speed being less than the speed limit.

The V/C ratio performance measure was calculated periodically by CTDOT and documented in their CMP Congestion Screening and Monitoring Report. The V/C values are calculated using traffic volumes and roadway characteristics for each segment of each state route in Connecticut. Road segment limits for the analysis have been defined by CTDOT and break wherever there is a change in traffic volume, a change in number of lanes, at town lines, and at locations of existing CTDOT count stations. Therefore, some road segments are very short. For example, a segment along a freeway can begin where a deceleration lane for an off-ramp is added and end where the lane exits.

The V/C ratios included in this CMP Report are for the peak hour. The volumes are based on actual traffic counts, K factors were determined from the count data, and assumed directional splits of 55%/45%. Capacities were estimated using the Transportation Research Board's (TRB) Highway Capacity Manual 2000 procedures. In evaluating V/C data for the region's roadways, congestion was defined where a V/C ratio was greater than 0.90, which is a threshold that is consistent with CTDOT's definition.

6.2 Defining Congested Corridors

For SCCOG's CMP, travel time runs were performed on the region's major corridors where congestion was known to be a problem. Results from this data collection confirmed and quantified these issues. V/C ratios were used as an additional performance measure, and were useful screening the entire region's roadway system to identify other potential problem areas. Both 2017 speed data and the 2011 V/C data were used to evaluate corridor performance and to compare performance from year to year. The congested corridors identified in this CMP Report are based on the most recently available speed data. If the average speed for a roadway segment was below a speed limit (for a given roadway classification) then the corridor was considered congested. Corresponding average (length-weighted) V/C ratios for each segment were calculated for each segment for comparison. V/C ratios above 0.90 are considered congested. Congested corridors in the SCCOG Region, based on the most recently available speed data and V/C ratios, are shown below.

Table 1: SCCOG Region Congested Corridors

City/Town	Road	Length (miles)
Colchester	CT-85 from CT-354 to Amston Road/Broadway	1.16
East Lyme	CT-161 from Society Road to Industrial Park Road	.64 miles
Groton	CT-117 from US-1 to I-95 southbound	1.24 miles
New London	CT-641 from Federal Street/Huntington Street to Bank Street/Shaw Street	.74 miles
New London	CT-32 from Mohegan Avenue on-ramp to the Montville Connector	2.79 miles
New London	US-1 from Jefferson Avenue to Ocean Avenue	.04 miles
Norwich	CT-642 from Connecticut Avenue to CT-2/CT-32	1.45 miles
Norwich	CT-2 from Harland Road (CT-169/SR-642) to the second intersection with Water Street	1.67 miles
Norwich	CT-12 from Summer Street to Main Street	.31 miles
Norwich	CT-12 from Boswell Street to CT-97/Jewett City Road	.94 miles
Stonington	US-1 from CT-234 from the Rhode Island State Line	.59 miles
Windham	CT-32 from CT-66 to the US-6 Ramp	.82

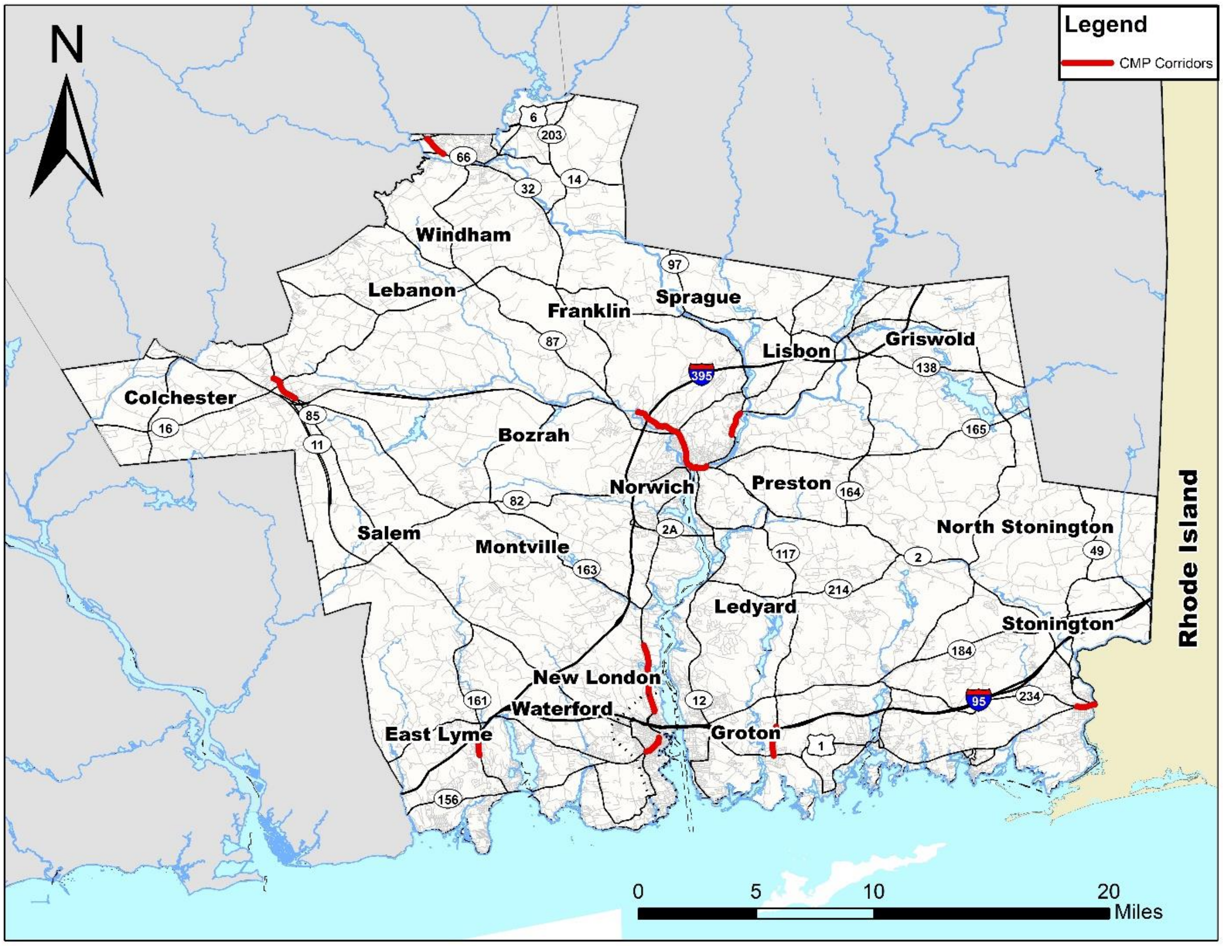


Figure 2: Congested Corridors in the Southeastern Transportation Management Area

Results from the two performance measures are not entirely consistent with one another. The difficulty interpreting travel speed data is a result of the uncertainty inherent in the selection of an appropriate threshold speed, as the actual roadway function may not correspond well to the given facility types. Average speeds can also vary greatly for shorter segments, or for highly signalized segments. The drawback to using V/C ratios is that they are calculated using several assumptions and simplifications. It was found for some corridors that congestion (based on measured travel speeds, as well as observation) is not as severe as the V/C ratios would indicate. In other locations, V/C ratios may underestimate the severity of congestion, since a bottleneck in one segment can impact adjacent segments causing a more widespread problem. This may be the case with several of the short segments identified based on V/C ratios.

7 CONGESTED CORRIDOR OVERVIEW

The results of the congested corridor evaluation are shown in the following figures and tables. The congested segments shown in the figures are based on 2017 speed data and the 2011 V/C data. The congested segments are highlighted in red in the tables and figures. In addition, the projected 2035 V/C data is highlighted in orange in the tables for projected V/C ratios that are greater than

0.90. Corridor segments are highlighted where the average travel speed was below the established speed limit.

7.1 CT-85 Congested Segments

Conditions: The study corridor along Route 85 in Colchester between Route 354 and Amston Road/Broadway is in a commercial zone. The businesses along the corridor tend to be in strip malls with large curb cuts. The small shopping plaza at the start of the corridor, at the southeast corner of the map, has approximately 160 feet of curb cut. Many vehicles were observed to be parked adjacent to the shoulder on the grass. The parking maneuvers necessary for this may cause delay. Furthermore, the inconsistency of sidewalks and lack of bicycle facilities along the roadway serve to dissuade use of alternative transportation modes.

Recommendations:

- Zoning ordinances, as well as physical changes to the roadway, such as adding a raised curb, could mitigate the delay associated with parking maneuvers in the roadway shoulders.
- Amending zoning to promote infill development could increase walkable areas along the corridor.
- As the traffic control devices along these segments only include three signals and a stop sign, signal optimization would be unlikely to have a dramatic change on traffic operations.
- Regulations that restrict development to two simple 12-foot curb cuts for vehicles entering and exiting the parking lot could serve to organize turning movements and improve safety.

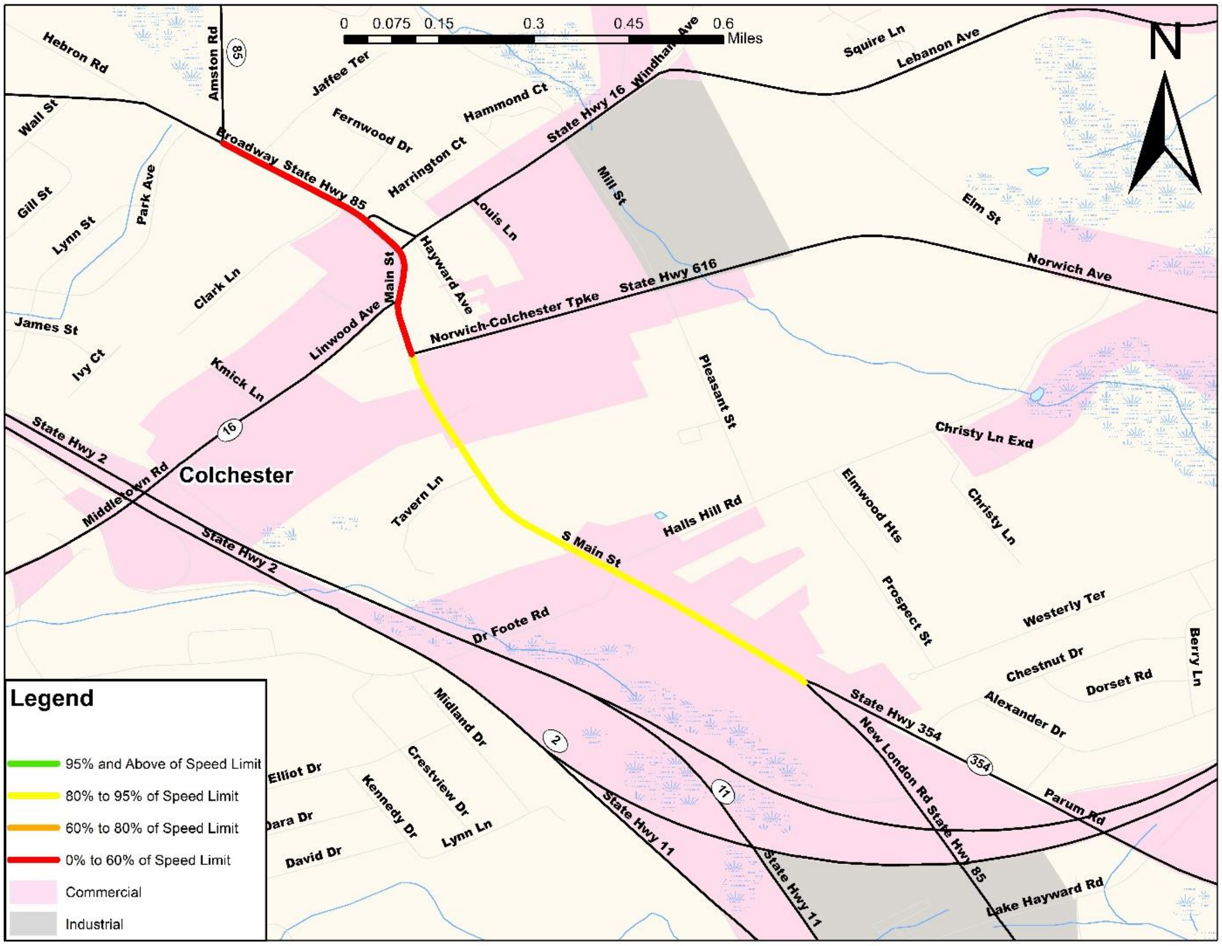


Figure 3: CT-85 Congested Segments

Table 2: CT-85 Corridor Evaluation

Segment		V/C		2017 Average Speed (mph)		Percent of Speed Limit	
		2011	2035	AM	PM	AM	PM
Westbound							
CT-354	Halls Hill Rd	0.94	1.15	28	16	81%	46%
Halls Hill Rd	.04 MI S OF SR 616	0.91	1.1	30	29	87%	83%
.04 MI S OF SR 616	SR 616(NORWICH AVE)	0.42	0.51				
SR 616(NORWICH AVE)	N JCT RTE 16(LEBANON AVE)	1.42	1.74	12	21	34%	61%
N JCT RTE 16(LEBANON AVE)	Amston Rd/Broadway (End Ovlp 615 and 85)	1.03	1.26				
Eastbound							
Amston Rd/Broadway (End Ovlp 615 and 85)	N JCT RTE 16(LEBANON AVE)	1.03	1.26	22	22	63%	64%
N JCT RTE 16(LEBANON AVE)	SR 616(NORWICH AVE)	1.42	1.74				
SR 616(NORWICH AVE)	.04 MI S OF SR 616	0.42	0.51	29	19	84%	55%
.04 MI S OF SR 616	Halls Hill Rd	0.91	1.1				
Halls Hill Rd	CT-354	0.94	1.15	19	22	56%	62%
Total		1.42	1.74	Speed Limit = 35			

7.2 CT-161 Congested Segments

Conditions: The study corridor along Route 161 from Society Road to Industrial Park Road is primarily residential for the first segment. Although it is interrupted by frequent curb cuts, there is not enough trip generation for turning movements to significantly delay traffic. Pedestrians are exposed at an unsignalized crosswalk at the intersection of Laurel Hill Road. The likelihood of a pedestrian surviving an automobile collision at 25 mph is more than double than at 35 mph, which is consistent with speeds that traffic is currently operating. This residential segment is followed by a long section of commercial land uses. Nearly all of these businesses operate out of suburban strip mall developments with numerous curb cuts that complicate traffic operations with vehicles turning in and out of the parking lots. Road width does not seem to be a problem on this segment.

Recommendations:

- One method to address delay may be to lower the speed limit to 25 mph to address safety concerns for residents and pedestrians.
- Reducing the speed limit to 25mph is a safety improvement would have the secondary impact of bringing the speed limit consistent with traffic flow.
- Discourage strip mall type of developments in the future, and incentivize redevelopment of large parking lots into more compact mixed-use centers that would function more like a traditional village.

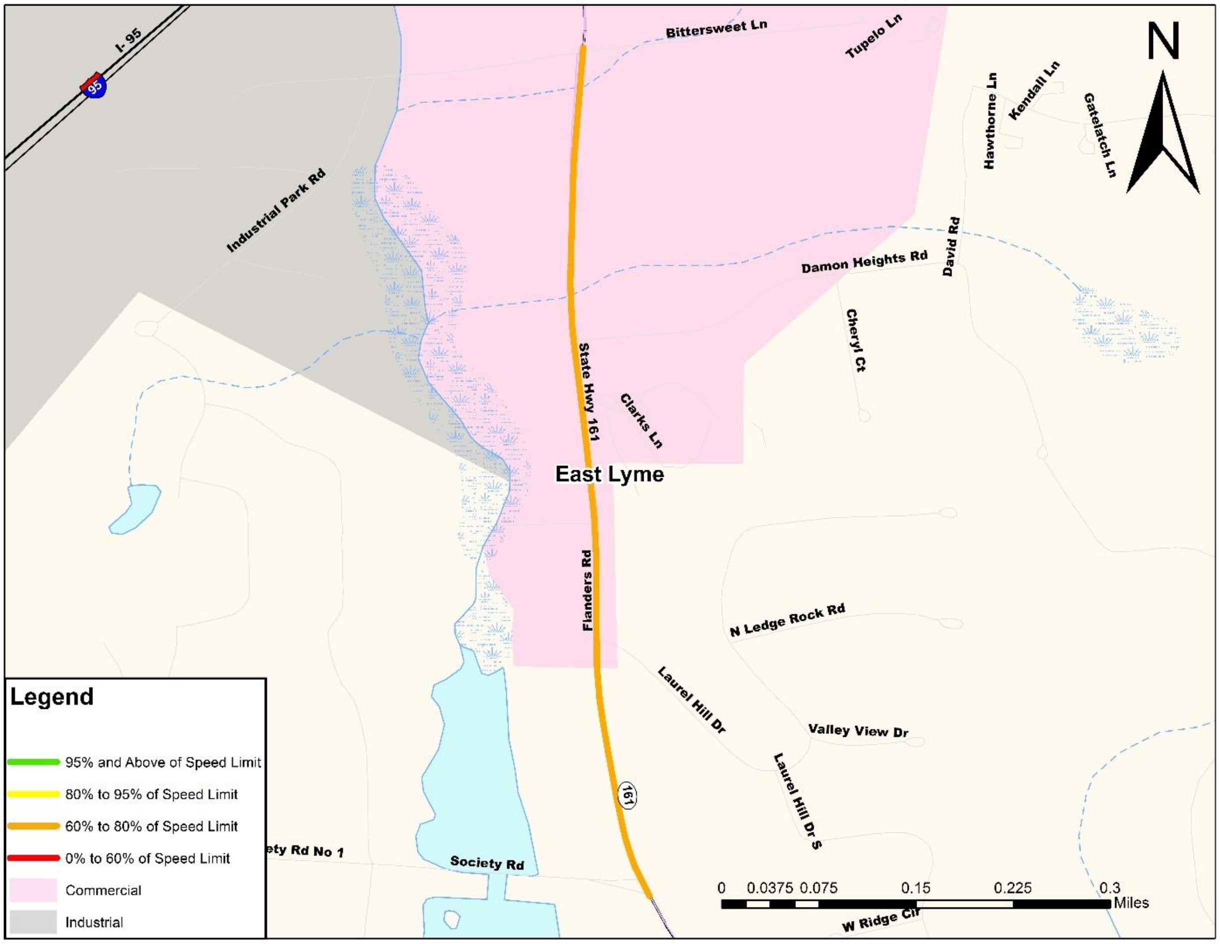


Figure 4: CT-161 Congested Segments

Table 3: CT-161 Corridor Evaluation

Segment		V/C		2017 Average Speed (mph)		Percent of Speed Limit	
		2011	2035	AM	PM	AM	PM
Northbound							
Society Rd	Damon Heights Rd	1.13	1.34	31	31	90%	88%
Damon Heights Rd	Industrial Park Rd	1.15	1.37	26	20	74%	58%
Southtbound							
Industrial Park Rd	Damon Heights Rd	1.15	1.37	23	25	66%	72%
Damon Heights Rd	Society Rd	1.13	1.34	32	28	91%	79%
Total		1.15	1.37	Speed Limit = 35			

7.3 CT-117 (Newton Road) Congested Segments

Conditions: The study corridor along Route 117 from US-1 to slightly past the I-95 overpass is a mixture of government institutions and a senior center; along with residential subdivisions on the southern segment. Field observations noted that school buses were parked on Route 117 near the Claude Chester Elementary School that significantly impaired traffic operations. The second segment is lined with open space and has few intersections to complicate traffic. As such, the travel speeds are significantly improved along the section from Indian Field Road to Hazelnut Hill Road but not operating at the speed limit during the peak periods. This corridor does not have land uses that are amenable to transit lines. Congestion's positive effect on this corridor is that speeds are lowered, which increases safety, particularly for vulnerable street users (elderly and children). This is especially important due to the proximity of the elementary school and senior center.

Recommendations:

- Roadway widening would encroach upon the open space. The final segment has wide roadways, but is subject to traffic entering and exiting Interstate 95.
- A revision to the speed limit that reflects the travel speeds noted in this report could both obviate the need to consider this a congested corridor and would be in line with the principles of the Connecticut Strategic Highway Safety Plan.

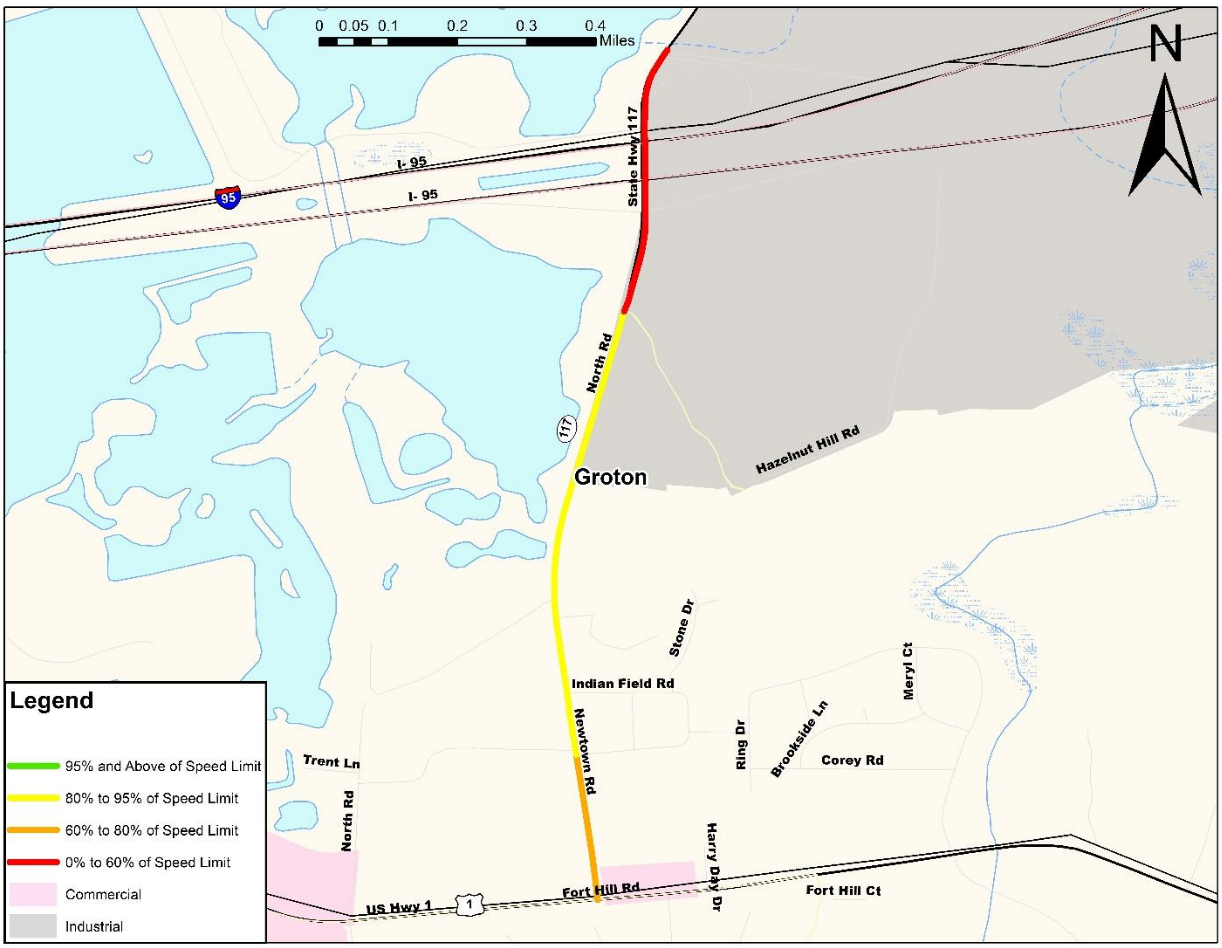


Figure 5: CT-117 (Newtown Road) US-1 Congested Segments

Table 4: CT-117 (Newtown Road) Corridor Evaluation

Segment		V/C		2017 Average Speed (mph)		Percent of Speed Limit	
		2011	2035	AM	PM	AM	PM
Westbound							
CT-66 Ramp (Columbia Ave)	Holbrook Ave	1.18	1.73	29	12	84%	33%
Holbrook Ave	Roanoak Ave	1.55	1.88	23	25	66%	78%
Roanoak Ave	Unmarked	0.78	0.94	34	31	98%	93%
Unmarked	US-6 Ramp	0.66	0.8				
Eastbound							
US-6 Ramp	Unmarked	0.66	0.8	31	26	88%	116%
Unmarked	Roanoak Ave	0.78	0.94				
Roanoak Ave	Holbrook Ave	1.55	1.88	18	19	52%	63%
Holbrook Ave	CT-66 Ramp (Columbia Ave)	1.18	1.73	23	12	65%	48%
Total		1.55	1.88	Speed Limit = 35			

7.4 CT-32 New London Congested Segments

Conditions: The study corridor along Route 32 from the Mohegan Avenue on-ramp in New London to the Montville Connector is a four-lane divided highway that is intermittently interrupted by traffic signals. As the traffic tends to flow at nearly the speed limit during the peak period for the second and third segments, the first segment to the Waterford town line is in the greatest need for congestion mitigation strategies. As V/C projections indicate an increase in traffic along the entire corridor, the following segment ending at Scotch Cap Road may experience a significant growth in delays, exacerbated by large suburban development that sprawls along the highway. The local side streets have too many entrances, which complicates traffic operations with unpredictable turning movements

Recommendations:

- Additional signal optimization for a smooth progression that prioritizes vehicles along the Mohegan Avenue Parkway (Route 32) may mitigate some of the delays associated with the congestion at the Waterford town line.
- To simplify traffic, many of the local side streets could be closed at their intersections with the parkway and traffic could be diverted to feeder roads with signalized entrances to the highway, such as Fitzgerald Avenue in Norwich.
- Open space preservation could abate further suburban development in the undeveloped area along the third segment. Discouraging further development through the protection of open space would minimize traffic entering the highway and mitigate future congestion.

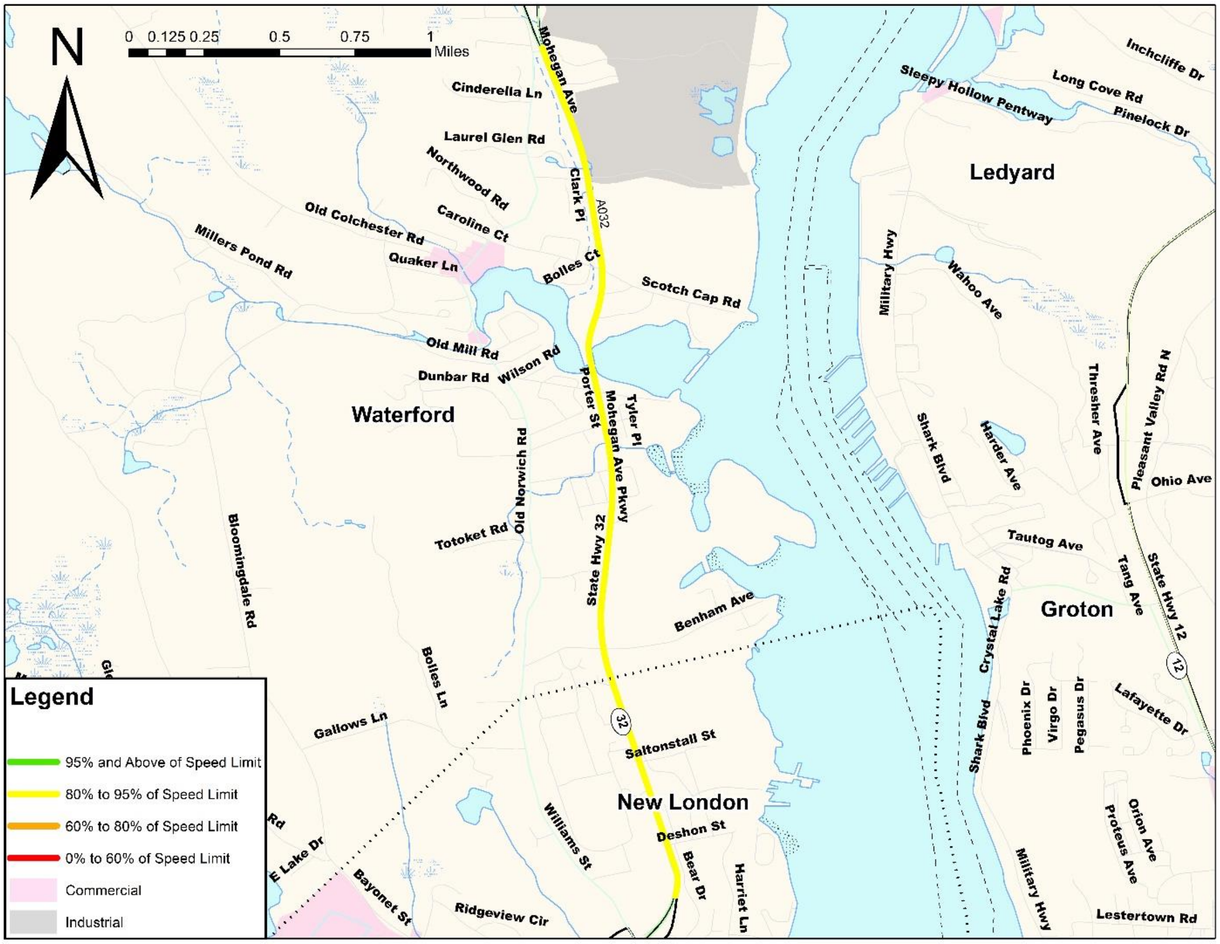


Figure 6: CT-32 New London Congested Segments

Table 5: CT-32 New London Corridor Evaluation

Segment		V/C		2017 Average Speed (mph)		Percent of Speed Limit	
		2011	2035	AM	PM	AM	PM
Northbound							
Mohegan Ave on-ramp	0.12 Mi N of NB ACC from SR 636	1.17	1.44	26	30	58%	67%
0.12 Mi N of NB ACC from SR 636	0.18 MI N of Deshon St	1.01	1.24				
0.18 MI N of Deshon St	0.07 MI S of New London-Waterford TL	1.01	1.24				
0.07 MI S of New London-Waterford TL	New London-Waterford TL	1.21	1.51				
New London-Waterford TL	May Ave #1	1.18	1.46	43	44	97%	98%
May Ave #1	Unmarked	1.21	1.51				
Unmarked	Scotch Cap Rd (DE)	0.85	1.06				
Scotch Cap Rd (DE)	Montville Connector	1.14	1.41	42	55	94%	122%
Southbound							
Montville Connector	Scotch Cap Rd (DE)	1.14	1.41	42	49	94%	110%
Scotch Cap Rd (DE)	Unmarked	0.85	1.06	40	37	89%	82%
Unmarked	May Ave #1	1.21	1.51				
May Ave #1	New London-Waterford TL	1.18	1.46				
New London-Waterford TL	0.07 MI S of New London-Waterford TL	1.21	1.51	24	32	53%	72%
0.07 MI S of New London-Waterford TL	0.18 MI N of Deshon St	1.01	1.24				
0.18 MI N of Deshon St	0.12 Mi N of NB ACC from SR 636	1.01	1.24				
0.12 Mi N of NB ACC from SR 636	Mohegan Ave on-ramp	1.17	1.44				
Total		1.21	1.51	**Speed Limit = 45**			

7.5 CT-641 (Truman Street) Congested Segments

Conditions: The study corridor along Route 641 in New London from Federal Street to Bank Street travels through a variety of land uses, from residential and commercial buildings built out to the street that exemplify strong urbanist principles, particularly in the second segment, to strip mall development with a surfeit of curb cuts, visible in the third segment. The first segment tends to have higher density residential land uses with large parking lots similar to the parking abundance in the third segment. Steps to minimize curb cuts in these areas could help to organize traffic.

Recommendations:

- The most promising effort to mitigate congestion would be to coordinate the signals along the corridor. Currently, the signals at the intersections with Truman Street and Hempstead Street are the only coordinated signals. Adding the signals at Bank Street, Huntington Street at State Street, and Huntington Street to an optimized progressive signal plan could significantly improve the flow of traffic.

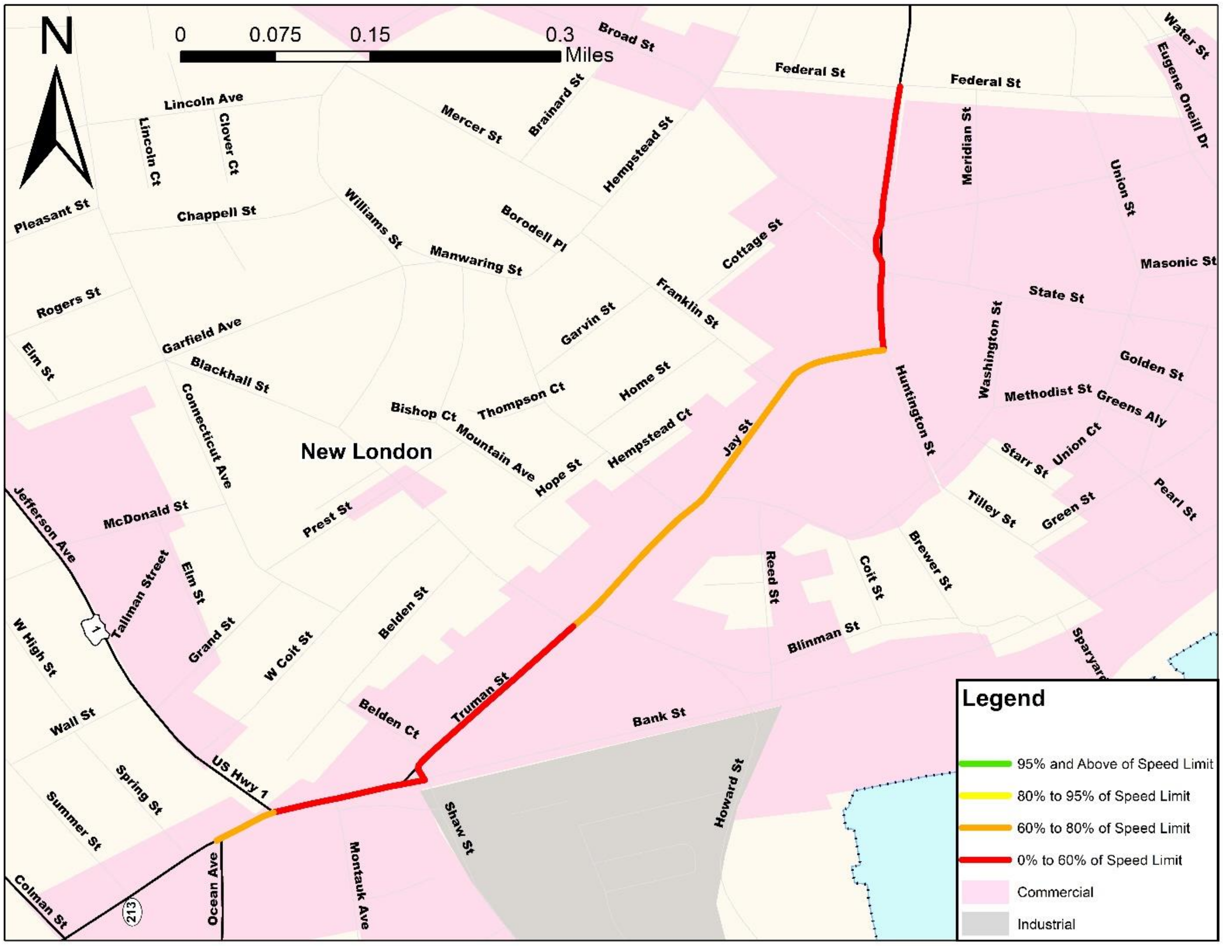


Figure 7: CT-641 (Truman Street) Congested Segments

Table 6: CT-641 (Truman Street) Corridor Evaluation

Segment		V/C		2017 Average Speed (mph)		Percent of Speed Limit	
		2011	2035	AM	PM	AM	PM
Northbound							
Bank St/Shaw St	Montauk Ave	0.44	0.54	10	10	68%	72%
Montauk Ave	Shaw St	0.72	0.88				
Shaw St	Blackhall St	0.36	0.44				
Blackhall St	Blinman St #2	0.72	0.88	17	20	56%	52%
Blinman St #2	0.06 MI S of Hempstead St	0.53	0.65				
0.06 MI S of Hempstead St	Hempstead St	0.6	0.74				
Hempstead St	Huntington St	0.3	0.37				
Huntington St	Unmarked	0.6	0.74	14	16	59%	31%
Unmarked	State St	0.81	0.99				
State St	Broad St	1.2	1.47				
Broad St	Federal St/Huntington St	0.6	0.74				
Southbound							
Federal St/Huntington St	Broad St	0.6	0.74	17	18	42%	41%
Broad St	State St	1.2	1.47				
State St	Unmarked	0.81	0.99				
Unmarked	Huntington St	0.6	0.74				
Huntington St	Hempstead St	0.3	0.37	14	13	69%	79%
Hempstead St	0.06 MI S of Hempstead St	0.6	0.74				
0.06 MI S of Hempstead St	Blinman St #2	0.53	0.65				
Blinman St #2	Blackhall St	0.72	0.88				
Blackhall St	Shaw St	0.36	0.44	15	8	56%	65%
Shaw St	Montauk Ave	0.72	0.88				
Montauk Ave	Bank St/Shaw St	0.44	0.54				
Total		1.2	1.47	Speed Limit = 25			

7.6 US-1 (Bank Street) New London Congested Segments

Conditions: The study corridor along US-1 from Jefferson Avenue to Ocean Avenue is a short one-block segment with frequent curb cuts to accommodate many commercial buildings on one block. The segment is defined by two three-way intersections at either side.

Recommendations:

- Depending on signal phasing, closing the signalized entrance/exit to CVS and directing those vehicles to the now secondary entrance/exit located on Jefferson Avenue could add more green time to each direction in the roadway and would also reduce the number of cars on this segment. Coordination of signals at the Bank Street/Ocean Street intersection with the following signals on Bank Street at Jefferson Street and Truman Street could allow for increased traffic throughput along the corridor.

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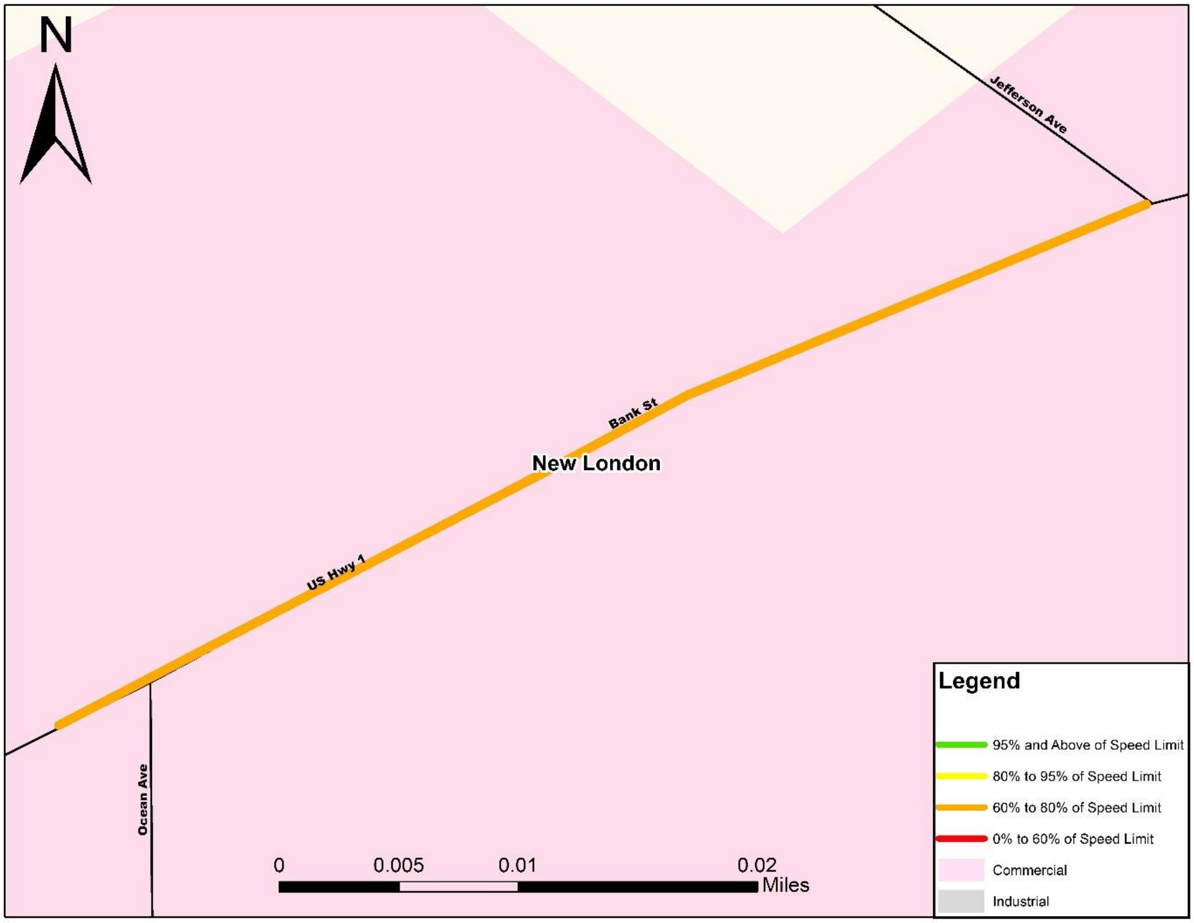

Figure 8: US-1 (Bank Street) Congested Segments

Table 7: US-1 (Bank Street) Corridor Evaluation

Segment		V/C		2017 Average Speed (mph)		Percent of Speed Limit	
		2011	2035	AM	PM	AM	PM
Westbound							
Jefferson Ave	Ocean Ave	1.07	1.32	26	18	77%	73%
Eastbound							
Ocean Ave	Jefferson Ave	1.07	1.32	16	18	64%	73%
Total		1.17	1.45	Speed Limit = 25			

7.7 CT-2 (Washington Street) Congested Segments

Conditions: The study corridor along Route 2 begins at an intersection with heavy traffic due its location at the juncture of several state highways. This is immediately followed by a very large traffic generator, The William W. Backus Hospital and its major entrance/exit immediately following the aforementioned intersection. If possible, the hospital could be asked to consider moving the main entrance from Route 2 to another secondary entrance on Lafayette Street. The corridor is then flanked by primarily residential land uses for the rest of the first segment. At

Broadway, the second segment, which is nearly all residential, operates at traffic flows at or above the speed limit for three out of the four period/direction combinations. The final segment from School Street exhibits the worst delays of the corridor, even though the roadway widens significantly.

Recommendations:

- Improved signal timing may ameliorate the delay along this section. Additionally, this part of the corridor is in an urbanized transit-supportive area that could benefit from improved bus service.
- Bus Rapid Transit (BRT) elements such as dedicated lanes, Transit Signal Priority (TSP), and queue jumps could potentially make a bus trip faster than a car trip; spurring some degree of mode shift for current automobile commuters. This could result in ultimately reducing vehicle traffic as motorists shift to transit riders.

Figure 9: CT-2 (Washington Street) Congested Segment

Table 8: CT-2 (Washington Street) Corridor Evaluation

Segment		V/C 2011	V/C 2035	2017 Average Speed (mph) AM	2017 Average Speed (mph) PM	Percent of Speed Limit AM	Percent of Speed Limit PM
Eastbound							
Harland Rd (RTE 169 & SR	Bliss Pl (DE)	1.54	1.91	21	20	84%	81%
Bliss Pl (DE)	Julian St	0.77	0.95				
Julian St	Lafayette St	1.54	1.91				
Lafayette St	Broadway #2	1.05	1.3				
Broadway #2	0.3 MI W of Williams St	0.76	0.95	25	31	101%	123%
0.3 MI W of Williams St	Sachem St	0.79	0.98				
Sachem St	Taylor Dr (CDS)	0.91	1.13				
Taylor Dr (CDS)	School St #1 (DE)	0.89	1.1				
School St #1 (DE)	0.4 MI W of RTE 32	0.95	1.18	15	15	61%	60%
0.4 MI W of RTE 32	RTE 32 SB & RTE 82 WB	0.48	0.59				
RTE 32 SB & RTE 82 WB	RTE 32 NB & RTE 82 EB	0.96	1.2				
RTE 32 NB & RTE 82 EB	Junction WB RT 2 (Water St)	1.05	1.3				
Junction WB RT 2 (Water St)	Unmarked	0.7	0.87				
Unmarked	Market St	0.70	0.87				
Market St	Water St (Second Intersection)	1.05	1.3				
Westbound							
Water St (second intersection)	Market St	1.05	1.3	17	18	69%	71%
Market St	Unmarked	0.70	0.87				
Unmarked	Junction WB RT 2 (Water St)	0.70	0.87				
Junction WB RT 2 (Water St)	RTE 32 NB & RTE 82 EB	1.05	1.3				
RTE 32 NB & RTE 82 EB	RTE 32 SB & RTE 82 WB	0.96	1.2				
RTE 32 SB & RTE 82 WB	0.4 MI W of RTE 32	0.48	0.59				
0.4 MI W of RTE 32	School St #1 (DE)	0.95	1.18				
School St #1 (DE)	Taylor Dr (CDS)	0.89	1.1	28	19	112%	76%
Taylor Dr (CDS)	Sachem St	0.91	1.13				
Sachem St	0.3 MI W of Williams St	0.79	0.98				
0.3 MI W of Williams St	Broadway #2	0.76	0.95				
Broadway #2	Lafayette St	1.05	1.3	25	12	102%	48%
Lafayette St	Julian St	1.54	1.91				
Julian St	Bliss Pl (DE)	0.77	0.95				
Bliss Pl (DE)	Harland Rd (RTE 169 & SR 642	1.54	1.91				
Total		1.54	1.91	Speed Limit = 25			

7.8 CT-642 Congested Segments

Conditions: The study corridor along Route 642 from Connecticut Avenue to Harland Road/CT-2/CT-32 begins through a commercial strip with a significant number of parking lots with little or no channelization of vehicles. As mentioned in earlier similar situations, restricting the ingress and egress of vehicles would simplify interruptions in the flow of traffic. This segment then passes through the series of entrance and exit ramps for I-395, which add significant traffic volume to the system. After the exit ramps, the next segment generally operates at traffic flows close to the speed limit.

Starting at the intersection with the New London Turnpike, the next segment is again dominated by strip mall development that was not designed with safety or traffic operations in mind. The

James Plaza, for example, has a parking lot that is not constrained by a curb at any point along Route 642.

Recommendations:

- Zoning restrictions could require curb lines to define the edges of the parking lots to simplify traffic operations along this segment.
- Additionally, at older/failing strip malls, there could be incentives to redevelop land in a more sustainable mixed-use pattern that prioritizes pedestrians, cyclists, and transit.

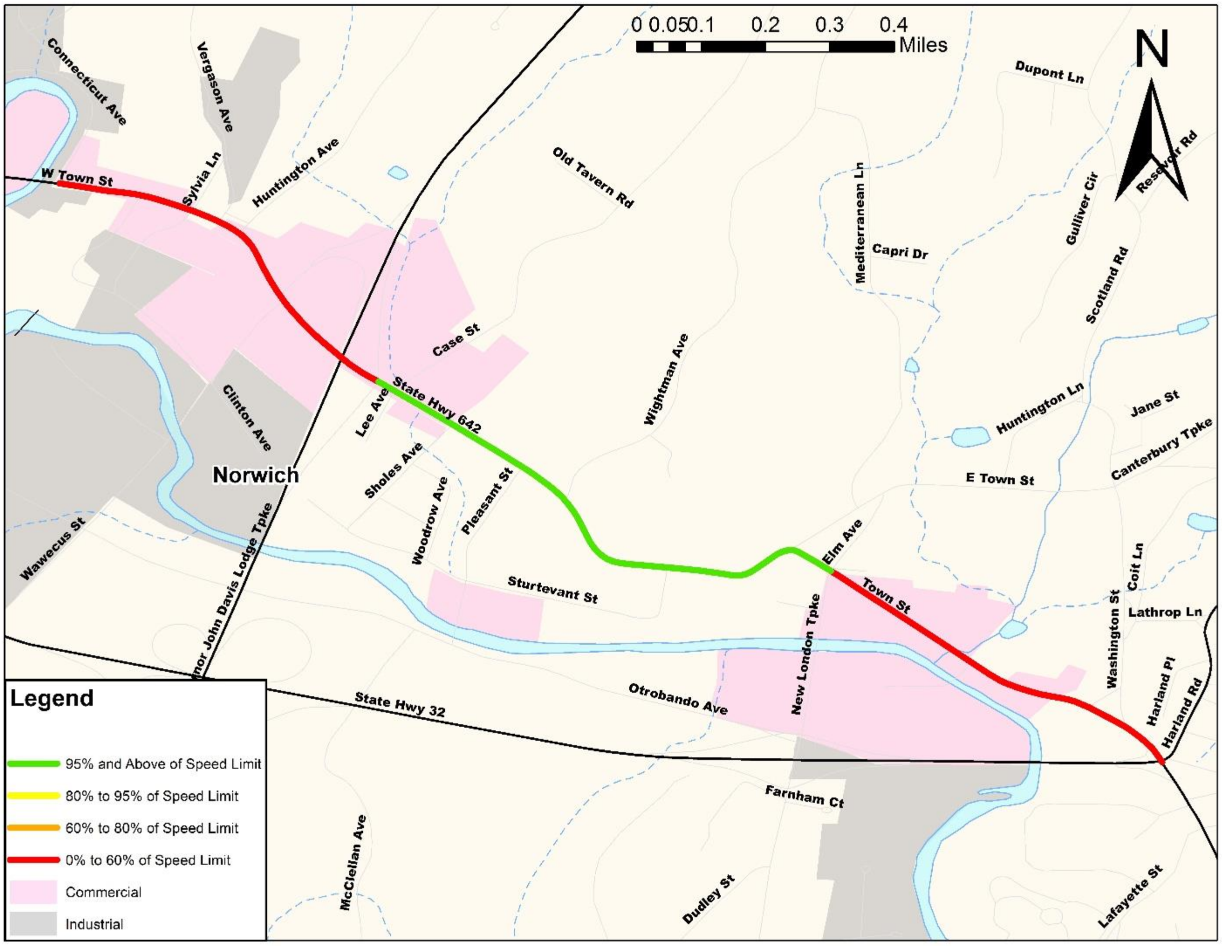

Figure 10: CT-642 Congested Segments

Table 9: CT-642 Corridor Evaluation

Segment		V/C		2017 Average Speed (mph)		Percent of Speed Limit	
		2011	2035	AM	PM	AM	PM
Eastbound							
Connecticut Ave	Access to SB I-395 (016)	1.46	1.8	8	8	34%	32%
Access to SB I-395 (016)	Exit from NB I-395 (015)	1.26	1.56				
Exit from NB I-395 (015)	E Town St	1.06	1.31	21	25	83%	98%
E Town St	New London TPKE	0.89	1.1				
New London TPKE	Washington St	0.82	1.01	15	11	62%	42%
Washington St	Town St/Harland Rd/CT-2/CT-32	1.15	1.43				
Westbound							
Town St/Harland Rd/CT-2/CT-32	Washington St	1.15	1.43	16	17	64%	68%
Washington St	New London TPKE	0.82	1.01				
New London TPKE	E Town St	0.89	1.1	35	23	138%	91%
E Town St	Exit from NB I-395 (015)	1.06	1.31				
Exit from NB I-395 (015)	Access to SB I-395 (016)	1.26	1.56	8	9	32%	37%
Access to SB I-395 (016)	Connecticut Ave	1.46	1.8				
Total		1.26	1.56	Speed Limit = 25			

7.9 CT-12 (Viaduct Road) Congested Segments

Conditions: The study corridor along Route 12 from Water Street to the intersection with Main Street begins with the complex intersection with Talman Street. Changes to the striping plan, roadway geometry, and signal timing plan at this intersection should optimize and organize the flow of traffic. There are no intersections or curb cuts to interrupt the narrow roadway of Route 2 until roughly the middle of this segment where Railroad Landing has a very large and highly utilized parking lot. This parking lot has no signalization or stop control. Additionally, there is little opportunity to move its entrance as the parking lot is bound by Viaduct Road (Route 12) and the railroad line.

Recommendations:

- A signal could be added at the parking lot entrance, and coordinated with the signal at Route 12 and Talman Street to regulate the number of vehicles entering the system.
- Further, eastbound vehicles entering the parking lot create delays for all eastbound traffic as the roadway width is very limited. A left-turn ban on Route 12 at this parking lot could eliminate excessive left-turn queues; this is additionally appealing as detours from Talman Street and Main Street would only add roughly 0.35 miles to an eastbound trip to this location while significantly improving delays.
- Additional signal retiming at the final Main Street intersection could potentially mitigate any other congestion along the corridor.

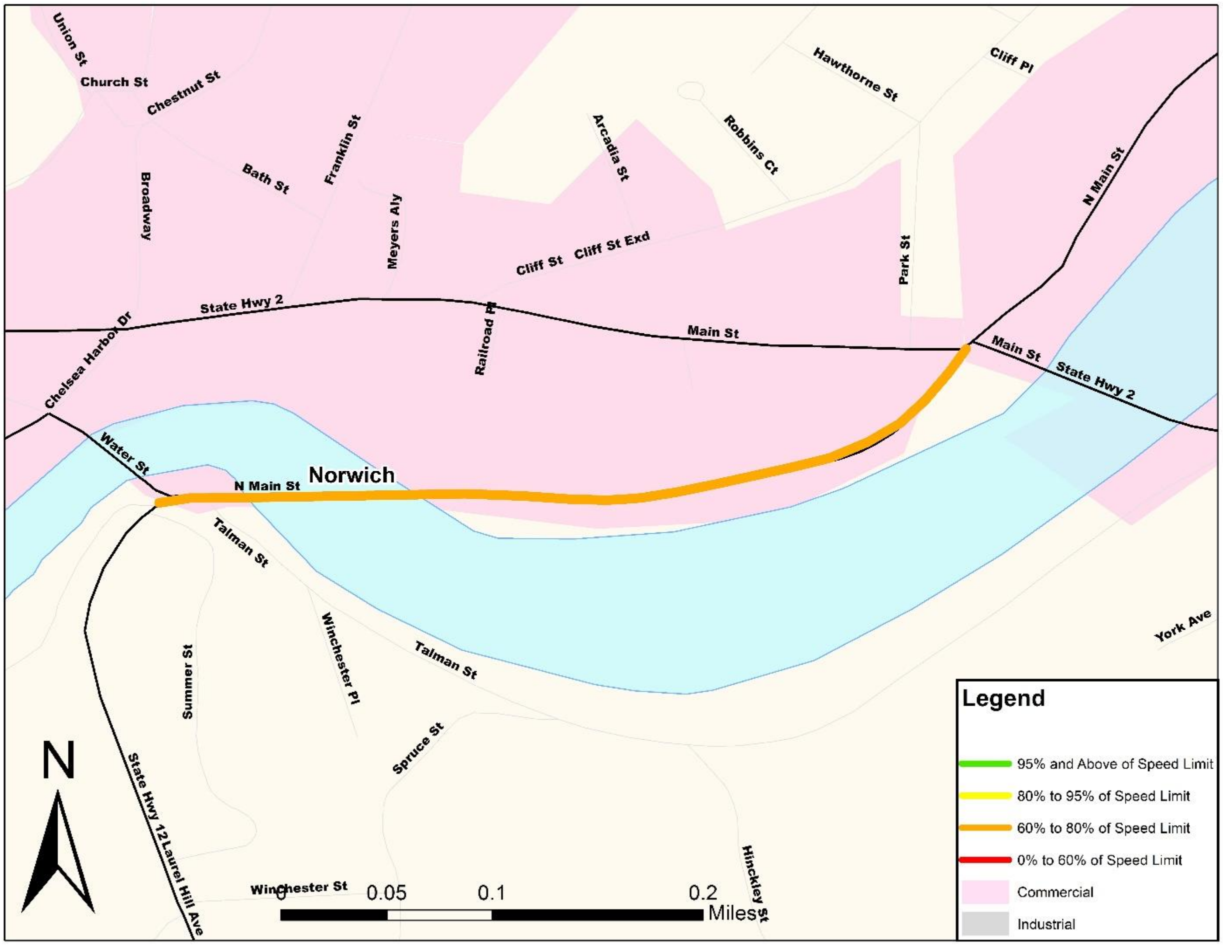

Figure 11: CT-12 (Viaduct Road) Congested Segments

Table 10: CT-12 (Viaduct Road) Corridor Evaluation

Segment		V/C		2017 Average Speed (mph)		Percent of Speed Limit	
		2011	2035	AM	PM	AM	PM
Eastbound							
Summer St	E Main St (Main St)	1.07	1.32	19	9	77%	37%
Westbound							
E Main St (Main St)	Summer St	1.07	1.32	17	17	67%	66%
Total		1.17	1.45	Speed Limit = 25			

7.10 CT-12 (N. Main Street) Congested Segments

Conditions: The study corridor along Route 12 from the intersection with North Main Street to the intersection with Jewett City Road begins with commercial retail land uses similar to other corridors in the study that tend to lack access management improvements in regard to vehicles entering and exiting parking lots. Regulations that require curb lines to be added to parking lots and for clearly defined space for vehicles to move would simplify traffic operations and improve safety. As the land use shifts to residential, the traffic flows without delay at the peak period. In the final segment, the land uses return to commercial but traffic delays are not present. This is due to the decline of this area as a thriving commercial center; many buildings are vacant or underutilized.

Recommendations:

- This area could be an excellent opportunity for redevelopment in a manner that does not prioritize automobiles or large parking lots, allowing for open space preservation while encouraging development, and providing a walkable transit-supportive community such as a Transit Oriented Development (TOD). This type of comprehensive redesign could be achieved through partnerships with the Town of Norwich (to implement strict zoning), Connecticut DOT, the Southeast Area Transit District, and private developers.

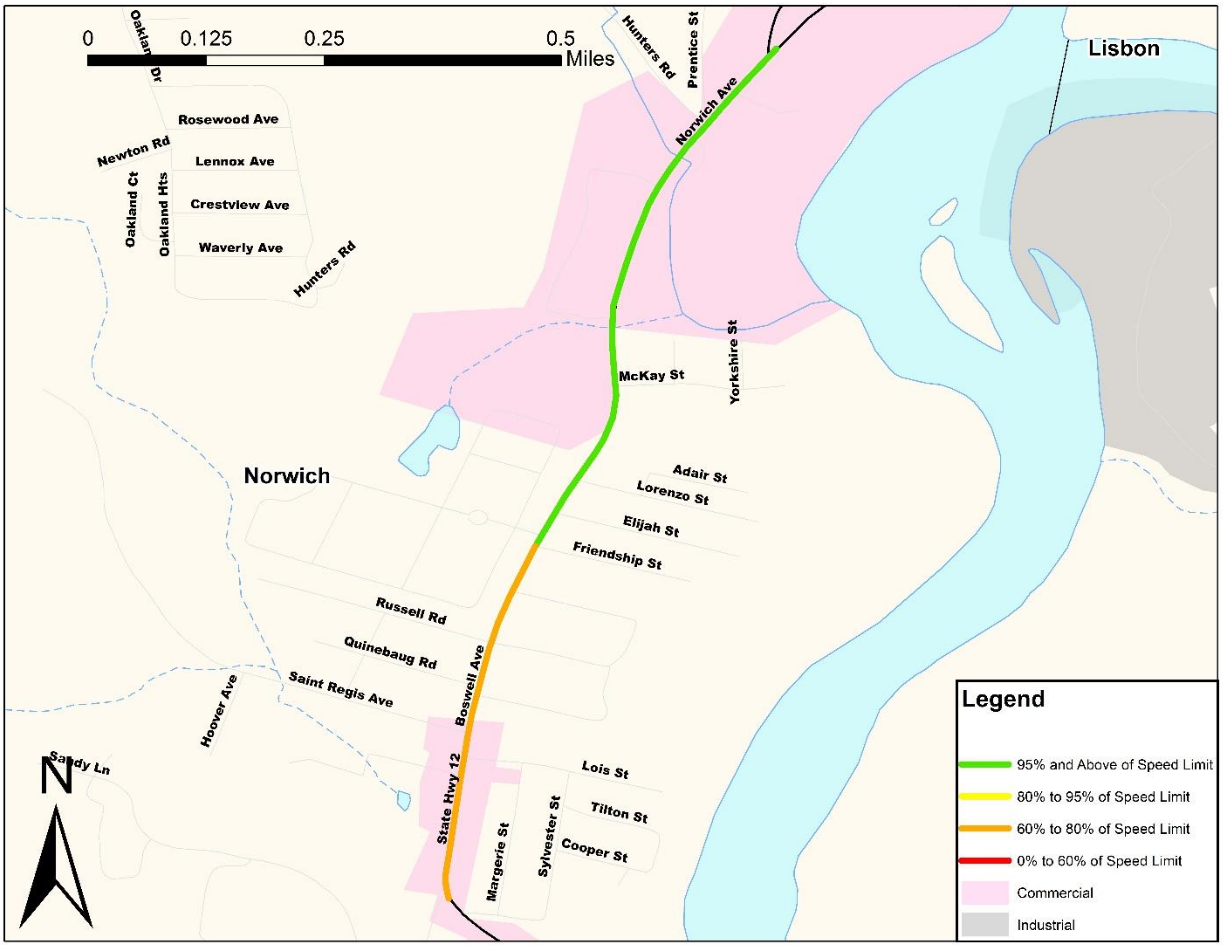

Figure 12: CT-12 (N Main Street) Congested Segments

Table 11: CT-12 (N Main Street) Corridor Evaluation

Segment		V/C		2017 Average Speed (mph)		Percent of Speed Limit	
		2011	2035	AM	PM	AM	PM
North/Eastbound							
N Main St/Boswell Ave	Friendship St	1.17	1.45	32	35	130%	141%
Friendship St	Hunters Rd	0.58	0.72	30	27	121%	107%
Hunters Rd	Prentice St	0.54	0.67	25	32	100%	130%
Prentice St	CT-97 (Norwich Ave/Jewett City Rd)	1.09	1.35				
South/Westbound							
CT-97 (Norwich Ave/Jewett City Rd)	Prentice St	1.09	1.35	13	9	54%	36%
Prentice St	Hunters Rd	0.54	0.67				
Hunters Rd	Unmarked	0.58	0.72	31	30	123%	120%
Unmarked	N Main St/Boswell Ave	1.17	1.45	32	29	129%	115%
Total		1.17	1.45	Speed Limit = 25			

7.11 US-1 (S. Broad Street) Congested Segments

Conditions: The study corridor along US Route 1 in Stonington begins at the intersection of Pequot Trail and South Broad Street and ends at the Rhode Island State line. The first segment to Washington Street, and the second segment to Route 2, travel through primarily residential land uses and showed no delay. Starting at Route 2, the land uses change to commercial and the traffic delays bring travel speeds down significantly. This area is a dense commercialized strip that is highly pedestrianized and has several un-signalized crosswalks.

Recommendations:

- A speed limit of 15 mph would be more appropriate for both the character of the district and safety. Furthermore, lowering the speed limit would direct much of the through traffic to nearby routes with higher speeds and capacities such as Rhode Island Route 78 or I-95.

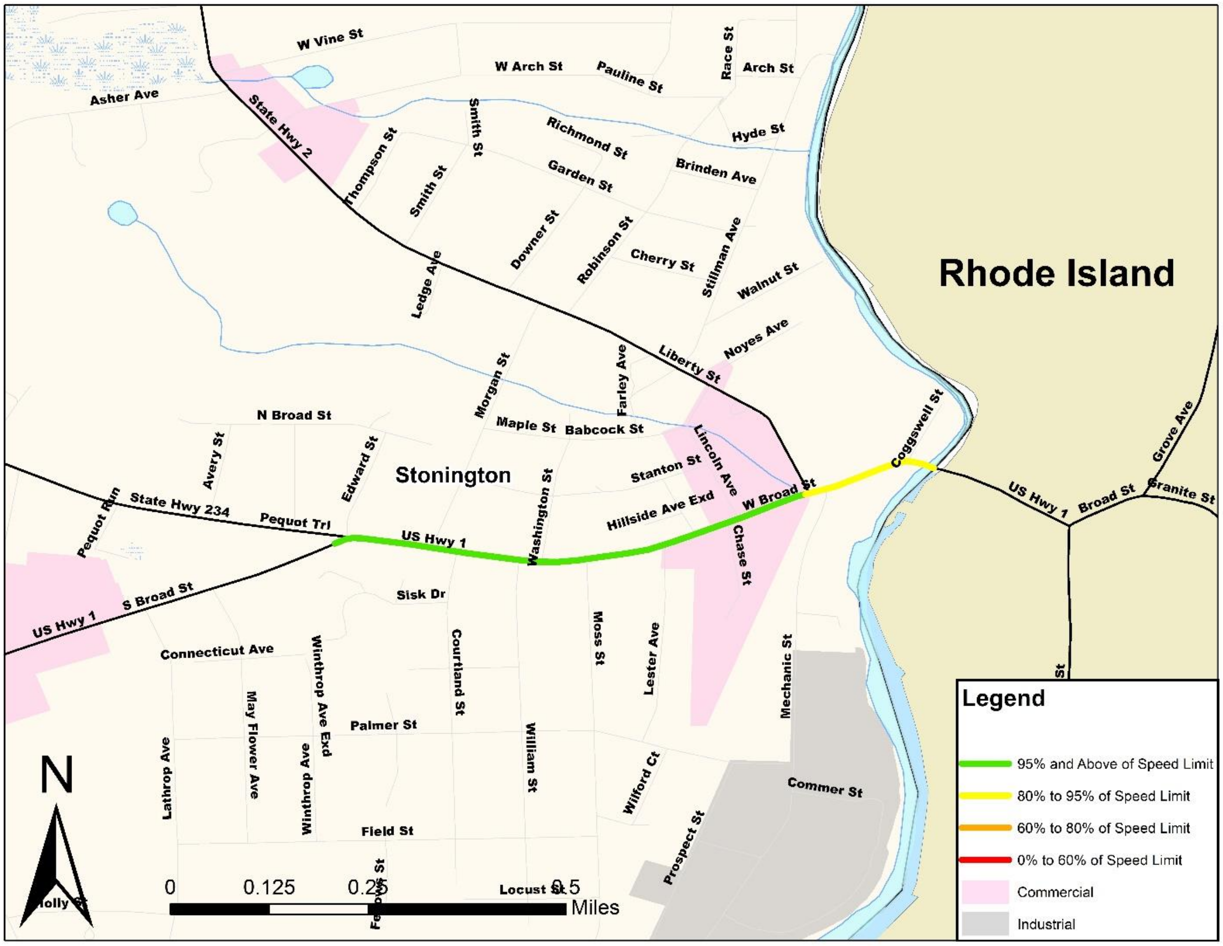

Figure 13: US-1 (S Broad Street)

Table 12: US-1 (S Broad Street) Corridor Evaluation

Segment		V/C		2017 Average Speed (mph)		Percent of Speed Limit	
		2011	2035	AM	PM	AM	PM
Eastbound							
CT-234 (Pequot Tr)	Washington St	0.69	0.77	24	31	97%	123%
Washington St	RT 2 (Liberty St)	0.8	0.89	30	30	122%	122%
RT 2 (Liberty St)	RI State Line	1.67	1.85	16	18	62%	74%
Westbound							
RI State Line	RT 2 (Liberty St)	1.67	1.85	20	15	80%	62%
RT 2 (Liberty St)	Washington St	0.8	0.89	30	30	121%	120%
Washington St	CT-234 (Pequot Tr)	0.69	0.77	29	30	115%	120%
Total		1.67	1.85	Speed Limit = 25			

7.12 CT-32 Windham Congested Segments

Conditions: The study corridor along Route 32 from Route 66/Columbia Avenue to Holbrook Avenue begins with a three-legged intersection that is complicated by vehicles exiting the Stop and Shop parking lot in the center of the intersection. Signal optimization may help with simplifying the traffic flow. The first segment is largely comprised of commercial land uses. The next segment starts with vacant land and smaller businesses whose parking lots lack defined entrances or exits as the entire length of the parking lots are unbounded by the curb lines. The erratic nature of turning movements in the absence of organized entrance and exit points serves to disrupt the flow of traffic.

Recommendations:

- Zoning to require a curb line with distinct access points to the roadway could simplify traffic operations and minimize the disruptions to the flow of traffic.
- Future comprehensive planning that limits automobile oriented strip mall development and encourages mixed use development could potentially serve to minimize trip generation and shorten travel distances along the corridor.

Figure 14: CT-32 Windham Congested Segments

Table 13: CT-32 Windham Corridor Evaluation

Segment		V/C		2017 Average Speed (mph)		Percent of Speed Limit	
		2011	2035	AM	PM	AM	PM
Westbound							
CT-66 Ramp (Columbia Ave)	Holbrook Ave	1.18	1.73	29	12	84%	33%
Holbrook Ave	Roanoak Ave	1.55	1.88	23	25	66%	78%
Roanoak Ave	Unmarked	0.78	0.94	34	31	98%	93%
Unmarked	US-6 Ramp	0.66	0.8				
Eastbound							
US-6 Ramp	Unmarked	0.66	0.8	31	26	88%	116%
Unmarked	Roanoak Ave	0.78	0.94				
Roanoak Ave	Holbrook Ave	1.55	1.88	18	19	52%	63%
Holbrook Ave	CT-66 Ramp (Columbia Ave)	1.18	1.73	23	12	65%	48%
Total		1.55	1.88	Speed Limit = 35			

8 PERFORMANCE MONITORING PLAN

Connecticut DOT has updated its CMP performance measures to a delay system based on observed travel times rather than V/C ratios; travel speeds on some of the regions congested corridors will be periodically collected by conducting travel time runs.

Limitations of V/C data include poor information on secondary roads, which are based on a series of assumptions and potentially outdated characteristics. Capacities of secondary roads are difficult to estimate, particularly where there are signalized intersections, cross streets, and driveways. It is also difficult to maintain accurate traffic counts at so many locations. Moreover, the methods used to calculate V/C ratios will not effectively capture the impact of small-scale improvements (such as coordinating traffic signals) that could improve efficiency. Additionally, the large datasets used to calculate the V/C ratios are not frequently updated; year over year improvements are not immediately apparent.

SCCOG will conduct travel time runs at regular intervals on several of the area's congested corridors to monitor congestion levels. Travel time data is used to determine average peak hour travel speeds and other operational information, such as the number of stops and travel speed profiles. This data is particularly useful as a CMP performance measure as it provides easily comparable measures from year to year, it is applicable to all modes of travel, and is straightforward enough for public use. In addition to travel time data collection on some of the region's main corridors, runs could be made for any trip route using any mode and could be designed to measure project pre/post-implementation performance levels. One of the current disadvantages of travel time data is the limited coverage of the region's transportation system due to the labor-intensive process of collecting and processing the data.

However, new efforts such as the World Bank's Open Traffic program are using vehicle and smartphone GPS locations to aggregate traffic statistics. Additionally, the FHA National Performance Management Research Data Set (NPMRDS) has speed probe data for travel times on the National Highway System. This data is limited to major routes and its reliability has come under question. The Wisconsin Traffic Operations and Safety Laboratory at the University of Wisconsin analyzed the data along the primary freight network with the NPMRDS Travel Time Reliability Map (see below), which shows significant issues with the data. However, the quality of the NPMRDS data and availability of open data sources should be expected to improve in the future. Soon, the need for travel time runs will be obviated by the availability of this data.

Future updates to this report will include the collection of travel time data. The data is particularly suited for capturing the effect of evolving travel patterns, as well as general growth and development. However, since the V/C ratios and travel time data that are currently used for the SCCOG CMP do not directly account for transit operations, the effect of non-recurring congestion, or preservation/maintenance issues, future CMPs could include new performance measures and additional data collection techniques as funding allows. It is particularly desirable to include measures for transit operations, such as on-time performance, passengers to capacity ratios, and daily ridership. System reliability measures could include the number of incidents or average clearance time for incidents. Measures to evaluate system preservation efforts in the region could include the number of bridges rated "poor" or number of roadway miles with deficient ride quality. Data for other projects on a smaller scale could be included in future CMP Update Reports.

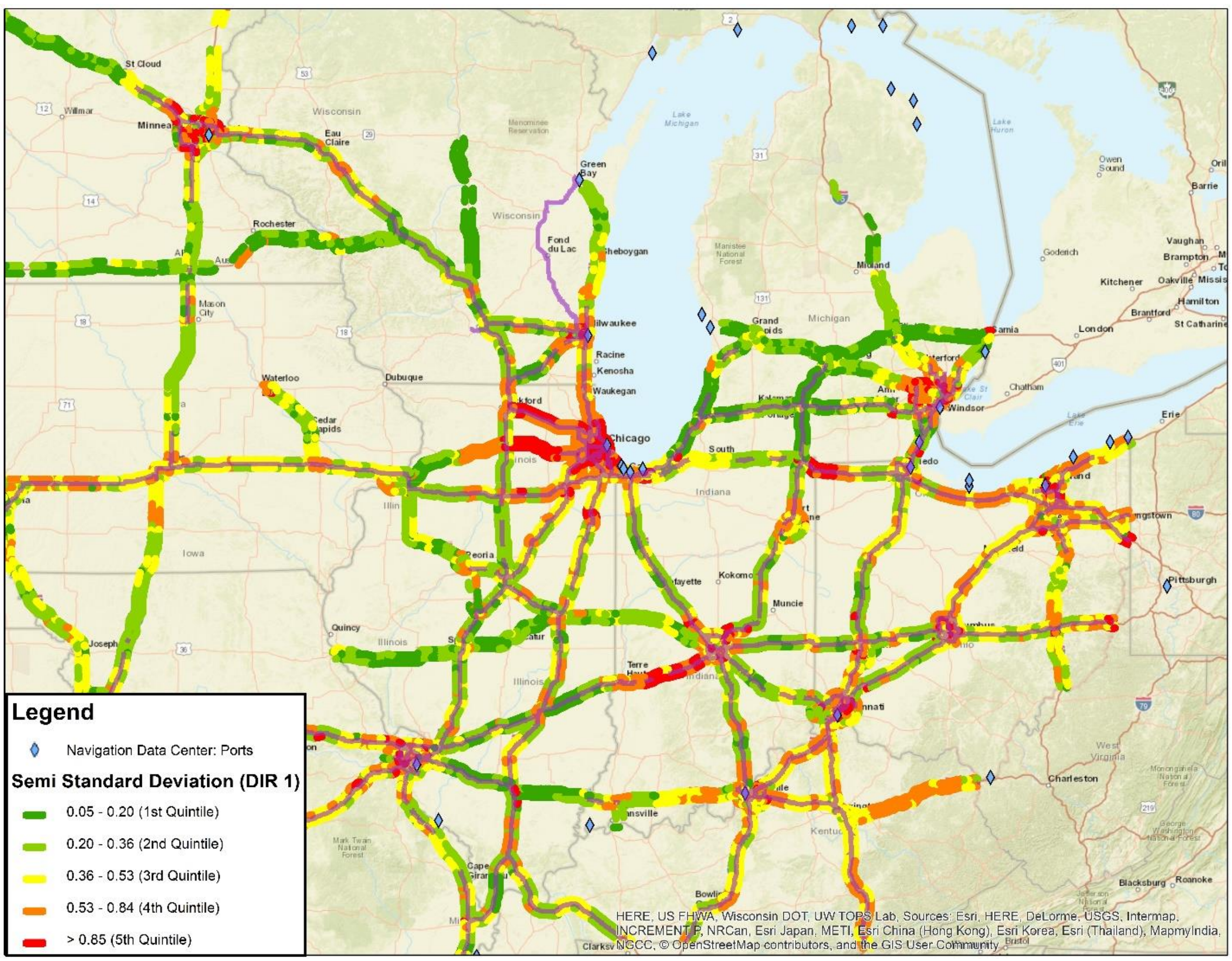

Figure 15: NPMRDS Travel Time Reliability Analysis

9 CONGESTION MITIGATION STRATEGIES

Strategies for addressing congestion fall into four main categories:

- Increasing capacity of the transportation system.
- Improving efficiency of the existing transportation system.
- Influencing travel patterns to reduce and/or spread peak demand.
- Land use policies that promote transit, walking, and cycling.

Projects to increase system capacity could include roadway widening, roadway construction on a new alignment, redesign of bottleneck areas, reconfiguration of intersections, adding transit service with shorter headways or new routes, constructing HOV lanes, and upgrading freight rail facilities. These projects play an important role in regional transportation planning, though financial and environmental concerns often limit their feasibility. Additionally, Transportation Management Areas in carbon monoxide or ozone nonattainment locations are prohibited from using federal funds for projects that significantly increase capacity for single occupant vehicles, unless management and operations strategies adequately address the congestion. As of July 2017, New London and Windham counties are within the Greater CT Moderate Ozone Area, which is a nonattainment status. The counties are in attainment areas regarding PM2.5and Carbon Monoxide (CO). Therefore, even though this TMA is in attainment for two out of the three air quality measures, in order to continue to air quality compliance, a project to increase capacity should not be prioritized for improving congestion issues.

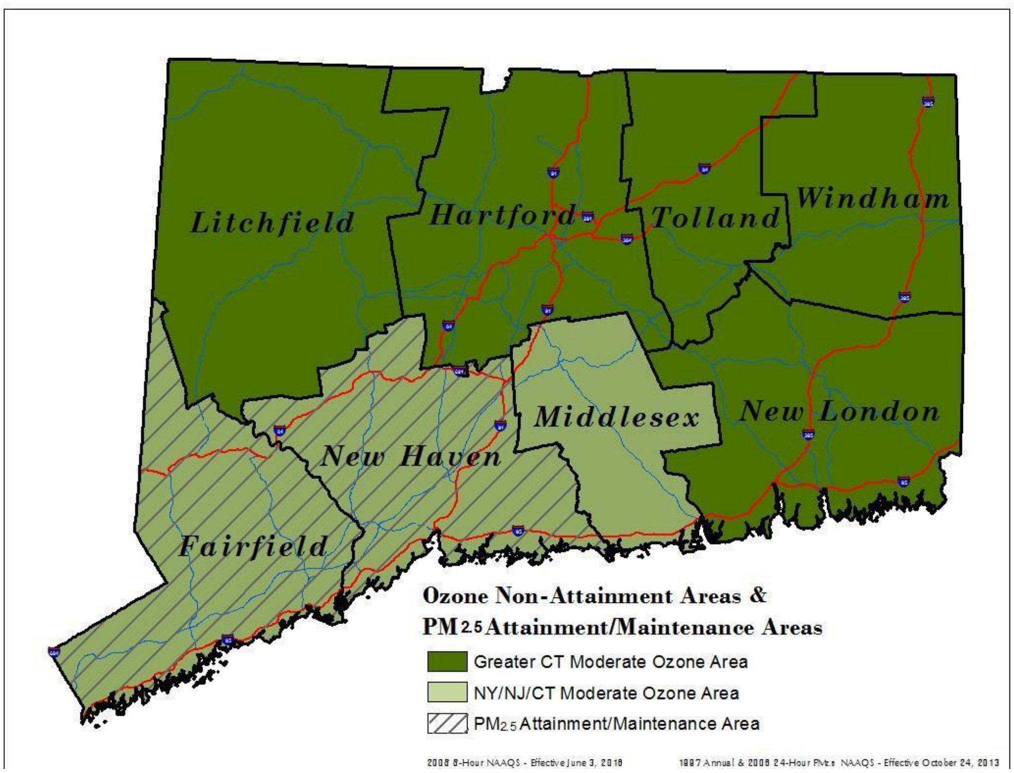

Figure 16 Connecticut Carbon Monoxide Maintenance and Attainment Areas

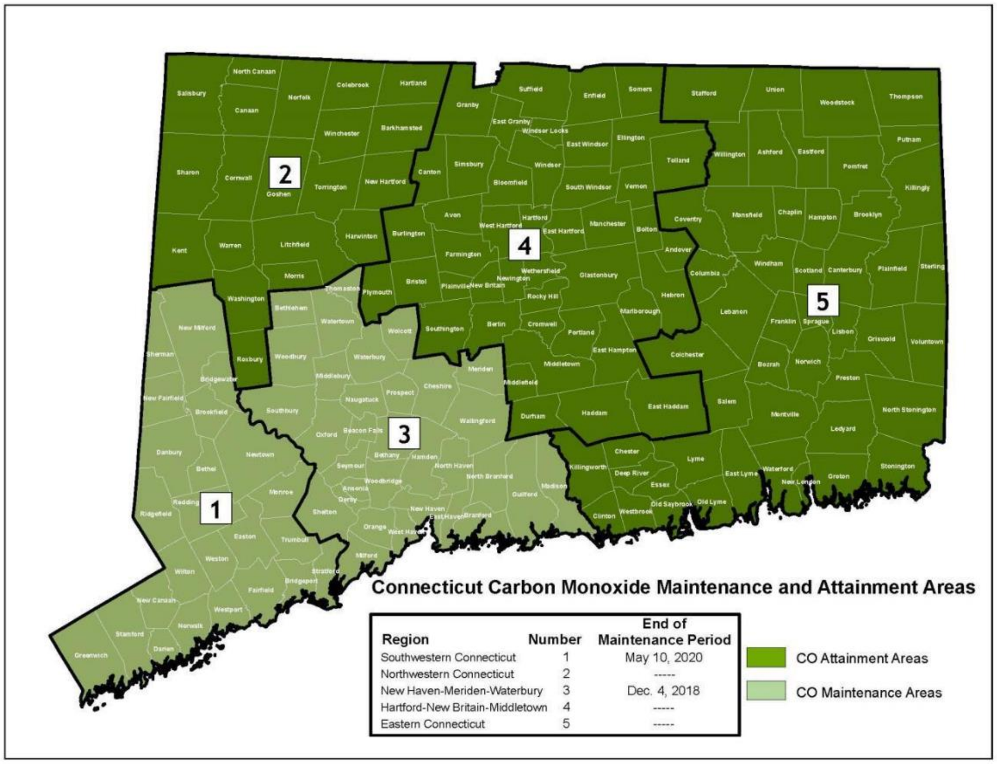

Figure 17 Connecticut Ozone Non-Attainment Areas & PM2.5 Attainment/Maintenance Areas

Improving system efficiency could be accomplished with improvements such as:

- Signal timing optimization
- Implementation of access management standards
- Prohibiting turning movements in problem areas
- Upgrades to roadway and intersection geometry
- Provisions for special events and weather patterns
- Real-time information on work zones, incidents, congestion, and transit schedules
- Reconfiguration of urban roadways into one-way pairs
- Improved management of incidents.

These types of projects can help optimize the existing transportation system. Associated projects may range from lower cost with a localized impact, to more highly priced with a regional impact, requiring considerable interagency coordination.

Demand management strategies seek to reduce congestion by limiting single occupant vehicle (SOV) travel during the peak hours. Strategies to reduce or distribute demand include:

- Flexible work hours and work from home incentives
- Carpooling programs
- Parking fees and restrictions
- Zoning revisions that promote dense land use and restrict sprawl
- Support of transit-oriented development,
- Congestion pricing.

All of these strategies require policy changes for private companies, municipalities, and/or the state.

Table 14: Projects Funded or Obligated in SCCOG FY 2018-2021 TIP by Corridor

Corridor	Town	Description	Year
I-95	EAST LYME	IMPROVEMENT OF I-95 INTERCHANGE 74 AT CT 161 - AC CONVERSION	FYI
I-95	GROTON	SAFETY IMPR., MYSTIC RIVER BR TO RI ST LINE	FYI
I-95 NB	NEW LONDON	NHS - REHAB BR 03819 - NB GOLD STAR - AC CONVERSION	2021
I-95	EAST LYME	IMPROVEMENT OF I-95 INTERCHANGE 74 AT CT 161 - AC CONVERSION	2021
I-95 NB	NEW LONDON	NHS - REHAB BR 03819 - NB GOLD STAR - AC CONVERSION	2020
CT 66	WINDHAM	REPLACE BR 00488 O/P&W RR (LIST 20)	2018
I-395	WATERFORD	NHS - REHAB BR 00255 O/RT 85	2018
SEAT	NORWICH	SEAT - REPLACE 8 2006 BUSES THREE 40FEET, THREE 35FEET AND TWO 30FEET	2018
I-95	EAST LYME	IMPROVEMENT OF I-95 INTERCHANGE 74 AT CT 161	2018
CT 156	EAST LYME	REHAB BR 06026 O/NIANTIC RIVER	FYI
CT 82	SALEM	REPLACE BR 01140 & 05401 O/EIGHT MILE RV	2018
SOUTHEAST AREA TD	NORWICH	SOUTHEAST AREA TD - FIXED ROUTE - FY2018	2018
SEAT	NORWICH	SEAT - REPLACE SIX 2007 35FEET BUSES FY 19	2019
I-95	EAST LYME	IMPROVEMENT OF I-95 INTERCHANGE 74 AT CT 161	2018

10 SELECTED STRATEGIES AND SYSTEM MANAGEMENT

10.1 Operational Level Application

Many of the corridors identified in this report are in various stages of improvement, whether initial studies are being conducted, study recommendations have been programmed as improvement projects, or plans are currently under construction.

SCCOG conducts studies to evaluate traffic operation and management issues for local towns as part of their Unified Planning Work Programs (UPWP). The following is a list of recently completed (or currently underway) studies relating to the congested corridors identified in this report:

- 2017 Regional Plan of Conservation and Development (2017)
- Update of the Regional Transportation Plan (2017)
- SCCOG Region Freight Profile (2017)

- Groton - New London Airport Master Plan Study (2017)
- 2015 SEAT Transit Study Final Report (2015)

Based on the results of these initial studies, suggestions and recommendations to mitigate congestion along the study corridors will be incorporated into future updates of the Regional Transportation Plan and programmed into the Transportation Improvement Program (TIP) for implementation. A list of projects in SCCOG's current TIP (FY 2018-2021) for corridor segments identified in this report is included in Table 1.

10.2 Policy Level Application

Congestion can be addressed using supply-side or demand-side tactics, although neither strategy necessarily reduces the number of trips taken in the region. Supply-side tactics include increasing road capacity, increasing transit capacity, and better managing incidents and crashes. Demand-side tactics are designed to reduce or manage the number of persons or vehicles traveling during peak periods, or to change the mode or length of the trip. They include flexible employer scheduling, telecommuting, pricing and market-oriented strategies, land use policies, and local growth management policies. SCCOG is using both types of strategies to find appropriate anti-congestion tactics for the region.

Supply-side efforts include additional highway capacity projects programmed through the SCCOG TIP approval process, the regional transit, regional planning recommendations, and the Unified Response Manual (URM) preparation to improve incident and accident response. Demand-side efforts include efforts to reduce dependence upon the single occupant vehicle, the pursuit of housing strategies which reduce trip generation, and the update of the Regional Plan of Conservation and Development with an emphasis on land use policies which encourage livable communities, control of sprawl, and the preservation of open space.

10.3 Automated and Connected Vehicle Technologies

The SCCOG region’s congestion management planning should work to incorporate and support the growing share of technologies associated with automated and connected vehicles. These technologies run the gamut from truck platooning to fully self-driving cars. At the statewide level, in 2017 the Connecticut legislature put forth a bill, SB-260, to establish a pilot program for municipalities to test autonomous vehicles, and a task force to report to the Transportation Committee by January 1, 2018. As of the publishing of this report, this bill has not been passed, but SCCOG is hopeful that the State will continue to advocate for research and adaptation of automated and connected vehicle technologies.

Preparing the regional transportation system for automated and connected vehicles will include changes and updates to policy, technology, infrastructure, and operations. For example, roads and signs may need to be restriped/replaced more frequently to ensure that automated vehicles can detect them, and local governments may have to adopt new transportation policies to accommodate highly advanced technologies on roads that were originally designed even before automobiles were invented. SCCOG will work closely with CTDOT on how to implement developing technologies in a manner consistent with relieving traffic congestion and maintaining safety. Organizations such as FHWA, the Transportation Research Board, the American Planning Association, and the

University of Connecticut are developing best practices for implementing autonomous and connective vehicle technologies, and will serve as resources to SCCOG as it develops future projects.

10.4 Access Management

To implement many of the recommendations suggested for the congested segments analyzed in this report, SCCOG will need to work with its member towns and District 2 of CTDOT to establish a more formalized access management policy. Currently, access management may be considered on a case by case basis, and so many of the region's commercial corridors do not have a cohesive strategy to reduce curb cuts, share driveways, or minimize unnecessary turning movements.

SCCOG last conducted Access Management studies in 1998-1999, primarily in response to increased traffic resulting from the then-recent establishment of the Mohegan and Foxwoods Casinos, and many of the recommendations from those plans are still applicable today. Those studies were conducted for the following routes/towns:

- Route 2 in North Stonington
- Route 2, 2A, 12, and 164 in Preston
- Route 117 in Ledyard
- Route 32 in Montville

Some of the recommendations from these studies include:

- Curb Cut Management Plans developed for Routes 2 and 12;
- Construction of bike and pedestrian accommodations such as paths, marked lanes, and enhanced crosswalks;
- Traffic signal operational improvements;
- Place-making measures, such as signage, plantings, and streetscaping improvements;
- Review characteristics of zoning regulations and/or town ordinances that may impact development along congested corridors.

It is strongly recommended that SCCOG and its member towns revisit the above options for access management at the congested locations described in this report.

11 Monitoring Effectiveness

An integral part of the CMP is the continuous monitoring of many aspects of area congestion and the effectiveness of the management strategies. The most fundamental element in system monitoring is the collection of data before and after strategy implementation to evaluate the traffic impact. The data assembled in this CMP Report provide a baseline for existing conditions in the region, and as strategies are implemented from year to year, the updated and comparable performance measures should account for major improvements made. However, using the same performance measures from report to report (travel speeds) is critical for evaluating strategy effectiveness. Although the region-wide data presented in this report is useful for large scale strategies and specific corridor locations, some congestion management enhancements may be difficult to evaluate with such performance measures. Improvements such as traffic signal coordination or bus stop relocation may require project-specific data to supplement travel speed data. In addition to answering the basic question of how strategies influence congestion, monitoring of the process can consider how well strategies were implemented and what factors contributed to their success or failure. The tools and analysis procedures involved in the process should be monitored as well to ensure that current standard practices are being used.

12 Conclusions

The CMP is an ongoing program of activities and an integral part of the planning process for the Transportation Management Area. SCCOG is in various stages of addressing congestion in the region: conducting studies, advancing the process of improvement plans, and constructing/implementing multimodal improvements. Although funding for maintaining an extensive data collection program is limited, the region's objectives to effectively prioritize projects, to use supply and demand side strategies to address transportation issues, to maintain aging infrastructure, to preserve multimodal transportation resources, to promote interconnection of modes, to encourage interagency cooperation to promote integrated land use and transportation planning, to work with appropriate entities to develop regional solutions to transportation issues, and to consider transportation impacts on the environment are all directly in line with values promoted in CMP Guidelines.

Increased congestion along interstates and crucial state routes is concerning because of the effect both on passenger and freight travel. The growth in freight throughout the country is consistent with the delay data showing key pinch points of increasing congestion within the study area, even while VMT is declining overall in the region. TRANSEARCH® Freight Movements projections suggest that freight travel could have a more significant impact on congestion. Per the CTDOT Statewide Freight Plan: TRANSEARCH® Freight Movements, by 2040 there is a projected 56.8% increase in freight tonnage by truck from 212.0 million tons to 332.4 million tons. Thus, freight is a major and growing source of congestion in SCCOG.

Any program to manage congestion, like updating and further implementing the Regional Plan of Conservation and Development in the region, must explicitly account for the projected growth in freight movement. Conversely, single occupant vehicle travel patterns are relatively stable and transportation system infrastructure is well-established in the region; thus, there are few opportunities for large scale capacity improvements. Therefore, projects funded in the region primarily involve maintenance, operations, and management improvements. These are all types of projects that are further justified using the CMP.