



EEA # 16837
Final Environmental Impact Report

Rocky Hill

(formerly Golden Triangle Residential Development)



Prepared for:
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114

Submitted by:
Dale Development, LLC
630 Washington Road
Rye, NH 03870

Prepared by:
Epsilon Associates, Inc.
3 Mill & Main Place, Suite 250
Maynard, MA 01754

In Association with:
Millenium Engineering Inc.
Lucas Environmental, LLC
Smolak & Vaughan, LLP
Union Studio
Vanasse & Associates Inc.

EEA # 16837

Final Environmental Impact Report

ROCKY HILL

(FORMERLY GOLDEN TRIANGLE RESIDENTIAL DEVELOPMENT)

Submitted to:

Executive Office of Energy and Environmental Affairs

100 Cambridge Street, Suite 900

Boston, MA 02114

Submitted by:

Dale Development, LLC

630 Washington Road

Rye, NH 03870

Prepared by:

Epsilon Associates, Inc.

3 Mill & Main Place, Suite 250

Maynard, MA 01754

In Association with:

Millenium Engineering Inc.

Lucas Environmental, LLC

Smolak & Vaughan, LLP

Union Studio

Vanasse & Associates Inc.

August 15, 2025

Chapter 5.0

Transportation

5.0 TRANSPORTATION

5.1 Executive Summary

Vanasse & Associates, Inc. (VAI) has conducted a Transportation Impact Assessment (TIA) as a part of this FEIR in order to determine the potential impacts on the transportation infrastructure associated with the proposed construction of a residential development to be located off of Elm Street in the “Rocky Hill” area of Amesbury, Massachusetts, that is generally situated between Elm Street, Interstate 95 (I-95) and I-495 (hereafter referred to as the “Project”). This assessment is responsive to the scope of work in the January 17, 2025 Certificate issued by the Secretary of Energy and Environmental Affairs on the December 11, 2024 DEIR (the “DEIR”). As identified in the Certificate and further discussed with the Massachusetts Department of Transportation (MassDOT), this assessment includes the following specific items:

- **Transportation Improvement Program** – The elements of the transportation improvement program have been refined and expanded to incorporate the suggested improvements from the Road Safety Audits (RSAs) that have been conducted at the Route 110/Merrill Street/Rabbit Road and Route 110/Elm Street/Clarks Road intersections;
- **Transportation Demand Management** – An assessment of operating conditions at the study area intersections has been undertaken to define the reduced impacts that could be achieved through attaining a ten percent reduction in Project-related single-occupancy vehicle (SOV) trips as a result of the implementation of the Transportation Demand Management (TDM) Program, which will be advanced as an integral part of the Project;
- **Pedestrian and Bicycle Circulation Planning** – A review of the integration of the Project into the existing and planned future pedestrian and bicycle infrastructure has been undertaken that includes enhancements to the accommodations within the Project Site to connect to these facilities;
- **Parking** – Strategies to reduce the number of parking spaces that are to be constructed as a part of the Project have been developed and will be further discussed with the City as means to disincentivize SOV travel;
- **Site Access** – The design of the site access and internal roadway network has been updated to incorporate traffic calming features, mobility enhancements and to address the comments from the Amesbury Public Works and Fire Rescue Departments; and
- **Transportation Monitoring** – The Transportation Monitoring Program (TMP) has been updated and expanded to include the monitoring of traffic volumes, parking occupancy, motor vehicle crash data and commuting modes of residents of the Project. Corrective measures have been identified that will be advanced to the extent that the measured criteria exceed identified thresholds.

This information is intended to supplement and expand upon the detailed information and analyses that are presented in the TIA that accompanied the DEIR, and has been prepared in consultation with MassDOT, the City of Amesbury and the Town of Salisbury.

Consistent with the findings of the TIA that accompanied the DEIR, it has been determined that the transportation infrastructure affords sufficient capacity to accommodate the additional traffic that will be associated with Project with specific improvements and trip reduction measures that have been refined as a part of this FEIR. These improvements and measures include the following:

- ***Project Site Access and Internal Roadway Design*** – Designing the internal roadway network and the Project Site driveway intersection with Elm Street to accommodate multimodal access, including sidewalks and bicycle accommodations within the Project that have been designed and located to facilitate connections to existing and future pedestrian and bicycle facilities; the implementation of traffic calming measures at targeted locations within the Project Site to enhance safety and promote mobility; coordinating with Merrimack Valley Transit (MeVA) to locate a bus stop at the Project Site; and ensuring that emergency vehicle access is maintained at all times.
- ***Route 110 Coordinated Traffic Signal System*** – Designing and implementing an optimal traffic signal timing, phasing, and coordination plan (where applicable) for the following intersections along the Route 110 corridor:
 1. Route 110 at the Carriagetown Marketplace Driveway;
 2. Route 110 at Elm Street and Clark’s Road;
 3. Route 110 at the I-95 Southbound Off-Ramp (future, by others); and
 4. Route 110 at Merrill Street and Rabbit Road (not currently coordinated).
- ***Route 110 Corridor Improvements*** – Assisting the City with the preparation of a Community One Stop for Growth grant application for the construction of improvements at the Route 110/I-95 southbound ramps intersection (submitted on June 4, 2025); designing and constructing capacity and traffic control improvements at the Route 110/Elm Street/Clark’s Road intersection to include the widening of Route 110 to provide an additional westbound travel lane and mobility and safety improvements. The improvements at the Route 110/Elm Street/Clark’s Road intersection were included in the Community One Stop for Growth grant application that was submitted by the City on June 4, 2025.
- ***Safety and Mobility Improvements*** – Design and construct specific safety and mobility enhancements, including improvements at the Route 110/Merrill Street/Rabbit Road and Route 110/Elm Street/Clark’s Road intersections that were identified as an outcome of the RSAs that were conducted by the Project Proponent at these intersections. These enhancements and improvements will include the following measures:

- Route 110/Merrill Street/Rabbit Road:
 - Test the vehicle detection system and repair or replace the associated equipment as needed;
 - Add backplates with reflective yellow tape to the vehicle signal indications;
 - Evaluate the impact to traffic operations of restricting right-turn-on-red movements. If deemed feasible and desirable by MassDOT, install the necessary signs to restrict this movement;
 - Evaluate the feasibility of implementing split-phasing for the intersection. If deemed feasible and desirable by MassDOT, implement the traffic signal timing plan;
 - Review and adjust the “yellow” and “all red” clearance intervals;
 - Increase the audible volume of the Audible Pedestrian Signals;
 - Trim vegetation to improve sight lines on the approaches to the intersection and at the intersection corners;
 - Add tracking lines to guide vehicles to proper lane assignments;
 - Reapply the pavement markings on the intersection approaches with high visibility thermoplastic markings;
 - Reapply the crosswalk pavement markings with high visibility, ladder style thermoplastic markings;
 - Reapply the “Bicycle Stop on Line for Green” pavement markings;
 - Add lane use signs to the sign bridge over Route 110 for eastbound motorists;
 - Review and fix any crooked or misaligned signs within the intersection;
 - Install “4 Feet to Pass” bicycle signs on Merrill Street south of Route 110;
 - Evaluate the compliance of the wheelchairs with the requirements of the Americans with Disabilities Act (ADA) and reconstruct the ramps as necessary;
 - Rotate the parallel drainage grate on the on the southwest corner of the intersection to be perpendicular to the path of vehicle travel; and
 - Evaluate the feasibility of installing “Do Not Block” signs and pavement markings on Merrill Street in front of the Aroma Joe’s/plaza entrance.
- Route 110/Elm Street/Clark’s Road:
 - Test the vehicle detection system and repair or replace the associated equipment as needed;
 - Replace the emergency vehicle pre-emption system and adjust the location of the receivers as necessary to ensure proper operation;

- Evaluate the impact to traffic operations of restricting right-turn-on-red movements. If deemed feasible and desirable by MassDOT, install the necessary signs to restrict this movement;
 - Review and adjust the “yellow” and “all red” clearance intervals;
 - Trim vegetation to improve sight lines on the approaches to the intersection and at the intersection corners;
 - Add advance lane assignment markings on the Elm Street approach;
 - Reapply the crosswalk pavement markings with high visibility, ladder style thermoplastic markings;
 - Reapply the pavement markings on the intersection approaches with high visibility thermoplastic markings;
 - Add additional directional guide signs for I-95 on Route 110 after (east of) the Macy Street; and
 - Install radar speed feedback signs on Route 110 east of Macy Street and west of I-495.
- Installing a pedestrian actuated Rectangular Rapid Flashing Beacon (RRFB) at the existing crosswalk across the Elm Street northwest leg of the Elm Street/Hampton Inn Amesbury driveway intersection to include pedestrian crossing warning signs at and in advance of the crossing. The location of the RRFB will be coordinated with MassDOT and the City of Amesbury as a part of the planning for the extension of the Amesbury Riverwalk connection to the Salisbury Point Ghost Trail.
 - A budget was established to implement these improvements in the Community One Stop for Growth grant application that was submitted by the City on June 4, 2025.
- ***Transportation Demand Management (TDM) Program*** – A comprehensive TDM program will be implemented as a part of the Project that includes measures to encourage the use of alternative modes of transportation to SOVs.
 - ***Traffic Monitoring Program*** – A detailed traffic monitoring program will be implemented as a part of the Project to evaluate the success and to refine the elements of the TDM program, validate the trip projections for the Project and to measure parking occupancy.

With implementation of the aforementioned recommendations, safe and efficient access will be provided to the Project Site and the Project can be accommodated within the confines of the existing and improved transportation system.

5.2 Introduction

VAI has prepared supplemental information and analyses as a part of this FEIR in support of the TIA that accompanied the December 11, 2024 DEIR. This information is responsive to the scope of work that was identified in the Secretary’s January 17, 2025 Certificate and includes the

following information: i) *Transportation Improvement Program* - refined and expanded to include safety enhancements defined as an outcome of the RSAs that were conducted as a part of the Project; ii) *Transportation Demand Management* - assessment of the benefit of achieving a 10% reduction in Project-related SOV trips; iii) *Pedestrian/Bicycle Circulation Planning* – evaluation of opportunities to connect the Project to existing and proposed pedestrian/bicycle facilities; iv) *Parking* – development of strategies to reduce parking demands; v) *Site Access* – integration of traffic calming measures and mobility enhancements along the internal community roadway network; and vi) *Transportation Monitoring* – expansion of the monitoring program to include traffic volumes, parking occupancy, motor vehicle crash data and a survey of commuting modes of residents of the Project.

5.2.1 Project Description

The Project, as described in Section 1.3 of this FEIR, involves the construction of 381 residential units; however, to ensure transportation impacts were adequately accounted for and to provide a conservative estimate of transportation impacts, the TIA that accompanied DEIR and the supplemental transportation analyses that are included as a part of this FEIR are based on the construction of 400 residential units in several buildings clustered within the Site to include up to 309 multifamily residential units, 83 single family attached homes (townhomes and duplex units) and eight single family detached cottage type homes, with amenities and supporting parking. For the proposed Project description, refer to Section 1.3.

The Project Site includes multiple lots in both the City of Amesbury and the Town of Salisbury, with the area that is to be developed located entirely within the City of Amesbury and encompasses approximately 87.36± acres of land that is bounded by residential properties and areas of open and wooded space to the north; I-495, residential properties and areas of open and wooded space to the south and east; and Elm Street, residential and commercial properties and areas of open and wooded space to the west. The Project Site currently contains three single-family homes with associated driveways and appurtenances, all of which will be removed to accommodate the Project. Figure 5-1 depicts the Project Site location in relation to the existing roadway network.

Access to the Project Site will be provided by way of a full-access driveway that will intersect the east side of Elm Street, generally opposite the south driveway to the Hampton Inn Amesbury. Secondary access for emergency vehicles will be provided through a connection to the abutting property to the north at 227 Elm Street, which will be secured by a gate or other means acceptable to the Amesbury Fire Department. The Project will require the issuance of a State Highway Access Permit from the Massachusetts Department of Transportation (MassDOT) for access to Elm Street as the section of roadway along which the Project Site is located is a State Highway that is under MassDOT jurisdiction, as well as to implement the improvements along Route 110 that have been identified as a part of this assessment.



Rocky Hill Amesbury, Massachusetts

On-site parking will be provided in individual driveways and garages for the single-family attached and detached units, and by surface and on-street parking for the multifamily units, with a targeted parking ratio of 1.5 parking spaces per residential unit to be provided. Additional parking will be provided for guests and at the amenity building. The proposed parking supply (a minimum of 1.5 parking spaces per unit) will meet or exceed the parking requirements of Section VIII, *Off Street Parking and Loading*, of the City of Amesbury Zoning Ordinance.¹

5.2.2 Study Methodology

This supplement to the TIA that accompanied the DEIR is responsive to the scope of work that was identified in the Secretary's January 17, 2025 DEIR Certificate, and was: i) prepared in consultation with MassDOT, the City of Amesbury and Town of Salisbury; and ii) performed in accordance with MassDOT's *Transportation Impact Assessment (TIA) Guidelines* and the standards of the Traffic Engineering and Transportation Planning professions for the preparation of such reports.

5.3 Transportation Improvement Program

As a part of the TIA, a detailed Transportation Improvement Program was developed for the Project that included specific measures to: i) off-set the predicted impact of the Project on the transportation infrastructure; ii) address existing capacity constraints; iii) enhance safety; and iv) improve mobility. In addition to the transportation improvement program, the Project also includes a TDM Program and a TMP, which are discussed in subsequent sections of this chapter. Table 5-1 summarizes the elements of the Transportation Improvement Program for the Project, which are consistent with those that were documented in the DEIR and have been expanded to include the short-term, low-cost improvements that were defined as an outcome of the Roadway Safety Audits (RSA) that were completed at the at the Route 110/ Merrill Street/Rabbit Road and Route 110/ Elm Street/Clark's Road intersections in May 2025 (draft RSA report issued in June 2025).

The Project Proponent has assisted the City to prepare a Community One Stop for Growth grant application that included the improvements defined below for the Project. The application was submitted to the Executive Office of Economic Development on June 4, 2025. Consistent with the mitigation commitments that were defined in the DEIR, the elements of the Transportation Improvement Program will be completed according to the schedule defined in Table 5-1 irrespective of the funding source(s) for the improvements.

¹ The City of Amesbury Zoning Ordinance requires a minimum of 1.5 parking spaces per dwelling or apartment unit.

Table 5-1 Transportation Improvement Program Summary

Improvement Category/Location	Description	Responsible Party	Implementation Schedule
Route 110 Coordinated Traffic Signal System	Design and implement an optimal traffic signal timing, phasing, and coordination plan (where applicable) for the following intersections: – Route 110/Carriagetown Marketplace Driveway – Route 110/Elm Street/Clark’s Road – Route 110/I-95 Southbound Off-Ramp (future) – Route 110/Merrill Street/Rabbit Road	Dale Development, LLC	Initial Retiming Prior to Certificate of Occupancy (CO); Further Review and Adjustment (as necessary) as a part of Annual Monitoring
Route 110 Corridor Improvements	• Route 110/I-95 North and Southbound Ramps – Assist the City with the preparation of a Community One Stop for Growth grant application for the construction of improvements at the Route 110/I-95 southbound ramps intersection. • Route 110/Elm Street/Clark’s Road – Widen Route 110 westbound to accommodate three through travel lanes between the I 95 southbound off-ramp to a point approximately 300 feet west of Elm Street; – Reconstruct the intersection and traffic signal system to accommodate the additional through travel lane, including a section of the Salisbury Point Ghost Trail that is situated along the north side Route 110; and – Design and implement an optimal traffic signal timing, phasing, and coordination plan.	Dale Development, LLC Dale Development, LLC	Prior to CO (submitted on June 4, 2025) Prior to CO

Table 5-1 Transportation Improvement Program Summary (Continued)

Improvement Category/Location	Description	Responsible Party	Implementation Schedule
<i>Safety Improvements</i>	Design and construct the safety and mobility enhancements defined as a part of this FEIR that were identified as a part of the RSA's that were conducted at the following intersections: • <i>Route 110/Merrill Street</i> • <i>Route 110/Elm Street/Clarks Road</i>	Dale Development, LLC	Prior to CO
<i>Mobility Improvements</i>	Design and construct a crosswalk across Elm Street to include the installation of a pedestrian actuated RRFB with accompanying pedestrian crossing warning signs and Americans with Disabilities Act (ADA) compliant wheelchair ramps. The location of the crossing will be defined in consultation with MassDOT and the City to compliment the planned connection between the Amesbury Riverwalk and the Salisbury Point Ghost Trail to the north of the Project Site.	Dale Development, LLC	Prior to CO

5.4 Transportation Demand Management

The Project has been planned and designed with specific features to support the use of alternative modes of transportation to SOVs, including: i) the development of a sidewalk network within the Project Site that will connect to the existing sidewalks along Elm Street; and ii) providing bicycle accommodations that include secure bicycle parking and wayfinding signs directing bicyclists to the parking areas within the Project Site that will serve to promote the use of the existing bicycle accommodations along Elm Street (marked bicycle lanes) and the connections to the Amesbury Riverwalk and the Salisbury Point Ghost Trail. In addition, the MeVA operates fixed-route bus service along Elm Street and Route 110 by way of bus Route 17, *Salisbury Beach via Amesbury*, and Route 19, *Amesbury/Costello*. The Route 17 bus provides service between the Washington Square Transit Center in Haverhill and Salisbury Beach and travels along Elm Street past the Project to Route 110. The Route 19 bus provides service between the Nicholas J. Costello Transportation Center in Amesbury and the Newburyport MBTA Station, and travels along Route 110 to the I-95 interchange. The closest regular stop for the Route 19 bus to the Project Site is in the Carriagetown Marketplace, approximately 0.25 miles (or a 5-minute walk) from the Project. MeVA buses also operate in a “flag stop” mode, where a rider can request a stop anywhere along the regular service route by signaling to the driver, including at the Project Site.

The Proponent has committed to implement of a comprehensive TDM program that will include the following elements:

- A transportation coordinator will be designated for the Project, who may have other duties and responsibilities, to coordinate the elements of the TDM program;
- The transportation coordinator will facilitate a rideshare matching program for residents to encourage carpooling;
- A “welcome packet” will be provided to new residents detailing available public transportation services, bicycle and walking alternatives, and other commuting options;
- Amenities will be provided to support telecommuting by residents of the Project that may take the form of meeting space or collaboration areas within the clubhouse;
- Information regarding public transportation services, maps, schedules, and fare information will be posted in a central location and/or otherwise made available to residents;
- Pedestrian accommodations will be incorporated within the Project and consist of sidewalks that connect to the existing sidewalk infrastructure along Elm Street where a crosswalk with an accompanying pedestrian actuated RRFB will be provided for crossing Elm Street; and
- Secure bicycle parking will be provided at appropriate locations within the Project Site, such as by the clubhouse and recreation areas.

In addition, the Proponent will consult with MeVA and the City to establish a bus stop along Elm Street at the Project Site. To the extent that a bus stop is established, and if so desired by MeVA, a bus shelter will be provided at a location determined in consultation with MeVA and MassDOT.

Given the existing and planned infrastructure that will be available to support non-SOV travel, including the comprehensive TDM program, the Proponent expects that a portion of the Project related trips will be by public transportation, walking, or bicycling, thereby reducing the number of SOV trips. To establish a baseline level for non-SOV use by residents and employees of the Project, travel mode data obtained from the 2019 through 2023 American Community Survey (ACS) for the Census Tract that contains the Project site (Tract 2663) were reviewed. Table 5-2 summarizes the commuting modes identified for workers aged 16 or older who reside within the Census Tract area:

Table 5-2 U.S. Census Commuting Travel Mode Data – Census Tract 2663

Primary Commuting Mode	%
Single-Occupant Vehicle:	74.0
Carpool/Vanpool:	5.0
Public Transportation:	0.5
Walk:	2.0
Bicycle:	0.3
Taxi, Motorcycle, or Other	0.0
Work from Home:	18.2
TOTAL:	100

According to the ACS, approximately 26 percent of workers that reside in the Census Tract area that contains the Project Site reported they used an alternative mode of transportation to SOV to travel to/from work or that they worked from home, with approximately five percent participating in car or vanpool, 0.5 percent using public transportation (transit), 2.3 percent walking/bicycling or using other methods of transportation and 18.2 percent reporting that they work from home.

An adjustment to the base ITE trip-generation calculations for the Project to account for the use of alternative modes of transportation to SOVs was not undertaken as a part of the analyses that were performed in support of the TIA that accompanied the DEIR in order to provide conservative (high) traffic volume projections from which to assess the impact of the Project.

Based on the ACS data, and with consideration of: i) the implementation of the TDM program that will be an integral part of the trip reduction strategy of the Project; ii) the existing and proposed pedestrian and bicycle infrastructure that will support pedestrian and bicycle trips to/from the Project and connections to shopping, employment and recreational opportunities; and iii) the

availability of MeVa transit services at the Project Site; opportunities will exist to achieve non-SOV use by residents of the Project that could exceed the approximate 8 percent reduction that is defined by the ACS data excluding the work-from-home reduction.

In order to establish a benchmark from which to assess the success of the TDM program and the supporting infrastructure that will be constructed as a part of the Project to encourage mobility and connections to existing and proposed pedestrian and bicycle facilities, a ten percent mode shift goal was established for the Project which represents a modest improvement over the ACS data and also recognizes the suburban location of the Project, the existing and planned future infrastructure that will support the mode shift goal and the location of employment centers in relation to the Project.

Table 5-3 summarizes the resulting trip reduction (non-SOV mode) that will result from achieving the 10 percent non-SOV mode shift for the Project. To convert the base ITE trip-generation calculations which are expressed in vehicle trips to person trips, a vehicle occupancy ratio of 1.04 persons per vehicle was used which was obtained from the ACS data for the Census Tract that contains the Project Site.

Table 5-3 Trip-Generation Summary

Time Period/Direction	Person Trips					
	(A) Base ITE Trip- Generation (Vehicle Trips) ^a	(B = A x 1.04) Person Trips	(C) Auto (90%)	(D) Transit (5%)	(E) Pedestrian/ Bicycle (5%)	(F = C ÷ 1.04) Auto Vehicle Trips
<i>Average Weekday:</i>						
Entering	1,369	1,424	1,282	71	71	1,233
Exiting	<u>1,369</u>	<u>1,424</u>	<u>1,282</u>	<u>71</u>	<u>71</u>	<u>1,233</u>
Total	2,738	2,848	2,564	142	142	2,466
<i>Weekday Morning Peak-Hour:</i>						
Entering	39	41	37	2	2	35
Exiting	<u>124</u>	<u>129</u>	<u>116</u>	<u>6</u>	<u>7</u>	<u>112</u>
Total	163	170	153	8	9	147
<i>Weekday Evening Peak-Hour:</i>						
Entering	130	135	121	7	7	117
Exiting	<u>78</u>	<u>81</u>	<u>73</u>	<u>4</u>	<u>4</u>	<u>70</u>
Total	208	216	194	11	11	187

^a Based on Institute of Transportation Engineers (ITE)² LUCs 210, *Single-Family Detached Housing* (8 Units); 215, *Single-Family Attached Housing* (83 Units); and 220, *Multifamily Housing (Low-Rise)* (309 Units).

² Trip Generation, 11th Edition; Institute of Transportation Engineers; Washington, DC; 2021.

5.4.1 Project-Generated Traffic

As can be seen in Table 5-3, with the ten percent non-SOV mode shift, the Project is expected to generate approximately 2,466 automobile trips, 142 transit trips and 142 pedestrian/bicycle trips on an average weekday (two way, 24-hour volumes). During the weekday morning peak-hour with the 10 percent non-SOV mode shift, the Project is expected to generate 147 automobile trips (35 vehicles entering and 112 exiting), 8 transit trips and 9 pedestrian/bicycle trips. During the weekday evening peak hour with the 10 percent non-SOV mode shift, the Project is expected to generate 187 automobile trips (117 vehicles entering and 70 exiting), 11 transit trips and 11 pedestrian/bicycle trips.

5.4.2 Traffic Operations

In order to assess the improvement in traffic operations (i.e., reductions in motorist delay and vehicle queuing) that can be attained as a result of achieving a ten percent non-SOV mode shift, a detailed traffic operations analysis was performed for the study area intersections that were assessed in the TIA that accompanied the DEIR using the auto vehicle trips from Table 5-3 (Column F) and the trip distribution pattern that was presented in the TIA that accompanied the DEIR.

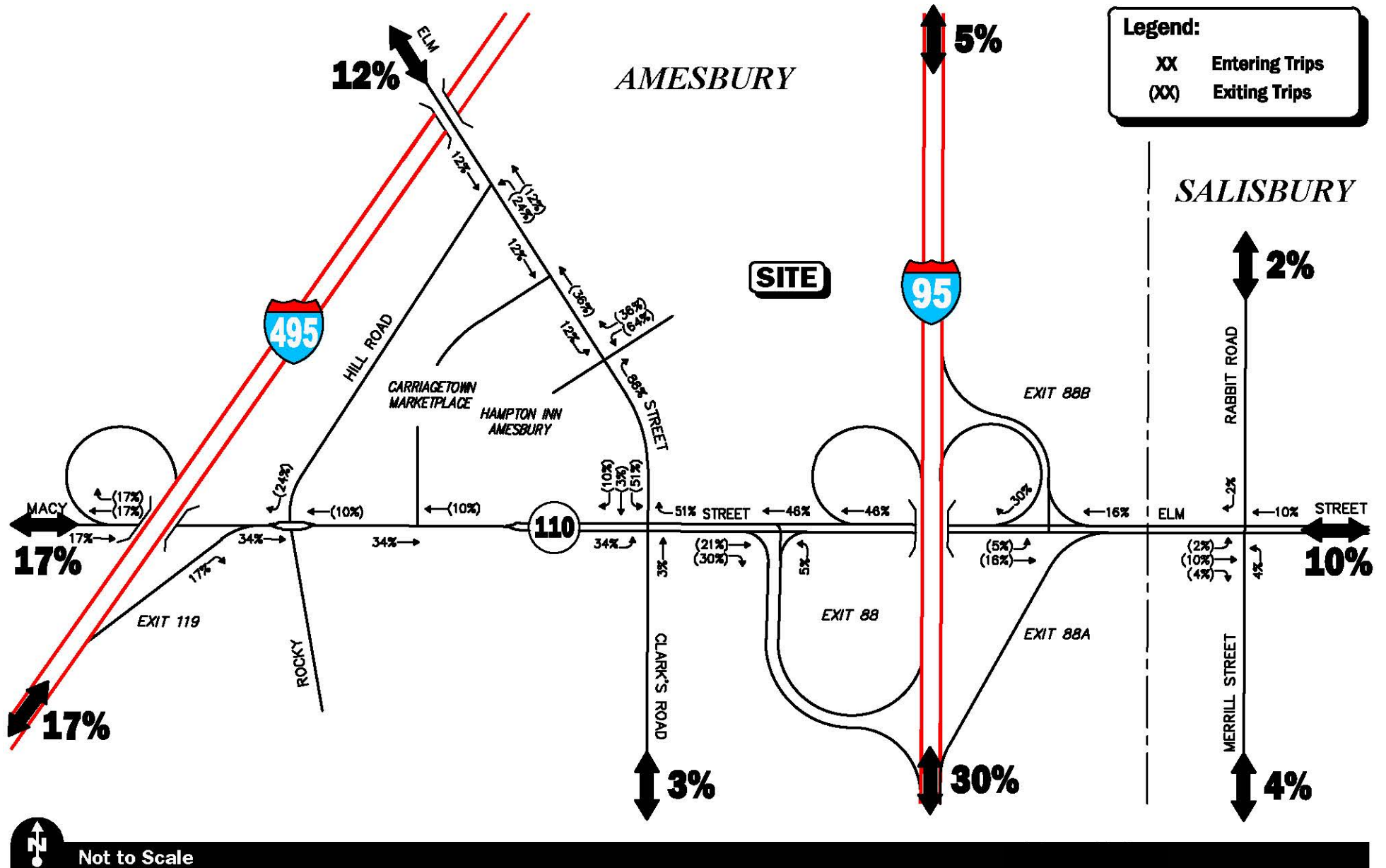
5.4.2.1 Build Condition Traffic Volumes with non-SOV Mode Shift

Figure 5-2 presents that trip distribution pattern for the Project that was developed based on a review of Journey-to-Work data obtained from the U.S. Census for persons residing in the City of Amesbury and then refined based on existing traffic patterns within the study area during the peak periods, with Figures 5-3 and 5-4 depicting the assignment of Project-related traffic with the 10 percent non-SOV mode shift to the roadway network for the weekday morning and evening peak hours, respectively. Figures 5-5 and 5-6 depict the resulting 2031 Build condition weekday morning and evening peak-hour traffic volumes.

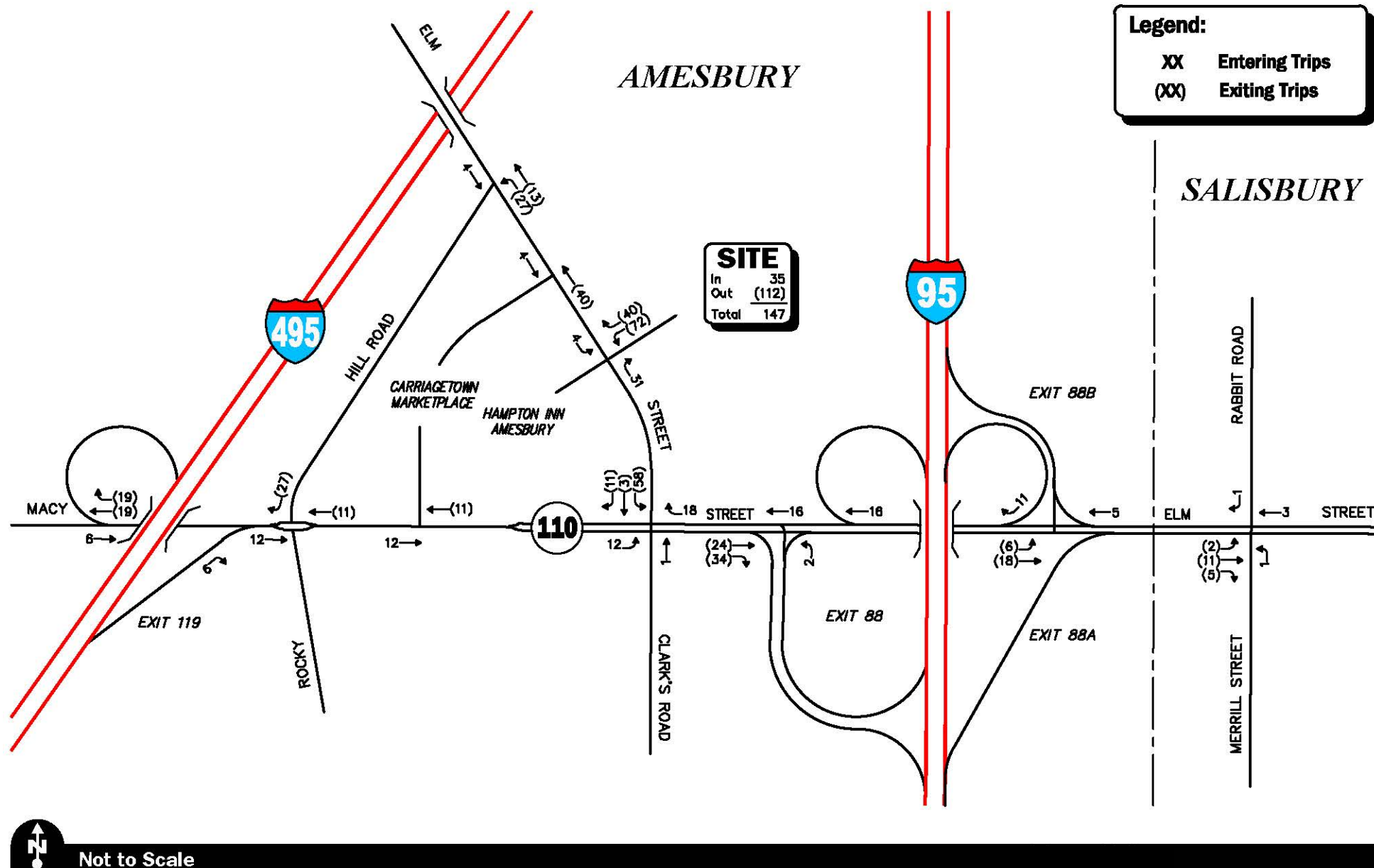
5.4.2.2 Traffic Operations (Capacity) Analysis Methodology

A primary result of capacity analyses is the assignment of level-of-service (LOS) to traffic facilities under various traffic-flow conditions.³ The concept of LOS is defined as a qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers. A LOS definition provides an index to quality of traffic flow in terms of such factors as speed, travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety.

³ The capacity analysis methodology is based on the concepts and procedures presented in the *Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2016.



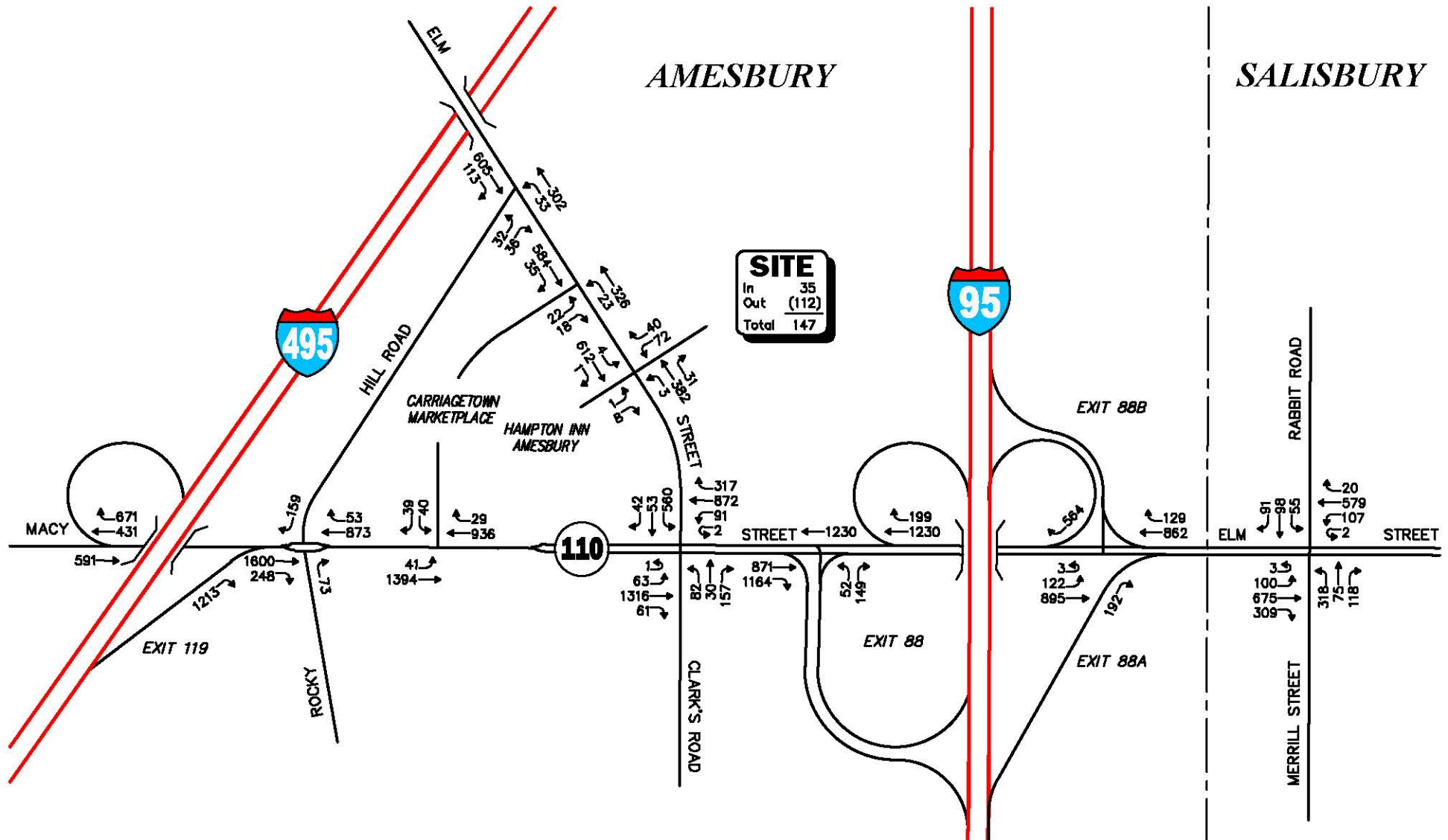
Rocky Hill Amesbury, Massachusetts



Rocky Hill Amesbury, Massachusetts



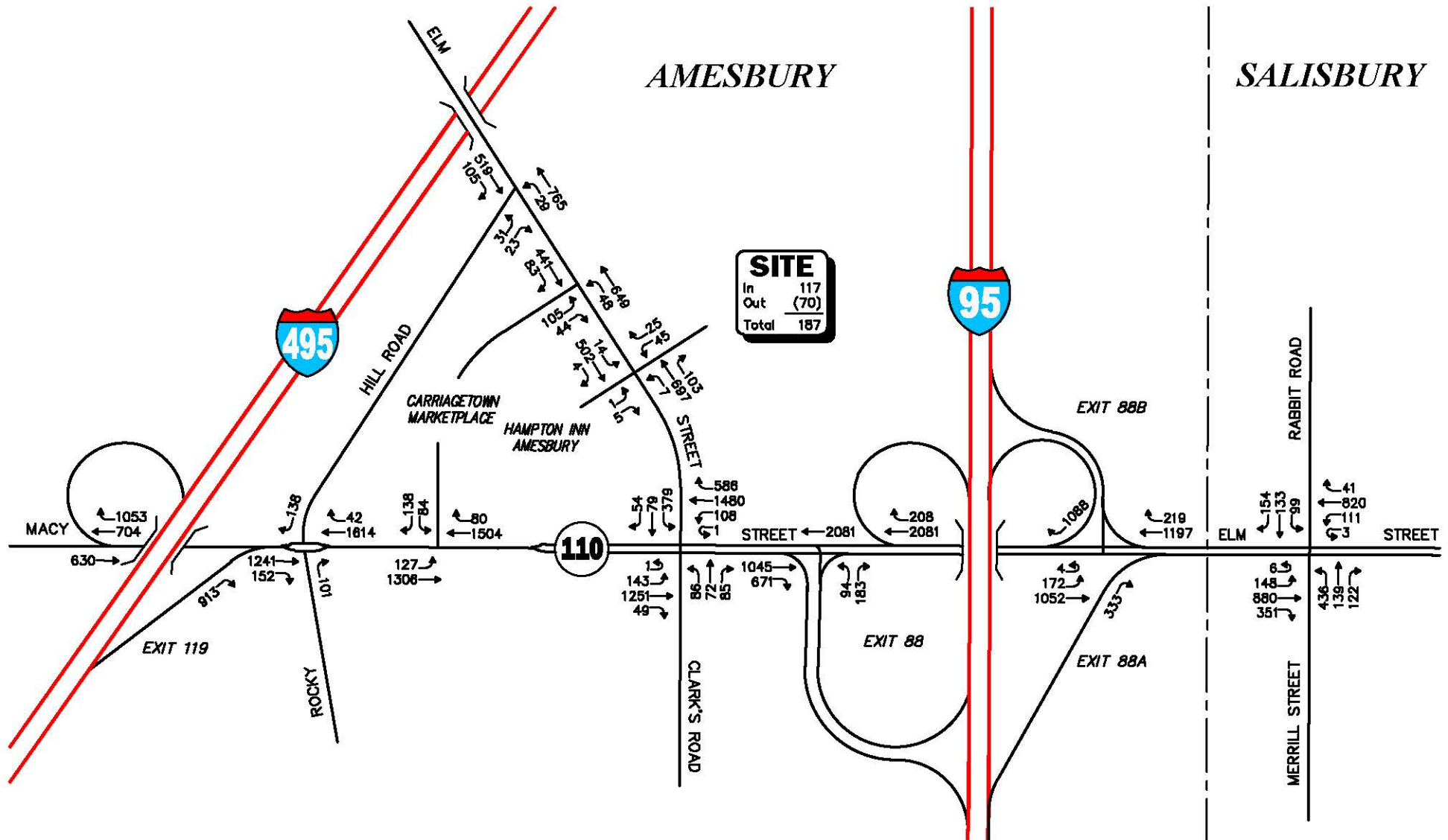
Project Generated Weekday Evening Peak-Hour Traffic Volumes (With Mode Split Adjustment)



Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

Not to Scale

Rocky Hill Amesbury, Massachusetts



Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

Not to Scale

Rocky Hill Amesbury, Massachusetts

Six levels of service are defined for each type of facility. They are given letter designations from A to F, with LOS A representing the best operating conditions and LOS F representing congested or constrained operating conditions. An LOS of “E” is representative of a transportation facility that is operating at its design capacity, with an LOS of “D” generally defined as the limit of “acceptable” traffic operations. Since the level of service of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of levels of service, depending on the time of day, day of week, or period of year. Consistent with the methodology that was used in the TIA that accompanied the DEIR, the Synchro® 12 software was used to complete the analysis with the methodology defined in the 2000 *Highway Capacity Manual*⁴ used to assess operating conditions at the signalized study area intersections and the methodology defined in the 7th Edition *Highway Capacity Manual* (HCM)⁵ used to assess operating conditions at the unsignalized study area intersections.

The Synchro® intersection capacity analysis software was also used to assess vehicle queuing at the study area intersections. The Synchro® vehicle queue analysis methodology is a simulation-based model which reports the number of vehicles that experience a delay of six seconds or more at an intersection. For signalized intersections, Synchro® reports both the average (50th percentile) and the 95th percentile vehicle queue. For unsignalized intersections, Synchro® reports the 95th percentile vehicle queue. Vehicle queue lengths are a function of the capacity of the movement under study and the volume of traffic being processed by the intersection during the analysis period. The 95th percentile vehicle queue is the vehicle queue length that will be exceeded only five percent of the time, or approximately 3 minutes out of 60 minutes during the peak one hour of the day (during the remaining 57 minutes, the vehicle queue length will be less than the 95th percentile queue length).

5.4.2.3 Analysis Results

LOS and vehicle queue analyses were conducted for 2031 Build conditions with and without the planned improvements that will be advanced or facilitated as a part of the Project (2031 Build (Mitigated)) for the intersections within the study area with the 10 percent non-SOV mode shift, the results of which are summarized in Tables 5-4 and 5-5, with the detailed analysis results presented in Appendix D. For context, the results of the 2031 No-Build condition traffic operations analysis are also presented in the tables.

The following is a summary of the level-of-service and vehicle queue analyses for the intersections within the study area. As defined previously, an LOS of “D” or better is generally defined as “acceptable” operating conditions.

⁴ *Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2000.

⁵ *Highway Capacity Manual*, Transportation Research Board; Washington, DC; 2023.

By way of and overall summary and in comparison to the results that were presented in the TIA that accompanied the DEIR, achieving a ten percent non-SOV mode shift for the Project was shown to reduce motorist delays and vehicle queuing; however, given the dispersal of Project-generated trips over the respective peak hours, no significant changes in operating conditions were identified to occur over the conditions at were reported in the DEIR and the elements of the transportation improvement program continue to be appropriate to off-set the predicted impact of the Project.

Signalized Intersections (Table 5-4)

Route 110 at the Carriagetown Marketplace Driveway

Consistent with the findings presented in the DEIR, no change in level of service is predicted to occur for any movement over No-Build conditions as a result of the addition of Project-related traffic, with Project-related impacts generally defined as a predicted increase in overall average motorist delay of less than 1.0 second that resulted in a corresponding increase in vehicle queuing of up to one vehicle.

Route 110 at Elm Street and Clark's Road

Consistent with the findings presented in the DEIR no change in overall LOS was shown to occur over No-Build conditions as a result of the addition of Project-related traffic, with Project-related impacts generally defined as a predicted increase in overall average motorist delay that resulted in a corresponding increase in vehicle queuing of up to three vehicles. Focusing on individual movements, the following changes in LOS were shown to occur as a result of the addition of Project-related traffic: *weekday morning peak-hour* – Route 110 eastbound U-turn/left-turn movements changed from LOS D to LOS E (6.4 second increase in average motorist delay) and Route 110 westbound U-turn/left-turn changed from LOS D to LOS E (7.7 second increase in average motorist delay); *weekday evening peak-hour* – Route 110 eastbound U-turn/left-turn movements changed from LOS E to LOS F and Clark's Road through/right-turn movements changed from LOS D to LOS E (18.2 second increase in average motorist delay). Independent of the Project, specific movements along Route 110 are currently or are predicted to operate at or over capacity (i.e., LOS "E" or "F", respectively).

With the planned traffic control and geometric improvements at this intersection that will be completed as a part of the Project, motorist delays and vehicle queuing generally will be reduced for critical movements and will result in an improvement over No-Build conditions during the weekday evening peak-hour.

Route 110 at Merrill Street and Rabbit Road

Consistent with the findings presented in the DEIR, the addition of Project-related traffic was shown to result in an increase in overall average motorist delay of 1.8 seconds during the weekday evening peak-hour that resulted in a change in level of service from LOS D to LOS E. Vehicle

queuing at the intersection was shown to increase by up to one vehicle as a result of the addition of Project-related traffic. Independent of the Project, specific movements along Route 110 are currently or are predicted to operate at or over capacity (i.e., LOS “E” or “F”, respectively).

Unsignalized Intersections (Table 5-5)

Route 110 at the I-495 Southbound On-Ramp

Consistent with the findings presented in the DEIR, no change in average motorist delay was shown to occur over No-Build conditions because of the addition of Project-related traffic with all movements continuing to operate at LOS A.

Route 110 at the I-495 Northbound Off-Ramp

Consistent with the findings presented in the DEIR, no change in average motorist delay was shown to occur over No-Build conditions because of the addition of Project-related traffic with all movements continuing to operate at LOS A.

Route 110 at Rocky Hill Road

Consistent with the findings presented in the DEIR, no change in LOS is predicted to occur for any movement over No-Build conditions as a result of the addition of Project-related traffic, with Project-related impacts generally defined as a predicted increase in average motorist delay that resulted in a corresponding increase in vehicle queuing of up to two vehicles. Independent of the Project, right-turn movements from the Rocky Hill Road southbound approach are predicted to operate over capacity under 2031 No-Build conditions.

Route 110 at the I-95 Southbound Ramps

Consistent with the findings presented in the DEIR, no change in LOS is predicted to occur for any movement over No-Build conditions as a result of the addition of Project-related traffic, with Project-related impacts generally defined as an increase in average motorist delay of that resulted in a corresponding increase in vehicle queuing of up to one vehicle. Independent of the Project, left-turn movements from the I-95 southbound off-ramp are currently operating at or over capacity during both peak hours.

With the installation of a traffic control signal at the intersection by others⁶ and the traffic control and geometric improvements at the Route 110/Elm Street/Clark's Road intersection that will be completed as a part of the Project, the signalized intersection is predicted to operate at an overall LOS A during both the weekday morning and evening peak hours with no movement predicted to operate below LOS D.

Route 110 at the I-95 Northbound Ramps

Consistent with the findings presented in the DEIR, no change in LOS is predicted to occur for any movement over No-Build conditions as a result of the addition of Project-related traffic, with Project-related impacts generally defined as a predicted increase in average motorist delay that resulted in a corresponding increase in vehicle queuing of up to six vehicles. Independent of the Project, U-turn/left-turn movements from the Route 110 eastbound approach and right-turns from the I-95 northbound off-ramp are currently operating over capacity during both peak hours, with vehicle queues on the off-ramp extending up to 72 vehicles under 2024 Existing conditions.

With the installation of a traffic control signal and associated geometric improvements at the Route 110/I-95 Southbound Ramps intersection by others and at the Route 110/Elm Street/Clark's Road intersection as a part of the Project, operating conditions will be improved along the Route 110 corridor such that all movements at the Route 110/I-95 Northbound Ramps intersection will operate at LOS C or better during the weekday peak hours.

Elm Street at Rocky Hill Road

The addition of Project-related traffic was shown to result in an increase in average motorist delay of 3.5 seconds during the weekday morning peak-hour and of 5.4 seconds during the weekday evening peak-hour for the Rocky Hill Road approach that resulted in a change in level of service from LOS C to LOS D during the weekday morning peak-hour and from LOS D to LOS E during the weekday evening peak-hour. No change in vehicle queuing is predicted to occur over No-Build conditions because of the addition of Project-related traffic.

Elm Street at the Carriagetown Marketplace Driveway

Consistent with the findings presented in the DEIR, no change in level of service is predicted to occur over No-Build conditions as a result of the addition of Project-related traffic, with Project-related impacts generally defined as a predicted increase in average motorist delay that resulted in a corresponding increase in vehicle queuing of up to one vehicle. Independent of the Project, the Carriagetown Marketplace is currently operating at capacity during the weekday evening peak-hour.

⁶ The Project proponent has coordinated with the City to file a Community One Stop for Growth grant application for the construction of improvements at the Route 110/I-95 southbound ramps intersection which was submitted on June 4, 2025.

Elm Street at the Hampton Inn Amesbury and Project Site Driveways

Consistent with the findings presented in the DEIR, all movements exiting the Project Site driveway to Elm Street are predicted to operate with extended delay (i.e., LOS “F”) due to the relatively large volume of conflicting traffic traveling along Elm Street during the peak periods. The resulting residual vehicle queue (up to four vehicles), can be contained along the Project Site driveway without inhibiting access, or the movement of vehicles, pedestrians, or bicyclists along Elm Street. All movements along Elm Street are predicted to operate at LOS A with negligible vehicle queuing.

Table 5-4 Signalized Intersection Level of Service and Vehicle Queue Summary (with 10 percent non-SOV mode shift)

Signalized Intersection/Peak-Hour/Movement	2031 No-Build				2031 Build				2031 Build (Mitigated)			
	V/C ^a	Delay ^b	LOS ^c	Queue ^d 50 th /95 th	V/C	Delay	LOS	Queue 50 th /95 th	V/C	Delay	LOS	Queue 50 th /95 th
Route 110 at Carriagetown Marketplace												
<i>Weekday Morning:</i>												
Route 110 EB LT	0.30	43.6	D	1/3	0.30	43.6	D	1/3	0.32	44.3	D	1/3
Route 110 EB TH	0.57	5.2	A	5/21	0.58	5.3	A	5/22	0.58	5.3	A	5/22
Route 110 WB TH/RT	0.46	2.2	A	0/19	0.46	2.3	A	0/18	0.46	4.3	A	4/18
Carriagetown Marketplace SB LT	0.41	47.1	D	1/3	0.41	47.1	D	1/3	0.41	47.1	D	1/3
Carriagetown Marketplace SB RT	0.03	36.5	D	0/1	0.03	36.5	D	0/1	0.03	37.0	D	0/1
Overall	--	6.0	A	--	--	6.1	A	--	--	6.8	A	--
<i>Weekday Evening:</i>												
Route 110 EB LT	0.56	42.3	D	3/9	0.56	42.3	D	3/9	0.56	42.3	D	3/9
Route 110 EB TH	0.53	6.4	A	5/16	0.55	6.6	A	5/17	0.55	6.6	A	5/17
Route 110 WB TH/RT	0.84	7.5	A	1/5	0.84	7.4	A	2/5	0.84	10.1	B	7/32
Carriagetown Marketplace SB LT	0.51	44.1	D	3/5	0.51	44.1	D	3/5	0.51	44.1	D	3/5
Carriagetown Marketplace SB RT	0.10	29.0	C	0/2	0.10	29.0	C	0/2	0.10	29.0	C	0/2
Overall	--	10.5	B	--	--	10.5	B	--	--	11.8	B	--
Route 110 at Elm Street and Clarks Road												
<i>Weekday Morning:</i>												
Route 110 EB UT/LT	0.42	50.3	D	2/3	0.60	56.7	E	2/4	0.47	45.8	D	2/4
Route 110 EB TH/RT	1.49	>80.0	F	26/32	1.49	>80.0	F	26/32	1.61	>80.0	F	26/34
Route 110 WB UT/LT	0.60	49.9	D	3/6	0.69	57.6	E	3/6	0.55	46.5	D	3/6
Route 110 WB TH	0.90	45.7	D	12/17	0.90	46.5	D	12/17	0.67	34.7	C	8/10
Route 110 WB RT	0.21	9.5	A	0/1	0.22	8.6	A	0/1	0.22	10.1	B	0/1
Clarks Road NB LT	0.54	45.2	D	3/6	0.60	49.4	D	3/6	0.52	44.2	D	3/6
Clarks Road NB TH/RT	0.33	42.4	D	1/4	0.37	43.8	D	1/4	0.33	42.0	D	1/4
Elm Street SB LT	0.54	30.1	C	6/13	0.56	28.9	C	6/15	0.59	30.3	C	7/14
Elm Street SB TH/RT	0.13	25.8	C	1/4	0.14	24.4	C	1/4	0.15	25.4	C	1/4
Overall	--	>80.0	F	--	--	>80.0	F	--	--	>80.0	F	--
<i>Weekday Evening:</i>												
Route 110 EB UT/LT	0.77	71.3	E	3/7	1.06	>80.0	F	5/10	1.06	>80.0	F	5/10
Route 110 EB TH/RT	1.25	>80.0	F	23/27	1.25	>80.0	F	14/25	1.21	>80.0	F	13/27
Route 110 WB UT/LT	0.79	70.2	E	3/7	0.79	70.2	E	3/7	0.79	70.3	E	3/5
Route 110 WB TH	1.37	>80.0	F	27/32	1.37	>80.0	F	27/32	0.93	36.9	D	14/15
Route 110 WB RT	0.45	13.9	B	2/4	0.49	12.5	B	2/5	0.40	14.1	B	1/2
Clarks Road NB LT	0.42	39.6	D	3/6	0.54	44.6	D	3/6	0.60	48.4	D	3/6
Clarks Road NB TH/RT	0.60	43.3	D	4/9	0.79	61.5	E	4/9	0.87	78.9	E	4/9
Elm Street SB LT	0.47	33.4	C	4/10	0.46	30.9	C	5/11	0.45	30.7	C	5/11
Elm Street SB TH/RT	0.29	31.8	C	2/6	0.27	29.1	C	2/7	0.27	29.0	C	2/7
Overall	--	>80.0	F	--	--	>80.0	F	--	--	68.5	E	--

See notes at end of table.

Table 5-4 Signalized Intersection Level of Service and Vehicle Queue Summary (with 10 percent non-SOV mode shift) (Continued)

Signalized Intersection/Peak-Hour/Movement	2031 No-Build				2031 Build				2031 Build (Mitigated)			
	V/C ^a	Delay ^b	LOS ^c	Queue ^d 50 th /95 th	V/C	Delay	LOS	Queue 50 th /95 th	V/C	Delay	LOS	Queue 50 th /95 th
Route 110 at Merrill Street and Rabbit Road												
<i>Weekday Morning:</i>												
Route 110 EB UT/LT	0.43	29.2	C	2/5	0.43	29.2	C	2/5	0.68	47.1	D	2/8
Route 110 EB TH	0.64	21.8	C	5/13	0.65	21.9	C	6/13	0.76	30.1	C	7/16
Route 110 EB RT	0.23	13.7	B	0/1	0.23	13.7	B	0/1	0.23	12.5	B	0/1
Route 110 WB UT/LT	0.97	>80.0	F	2/9	0.97	>80.0	F	2/9	0.69	48.2	D	2/8
Route 110 WB TH/RT	0.74	29.5	C	5/17	0.74	29.5	C	5/17	0.64	27.7	C	5/13
Merrill Street NB LT	1.00	72.2	E	5/20	1.01	75.3	E	5/20	0.78	28.8	C	5/15
Merrill Street NB TH/RT	0.29	18.3	B	2/6	0.29	18.5	B	2/6	0.26	18.1	B	2/6
Rabbit Road SB LT/TH	0.56	29.0	C	3/8	0.56	29.3	C	3/8	0.81	54.8	D	3/11
Rabbit Road SB TH	0.07	12.8	B	0/1	0.07	12.8	B	0/1	0.07	21.4	C	0/2
Overall	--	32.5	C	--	--	32.9	C	--	--	28.9	C	--
<i>Weekday Evening:</i>												
Route 110 EB UT/LT	1.06	>80.0	F	3/11	1.07	>80.0	F	3/11	0.96	>80.0	F	5/14
Route 110 EB TH	0.96	48.3	D	8/22	0.97	49.8	D	9/22	0.81	42.5	D	13/25
Route 110 EB RT	0.24	15.5	B	0/1	0.24	15.5	B	0/1	0.24	14.3	B	0/1
Route 110 WB UT/LT	1.03	>80.0	F	2/9	1.03	>80.0	F	2/9	1.15	>80.0	F	4/12
Route 110 WB TH/RT	0.96	50.9	D	8/21	0.98	54.0	D	8/22	0.85	48.7	D	13/25
Merrill Street NB LT	1.13	>80.0	F	7/26	1.14	>80.0	F	7/26	0.94	54.9	D	10/28
Merrill Street NB TH/RT	0.35	15.8	B	3/9	0.35	15.8	B	3/9	0.33	21.7	C	5/11
Rabbit Road SB LT/TH	0.81	42.9	D	5/14	0.81	42.9	D	5/14	0.97	>80.0	F	8/19
Rabbit Road SB TH	0.12	16.5	B	0/2	0.12	16.5	B	0/2	0.19	30.0	C	1/4
Overall	--	54.4	D	--	--	56.2	E	--	--	52.3	D	--

See notes at end of table.

Table 5-4 Signalized Intersection Level of Service and Vehicle Queue Summary (with 10 percent non-SOV mode shift) (Continued)

Signalized Intersection/Peak-Hour/Movement	2031 No-Build				2031 Build				2031 Build (Mitigated)			
	V/C ^a	Delay ^b	LOS ^c	Queue ^d 50 th /95 th	V/C	Delay	LOS	Queue 50 th /95 th	V/C	Delay	LOS	Queue 50 th /95 th
Route 110 at the I-95 SB Ramps												
<i>Weekday Morning:</i>												
Route 110 EB TH									0.36	2.4	A	2/3
Route 110 EB RT									0.78	3.9	A	0/0
Route 110 WB TH									0.52	3.0	A	3/5
Route 110 WB RT									0.14	0.2	A	0/0
I-95 SB Off-Ramp NB LT									0.40	23.2	C	1/2
I-95 SB Off-Ramp NB RT									0.13	0.2	A	0/0
Overall									--	3.2	A	--
<i>Weekday Evening:</i>												
Route 110 EB TH									0.39	2.6	A	1/4
Route 110 EB RT									0.46	0.3	A	0/0
Route 110 WB TH									0.75	6.5	A	12/14
Route 110 WB RT									0.14	0.2	A	0/0
I-95 SB Off-Ramp NB LT									0.54	44.8	D	3/5
I-95 SB Off-Ramp NB RT									0.13	0.2	A	0/0
Overall									--	4.8	A	--

^aVolume-to-capacity ratio.

^bControl (signal) delay per vehicle in seconds.

^cLevel of service.

^dQueue length in vehicles.

NB = northbound; SB = southbound; EB = eastbound; WB = westbound.

UT = U-turning movement; LT = left-turning movements; TH = through movements; RT = right-turning movements.

Table 5-5 Unsignalized Intersection Level of Service and Vehicle Queue Summary (with 10 percent non-SOV mode shift)

Unsignalized Intersection/Peak-hour/Movement	2031 No-Build				2031 Build				2031 Build (Mitigated)			
	Demand ^a	Delay ^b	LOS ^c	Queue ^d 95 th	Demand	Delay	LOS	Queue 95 th	Demand	Delay	LOS	Queue 95 th
Route 110 at the I-495 SB On-Ramp												
Weekday Morning:												
Route 110 WB TH	412	0.0	A	0	431	0.0	A	0	Mitigation Not Proposed at this Intersection			
I-495 SB On-Ramp WB RT	652	0.0	A	0	671	0.0	A	0				
Weekday Evening:												
Route 110 WB TH	692	0.0	A	0	704	0.0	A	0				
Interstate 495 On Ramp WB RT	1,041	0.0	A	0	1,053	0.0	A	0				
Route 110 at the I-495 NB Off-Ramp												
Weekday Morning:												
Route 110 EB TH	585	0.0	A	0	591	0.0	A	0	Mitigation Not Proposed at this Intersection			
Interstate 495 Off Ramps NB RT	1,207	0.0	A	0	1,213	0.0	A	0				
Weekday Evening:												
Route 110 EB TH	610	0.0	A	0	630	0.0	A	0				
Interstate 495 Off Ramps NB RT	893	0.0	A	0	913	0.0	A	0				
Route 110 at Rocky Hill Road												
Weekday Morning:												
Route 110 EB TH/RT	1,836	0.0	A	0	1,848	0.0	A	0	Mitigation Not Proposed at this Intersection			
Route 110 WB TH/RT	915	0.0	A	0	926	0.0	A	0				
Rocky Hill Road NB RT	73	27.5	D	2	73	27.9	D	2				
Rocky Hill Road SB RT	132	14.0	B	1	159	14.8	B	2				
Weekday Evening:												
Route 110 EB TH/RT	1,353	0.0	A	0	1,393	0.0	A	0				
Route 110 WB TH/RT	1,649	0.0	A	0	1,656	0.0	A	0				
Rocky Hill Road NB RT	101	19.7	C	2	101	20.5	C	2				
Rocky Hill Road SB RT	121	>50.0	F	6	138	>50.0	F	8				

See notes at the end of Table.

Table 5-5 Unsignalized Intersection Level of Service and Vehicle Queue Summary (with 10 percent non-SOV mode shift) (Continued)

Unsignalized Intersection/Peak-Hour/Movement	2031 No-Build				2031 Build				2031 Build (Mitigated)			
	Demand ^a	Delay ^b	LOS ^c	Queue ^d 95 th	Demand	Delay	LOS	Queue 95 th	Demand	Delay	LOS	Queue 95 th
Route 110 at the I-95 SB Ramps												
Weekday Morning:												
Route 110 EB TH	847	0.0	A	0	871	0.0	A	0	See Mitigated Signalized Intersection Level-of-Service and Vehicle Queue Summary (Table 5-4)			
Route 110 EB RT	1,130	0.0	A	0	1,164	0.0	A	0				
Route 110 WB TH	1,214	0.0	A	0	1,230	0.0	A	0				
Route 110 WB RT	199	0.0	A	0	199	0.0	A	0				
I-95 SB Off-Ramp NB LT	50	>50.0	F	4	52	>50.0	F	4				
I-95 SB Off-Ramp NB RT	149	15.3	C	2	149	15.6	C	2				
Weekday Evening:												
Route 110 EB TH	1,030	0.0	A	0	1,045	0.0	A	0				
Route 110 EB RT	650	0.0	A	0	671	0.0	A	0				
Route 110 WB TH	2,027	0.0	A	0	2,081	0.0	A	0				
Route 110 WB RT	208	0.0	A	0	208	0.0	A	0				
I-95 SB Off-Ramp NB LT	88	>50.0	F	11	94	>50.0	F	12				
I-95 SB Off-Ramp NB RT	183	18.3	C	2	183	18.6	C	2				
Route 110 at the I-95 NB Ramps												
Weekday Morning:												
Route 110 EB UT/LT	119	>50.0	F	N/C	125	>50.0	F	N/C	125	11.4	B	1
Route 110 EB TH	877	0.0	A	0	895	0.0	A	0	895	0.0	A	0
Route 110 WB TH	857	0.0	A	0	862	0.0	A	0	862	0.0	A	0
Route 110 WB RT	129	0.0	A	0	129	0.0	A	0	129	0.0	A	0
I-95 NB Off-Ramp NB RT	192	0.0	A	0	192	0.0	A	0	192	0.0	A	0
I-95 NB Off-Ramp SB RT	553	>50.0	F	25	564	>50.0	F	27	564	0.0	A	0
Weekday Evening:												
Route 110 EB UT/LT	172	>50.0	F	N/C	175	>50.0	F	N/C	176	15.3	C	2
Route 110 EB TH	1,041	0.0	A	0	1,052	0.0	A	0	1,052	0.0	A	0
Route 110 WB TH	1,178	0.0	A	0	1,197	0.0	A	0	1,197	0.0	A	0
Route 110 WB RT	219	0.0	A	0	219	0.0	A	0	219	0.0	A	0
I-95 NB Off-Ramp NB RT	333	0.0	A	0	333	0.0	A	0	333	0.0	A	0
I-95 NB Off-Ramp SB RT	1,053	>50.0	F	95	1,088	>50.0	F	101	1,088	0.0	A	0

See notes at the end of Table.

Table 5-5 Unsignalized Intersection Level of Service and Vehicle Queue Summary (with 10 percent non-SOV mode shift) (Continued)

Unsignalized Intersection/Peak-Hour/Movement	2031 No-Build				2031 Build				2031 Build (Mitigated)			
	Demand ^a	Delay ^b	LOS ^c	Queue ^d 95 th	Demand	Delay	LOS	Queue 95 th	Demand	Delay	LOS	Queue 95 th
Elm Street at Rocky Hill Road												
Weekday Morning:												
Rocky Hill Road EB LT/RT	71	24.0	C	2	71	27.5	D	2	Mitigation Not Proposed at this Intersection			
Elm Street NB LT/TH	355	0.2	A	0	395	0.8	A	0				
Elm Street SB TH/RT	714	0.0	A	0	718	0.0	A	0				
Weekday Evening:												
Rocky Hill Road EB LT/RT	54	33.6	D	2	54	39.0	E	2				
Elm Street NB LT/TH	769	0.1	A	0	794	0.3	A	0				
Elm Street SB TH/RT	610	0.0	A	0	624	0.0	A	0				
Elm Street at the Carriagetown Marketplace												
Weekday Morning:												
Carriagetown Marketplace EB LT/RT	40	18.7	C	1	40	19.5	C	1	Mitigation Not Proposed at this Intersection			
Elm Street NB LT/TH	309	0.8	A	0	349	0.6	A	0				
Elm Street SB TH/RT	615	0.0	A	0	619	0.0	A	0				
Weekday Evening:												
Carriagetown Marketplace EB LT/RT	149	>50.0	F	6	149	>50.0	F	7				
Elm Street NB LT/TH	672	0.7	A	0	697	0.6	A	0				
Elm Street SB TH/RT	510	0.0	A	0	527	0.0	A	0				
Elm Street at Hampton Inn and Project Site												
Weekday Morning:												
Hampton Inn Driveway EB LT/RT	9	15.4	C	0	9	16.3	C	0	Mitigation Not Proposed at this Intersection			
Project Site Driveway WB LT/RT	--	--	--	--	112	>50.0	F	4				
Elm Street NB LT/TH/RT	384	0.1	A	0	416	0.1	A	0				
Elm Street SB LT/TH/RT	613	0.0	A	0	617	0.1	A	0				
Weekday Evening:												
Hampton Inn Driveway EB LT/RT	6	14.4	B	0	6	16.4	C	0				
Project Site Driveway WB LT/RT	--	--	--	--	70	>50.0	F	3				
Elm Street NB LT/TH/RT	704	0.1	A	0	807	0.1	A	0				
Elm Street SB LT/TH/RT	506	0.0	A	0	520	0.3	A	0				

^aDemand in vehicles per hour.

^bAverage control delay per vehicle (in seconds).

^cLevel of service.

^dQueue length in vehicles.

NB = northbound; SB = southbound; EB = eastbound; WB = westbound; LT = left-turning movements; TH = through movements; RT = right-turning movements.

5.5 Pedestrian and Bicycle Circulation Planning

The Project has been planned and designed to encourage pedestrian and bicycle travel between the proposed buildings and includes connections to the existing and planned future pedestrian and bicycle infrastructure along Elm Street and Route 110. Figure 5-7 provides a graphical summary of the location of existing pedestrian and bicycle facilities within the study area.

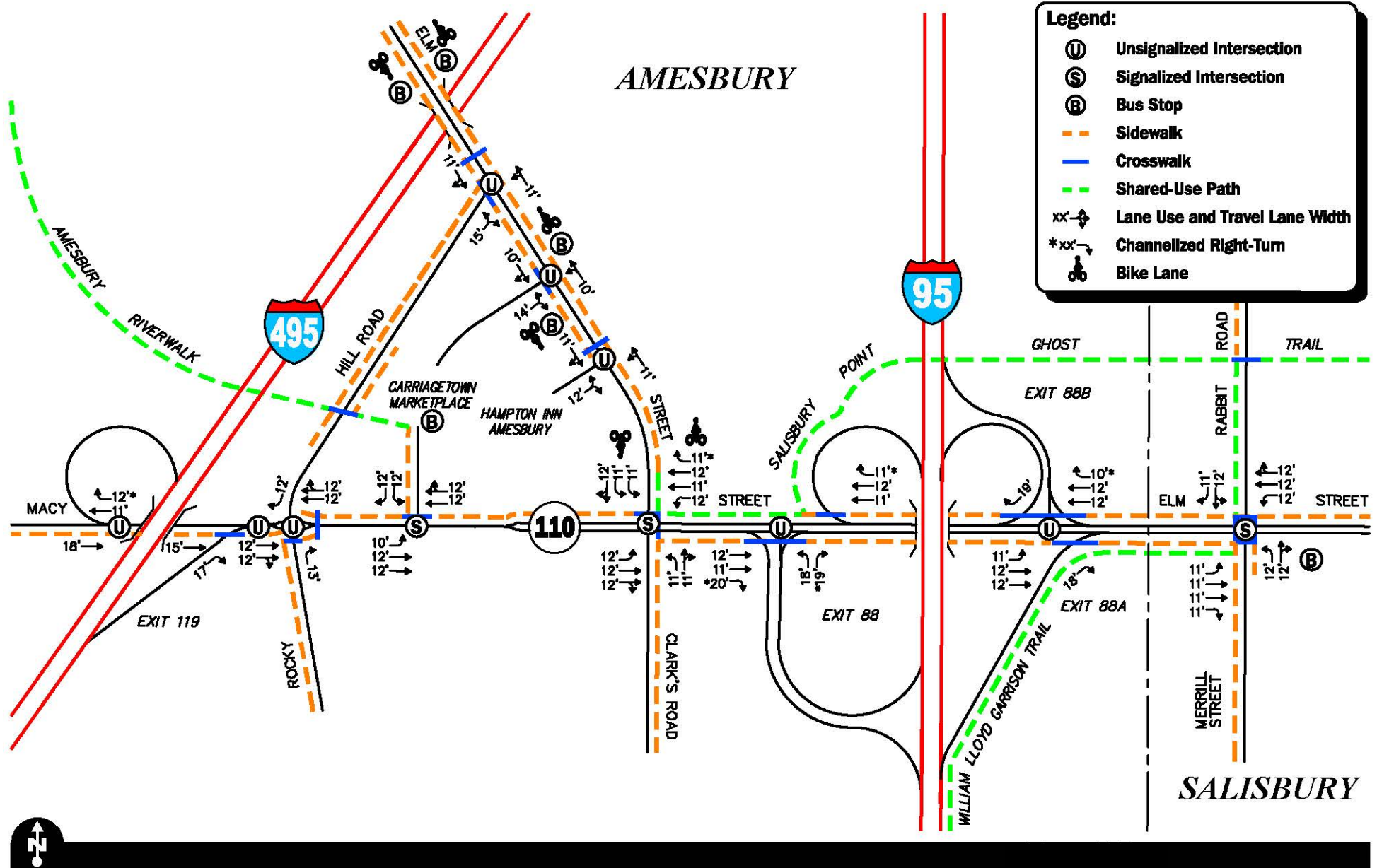
5.5.1 *Pedestrian Accommodations*

Sidewalks will be provided along one or both sides of the internal roadway network, the majority of which will be separated from the edge of the vehicular traveled-way by a grassed or planted buffer that will include street trees. Marked crosswalks will be provided where crossings are proposed to link the neighborhood areas and to connect to the amenity area at the Neighborhood Center. In addition, a trail network is also proposed that extends from the sidewalk system to the existing trails within the open space area to the east of the Project Site.

The proposed sidewalk system will extend to Elm Street where recently constructed ADA compliant sidewalks are provided continuously along the east side of the roadway that extends to Route 110 and connects to the Salisbury Point Ghost Trail shared-use path and along the west side of the roadway north of the Hampton Inn Amesbury. A crosswalk is provided across Elm Street at the Hampton Inn that connects the southern terminus of the sidewalk along the west side of the roadway to the continuous sidewalk along the east side. Crosswalks are also provided at the Route 110/Elm Street/Clark's Road intersection and for crossing one or more legs of the study area intersections along Route 110 and Elm Street.

In conjunction with the Project, the following pedestrian mobility and safety improvements will be advanced subject to receipt of all necessary rights, permits and approvals:

- **Elm Street Pedestrian Crossing** - In order to facilitate pedestrian access to the Project and connectivity to public transportation (MeVa bus routes), the Carriagetown Marketplace and the Salisbury Point Ghost Trail, a pedestrian actuated RRFB will be installed at the existing crosswalk across the Elm Street northwest leg of the Elm Street/Hampton Inn Amesbury driveway intersection to include pedestrian crossing warning signs at and in advance of the crossing. The location of the crossing and RRFB installation will be defined in consultation with MassDOT and the City to compliment the planned connection between the Amesbury Riverwalk and the Salisbury Point Ghost Trail to the north of the Project site.
- **Traffic Calming** – In order to promote travel speeds within the Project that are conducive to the pedestrian focused environment that has been a part of the planning and design of the Project, the following traffic calming measures will be introduced at appropriate locations along the internal street system:



Rocky Hill Amesbury, Massachusetts

- *Raised crosswalks* will be used along the primary (spine) roadways that convey through traffic between the residential buildings and Elm Street.
- *Raised intersections* will be used at the intersections of the distributor roadways with the spine roadway.
- A *modern roundabout* is proposed at the transition between the north and south neighborhoods.
- *Street trees and plantings* will be used to create a visual narrowing of the traveled-way.

In addition, pedestrian crossing and “share the roadway” signs will be installed at appropriate locations to reinforce the pedestrian focused environment within the Project.

5.5.2 *Bicycle Accommodations*

The Project has been planned and designed to encourage slow travel speeds. This design coupled with the relatively low traffic volumes that will be produced by the Project and that will be dispersed throughout the day will allow for shared use of the traveled-way by motor vehicles and cyclists. Recently constructed improvements along Elm Street included the addition of bicycle lanes along both sides of the roadway from the Salisbury Point Ghost Trail northerly to R Street in Amesbury, a distance of approximately 1.6 miles. The bicycle lanes travel past the Project Site and provide connections between the Project Site and the Salisbury Point Ghost Trail to the south and the Amesbury Riverwalk to the north, which is accessed from within the Carriage Town Marketplace. To the east of the Project Site, the William Lloyd Garrison shared-use trail is accessible from a trail-head situated on the southwest corner of the Route 110/Rabit Road/Merrill Street intersection in Salisbury.

The Project Site is physically separated from the Salisbury Point Ghost Trail by a stream and associated wetlands that prevent a direct connection to the trail from within the ; however, the on-road bicycle lanes along Elm Street facilitate connectivity between the Project and both the Salisbury Point Ghost Trail and the Amesbury Riverwalk. To promote and encourage bicycle travel by residents and guests, the following measures will be implemented as a part of the Project:

- Exterior bicycle racks will be provided proximate to building entrances and at the amenities area;
- Weather protected bicycle parking will be provided for residents in each residential building;
- Wayfinding signs will be provided within the Project Site to direct bicyclists to the bicycle parking areas and to the Salisbury Point Ghost Trail and the Amesbury Riverwalk from the Project site; and
- The TDM program will include information and maps of the shared-use trail network that is accessible from the Project Site, including the Salisbury Point Ghost Trail, the Amesbury Riverwalk, and the William Lloyd Garrison shared-use trails.

5.6 Parking

On-site parking will be provided in individual driveways and garages for the single-family attached and detached units, and by surface and on-street parking for the multifamily units, with a targeted parking ratio of 1.5 parking spaces per residential unit to be provided. Additional parking will be provided for guests and at the amenity building. The proposed parking supply (a minimum of 1.5 parking spaces per unit) has been designed to meet the parking requirements of Section VIII, *Off Street Parking and Loading*, of the City of Amesbury Zoning Ordinance.⁷ The proposed parking ratio is also consistent with the parking demands that have been documented by the ITE⁸ for multifamily residential communities in a similar suburban setting, which document average observed peak parking demands of between 1.27 and 1.41 parking spaces per unit and 85th percentile peak parking demands of between 1.59 and 2.27 parking spaces per unit.⁹

In consideration of both the requirements of the Zoning Ordinance and the parking demand observations documented by the ITE, the proposed parking ratio represents a reasonably balanced parking ratio that will meet the parking demands of residents, visitors and guests, while encouraging a reduce automobile ownership by residents and supporting the TDM program that will be associated with the Project. That being said, the Project Proponent will discuss opportunities with the City to “land bank” (design but not construct unless necessary) parking at defined locations within the Project Site.

5.7 Site Access

Access to the Project Site will be provided by way of a full access driveway that will intersect the east side of Elm Street, generally opposite the south driveway to the Hampton Inn Amesbury. Secondary access for emergency vehicles will be provided through a connection to the abutting property to the north at 227 Elm Street, which will be secured by a gate or other means acceptable to the Amesbury Fire Department. The capacity analyses that have been provided as a part of the TIA that accompanied the DEIR and as supplemented as a part of this FEIR have demonstrated that a single means of access for general traffic is sufficient to accommodate the traffic volumes that are expected to be associated with the proposed residential community and serves to reduce the reduce the number of new driveways and the associated conflict points along Elm Street. Secondary access is provided for emergency vehicles by way of a connection to the abutting property to the north at 227 Elm Street, which will be 20-feet in width, paved and secured by means of a gate.

⁷ The City of Amesbury Zoning Ordinance requires a minimum of 1.5 parking spaces per dwelling or apartment unit.

⁸ *Parking Generation*, 6th Edition; Institute of Transportation Engineers; Washington D.C.; October 2023.

⁹ The 85th percentile peak parking demand is defined as the parking demand at which 85 percent of the observed peak parking demands fall below, and 15 percent are above.

Within the Project Site the primary or spine drive will be a minimum of 22-feet in width without a median with the section of drive that will include a median designed to provide a 14-foot wide traveled-way on either side of the median. Minor drives that are not intended to convey through traffic to Elm Street will be a minimum of 20-feet in width. These dimensions are sufficient to accommodate two-way traffic while encouraging reduced travel speeds within the residential community. Corner radii and terminus points of the drives within the Project site will be designed to accommodate the turning and maneuvering requirements of an emergency vehicle as defined by the Amesbury Fire Chief.

As discussed in Section 5.5.1, traffic calming measures will be incorporated into the design of the internal roadway network to reduce travel speeds and enhance mobility:

- ***Raised crosswalks*** will be used along the primary (spine) roadways that convey through traffic between the residential buildings and Elm Street.
- ***Raised intersections*** will be used at the intersections of the distributor roadways with the spine roadway.
- A ***modern roundabout*** is proposed at the transition between the north and south neighborhoods.
- ***Street trees and plantings*** will be used to create a visual narrowing of the traveled-way.

In addition, pedestrian crossing and “share the roadway” signs will be installed at appropriate locations to reinforce the pedestrian focused environment within the Project.

5.8 Transportation Monitoring

As detailed in the TIA that accompanied the DEIR, the Proponent will conduct a post-development traffic monitoring and resident survey program to evaluate the success and to refine the elements of the TDM program, and to validate the trip projections for the Project. The monitoring program has been expanded to include parking demand observations and will include:

1. Obtaining traffic-volume information over a continuous seven-day, weeklong period on the driveway serving the Project;
2. Performing manual turning movement and vehicle classification counts at the following intersections (the “Monitored Intersections”) during the weekday morning (7:00 to 9:00 AM) and evening (4:00 to 6:00 PM) peak periods:
 - Elm Street at the Project site driveway
 - Route 110 at the Carriagetown Marketplace Driveway;
 - Route 110 at Elm Street and Clark’s Road;
 - Route 110 at the I-95 Southbound Ramps
 - Route 110 at the I-95 Northbound Ramps
 - Route 110 at Merrill Street and Rabbit Road;
3. Evaluating motor vehicle crash data at the Monitored Intersections;

4. Obtaining parking demand observations between 5 AM and 7 AM on a weekday (the peak parking demand period for a residential use); and
5. Performing a survey of resident commuting modes.

The monitoring program will commence six months after issuance of the first Certificate of Occupancy for the Project and will continue on an annual basis thereafter for a period not to exceed five years after completion of the Project. The results of the monitoring program will be summarized in a report (the “Traffic Monitoring Report”) to be provided to MassDOT, the Merrimack Valley Planning Commission (MVPC) and the City of Amesbury within two months after the completion of the data collection effort. The Traffic Monitoring Report will document: i) traffic volumes associated with the Project; ii) motorist delays, vehicle queuing, crash severity and calculated crash rates at the Monitored Intersections; iii) parking occupancy; and iii) the elements of the TDM program that have been implemented and use of alternative modes of transportation to SOVs by residents.

If and to the extent any of the following occur: i) the volume of traffic attributable to the Project as measured at the Project Site driveway exceeds the projected traffic volumes on a daily or peak-hour basis by more than ten percent ii) there is an increase in the frequency of occurrence of motor vehicle crashes at the Monitored Intersections that can be attributed to the Project; or iii) traffic operations at the Monitored Intersections are materially degraded as a result of the addition of Project-related traffic; the Proponent will coordinate with the appropriate approving authorities to implement one or more of the following measures subject to receipt of all necessary rights, permits and approvals:

- Traffic signal timing, phasing, and coordination improvements
- Sign and pavement marking installation;
- Expansion or refinement of the elements of the TDM program; and
- On-site operation and management strategies that are designed to reduce overall and peak traffic volumes and parking demands that may include providing a resident shuttle service to supplement the MeVa bus service.

The specific improvement measure(s) will be summarized in the Traffic Monitoring Report, and their status and effectiveness will be evaluated in the subsequent Traffic Monitoring Report.

5.9 Conclusion

VAI has performed supplemental analyses in support of the TIA that accompanied the DEIR as a part of this FEIR in order to determine the potential impacts on the transportation infrastructure associated with the proposed construction of a residential development to be located off of Elm Street in the “Rocky Hill” area of Amesbury. These analyses are responsive to the scope of work that was identified in the January 17, 2025 DEIR Certificate. As identified in the Certificate and further discussed with MassDOT, this supplemental assessment includes the following specific items:

- **Transportation Improvement Program** – The elements of the transportation improvement program have been refined and expanded to incorporate the suggested improvements from the RSAs that have been conducted at the Route 110/Merrill Street/Rabbit Road and Route 110/Elm Street/Clarks Road intersections;
- **Transportation Demand Management** – An assessment of operating conditions at the study area intersections has been undertaken to define the reduced impacts that could be achieved through attaining a 10% reduction in Project-related SOV trips as a result of the implementation of the TDM Program that will be advanced as an integral part of the Project;
- **Pedestrian and Bicycle Circulation Planning** – A review of the integration of the Project into the existing and planned future pedestrian and bicycle infrastructure has been undertaken that includes enhancements to the accommodations within the Project Site to connect to these facilities;
- **Parking** – Strategies to reduce the number of parking spaces that are to be constructed as a part of the Project have been developed and will be further discussed with the City as means to disincentivize SOV travel;
- **Site Access** – The design of the site access and internal roadway network has been updated to incorporate traffic calming features, mobility enhancements and to address the comments from the Amesbury Public Works and Fire Rescue Departments; and
- **Transportation Monitoring** – The Transportation Monitoring Program has been updated and expanded to include the monitoring of traffic volumes, parking occupancy, motor vehicle crash data and commuting modes of residents of the Project. Corrective measures have been identified that will be advanced to the extent that the measured criteria exceed identified thresholds.

Consistent with the findings of the TIA that accompanied the DEIR, it has been determined that the transportation infrastructure affords sufficient capacity to accommodate the additional traffic that will be associated with Project with specific improvements and trip reduction measures that have been refined as a part of this FEIR.

Chapter 5: Transportation Attachments

Route 110 Road Safety Audit
Trip-Generation Calculations
2019-2023 ACS Census Tract 2663 Data
Capacity Analysis Worksheets

Route 110 Road Safety Audit

ROAD SAFETY AUDIT

Macy Street (Route 110) at Elm's Street/Clark's Road and
Elm Street (Route 110) at Rabbit Road/Merrill Street

City of Amesbury/Town of Salisbury

September 10, 2025

Prepared For:
MassDOT



Prepared By:
Toole Design
141 Tremont Street, 9th Floor
Boston, MA 02111

T'OOLE
DESIGN

Table of Contents

Contents

Background	1
Project Data	1
Project Location and Description	4
Roadways	4
Intersections	6
Macy Street (Route 110) at Elm Street and Clark's Road.....	6
Elm Street (Route 110) at Rabbit Road and Merrill Street	7
Traffic Counts.....	8
Audit Observations and Potential Safety Enhancements.....	10
Macy Street (Route 110) at Elm Street and Clark's Road	11
Intersection Geometry.....	11
Traffic Signal Timing and Equipment.....	12
Pavement Markings and Signage.....	13
Pedestrian, Bicycle, and Accessibility Accommodations	15
Lighting.....	17
Access Management	17
Elm Street (Route 110) at Rabbit Road and Merrill Street.....	18
Intersection Geometry.....	18
Traffic Signal Timing and Equipment.....	19
Pavement Markings and Signage.....	21
Pedestrian, Bicycle, and Accessibility Accommodations	23
Access Management	26
Summary of Road Safety Audit	26

List of Appendices

Appendix A.	RSA Meeting Agenda & Prompt List
Appendix B.	RSA Audit Team Contact List
Appendix C.	Detailed Crash Data
Appendix D.	Road Safety Audit References

List of Figures

Figure 1: Map of study intersections.....	4
Figure 2: Macy Street (Route 110) at Elm Street and Clark's Road.....	7
Figure 3: Macy/Elm Street (Route 110) at Merrill Street and Rabbit Road.....	8
Figure 4: Morning peak hour turning movement counts (Source: TIA; Rocky Hill Residential Development performed by VAI).....	9
Figure 5: Evening peak hour turning movement counts (Source; TIA; Rocky Hill Residential Development performed by VAI).....	9
Figure 6: Vegetation present near Sunoco driveway.....	11
Figure 7: Crooked signal head on slip lane median island.....	13
Figure 8: Lane assignment signs on Elm Street approaching Route 110.....	14
Figure 9: Macy Street (Route 110) at Elm Street and Clark's Road faded markings.....	14
Figure 10: Pedestrian ramp on southeast corner.....	16
Figure 11: Access management out of Sunoco driveway (across from Burger King).....	18
Figure 12: View of large turning radius on northwest corner.....	19
Figure 13: Signal heads on the north leg of the intersection, two with retroreflective backplates and one without.....	20
Figure 14: Missing pavement markings for designated right turn only lane for the eastbound approach to the intersection.....	21
Figure 15: Vegetation blocking lane median drop.....	22
Figure 16: Vegetation in front of I-95 sign westbound.....	22
Figure 17: Cyclist attempting to cross Elm Street (Route 110) from Rabbit Road on the west.....	23
Figure 18: Non-APS pushbuttons on southeast corner.....	24
Figure 19: Curb ramps on southeast corner.....	24
Figure 20: Parallel catch basin grate on southwest corner.....	25

List of Tables

Table 1: Participating Audit Team Members – Macy Street (Route 110) at Elm Street/Clark's Road.....	2
Table 2: Participating Audit Team Members – Elm Street (Route 110) at Rabbit Road/Merrill Street.....	2
Table 3: Estimated Time Frame and Costs Breakdown.....	26
Table 4: Potential Safety Enhancement Summary.....	27

Background

The Federal Highway Administration (FHWA) defines a Road Safety Audit (RSA) as the formal safety examination of an existing or future road or intersection by an independent, multidisciplinary team. The goal of an RSA is to identify safety issues and provide potential enhancements to improve safety for all roadway users.

Toole Design has conducted a Road Safety Audit (RSA) for the intersections of Macy Street (Route 110) at Elm Street and Clark's Road in Amesbury and Elm Street (Route 110) at Rabbit Road and Merrill Street in Salisbury. Macy Street (Route 110) at Elm Street and Clark's Road is a high crash location with 45 total crashes occurring from 2017-2021, indicating that the intersection poses a high-risk for all roadway users. Elm Street (Route 110) at Rabbit Road and Merrill Street is listed as a Highway Safety Improvement Program (HSIP) Top 5% Intersection Crash Cluster for the 2019-2021 period. This indicates that the location fell within the top 5% of crash locations within the State of Massachusetts during that period. This RSA was conducted as part of mitigation commitments for the Rocky Hill Residential Development, located on Elm Street. This proposed development includes the construction of up to 400 residential units in several buildings clustered within the project site.

Project Data

Toole Design conducted two separate RSA meetings for the two intersections. Each RSA involved holding a public meeting in each town to discuss existing safety concerns and issues. Next, audit teams conduct field visits to the study intersection. Following each field visit, the team discussed countermeasures for the infrastructure and operating conditions of the subject intersections. The audit team was comprised of representatives from local and state agencies ranging from emergency responders to transportation planners and engineers.

The first RSA occurred at the intersection of Macy Street (Route 110) at Elm Street and Clark's Road in the City of Amesbury on Monday, May 12th, 2025. For the audit, members of the audit team first met at the Police Department located at 19 School St, Amesbury, MA to discuss existing safety concerns and issues. The team then conducted a field visit to the intersection of Macy Street (Route 110) at Elm Street and Clark's Road. Contact information for Amesbury RSA attendees is provided in Table 1 and **Appendix B**.

The second RSA occurred at the intersection of Elm Street (Route 110) at Rabbit Road and Merrill Street in the Town of Salisbury on Tuesday, May 20th, 2025. For the audit, members of the audit team first met at the Police Department located at 181 Beach Road, Salisbury, MA to discuss existing safety concerns and issues. The team then conducted a field visit to the intersection of Elm Street (Route 110) at Rabbit Road and Merrill Street. Contact information for Amesbury RSA attendees is provided in Table 2 and **Appendix B**.

Table 1: Participating Audit Team Members – Macy Street (Route 110) at Elm Street/Clark's Road

Audit Team Member	Agency/Affiliation
Lisa DeMeo	City of Amesbury
Jason Plourde	BETA Group Inc.
Craig Bailey	Amesbury Police Department
Lauren Blatchford	Amesbury Police Department
Robert Serino	Amesbury Fire Department
Elizabeth Maldari	Merrimack Valley Planning Commission
Jim Terlizzi	MassDOT – Traffic and Safety
Michelle Deng	MassDOT – Traffic and Safety
Evelyn Densmore	MassDOT – Traffic and Safety
Kevin Fitzgerald	MassDOT – Traffic and Safety
Bob Tragert	MassDOT – D4 Traffic and Safety
Timothy Paris	MassDOT – D4 Planning
Christopher Bach	Toole Design
Sophia Cotman	Toole Design

Table 2: Participating Audit Team Members – Elm Street (Route 110) at Rabbit Road/Merrill Street

Audit Team Member	Agency/Affiliation
Keith Forget	Salisbury Police Department
Elizabeth Maldari	Merrimack Valley Planning Commission
Evelyn Densmore	MassDOT – Traffic and Safety
Jim Terlizzi	MassDOT – Traffic and Safety
Katherine Duffy	MassDOT – D4 Traffic and Safety
Kevin Fitzgerald	MassDOT – D4 Traffic and Safety
Bob Tragert	MassDOT – D4 Traffic and Safety
Leo Worcester	Merrimack Valley Transit
Tom Loughlin	Vanasse and Associates, Inc.
Jason Plourde	BETA Group Inc.
Joshua Grzegorzewski	Federal Highway Administration
Christopher Bach	Toole Design
Sophia Cotman	Toole Design

Audit team members received a meeting packet prior to the RSA including a meeting agenda (**Appendix A**), study area details, crash data analysis (**Appendix C**), collision diagrams of the study area intersection (**Appendix C**), and an RSA prompt list (**Appendix A**). A collision diagram is a graphical representation of the crash data showing both the crash type and approximate crash location within a study area, as well

as injury severity type and whether the crash occurred in daylight or nighttime conditions. The audit members were asked to review the packet and visit the RSA study area prior to the meeting.

Crash data from 2017-2021 was provided by Amesbury Police Department (PD) for analysis of the intersection of Macy Street (Route 110) and Elm Street/Clark's Road. According to this data, 45 crashes were reported at the intersection. Of the reported crashes, 89% (40) resulted in property damage only and 11% (5) resulted in non-fatal injury. Many crashes within the study area were rear-end crashes, representing 44% (20) of the total collisions. Angle crashes and sideswipes accounted for 24% (11) and 29% (13) respectively. The most prevalent crash trend consisted of rear-end crashes between vehicles traveling both eastbound and westbound on Macy Street. The data provided also shows a significant number of sideswipes for vehicles heading both southbound and westbound on Elm Street. Crashes occurred throughout the day with the most prominent time being 2 PM – 4 PM accounting for 18% (8) of the collisions. Other prominent times include the 10 AM – 12 PM and 4 PM – 6 PM windows, accounting for 13% (6) of the total collisions each. The per month crash frequency was greatest in May with 22% (9). Overall, most crashes occurred in the daylight (82%, 37) though a notable number did occur either at dusk or in the dark (18%, 8). Rain was present for 16% (7) of the crashes, while snow/sleet/hail accounted for 4% (2). 16% (7) of crashes occurred under wet conditions and 4% (2) occurred under snowy conditions.

Crash data from 2017-2021 was provided by Salisbury PD for analysis of the intersection of Elm Street (Route 110) and Merrill Street/Rabbit Road. According to this data, 61 crashes were reported at the intersection. Of the reported crashes, 79% (48) resulted in property damage only and 21% (13) resulted in non-fatal injury. Most crashes within the study area were rear-end crashes, representing 54% (33) of the total collisions. Angle crashes and sideswipes made up the remaining collisions, representing 30%, (18), and 13% (8) respectively. The most prevalent crash trend consisted of rear-end crashes between vehicles traveling both eastbound and westbound on Elm Street. The data provided also shows that there were a significant number of angle crashes for vehicles turning left from either Rabbit Road or Merrill Street onto Elm Street. Crashes occurred throughout the day with the most prominent times being the 2PM - 4PM period and the 4 PM – 6 PM period, accounting for 23% (14) and 21% (13) respectively. The distribution of crashes throughout the week was relatively consistent, but there was a noticeable increase in crash frequency between May and August, with each of the four months accounting for at least 10% of crashes. Overall, most crashes occurred in the daylight (77%, 47) though a notable number did occur at either dawn/dusk or in the dark (23%, 14). Rain was accounted for in 7% (4) of crashes, with snow following at 3% (2). Wet roadway conditions were accounted for in 16% (10) of crashes and 2% (1) occurred under snowy conditions.

Project Location and Description

The study area includes the intersections of Macy Street (Route 110) at Elm Street and Clark's Road and Elm Street (Route 110) at Rabbit Road and Merrill Street.

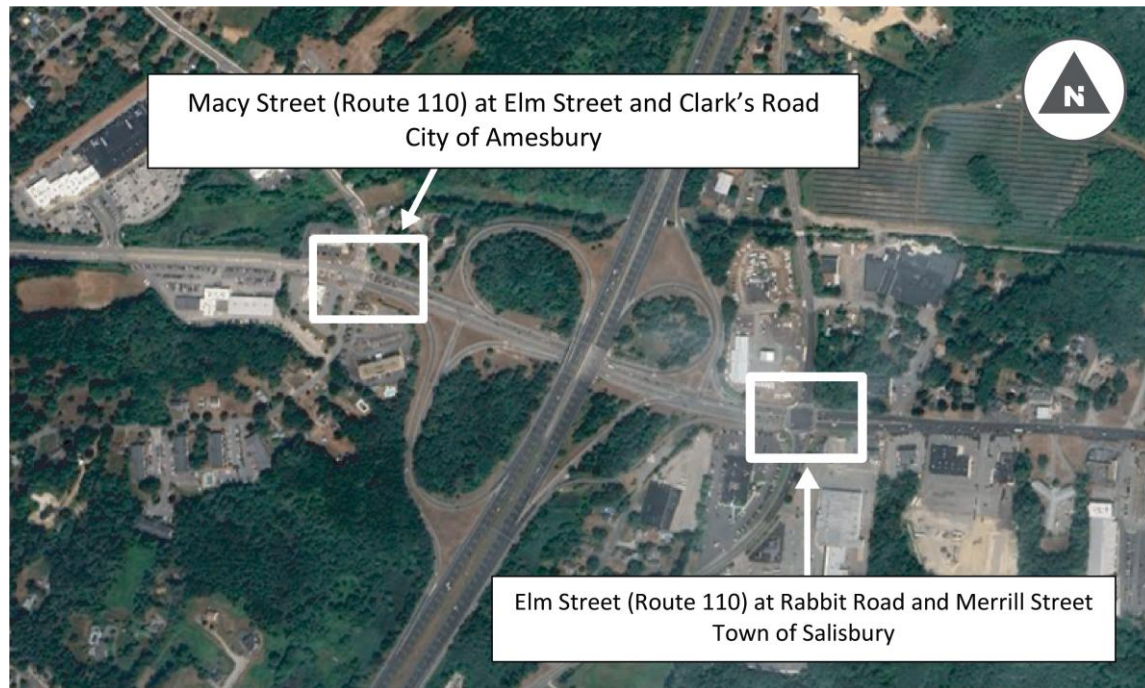


Figure 1: Map of study intersections

Roadways

Route 110 (Macy Street in Amesbury and Elm Street in Salisbury) is a two-way roadway running in the east/west direction connecting Amesbury and Salisbury residents to Interstate 95, Interstate 495, and US Route 1. Route 110 experiences heavy traffic in the summer due to demand from Salisbury Beach, as it helps connect the beach to I-95 and I-495. In Amesbury, Route 110 is classified as a principal arterial and is under the jurisdiction of MassDOT. Its cross section consists of two lanes in each direction throughout the study area divided by a concrete or painted median of variable width, with the median narrowing or being removed near intersections to accommodate turning lanes. At the intersection of Route 110 at Elm Street and Clark's Road, the roadway widens to accommodate an exclusive left turn lane on the eastbound and westbound approaches and a channelized right turn slip lane on the westbound approach. Just east of the intersection, on-ramps and off-ramps are provided for vehicles traveling to and from I-95 South. West of the intersection, the raised concrete median transitions into a painted median. Route 110 (Macy Street) transitions to Route 110 (Elm Street) at the intersection of Rabbit Road and Merrill Street in Salisbury, east of the I-95 interchange. Parking is generally not permitted on the roadway, and approximately 3-foot-wide shoulders are provided on both sides throughout the corridor. Sidewalks are provided along both sides of the roadway between Clark's Road and Rabbit Road. Sidewalks are only present on the northern side of the roadway west of Clark's Road and east of Rabbit Road. No bicycle facilities are present on the roadway; however, the Salisbury Point Ghost Trail runs parallel to the roadway for about 300 feet before

the Route 110 and Clark's Road intersection and the William Lloyd Garrison Trail runs parallel to the roadway for about 400 feet before terminating at the Rabbit Road and Merrill Street intersection.

In Salisbury, Route 110 is classified as a minor arterial and is under the jurisdiction of MassDOT. The cross section consists of one travel lane in each direction with a center turning lane, widening to accommodate two travel lanes in each direction, and an exclusive left turn lane with a median approximately 400 feet before the Merrill Street/Rabbit Road intersection. Shoulders ranging in width from 1 to 3 feet are provided along the roadway. There are no bicycle facilities present on the roadway. Parking is not permitted along the roadway, and sidewalks are present on the northern side of the roadway east of Rabbit Road. Just west of the intersection, on and off ramps are provided for vehicles travelling onto and from I-95 North.

Elm Street in Amesbury is a two-way roadway oriented in the north/south direction. It is classified as a minor arterial and is under the jurisdiction of MassDOT. Its cross section consists of one travel lane in each direction, widening to two exclusive left turn lanes and a right/through lane. Conventional bike lanes begin approximately 450 feet north of the intersection. At the northeast corner of the intersection with Macy Street (Route 110), the Salisbury Point Ghost Trail terminates. Parking is not permitted along the roadway. Sidewalks are present on the eastern side of the roadway approaching Macy Street (Route 110). Speed data was collected along Elm Street in Amesbury. The statutory speed limit is 25 MPH in both directions. The mean travel speed is 29 MPH northbound and 27 MPH southbound. 85th percentile speed northbound is 33 MPH and southbound is 29 MPH.

Clark's Road is a two-way roadway running in the north/south direction. It is classified as a major collector and is under the jurisdiction of the City of Amesbury. Its cross section consists of one travel lane in each direction, widening to include a northbound exclusive left turn lane approximately 200 feet before the Macy Street intersection. Marked shoulders or bicycle facilities are not provided. Parking is not permitted along the roadway, and sidewalks are not present, except for a short 200-foot section on the eastern side of the roadway approaching the intersection. This roadway is included in the city-wide 25 MPH speed limit regulation.

Merrill Street is a two-way roadway running in the north/south direction connecting residents of both the Town of Salisbury and the City of Amesbury to Newburyport, and residents of Newburyport to I-95. It is classified as a principal arterial and is under the jurisdiction of MassDOT. The street consists of one travel lane in each direction, widening to accommodate a northbound exclusive left turn approximately 250-feet south of the Route 110 intersection. No bicycle facilities are present on the roadway. Parking is not permitted along the roadway, and a sidewalk is present on the western side. Merrill Street northbound approaching the intersection is signed for a 30 MPH speed limit, while southbound traffic leaving the intersection has a speed limit of 40 MPH.

Rabbit Road is a two-way road running in the north/south direction paralleling Interstate 95 and connecting residents of the Town of Salisbury to State Route 286. It is classified as a minor arterial and is under the jurisdiction of MassDOT. Its cross section consists of one travel lane in each direction, widening to accommodate a southbound exclusive right turn lane approximately 250-feet north of the Route 110 intersection. A two-way separated shared-use path is present on the western side of the roadway to connect users of the William Lloyd Garrison Trail to the Salisbury Point Ghost Trail. Parking is not permitted. Rabbit Road southbound approaching the intersection is signed for a 30 MPH speed limit, while northbound traffic leaving the intersection has a speed limit of 45 MPH.

Intersections

Macy Street (Route 110) at Elm Street and Clark's Road is a four-way signalized intersection located west of Interstate 95. The primary land use surrounding the study intersection is both commercial and residential, with commercial properties present on the northwest and southern side of the intersection and a few residential properties on the northeast corner. The concentration of commercial properties has led to several driveways near the study intersection. Major businesses near the intersection include a Burger King at 133 Macy St, a Sunoco Gas Station at 108 Macy St, and a Fairfield Inn at 35 Clark's Road, all of which have driveways within 250 feet of the study intersection. A new Starbucks location is projected to open in the fall of 2025 at the southeast corner of the intersection at 111 Macy Street.

Heading west on Macy Street brings drivers to Interstate 495 and heading east brings drivers to Interstate 95. The Salisbury Point Ghost Trail, a shared-use path connecting to the Old Eastern Marsh Trail, terminates on the northeast corner of the intersection, leading to many cyclists and pedestrians to interact with the study intersection. No other bicycle facilities exist within the intersection. Sidewalks exist on both sides of Macy Street (Route 110) east of the intersection and on the north side to the west. Sidewalks are present on the eastern side of both Elm Street and Clark's Road but end on Clark's Road approximately 200 feet from the intersection. Merrimack Valley Transit (MeVa) operates Routes 17 and 19 through this intersection with flag stops on Elm Street and Macy Street (Route 110) before the intersection. No buses operated by MeVa stop between Macy Street (Route 110) at Elm Street/Clark's Road and Elm Street (Route 110) at Rabbit Road/Merrill Street.

Macy Street (Route 110) runs in the general east-west direction with Elm Street and Clark's Road intersecting from the north and south, respectively. The intersection has span-wire signal heads in the center of the intersection for all directions along with post-mounted signal heads on the northeast and southwest corners, as well as above the northeast slip lane onto Elm Street.

Signalized crosswalks are provided on the eastern and northern legs of the intersection, as well as across the slip lane on the northeast corner. The pedestrian signals are "Walk/Don't Walk" signals without countdown timers and are post mounted. All pedestrian push buttons lack APS style push buttons. Curb ramps with tactile warning panels are provided on the northwest, northeast, and southeast corners of the intersection.

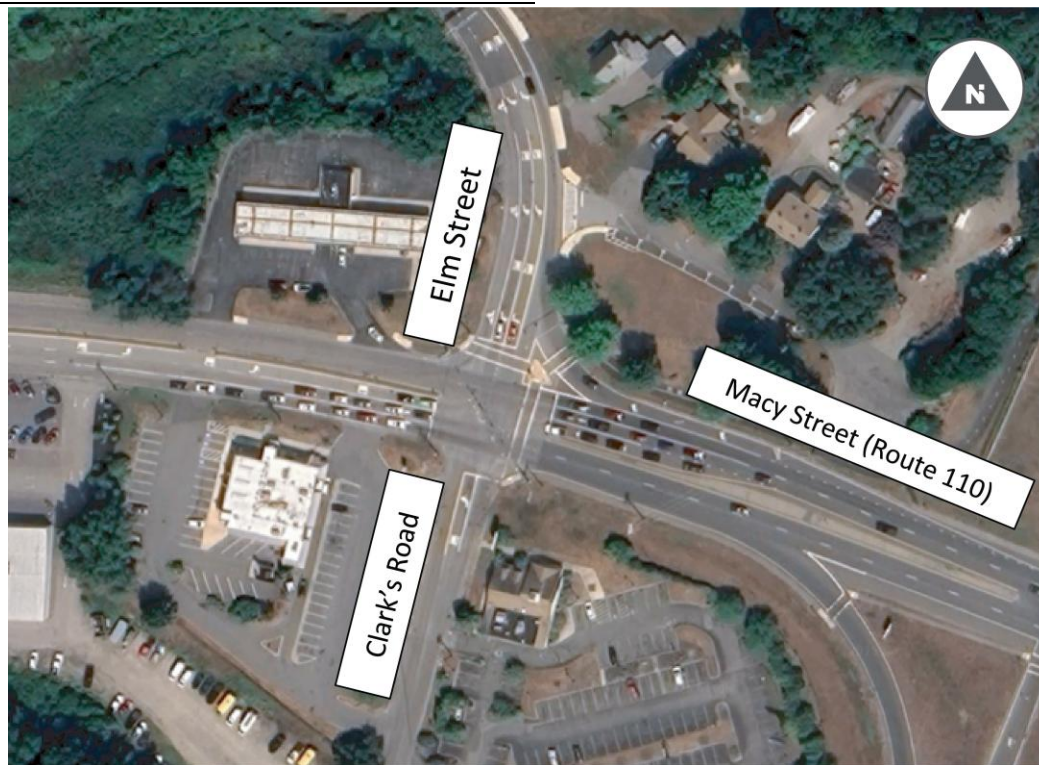


Figure 2: Macy Street (Route 110) at Elm Street and Clark's Road

Elm Street (Route 110) at Rabbit Road and Merrill Street is a four-way signalized intersection located east of Interstate 95. The primary land use surrounding the study intersection is commercial. The concentration of commercial properties has led to several driveways on the southeast and northeast sides of the study intersection. Major businesses near the intersection include Wall's Ford at 2 Merrill St, Dollar Tree at 208 Elm St, and Cross Roads Plaza on the southeast corner, all of which have driveways within 350-feet of the study intersection. Resurfacing last occurred in 2024, and the field visit confirmed the recently updated pavement condition and pavement markings.

Heading west on Route 110 brings drivers to Interstate 95 and heading east brings drivers to US Route 1. The William Lloyd Garrison Trail crosses the western half of the intersection before continuing on the west side of Rabbit Road to connect to the Salisbury Point Ghost Trail to the north. No other bicycle facilities exist within the study intersection. Sidewalks exist on both sides of Elm Street (Route 110) west of Rabbit Road and only on the north side of the roadway east of Rabbit Road. Sidewalks are also present on the west side of both Merrill Street and Rabbit Road at the intersection. Merrimack Valley Transit (MeVa) operates Route 17 through this intersection with flag stops on Elm Street (Route 110) east of the intersection. No buses operated by MeVa stop between Macy Street (Route 110) at Elm Street/Clark's Road and Elm Street (Route 110) at Rabbit Road/Merrill Street.

Elm Street (Route 110) runs in the general east-west direction with Rabbit Road and Merrill Street intersecting from the north and south, respectively. Elm Street transitions to Macy Street on the west side of the intersection. The intersection has mast arm signal heads on all approaches, with protected left signals and through signals provided on each leg of the intersection and right turn signals provided on the eastbound and southbound approaches. Right turns on red are permitted.

Signalized crosswalks are provided on all legs of the intersection. All the pedestrian signals are “Walk/Don’t Walk” signals with countdown timers and are post mounted. Pedestrian pushbuttons on the northwest and southwest corners have APS push buttons and push buttons on the northeast and southeast corners lack APS style push buttons. Curb ramps with tactile warning panels are provided on all four corners of the intersection.

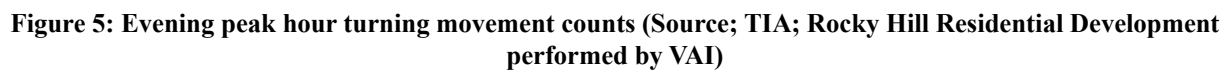
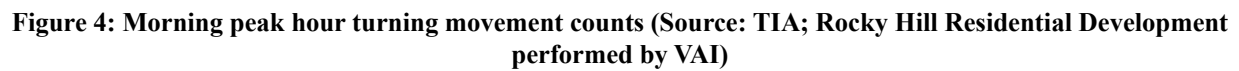


Figure 3: Macy/Elm Street (Route 110) at Merrill Street and Rabbit Road

Traffic Counts

Turning movement counts were conducted by Vanasse & Associates, Inc. in February of 2024 for the study area surrounding the new Rocky Hill Residential Development. A summary of the peak hour counts is represented in Figure 4 and Figure 5. These counts show a high volume of left turning movements onto Route 110 from Elm Street and onto Route 110 from Merrill Street in both the morning and evening peak hours. High volumes of right turns are also present from Route 110 eastbound onto Merrill Street and from Route 110 onto Elm Street. A high volume of vehicles also accesses I-95 SB from Route 110 eastbound.

FINAL



Additionally, the Merrimack Valley Planning Commission (MVPC) installed piezoelectric sensors and infrared readers in late 2024/early 2025 for trails throughout the Merrimack Valley to collect information about trail usage for trails throughout the Merrimack Valley. Sensors were installed at both the Salisbury Point Ghost Trail in January 2025 and William Lloyd Garrison Trail in October 2024 to record both pedestrian and cyclist movements. Since their installation, both sensors have recorded a cumulative total of over 22,170 total visits (as of May 2025). The William Lloyd Garrison Trail experienced 15,340 total visitors from October 2024 to May 2025, with an average of 95 bicycle and pedestrian detections per day. The Salisbury Ghost Trail experienced 6,830 total visitors from January 2025 to May 2025, with an average of 60 bicycle and pedestrian detections per day. Data on these trails will continue to be uploaded on the MVPC website, which can be found at <https://mvpc.org/data-collection/>. Data regarding other trails in the MVPC region are also available via the data collection link above.

Audit Observations and Potential Safety Enhancements

Following an introduction to the RSA process and a summary of existing geometry, signal operations, and crash history data, the audit participants were asked to discuss safety concerns at the study area intersections. Audit team members then visited the study area as a team, at which time observations were offered in the field. Several of the safety issues identified by the audit team were:

- Intersection Geometry
- Traffic Signal Timing and Equipment
- Pavement Marking and Signage
- Pedestrian and bicycle accommodations and accessibility
- Lighting
- Access Management

The following sections discuss in detail the safety issues and potential enhancements that were identified during each RSA. It should be noted that current, applicable design standards referenced throughout the report include but are not limited to the Manual on Uniform Traffic Control Devices (MUTCD), Americans with Disabilities Act (ADA), Public Right-of-Way Accessibility Guidelines (PROWAG), and MassDOT, the City of Amesbury, and the Town of Salisbury standards and specifications. In addition, consideration should be given to other applicable local, state, and national guidelines. Several of the issues identified require further study and engineering judgment to determine the feasibility of implementing the improvements to address them. A Route 110 corridor study was suggested during each individual audit and should be considered to complement this report in consideration of cross-sectional evaluation, vulnerable roadway user accommodations, and speed management.

Macy Street (Route 110) at Elm Street and Clark's Road

Intersection Geometry

Observations

Audit members noted that vehicles traveling southbound on Elm Street had poor visibility upon approaching the intersection due to the geometry, topography, and vegetation present on Elm Street (as seen in Figure 6 potentially leading to sideswipe crashes (10, 19, and 24) and angle crashes (1 and 11) on Elm Street. This skewed and angled geometry can cause confusion for drivers who cannot see far in front of them upon approaching the intersection. Audit members noted that this lack of visibility can also cause issues for drivers attempting to exit out of the northern Sunoco driveway and turn onto Elm Street. These visibility issues contributed to crashes 22 and 25.



Figure 6: Vegetation present near Sunoco driveway

Additionally, audit members noted the excessive width and large radius of the slip lane, measured to be 26-feet wide on Macy Street (Route 110) westbound. The slip lane has its own overhead signal-head; however, audit members noticed drivers frequently failed to stop for the red light and traveled through the slip lane without stopping. This could become an issue as pedestrians walk during the pedestrian phase across the slip lane. It also puts drivers who fail to stop into conflict with vehicles turning left onto Elm Street from Macy Street (Route 110) eastbound in a protected left turn phase, and vehicles traveling straight on Clark's Road through the intersection. Drivers were also often observed to be stuck in westbound queues on Macy Street (Route 110) that prevented them from being able to enter the slip lane at all.

Existing widths and geometries pose a significant risk to vulnerable road users. Audit team members noted that the wide multi-lane condition and high prevailing speeds on Route 110 increased risk for all roadway users. During off-peak hours, the wide geometry of the intersection creates ideal conditions for speeding and can ultimately contribute to collisions occurring, such as crashes 2 and 30. The width also may make drivers subjectively feel as though they are still traveling on a highway.

Potential Safety Enhancements

- Consider trimming vegetation at the Elm Street Sunoco Gas Station exit to improve the sight lines on Elm Street for drivers.
- Evaluate realigning the Elm Street approach of the intersection to remove the bend in the roadway.
- Evaluate adding experimental transverse rumble strips on Elm Street southbound to reduce vehicle speeds around the corner.
- Consider narrowing the westbound slip lane by adding a truck apron to slow down passenger vehicles while still accommodating larger truck movements.
- Consider raising the crossing across the slip lane to slow turning vehicle speeds.
- Evaluate increasing the westbound right-hand turn/slip lane storage length on Macy Street (Route 110) to accommodate longer vehicle queues.
- Evaluate removing the slip lane and bringing the right turn lane into the intersection to reduce exposure for pedestrians and turning speeds for drivers.
- Consider implementing speed feedback signs on Macy Street (Route 110) to reduce vehicle speeds.

Traffic Signal Timing and Equipment

Observations

Audit members noted that this intersection experiences congestion due to the proximity of I-95 and Salisbury Beach, especially during the peak summer season. This can cause drivers to exhibit potentially risky behavior, such as speeding through the intersection towards the end of a yellow signal interval, potentially contributing to the 20 rear-end crashes (4, 7, 8, 14, 15, 16, 18, 21, 27, 28, 30, 31, 33, 34, 37, 38, 41, 43, and 45). Long yellow intervals can also contribute to rear-end crashes, as the yellow light dilemma zone effect causes drivers to be unsure whether to continue through an intersection during a yellow light or stop abruptly. Additionally, the red clearance time for all phases is approximately 3 seconds, which may be too long for the Macy Street phase specifically given the intersection length.

Additionally, audit members observed two post mounted signals without retroreflective backplates on the northwest corner and southeast corner of the intersection. The signal heads posted above the slip lane also lacked retroreflective backplates, which can contribute to red light running at night and during inclement weather. All other signal heads on the span-wires had retroreflective backplates.

The signal head on the northeast corner of the intersection on the slip lane median island was also observed to be crooked and unstable as seen in Figure 7, leaving audit members concerned that it could fall off if hit by a vehicle. Audit members mentioned that during inclement weather, the span wire signals swing, potentially causing visibility issues for drivers and disruptions to traffic operations. Additionally, audit members noted that emergency vehicle pre-emption did not activate properly on Elm Street due to the roadway curve blocking the Opticom actuation. It is important to note that this intersection serves as a primary route to the Anna Jaques Hospital in Newburyport, MA.



Figure 7: Crooked signal head on slip lane median island

Potential Safety Enhancements

- Evaluate the signal timing and phasing to account for current traffic volumes.
- Consider replacing the span wire with mast arms to improve signal head visibility and allow for additional signal head configurations.
- Consider updating emergency signal preemption at the intersection or moving actuating receivers further up Elm Street to ensure proper functionality.
- Repair crooked signal head mounted on post on slip lane island.
- Consider adding retroreflective backplates to all signal heads where they are missing.

Pavement Markings and Signage

Observations

During the audit, team members noted that signage directing drivers heading southbound on Elm Street towards I-95 south was unclear, causing drivers in the left-most left turn lane to make last minute lane changes to the left turn lane in the center of the three lane intersection approach to merge onto I-95 south, potentially contributing to the cause of sideswipe crashes 23, 36, and 39. Currently, drivers are not provided with any lane assignment signs on either Route 110 approach or the Clark's Road approach. Audit members observed that the overhead guide signs on Elm Street could lead drivers to believe that there are 4 lanes at the approach instead of 3, as seen in Figure 8. Crashes such as number 19, may be a result of drivers entering the center lane believing that they will be able to travel straight on Clark's Road, before realizing they must change lanes to the far-right lane. 3 sideswipe crashes (10, 19, and 24) occurred in this location. The post-mounted lane assignment sign, which more clearly showed 3 lanes, was being covered by vegetation.



Figure 8: Lane assignment signs on Elm Street approaching Route 110

Additionally, pavement markings within the study area seem to be faded on Macy Street (Route 110), including a series of dashed intersection extension lines, potentially contributing to the sideswipe (3, 6, 10, 13, 17, 19, 23, 24, 26, 29, 32, 36, and 39) crashes in the study intersection, as shown in Figure 9. In addition to roadway markings, the crosswalk markings were also observed to be faded across the intersection. Audit team members noted issues with rutting and drainage along Macy Street (Route 110) at the intersection, specifically near pedestrian crossings and wheelchair ramps.

Audit members also observed an inconsistency in speed limit signage, with drivers heading eastbound on Macy Street (Route 110) observing a speed limit of 45 mph and drivers heading westbound on Macy Street (Route 110) observing a speed limit of 40 mph, potentially contributing to reported speeding issues along the corridor.



Figure 9: Macy Street (Route 110) at Elm Street and Clark's Road faded markings

Potential Safety Enhancements

- Consider updating speed regulations to be consistent on Macy Street (Route 110) in both directions.
- Consider adding advanced lane assignment pavement markings on Elm Street to further clarify lane movements prior to the intersection.
- Consider replacing existing and adding new lane assignment signage at each approach to decrease likelihood of sideswipe crashes from last minute lane changes.
- Refresh all crosswalks and pavement markings with thermoplastic paint.
- Consider striping crosswalks in high visibility ladder style.
- Consider trimming vegetation to improve sign visibility and sight distance for drivers.
- Consider adding additional signage to alert and direct drivers of the I-95 ramp location past the intersection on Macy Street (Route 110).
- Consider implementing speed feedback signage to reduce speeding along Route 110.
- Resurface Route 110 to address pavement rutting and drainage.

Pedestrian, Bicycle, and Accessibility Accommodations

Observations

During the site visit, audit members noted a fair amount of pedestrian and bicyclist traffic in the area due to the proximity of businesses and termination of the Salisbury Ghost Trail. Cyclists and pedestrians were observed to be crossing Macy Street (Route 110) during the audit, both at the intersection and elsewhere on the Route 110 corridor. Audit team members noted a future potential extension of the Salisbury Ghost Trail west of the present-day terminus may enhance the cycling network in Amesbury.

Audit members also noted that the pedestrian indicators did not have a countdown timer and had non-APS push buttons. It was also noted that the total pedestrian exclusive crossing time of 27 seconds was sufficient to cross at a speed of 3.5 ft/sec. All-red buffer time at the end of the pedestrian phase was observed to be 2 seconds instead of the typical 4 seconds.

Sidewalks were observed on the north side of Macy Street (Route 110) and east side of Elm Street with crosswalks being present on the north and east sides of the intersection. Audit members noted that sidewalks along Route 110 were very narrow and were often obstructed by utility poles. During the audit, a pedestrian was also observed to be crossing Macy Street (Route 110) further west between the Stop and Shop lot and Chevy Dealership. It is important to note that the MeVa Bus Route stops within the Stop and Shop Plaza, potentially contributing to pedestrian desire lines. Crosswalks were not present on the west and south legs of the intersection. Audit members also noted that with the upcoming housing developments and Starbucks on the southeast corner of Clark's Road, pedestrian activity in the area is likely to increase.

Curb ramps were observed on the northwest, northeast, and southwest corners of the intersection, as well as along the northeast slip lane island. The ramps on the southeast (shown in Figure 10) and northwest corners were not directional which limit their ability to guide visually impaired roadway users. Members of the audit also noted that during periods of high rain, puddles often form in the curb ramps, creating obstacles for pedestrians attempting to cross.



Figure 10: Pedestrian ramp on southeast corner

No pedestrian or bicyclist crashes were reported during the study period for this intersection; however, audit team members noted that high vehicle speeds and volumes across the crosswalk made the intersection feel uncomfortable for walking or cycling.

Potential Safety Enhancements

- Consider upgrading pedestrian signal equipment to include signal heads with countdown timers and APS-style pedestrian actuation buttons.
- Consider extending the Salisbury Ghost Trail to enhance cycling and pedestrian network connectivity in Amesbury.
- Consider reconstructing curb ramps to be directional instead of apex style.
- Consider curb extensions to shorten the crossing distance and allow bidirectional curb ramps.
- Consider adding pedestrian refuge islands to the long crosswalk across Macy Street (Route 110).
- Consider adding crosswalks on both the south and west legs of the intersection to provide pedestrian connections to nearby businesses.
- Evaluate ADA and PROWAG compliance of all curb ramps currently present at the intersection.

-
- Consider conducting a corridor-wide study on travel along Macy Street (Route 110) to improve vulnerable road user safety and evaluate crossing locations.
 - Consider restricting right turns on red to improve safety for crossing pedestrians.
 - Evaluate ponding and drainage issues at curb ramps.

Lighting

Observations

Audit members noted poor roadway lighting in the study area, specifically under the I-95 underpass, causing dangerous conditions for drivers and potentially contributing to the 8 nighttime crashes (4, 5, 6, 18, 20, 23, 24, and 45). Audit members noted an extreme change in lighting condition between the well-lit intersection at Rabbit Road and Merrill Street and the darkness under I-95 and its continuation as drivers travel westbound. Drivers may be expecting the lighting to increase as they approach the intersection of Route 110 at Elm Street and Clark's Road.

Potential Safety Enhancements

- Consider upgrading roadway lighting in the study area, especially under the I-95 underpass or at the intersection of Route 110 at Elm Street and Clark's Road.

Access Management

Observations

During the audit, driveway entrances along Macy Street (Route 110), specifically for the entrances and exits to 133 Macy Street (Burger King) and 108 Macy Street (Sunoco Gas Station) were observed to be potential sources of conflict for drivers. The exit from 133 Macy Street (Burger King) onto Clark's Road was also noted by audit members as being extremely close to the intersection and potentially dangerous, as shown in Figure 11. It may have contributed to crash 12 as a driver attempted to enter the driveway from Clark's Road northbound. The driveway on Elm Street at 108 Macy Street (Sunoco Gas Station) likely contributed to crashes 1, 11, 22, and 25 as drivers attempted to cross all three lanes of traffic at the Elm Street approach. These conditions can cause confusion for drivers entering the roadway and encourage them to perform risky maneuvers while simultaneously creating unsafe conditions for pedestrians. The eastern driveway on Macy Street for 108 Macy Street was observed to be right-in and right-out only, with left turns onto Route 110 prohibited upon exiting. The western driveway on Macy Street for 108 Macy Street was observed to be right-out only, with left turns onto Route 110 allowed upon entering but prohibited upon exiting.

The break in the median on Route 110 west of the intersection allows vehicles to make a left turn into 108 Macy Street (Sunoco Gas Station) or 133 Macy Street. Crashes 5 and 26 both involved vehicles who attempted to improperly travel through the median break from an outside lane, across an inside lane, which led to collisions. The median break may also be dangerous if drivers queueing in the left turn lane at the Route 110 eastbound approach are closely trailed by vehicles intending to turn at the intersection, not the median break.



Figure 11: Access management out of Sunoco driveway (across from Burger King)

Potential Safety Enhancements

- Coordinate with business owners and consider consolidating redundant curb cuts at the intersection on all approaches.

Elm Street (Route 110) at Rabbit Road and Merrill Street

Intersection Geometry

Observations

Drivers exiting I-95 South were observed to be traveling at high speeds into the intersection due to the large curb radii geometry. Drivers who wanted to proceed straight through on Elm Street (Route 110) or turn left onto Rabbit Road were forced to weave through up to four lanes of traffic in the span of 350-feet, which can be especially difficult during peak travel hours and cause sideswipe crashes similar to crashes 5, 13, 35, and 43. Audit members observed multiple vehicles coming to a stop at the lane merge to conduct this movement, causing confusion as drivers swerved around one another at high speeds due to the proximity of the highway and Route 110's wide footprint, potentially contributing to rear-end crashes 21, 23, 24, 26, 27, 31, 33, 40, 42, 48, 51, 52, and 54 for vehicles heading eastbound on Elm Street (Route 110). Audit members also noticed that the sight distance on the northwest corner for vehicles turning right on red onto Route 110 is minimal due to a combination of topography and vegetation. This movement crosses over the William Lloyd Garrison trail and is typically conducted at high speeds due to large curb radii at this location, as seen in Figure 12. Vehicles were not able to see pedestrians queuing up to cross Route 110 until they had moved past the intersection stop line on Rabbit Road. The northeast corner of the intersection also has vegetation blocking sightlines for turning vehicles. In addition to the large radii on the northwest and southwest corners, the radii on the eastern side of the intersection are also large.



Figure 12: View of large turning radius on northwest corner

Additionally, vehicles traveling westbound on Elm Street (Route 110) ran into lane alignment issues, as without intersection markings, it was unclear which lane vehicles were supposed to be in upon exiting the west leg of the intersection, potentially contributing to rear-end crashes 7, 18, and 50 along with angle crashes 37, 45, 47, and 58 within the intersection. Audit members also noted vehicles turning left onto Route 110 from Merrill Street may not know which receiving lane to enter and compete to change lanes depending on where they intend to travel. This can cause angle crashes like crashes 34, 38, and 60 within the intersection.

Potential Safety Enhancements

- Evaluate the feasibility of restricting right turn on red movements for all legs of the intersection to avoid potential bike/pedestrian conflicts between vehicles.
- Consider working with the property owner of 33 Old Elm St to shift the fencing on the property to improve sightlines on the northwest intersection corner.
- Consider adding curb extensions with truck aprons to slow down passenger vehicles and improve visibility while providing large vehicles with room to complete necessary turns.
- Consider adding intersection guide markings and signage to direct turning vehicles to their appropriate lane assignments.
- Trim vegetation on the northeast and northwest corners of the intersection to improve sightlines for vehicles turning in or out of Rabbit Road.

Traffic Signal Timing and Equipment

Observations

Audit members noted that this intersection experiences peak hour congestion which leads to potentially risky driving, such as attempting to travel through the intersection towards the end of a yellow indication

or running red lights. potentially contributing to the 16 angle crashes within the intersection (crashes 9, 14, 19, 34, 36, 37, 38, 49, 45, 47, 49, 55, 58, 59, 60, and 61) and 18 rear-end crashes (crashes 6, 10, 20, 21, 23, 24, 25, 26, 27, 31, 33, 40, 42, 48, 51, 52, 53, and 54). These types of crashes may also be experienced more often as drivers become frustrated and impatient due to long queues forming at the approaches and potentially having to wait for additional signal cycles to travel through the intersection. It was noted during the audit that Merrill Street tends to form extremely long queues that can block the driveway to both 1 and 2 Merrill Street approximately 350 and 600 feet south of the intersection respectively.

Audit members noted that yellow interval times were long, with some lasting as long as 6 seconds, further contributing to the yellow time dilemma zone effect causing drivers to be unsure whether to continue through an intersection during a yellow signal or stop abruptly. All-red clearance times were estimated to be 4 seconds for the Merrill Street and Rabbit Road phases and 3 seconds for the Elm Street phase. This was confirmed to be appropriate at this intersection. The northbound left turn is phased as protected-permissive. The permissive phase may allow drivers to misjudge gaps, such as in crashes 38 and 60, as drivers that attempt to make this left turn may be rushing to travel through the intersection after waiting in a long queue on Merrill Street, as previously mentioned.

During the audit, it was also noted that most of the signal heads were missing retroreflective backplates except for the northbound left and a northbound through signal head, as shown in Figure 13. Crashes 9, 13, 35, 38, 49, 55, and 60 all occurred in nighttime conditions suggesting that the signal head may not be clearly visible. Audit team members noted that the emergency vehicle preemption is functioning normally at this intersection.



Figure 13: Signal heads on the north leg of the intersection, two with retroreflective backplates and one without

Potential Safety Enhancements

- Evaluate the signal timing and phasing to account for current traffic volumes.
- Consider adding retroreflective backplates to all signal heads.

- Evaluate implementing split phasing for the intersection to prevent the potential for angle crashes from left turn movements.

Pavement Markings and Signage

Observations

During the audit, members noticed that upon exiting I-95 northbound onto eastbound Elm Street (Route 110), drivers exit into a right-turn only lane from Elm Street (Route 110) onto Merrill Street approximately 500-feet ahead of the intersection with minimal warning. Audit members noted that pavement markings on the northern, southern, and eastern legs of the intersection had been recently refreshed; however, pavement markings west of the crosswalk on the western leg had not, specifically the right turn only markings. East of the intersection, Route 110 merges from two lanes to one, and it was noted that signage was present within the median and may not have been in the correct place to adequately warn drivers of its presence.



Figure 14: Missing pavement markings for designated right turn only lane for the eastbound approach to the intersection.

Audit members also noticed that the signage on Elm Street (Route 110) eastbound after the intersection alerting drivers of the upcoming lane drop and median end was cluttered and blocked by vegetation. Signage alerting westbound drivers of the upcoming I-95 interchange before the intersection on Elm Street (Route 110) was also blocked by a large tree, as shown in Figure 15 and Figure 16.



Figure 15: Vegetation blocking lane median drop



Figure 16: Vegetation in front of I-95 sign westbound

During the audit it was also observed that the Elm Street and Merrill Street signs on the southwest corner were crooked and misaligned. Additionally, pavement markings informing cyclists that they could request a green signal by waiting on the stop line were missing on all four legs of the intersection despite there being signage for it. Additionally, no signage was present indicating drivers to be aware of cyclists that could be traveling on nearby roadways, specifically on Merrill Street where cyclists were observed traveling towards Newburyport. No speed limit signage was observed in the vicinity of the intersection along Elm Street (Route 110) or Merrill Street and Rabbit Road.

Potential Safety Enhancements

- Refresh pavement markings for lane assignments on the Elm Street (Route 110) eastbound to further clarify lane movements prior to the intersection.
- Refresh all crosswalks and pavement markings with high visibility thermoplastic.
- Consider striping crosswalks in high visibility ladder style.
- Refresh “Bicycle Stop on Line for Green” pavement markings or install “Bikes Use Ped Signal” signage.
- Consider adding lane designation signage for each approach to decrease the last-minute lane changes contributing to sideswipe crashes.
- Consider trimming vegetation to improve sign visibility and sight distance for drivers.
- Consider fixing any crooked or misaligned signs within the intersection.

- Consider installing “Motorists Give 4 Feet to Pass” signs on Merrill Street to alert drivers of cyclists.
- Consider adding speed limit signage around the intersection to alert drivers of the speed limit.
- Consider implementing speed feedback signage to reduce speeding along Route 110.
- Evaluate replacing the two-way traffic and lane merge warning signage with the proper signage and placement.

Pedestrian, Bicycle, and Accessibility Accommodations

Observations

During the site visit, audit members noted a fair amount of pedestrian and bicyclist traffic in the area due to the proximity of the William Lloyd Garrison Trail, Newburyport, and Salisbury Beach. Cyclists and pedestrians were observed to be most commonly crossing along the western crosswalk across Elm Street (Route 110). Audit members noticed that the western crossing was both the longest and most dangerous crossing in the intersection due to vehicle speeds and crossing distance, potentially contributing to the only pedestrian/bicyclist crash (crash 55) in the study intersection. Traffic data from 2024 shows that the right turn from Elm Street onto Merrill Street has a volume of 268 vehicles in the AM peak and 309 vehicles in the PM peak. The high volume of right turns was confirmed and observed during the audit, even in off-peak conditions. Vehicles were observed turning right on red from Rabbit Road onto Macy Street during the pedestrian exclusive phase at high speed and without stopping.



Figure 17: Cyclist attempting to cross Elm Street (Route 110) from Rabbit Road on the west

Audit members also noted that although all pedestrian indicators included countdown timers, only the push buttons on the southwest and northwest corners included APS push buttons. Audit members noted that the volume on the existing APS push buttons was low and difficult to hear. The total crossing cycle length of 42 seconds was found to be enough time to cross the intersection, the all-red buffer time at the end of the pedestrian phase was observed to be 2 seconds instead of the minimum 3 seconds.

Curb ramps were observed on all corners of the intersection. The detectable warning panels on the southeast, northeast, and southwest corners were not directional, as shown in Figure 19, which limit their ability to guide visually impaired roadway users. Members of the audit also noted that waiting areas, specifically the area on the northwest corner, seemed small for the existing volume of pedestrians and cyclists, ultimately forcing vulnerable road users to stand close to the roadway edge. Proposed development in Amesbury may increase the volume of pedestrians and cyclists using this crossing, exacerbating this issue.



Figure 18: Non-APS pushbuttons on southeast corner



Figure 19: Curb ramps on southeast corner

Sidewalks were observed on both sides of Elm Street (Route 110), west of the intersection, and the western side of Merrill Street and Rabbit Road. Sidewalks were not present on the south side Elm Street (Route 110) east of the intersection nor the east side of Merrill Street beyond the curb ramps. Crosswalks were present on all four legs of the intersection. Audit members noted that sidewalks along Route 110 were very narrow and often obstructed by utility poles. During the audit, it was also noted that many pedestrians were seen crossing between the Sunoco and Link House for Women on Route 110 located east of the study intersection. This was observed to be particularly dangerous due to the presence of a lane drop and lack of marked crossing.

Audit members also noticed that a catch basin grate present on the southwest corner was parallel to the direction of travel, posing a significant risk for cyclists, as seen in Figure 20. Only one pedestrian or

bicyclist crash (55) was reported during the study period for this intersection; however, it is important to note that members of the audit felt like the conditions were dangerous for pedestrians and did not feel comfortable walking around the area.



Figure 20: Parallel catch basin grate on southwest corner

Potential Safety Enhancements

- Consider upgrading all pedestrian signal equipment to include APS-style pedestrian actuation buttons.
- Consider increasing the volume of existing APS-style pushbuttons on pedestrian heads.
- Evaluate the length of the pedestrian clearance time to better accommodate all pedestrians and comply with MUTCD standards.
- Consider reconstructing curb ramps to be directional.
- Consider curb extensions to reduce turning radii, shorten the crossing distances and allow directional curb ramps.
- Evaluate ADA compliance of all curb ramps currently present at the intersection.
- Consider conducting a corridor-wide study on travel along Macy Street (Route 110) to improve vulnerable road user safety and evaluate crossing locations.
- Consider widening pedestrian queue areas, specifically on the southwest and northwest corners, to create a safer environment for pedestrians and cyclists on the William Lloyd Garrison trail.
- Rotate parallel bar grate on southwest corner of the intersection to be perpendicular to the path of travel.

Access Management

Observations

Audit members noted that although there are no direct access control issues within a 100-foot vicinity of the intersection, the driveway to Aroma Joe's approximately 350-feet south of the intersection on Merrill Street is frequently blocked by traffic queues. Because of this, drivers who have turned onto Merrill Street must wait for a gap to turn left into the plaza, leading the queue of vehicles to extend to the intersection. Audit members also noted that business owners currently block one out of two access points for Tint's Auto even though MassDOT permitting and driveway geometry suggest that both outlets should be open, one for entering and one for exiting. Lastly, the Winner's Circle driveway was noted to be difficult to exit due to its uphill geometry creating a blind spot for drivers, causing crashes like 12 and 22.

Potential Safety Enhancements

- Evaluate the feasibility of marking a "Do Not Block" box along Merrill Street in front of the Aroma Joe's/plaza entrance.
- Evaluate the feasibility of reopening the closed Tint's Auto (213 Elm Street) driveway exit.
- Evaluate traffic volume warrants for the inclusion of a short left-turn pocket for vehicles heading southbound on Merrill Street and wanting to turn left into the Crossroads shopping plaza.

Summary of Road Safety Audit

Based on observations and discussions, the RSA team identified the issues and potential enhancements that could improve safety at the intersections of Macy Street (Route 110) at Clark's Road and Elm Street and Elm Street (Route 110) at Merrill Street and Rabbit Road. The timeframe and costs are categorized below in **Table 3**.

Table 3: Estimated Time Frame and Costs Breakdown

Time Frame		Costs	
Short-Term	<1 Year	Low	<\$10,000
Mid-Term	1-3 Years	Medium	\$10,001-\$50,000
Long-Term	>3 Years	High	>\$50,000

Table 4 lists each safety issue and the corresponding potential safety enhancements that were discussed at the audit and within the previous sections for the intersection of Macy Street (Route 110) at Elm Street and Clark's Road and for the intersection of Elm Street (Route 110) at Merrill Street and Rabbit Road. The tables include the safety benefit, estimated timeframe for completion, estimated construction cost, and jurisdiction for each observed safety issue and potential safety enhancement. Safety payoff estimates are subjective and may be based on the relative percent of crashes that may be reduced by the enhancement based on known and documented crash reduction factors, if available or estimated crash reduction based on a stated source.

Table 4: Potential Safety Enhancement Summary

Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Jurisdiction
Macy Street (Route 110) at Elm Street and Clark's Road					
Intersection Geometry	Consider trimming vegetation at the Elm Street Sunoco Gas Station to improve the sight lines on Elm Street for drivers.	High	Short-Term	Low	City of Amesbury/MassDOT
	Evaluate realigning the Elm Street approach of the intersection to remove the bend in the roadway.	High	Long-Term	High	City of Amesbury/MassDOT
	Evaluate adding experimental transverse rumble strips on Elm Street southbound to reduce vehicle speeds around the corner.	Low	Short-Term	Low	City of Amesbury/MassDOT
	Consider narrowing the westbound slip lane by adding a truck apron to slow down passenger vehicles while still accommodating larger truck movements.	Medium	Mid-Term	Medium	City of Amesbury/MassDOT
	Consider raising the crossing across the slip lane to slow turning vehicle speeds.	High	Long-Term	High	City of Amesbury/MassDOT
	Evaluate increasing the westbound right-hand turn/slip lane storage length on Macy Street (Route 110) to accommodate longer vehicle queues.	Low	Long-Term	High	City of Amesbury/MassDOT
	Evaluate removing the slip lane and bringing the right turn lane into the intersection to reduce exposure for pedestrians and turning speeds for drivers.	Medium	Long-Term	High	City of Amesbury/MassDOT
	Consider implementing speed feedback signs on Macy Street (Route 110) to reduce vehicle speeds.	Medium	Short-Term	Low	City of Amesbury/MassDOT

Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Jurisdiction
Traffic Signal Timing and Equipment	Evaluate the signal timing and phasing to account for current traffic volumes.	Medium	Short-Term	Low	MassDOT
	Consider replacing the span wire with mast arms to improve signal head visibility and allow for additional signal head configurations.	High	Long-Term	High	MassDOT
	Consider updating emergency signal preemption at the intersection or moving actuating receivers further up Elm Street to ensure proper functionality.	Medium	Short-Term	Low	MassDOT
	Repair crooked signal mounted on post on slip lane island.	Medium	Short-Term	Low	MassDOT
	Consider adding retroreflective backplates to all signal heads where they are missing.	Medium	Short-Term	Low	MassDOT
Pavement Markings and Signage	Consider updating speed regulations to be consistent on Macy Street (Route 110) in both directions.	Low	Short-Term	Low	City of Amesbury/Mass DOT
	Consider adding advanced lane assignment pavement markings on Elm Street to further clarify lane movements prior to the intersection	Low	Short-Term	Low	City of Amesbury/Mass DOT
	Consider replacing existing and adding new lane assignment signage at each approach to decrease the likelihood of sideswipe crashes from last minute lane changes.	Low	Short-Term	Low	City of Amesbury/Mass DOT
	Refresh all crosswalks and pavement markings with high visibility thermoplastic paint.	Medium	Short-Term	Low	City of Amesbury/Mass DOT
	Consider striping crosswalks in high visibility ladder style.	Medium	Short-Term	Low	City of Amesbury/Mass DOT
	Consider trimming vegetation to improve sign visibility and sight distance for drivers.	Medium	Short-Term	Low	City of Amesbury/Mass DOT

Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Jurisdiction
Pavement Markings and Signage (Cont.)	Consider adding additional signage to alert and direct drivers of the I-95 ramp location past the intersection on Macy Street (Route 110)	Medium	Short-Term	Low	City of Amesbury/Mass DOT
	Consider implementing speed feedback signage to reduce speeding along Route 110.	Medium	Short-Term	Low	City of Amesbury/Mass DOT
	Resurface Route 110 to address pavement rutting and drainage.	Low	Short-Term	High	City of Amesbury/Mass DOT
Pedestrian, Bicycle, and Accessibility Accommodations	Consider upgrading pedestrian signal equipment to include signal heads with countdown timers and APS-style pedestrian actuation buttons.	Low	Short-Term	Low	City of Amesbury/Mass DOT
	Consider extending the Salisbury Ghost Trail to enhance cycling and pedestrian network connectivity.	High	Long-Term	High	City of Amesbury/Mass DOT
	Consider reconstructing curb ramps to be directional instead of apex style.	Medium	Long-Term	High	City of Amesbury/MassDOT
	Consider curb extensions to shorten the crossing distance and allow bidirectional curb ramps.	Medium	Mid-Term	High	City of Amesbury/MassDOT
	Consider adding pedestrian refuge islands to the long crosswalk across Macy Street (Route 110).	Medium	Long-Term	High	City of Amesbury/MassDOT
	Consider adding crosswalks on both the south and west legs of the intersection to provide pedestrian connections to nearby businesses.	High	Long-Term	High	City of Amesbury/MassDOT
	Evaluate ADA and PROWAG compliance of all curb ramps currently present at the intersection.	Medium	Short-Term	Low	City of Amesbury/MassDOT

Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Jurisdiction
Pedestrian, Bicycle, and Accessibility Accommodations (Cont.)	Consider conducting a corridor-wide study on travel Route 110 to improve vulnerable road user safety and evaluate crossing locations.	High	Long-Term	Medium	City of Amesbury/ MassDOT
	Consider restricting right turns on red to improve safety for crossing pedestrians.	High	Short-Term	Low	City of Amesbury/ MassDOT
	Evaluate ponding and drainage issues at curb ramps.	Medium	Long-Term	High	City of Amesbury/ MassDOT
Lighting	Consider upgrading roadway lighting in the intersection, especially under the I-95 underpass.	High	Medium-Term	Medium	City of Amesbury/ MassDOT
Access Management	Coordinate with business owners and consider consolidating redundant curb cuts at the intersection on all approaches.	Medium	Long-Term	Medium	City of Amesbury/ MassDOT
Elm Street (Route 110) at Merrill Street and Rabbit Road					
Intersection Geometry	Evaluate restricting right turn on red movements for all legs of the intersection to avoid potential bike/pedestrian conflicts between vehicles.	High	Short-Term	Low	Town of Salisbury/ MassDOT
	Consider working with the property owner of 33 Old Elm St to shift the fencing on the property to improve sightlines on the northwest intersection corner.	Medium	Short-Term	Low	Town of Salisbury/ MassDOT
	Consider adding curb extensions with truck aprons to slow down passenger vehicles and improve visibility but still provide large vehicles with room to complete necessary turns.	Medium	Medium-Term	Medium	Town of Salisbury/ MassDOT
	Consider adding intersection guide markings and signage to direct vehicles to their appropriate lane assignments.	High	Short-Term	Low	Town of Salisbury/ MassDOT
	Trim vegetation on the northeast and northwest corners of the intersection to improve sightlines for vehicles turning in or out of Rabbit Road.	Medium	Short-Term	Low	Town of Salisbury/ MassDOT

Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Jurisdiction
Traffic Signal Timing and Operations	Evaluate the signal timing and phasing to account for current traffic volumes.	Medium	Short-Term	Low	MassDOT
	Consider adding retroreflective backplates to all signal heads.	Medium	Short Term	Low	MassDOT
	Evaluate implementing split phasing for the intersection to prevent the potential for angle crashes from left turn movements.	Medium	Short Term	Low	MassDOT
Pavement Markings and Signage	Refresh pavement markings for lane assignments on the Elm Street (Route 110) eastbound to further clarify lane movements prior to the intersection.	High	Short-Term	Low	Town of Salisbury/ MassDOT
	Refresh all crosswalks and pavement markings with high visibility thermoplastic.	Medium	Short-Term	Low	Town of Salisbury/ MassDOT
	Consider striping crosswalks in high visibility ladder style.	Medium	Short-Term	Low	Town of Salisbury/ MassDOT
	Refresh "Bicycle Stop on Line for Green" pavement markings or install "Bikes Use Ped Signal" signage.	Medium	Short-Term	Low	Town of Salisbury/ MassDOT
	Consider adding lane designation signage for each approach to decrease the last-minute lane changes contributing to sideswipe crashes.	Medium	Short-Term	Low	Town of Salisbury/ MassDOT
	Consider trimming vegetation to improve sign visibility and sight distance for drivers.	High	Short-Term	Low	Town of Salisbury/ MassDOT
	Consider fixing any crooked or misaligned signs within the intersection.	Low	Short-Term	Low	Town of Salisbury/ MassDOT
	Consider installing "Motorists Give 4 Feet to Pass" signs on Merrill Street to alert drivers of cyclists.	Medium	Short-Term	Low	Town of Salisbury/ MassDOT

Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Jurisdiction
Pavement Markings and Signage (Cont.)	Consider adding speed limit signage around the intersection to alert drivers of the speed limit and encourage them to slow down.	Medium	Short-Term	Low	Town of Salisbury/ MassDOT
	Consider implementing speed feedback signage to reduce speeding along Route 110.	Medium	Short-Term	Low	Town of Salisbury/ MassDOT
	Evaluate replacing the two-way traffic and lane merge warning signage with the proper signage and placement.	Low	Short-Term	Low	Town of Salisbury/ MassDOT
Pedestrian, Bicycle, and Accessibility Accommodations	Consider upgrading all pedestrian signal equipment to include APS-style pedestrian actuation buttons.	Low	Short-Term	Low	Town of Salisbury/ MassDOT
	Consider increasing the volume of existing APS-style pushbuttons on pedestrian heads.	Low	Short-Term	Low	Town of Salisbury/ MassDOT
	Evaluate the length of the pedestrian clearance time to better accommodate all pedestrians and comply with MUTCD standards.	Medium	Short-Term	Low	Town of Salisbury/ MassDOT
	Consider reconstructing curb ramps to be directional.	Medium	Long-Term	High	Town of Salisbury/ MassDOT
	Consider curb extensions to reduce turning radii, shorten the crossing distances and allow directional curb ramps.	Medium	Short-Term	Medium	Town of Salisbury/ MassDOT
	Evaluate ADA compliance of all curb ramps currently present at the intersection.	Low	Short-Term	Low	Town of Salisbury/ MassDOT
	Consider conducting a corridor-wide study on travel along Route 110 to improve vulnerable road user safety and evaluate crossing locations.	Medium	Short-Term	Medium	Town of Salisbury/ MassDOT

Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Jurisdiction
Pedestrian, Bicycle, and Accessibility Accommodations (Cont.)	Consider widening pedestrian queue areas, specifically on the southwest and northwest corners, to create a safer environment for pedestrians and cyclists on the William Lloyd Garrison trail.	Medium	Medium-Term	Medium	Town of Salisbury/ MassDOT
	Rotate parallel bar grate on southwest corner of the intersection to be perpendicular to the path of travel.	Medium	Short-Term	Low	Town of Salisbury/ MassDOT
Access Management	Consider marking a "Do Not Block" box along Merrill Street in front of the Aroma Joe's/plaza entrance.	Low	Short-Term	Low	Town of Salisbury/ MassDOT
	Evaluate reopening the closed Tint's Auto (213 Elm Street) driveway exit.	Low	Short-Term	Low	Town of Salisbury/ MassDOT
	Evaluate traffic volume warrants for the inclusion of a short left-turn pocket for vehicles heading southbound on Merrill Street and wanting to turn left into the Crossroads shopping plaza at 1 Merrill Street.	Medium	Medium-Term	Low	Town of Salisbury/ MassDOT

Appendix A. RSA Meeting Agenda & Prompt List

Agenda

Road Safety Audit

Amesbury, MA

Macy Street (Route 110) at Elm Street and Clark's Road

Meeting Location: Amesbury Police Department

Monday, May 12th

10 AM – 1 PM

Type of meeting:

Road Safety Audit

Attendees:

Invited Participants to Comprise a Multidisciplinary Team

Please bring:

Thoughts and Enthusiasm!

10:00 AM

Welcome and Introductions

10:15 AM

Discussion of Safety Issues

- Crash history– provided in advance
- Existing Geometries and Conditions

11:15 AM

Site Visit

- Drive to the study area intersection
- As a group, identify areas for improvement

12:15 PM

Discussion of Potential Improvements

- Return to the meeting location
- Discuss observations and finalize safety issues
- Discuss potential improvements and finalize recommendations

1:00 PM

Adjourn for the Day – but the RSA has not ended

Instructions for Participants:

- Before attending the RSA on May 12th, participants are encouraged to drive/walk through the intersection and complete/consider elements on the RSA Prompt List with a focus on safety.
- All participants will be actively involved in the process throughout. Participants are encouraged to come with thoughts and ideas, but are reminded that the synergy that develops and respect for others' opinions are key elements to the success of the overall RSA process.
- After the RSA meeting, participants will be asked to comment and respond to the document materials to assure it is reflective of the RSA completed by the multidisciplinary team.

Agenda

Road Safety Audit

Salisbury, MA

Elm Street (Route 110) at Rabbit Road and Merril Street

Meeting Location: 181 Beach Road, Salisbury, MA

Tuesday, May 20th

10 AM – 1 PM

Type of meeting:

Road Safety Audit

Attendees:

Invited Participants to Comprise a Multidisciplinary Team

Please bring:

Thoughts and Enthusiasm!

10:00 AM

Welcome and Introductions

10:15 AM

Discussion of Safety Issues

- Crash history– provided in advance
- Existing Geometries and Conditions

11:15 AM

Site Visit

- Drive to the study area intersection
- As a group, identify areas for improvement

12:15 PM

Discussion of Potential Improvements

- Return to the meeting location
- Discuss observations and finalize safety issues
- Discuss potential improvements and finalize recommendations

1:00 PM

Adjourn for the Day – but the RSA has not ended

Instructions for Participants:

- Before attending the RSA on May 20th, participants are encouraged to drive/walk through the intersection and complete/consider elements on the RSA Prompt List with a focus on safety.
- All participants will be actively involved in the process throughout. Participants are encouraged to come with thoughts and ideas, but are reminded that the synergy that develops and respect for others' opinions are key elements to the success of the overall RSA process.
- After the RSA meeting, participants will be asked to comment and respond to the document materials to assure it is reflective of the RSA completed by the multidisciplinary team.

GEOMETRIC DESIGN	
Issue	Comment
A. Speed – (Design Speed; Speed Limit & Zoning; Sight Distance; Overtaking)	
Are there speed-related issues along the corridor? Please consider the following elements: • Horizontal and vertical alignment • Posted and advisory speeds • Driver compliance with speed limits • Approximate sight distance • Safe passing opportunities	
B. Road alignment and cross section	
With respect to the roadway alignment and cross-section please consider the appropriateness of the following elements: • Functional class (Urban Principal Arterial) • Delineation of alignment; • Widths (lanes, shoulders, medians); • Sight distance for access points; • Cross-slopes • Curbs and gutters • Drainage features	
C. Intersections	
For intersections along the corridor please consider all potential safety issues. Some specific considerations should include the following: • Intersections fit alignment (i.e. curvature) • Traffic control devices alert motorists as necessary • Sight distance and sight lines seem appropriate • Vehicles can safely slow/stop for turns • Conflict point management • Adequate spacing for various vehicle types • Capacity problems that result in safety problems	
D. Auxiliary lanes	
• Do auxiliary lanes appear to be adequate? • Could the taper locations and alignments be causing safety deficiencies? • Are shoulder widths at merges causing safety deficiencies?	

E. Clear zones and crash barriers	
For the roadside the major considerations are clear zone issues and crash barriers. Consider the following: • Do there appear to be clear zones issues? — Are hazards located too close the road? — Are side slopes acceptable? • Are suitable crash barriers (i.e, guard rails, curbs, etc.) appropriate for minimizing crash severity? • Barrier features: end treatments, visibility, etc.	
F. Bridges and culverts – (if necessary)	
Are there specific issues related to bridges and culverts that may result in safety concerns?	
G. Pavement – (Defects, Skid Resistance, and Flooding)	
• Is the pavement free of defects including excessive roughness or rutting, potholes, loose material, edge drop-offs, etc. that could result in safety problems (for example, loss of steering control)? • Does the pavement appear to have adequate skid resistance, particularly on curves, steep grades and approaches to intersections? • Is the pavement free of areas where flooding or sheet flow of water could contribute to safety problems? • In general, is the pavement quality sufficient for safe travel of heavy and oversized vehicles?	
H. Lighting (Lighting and Glare)	
It is important to consider to the impacts of lighting. Some specifics include the following: • Is lighting required and, if so, has it been adequately provided? • Are there glare issues resulting from headlights during night time operations or from sunlight?	

TRAFFIC CONTROL DEVICES	
Issue	Comment
I. Signs	
Signage is a critical element in providing a safe roadway environment. Please consider the following: • Are all current signs visible (consider both night and day)? Are they conspicuous and clear? Are the correct signs used for each situation? • Does the retroreflectivity or illumination appear satisfactory? • Are there any concerns regarding sign supports?	
J. Traffic signals	
• If present, do the traffic signals appear to be designed, installed, and operating correctly? • Is the signal processing the traffic efficiently? • Is the controller located in a safe position? (where it is unlikely to be hit, but maintenance access is safe) • Is there adequate sight distance to the ends of possible vehicle queues?	
K. Marking and delineation	
• Is the line marking and delineation: — appropriate for the function of the road? — consistent along the route? — likely to be effective under all expected conditions? (day, night, wet, dry, fog, rising and setting sun, oncoming headlights, etc.) • Are centerlines, edgelines, and lane lines provided? If not, do drivers have adequate guidance?	

ROADWAY ACTIVITY	
Issue	Comment
With respect to roadway activity please consider safety elements related to the following: • Pedestrians • Bicycles • Public transportation vehicles and riders • Emergency vehicles • Commercial vehicles • Slow moving vehicles	

ENVIRONMENTAL CONSIDERATIONS	
Issue	Comment
Weather & Animals	
From an environmental perspective it is important to consider any potential impacts. Most notably is likely to be the impacts of weather or animals, including: • Possible effects of rain, fog, snow, ice, wind on design features. • Has snow fall accumulation been considered in the design (storage, sight distance around snowbanks, etc.)? • Are there any known animal travel/migration routes in surrounding areas which could affect design?	

Appendix B. RSA Audit Team Contact List

Participating Audit Team Members: Macy Street (Route 110) at Elm Street and Clark's Road

Audit Team Members	Agency/Affiliation	Email Address
Lisa Demeo	City of Amesbury	demeol@amesbury.gov
Jason Plourde	BETA Group Inc.	jplourde@beta-inc.com
Craig Barley	Amesbury Police Department	craigb@amesburyma.gov
Lauren Blatchford	Amesbury Police Department	blatchfordl@amesburyma.gov
Robert Serino	Amesbury Fire Department	serinor@amesburyma.gov
Elizabeth Maldari	Merrimack Valley Planning Commission	emaldari@mvpc.org
Jim Terlizzi	MassDOT – Traffic and Safety	James.v.terlizzi@dot.state.ma.us
Michelle Deng	MassDOT – Traffic and Safety	Michelle.deng@dot.state.ma.us
Evelyn Densmore	MassDOT – Traffic and Safety	Evelyn.s.densmore@dot.state.ma.us
Kevin Fitzgerald	MassDOT – Traffic and Safety	Kevin.t.fitzgerald@dot.state.ma.us
Bob Tragert	MassDOT – D4 Traffic and Safety	Robert.l.tragert@dot.state.ma.us
Timothy Paris	MassDOT – D4 Planning	Timothy.paris@dot.state.ma.us
Christopher Bach	Toole Design	cbach@tooledesign.com
Sophia Cotman	Toole Design	scotman@tooledesign.com

Participating Audit Team Members: Elm Street (Route 110) at Rabbit Road and Merrill Street

Audit Team Members	Agency/Affiliation	Email Address
Keith Forget	Salisbury Police Department	kforget@salisburypolice.com
Elizabeth Maldari	Merrimack Valley Planning Commission	emaldari@mvpc.org
Evelyn Densmore	MassDOT – Traffic and Safety	Evelyn.s.densmore@dot.state.ma.us
Jim Terlizzi	MassDOT – Traffic and Safety	James.v.terlizzi@dot.state.ma.us
Katherine Duffy	MassDOT – D4 Traffic and Safety	Katherine.l.duffy@dot.state.ma.us
Kevin Fitzgerald	MassDOT – Traffic and Safety	Kevin.t.fitzgerald@dot.state.ma.us
Bob Tragert	MassDOT – D4 Traffic and Safety	Robert.l.tragert@dot.state.ma.us
Leo Worcester	Merrimack Valley Transit	lworcester@mevatransit.com
Tom Loughlin	Vanasse and Associates, Inc.	tloughlin@RDVA.com
Jason Plourde	BETA Group Inc.	jplourde@beta-inc.com
Joshua Grzegorzewski	Federal Highway Administration	Joshua.grezgorzewski@dot.gov
Christopher Bach	Toole Design	cbach@tooledesign.com
Sophia Cotman	Toole Design	scotman@tooledesign.com

Appendix C. Detailed Crash Data



141 Tremont Street, 9th Floor, BOSTON, MA 02111
PHONE: 617.619.9910 FAX: 301.927.2800
www.tooledesign.com

COLLISION DIAGRAM

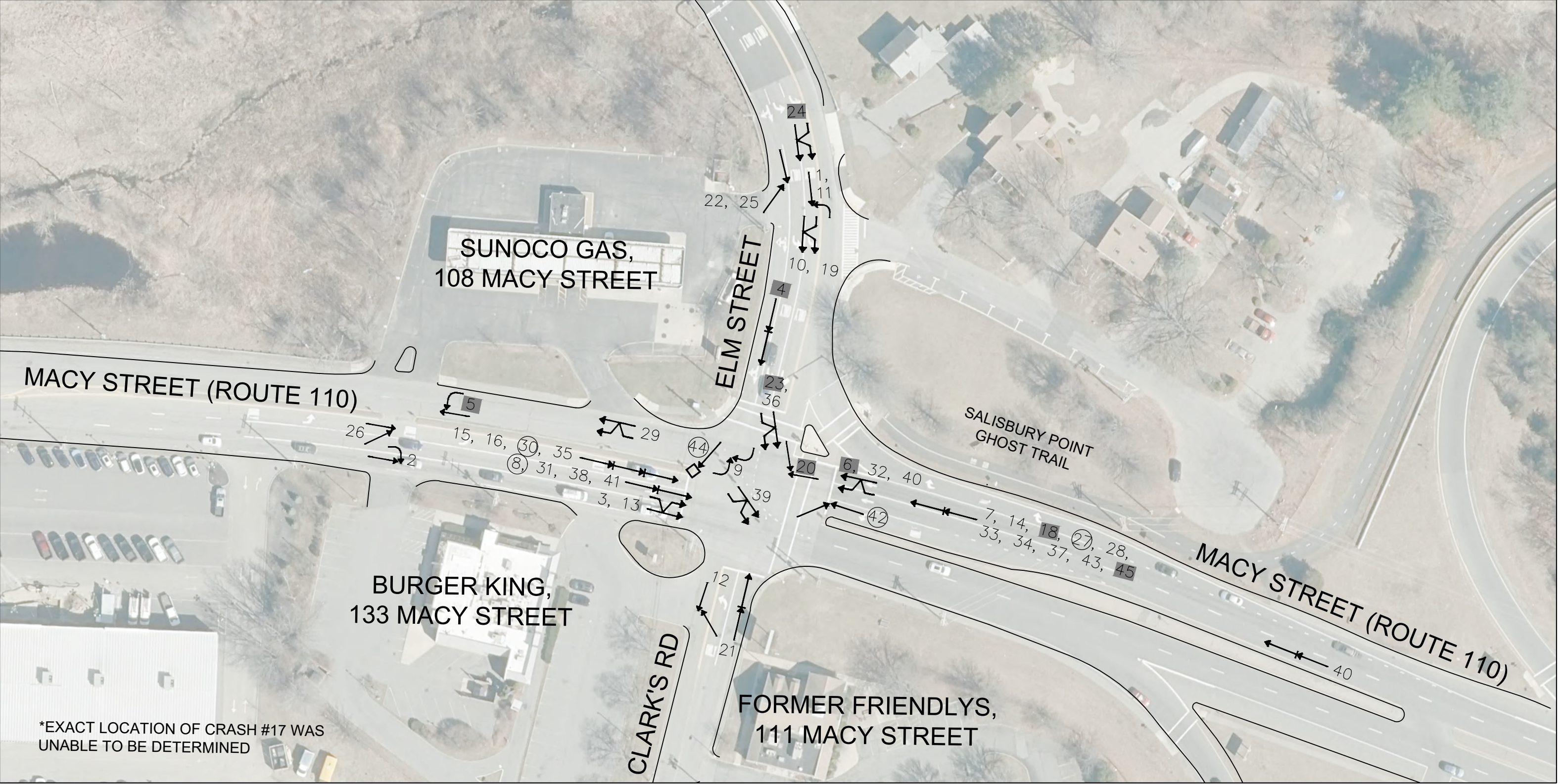
SYMBOLS	TYPE OF CRASH	SEVERITY
Moving Vehicle	Head on	Injury
Backing Vehicle	Rear End	Fatal
Non-Involved Vehicle	Angle	
Pedestrian	Turning Movement	
Bicycle	Sideswipe	
Animal	Out of Control	
Parked Vehicle	Twilight/Night Time Crash	
Fixed Object		

AMESBURY, MA

REGION: MVPC

MACY STREET (ROUTE 110) AT CLARK'S ROAD AND ELM STREET

TIME PERIOD ANALYZED: 2017-2021
SOURCE OF CRASH REPORTS: AMESBURY POLICE DEPARTMENT
DATE PREPARED: 04/18/2025
PREPARED BY: TOOLE DESIGN



*EXACT LOCATION OF CRASH #17 WAS UNABLE TO BE DETERMINED

Collision Data Summary Table: (2017-2021)													
Town of Amesbury: Macy Street (Route 110) at Clark's Road and Elm Street													
Crash Diagram #	Crash Date	Crash Day	Time of Day	Crash Severity	Manner of Collision	Light Condition	Weather Condition	Road Surface	Driver Contributing Code	D1 Age	D2 Age	D3 Age	Comment
1	2/27/2017	Monday	5:37 AM	Property Damage Only (PDO)	Angle	Daylight	Clear	Dry	No improper driving	72	21		SB V1 on Elm St in the turning lane was struck by NB V2 attempting to turn left into the Sunoco parking lot. OP1 stated they did not see V2 pull into their lane.
2	3/8/2017	Wednesday	6:00 AM	Property Damage Only (PDO)	Angle	Daylight	Clear	Dry	Exceeded authorized speed limit	19	56		EB V1 in the right lane struck EB V2 (truck with trailer) attempting to take a right turn into Burger King. OP1 stated they were not paying attention to V2 when they collided.
3	3/16/2017	Thursday	12:18 PM	Property Damage Only (PDO)	Sideswipe, same direction	Daylight	Clear	Dry	Failure to keep in proper lane or running off road	33	53		EB V1 was in the left lane and EB V2 was in the right lane. V2 attempted to pass V1 and struck V1 on the right side.
4	4/1/2017	Saturday	1:23 AM	Property Damage Only (PDO)	Rear-end	Dark - lighted roadway	Sleet, Hail, Freezing Rain	Snow	Other improper action	60	37		SB V1 was stopped at red light when it was rear ended by SB V2. V2 fled the scene.
5	5/10/2017	Wednesday	10:09 PM	Property Damage Only (PDO)	Angle	Dark - lighted roadway	Clear	Dry	Inattention	30	51		V2 (police cruiser) was traveling WB in the right lane. V1 was operating WB in the left lane. V2 attempted to turn left into the path of V1, to investigate suspicious activity and collided with V1.
6	5/18/2017	Thursday	8:46 PM	Property Damage Only (PDO)	Sideswipe, same direction	Dark - lighted roadway	Clear	Dry	No improper driving	27	Unknown		V1 was traveling WB on Macy St when she was sideswiped by V2. V2 fled the scene.
7	5/25/2017	Thursday	4:25 PM	Property Damage Only (PDO)	Rear-end	Daylight	Rain	Wet	Inattention	44	20		V1 was stopped in WB traffic at the Macy St and Elm St intersection. WB V2 struck V1 from behind. OP2 stated they were looking down and adjusting the radio.
8	6/16/2017	Friday	5:41 AM	Non-Fatal Injury	Rear-end	Daylight	Clear	Dry	Inattention	32	70		V2 was traveling east on Macy St and came to a stop at the red light near Burger King. V1 rear ended V2 with high impact. OP2 stated they were looking down at the radio.
9	8/6/2017	Sunday	8:27 AM	Property Damage Only (PDO)	Angle	Daylight	Clear	Dry	Distracted	31	27		V2 was taking a left from Macy Street EB onto Elm St NB. SB V2 attempting to turn left onto Macy St EB ran the red light and struck V1 on the right rear.
10	12/4/2017	Monday	8:51 AM	Property Damage Only (PDO)	Sideswipe, same direction	Daylight	Clear	Dry	Failure to keep in proper lane or running off road	31	25		V1 was traveling SB on Elm St towards Macy St . V2 was traveling in the same direction as V1 when it attempted to illegally pass V1 on the left, resulting in a sideswipe.
11	1/2/2018	Tuesday	12:43 PM	Property Damage Only (PDO)	Angle	Daylight	Clear	Dry	Failed to yield right of way	20	60		V2 was traveling south on Elm St. V1 was traveling north on Elm St and turned into the Sunoco Station driveway and collided with V2.
12	1/30/2018	Tuesday	2:13 PM	Property Damage Only (PDO)	Angle	Daylight	Cloudy	Dry	Failed to yield right of way	64	68		V1 was traveling south on Clark's Rd when NB V2 attempted to make a left turn into the Burger King parking lot and collided with V1. OP2 stated they did not see V1.
13	2/3/2018	Saturday	7:50 AM	Property Damage Only (PDO)	Sideswipe, same direction	Daylight	Clear	Dry	Disregarded traffic signs, signals, road markings	41	25		EB V1 was stopped at the traffic light in the middle lane. EB V2 attempted to pass V1 on the left and struck V1. Report states V2 was not in a proper lane and attempted to pass between the left turning lane and middle lane. V2 fled the scene.
14	2/8/2018	Thursday	4:44 PM	Property Damage Only (PDO)	Rear-end	Daylight	Clear	Dry	No improper driving	17	30		V2 was traveling WB on Macy Street. V1 was traveling behind and looking in their mirror to merge. In attempting to merge, V1 struck the back of V2.
15	5/1/2018	Wednesday	4:20 PM	Property Damage Only (PDO)	Rear-end	Daylight	Clear	Dry	No improper driving	53	51	42	All vehicles EB V1 rear ended V2 causing V2 to rear end V3 at the red light.
16	5/14/2018	Monday	11:46 AM	Property Damage Only (PDO)	Rear-end	Daylight	Cloudy	Dry	Inattention	34	76	45	All vehicles EB. V1 rear ended V2 causing V2 to rear end V3.

Collision Data Summary Table: (2017-2021)

Town of Amesbury: Macy Street (Route 110) at Clark's Road and Elm Street

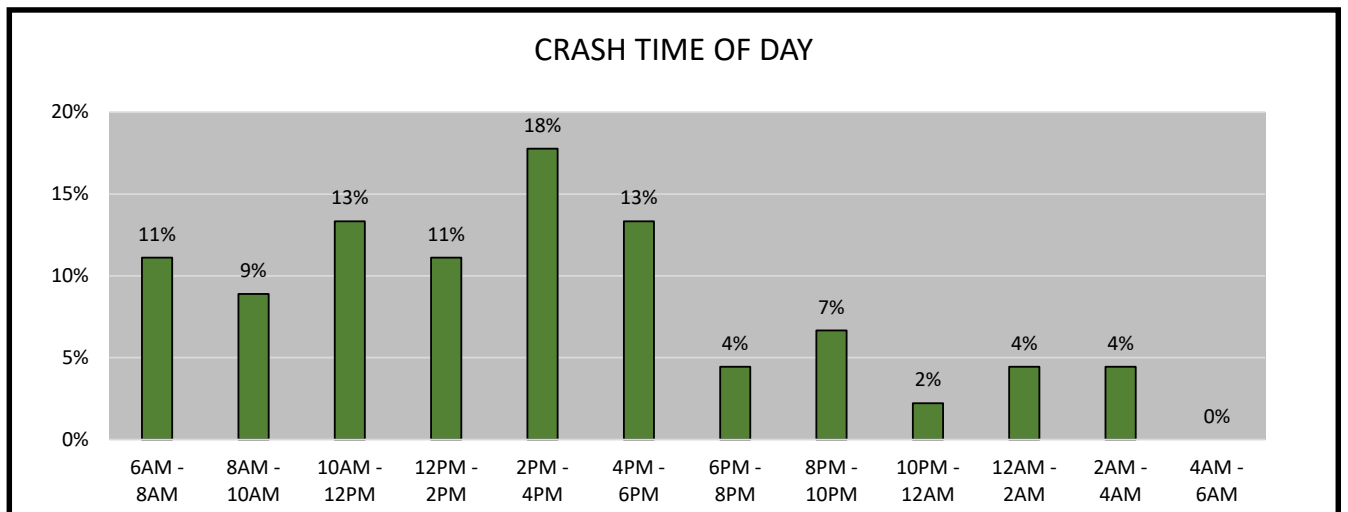
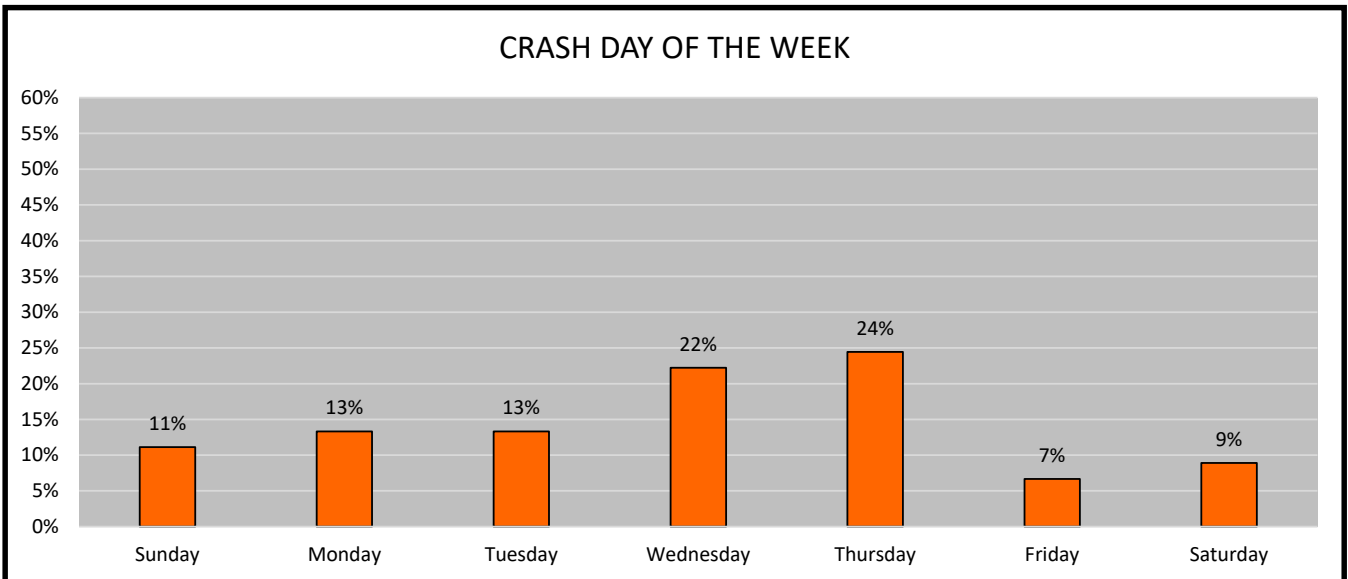
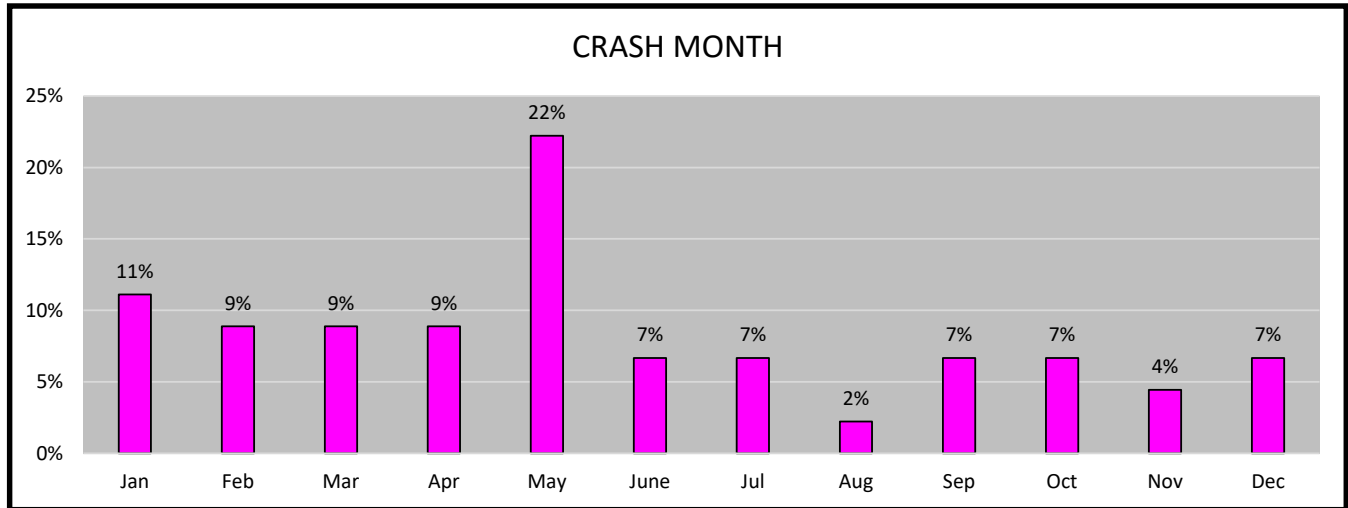
Crash Diagram #	Crash Date	Crash Day	Time of Day	Crash Severity	Manner of Collision	Light Condition	Weather Condition	Road Surface	Driver Contributing Code	D1 Age	D2 Age	D3 Age	Comment
17	5/23/2018	Wednesday	7:43 AM	Property Damage Only (PDO)	Sideswipe, same direction	Daylight	Clear	Dry	No improper driving	56	28		V1 was attempting to switch lanes from right to left when it collided with V2 in the left lane.
18	6/14/2018	Thursday	1:06 AM	Property Damage Only (PDO)	Rear-end	Dark - lighted roadway	Clear	Dry	No improper driving	21	55		V1 and V2 were both traveling WB on Macy St. V1 was in the center lane. V2 switched from the far right lane to the center lane and V1 rear-ended V2. OP1 suspected OUI.
19	6/21/2018	Thursday	12:21 PM	Property Damage Only (PDO)	Sideswipe, same direction	Daylight	Clear	Dry	Inattention	30	74		SB V1 was in the right lane to travel across the intersection onto Clark's Rd. SB V2 was in the middle lane, attempted to switch to the right lane, and sideswiped V1.
20	7/26/2018	Thursday	7:23 PM	Property Damage Only (PDO)	Angle	Dusk	Clear	Dry	Inattention	22	17		SB V2 attempted to turn left onto Macy St from Elm St when WB V1 failed to stop at a red light traveling WB on Macy St and struck V2.
21	9/6/2018	Thursday	4:50 PM	Property Damage Only (PDO)	Rear-end	Daylight	Clear	Dry	Inattention	32	73		NB V1 (with attached trailer) was traveling on Clark's Rd towards Macy St when it came to a stop and was rear-ended by V2.
22	10/3/2018	Wednesday	7:46 AM	Property Damage Only (PDO)	Angle	Daylight	Cloudy	Wet	No improper driving	23	55		V1 was turning left out of the Sunoco driveway on Elm St. V2 was traveling SB on Elm St in the left turn lane closest to the centerline. OP1 stated they could not see V2 due to the curvature of the roadway and foliage.
23	10/11/2018	Thursday	8:02 PM	Property Damage Only (PDO)	Sideswipe, same direction	Dark - lighted roadway	Rain	Wet	Made an improper turn	17	55		V1 was in the far left lane on Elm St at a red light waiting to turn left onto Macy St. V2 was stopped at the red light on Elm St in the second left turn lane. While completing simultaneous left turns, V2 struck V1.
24	11/28/2018	Wednesday	5:19 PM	Property Damage Only (PDO)	Sideswipe, same direction	Dark - lighted roadway	Clear	Dry	Unknown	78	48		V1 was traveling south on Elm St when it attempted to change lanes from the middle lane to the far left lane and struck SB V2, who was traveling in the far left lane.
25	12/9/2018	Sunday	9:57 AM	Property Damage Only (PDO)	Angle	Daylight	Clear	Dry	Failed to yield right of way	43	22		SB V1 on Elm St collided with V2 exiting Sunoco.
26	1/19/2019	Saturday	10:14 AM	Property Damage Only (PDO)	Sideswipe, same direction	Daylight	Clear	Dry	Failed to yield right of way	59	39		EB V1 attempted to turn left into the Sunoco station while traveling on Macy St. in the middle lane. V1 failed to see V2 in the adjacent lane and collided with V2.
27	1/24/2019	Thursday	2:43 PM	Non-Fatal Injury	Rear-end	Daylight	Rain	Wet	Inattention	33	54		V1 rear-ended V2 on Macy Street WB while V2 slowed down due to traffic congestion.
28	1/29/2019	Tuesday	3:17 PM	Property Damage Only (PDO)	Rear-end	Daylight	Snow	Snow	Unknown	60	16		V1 was stopped at a red light heading WB on Macy St when V2 rear-ended them. Report states a severe snow storm as occuring at the time.
29	2/4/2019	Monday	10:11 AM	Property Damage Only (PDO)	Sideswipe, same direction	Daylight	Clear	Dry	Made an improper turn	31	52		V1 was traveling WB in the middle through lane on Macy St alongisde V2 in the rightmost through lane. Upon traveling through the intersection with Elm St, V1 made an abrupt turn from the left lane into the right hand lane in an attempt to enter the Sunoco Gas Station and struck V2.

Collision Data Summary Table: (2017-2021)													
Town of Amesbury: Macy Street (Route 110) at Clark's Road and Elm Street													
Crash Diagram #	Crash Date	Crash Day	Time of Day	Crash Severity	Manner of Collision	Light Condition	Weather Condition	Road Surface	Driver Contributing Code	D1 Age	D2 Age	D3 Age	Comment
30	3/13/2019	Wednesday	7:53 AM	Non-Fatal Injury	Rear-end	Daylight	Clear	Dry	Driving too fast for conditions	41	65	40	All vehicles traveling EB. V2 and V3 were stopped at the red light. V1 rear ended V2 causing V2 to strike V3. Report states V1 was operating at a high rate of speed.
31	3/28/2019	Thursday	10:46 AM	Property Damage Only (PDO)	Rear-end	Daylight	Clear	Dry	Inattention	46	55		Both V1 and V2 were traveling EB on Macy St in the right and left lanes respectively approaching the Clark's Rd intersection when V2 merged right to enter the right lane and did not see V1.
32	4/12/2019	Friday	7:13 PM	Property Damage Only (PDO)	Sideswipe, same direction	Daylight	Clear	Dry	No improper driving	27	66		WB V1 and WB V2 were traveling in the right and middle lanes respectively. V1 attempted to move into the middle lane and struck V2.
33	4/15/2019	Monday	3:47 PM	Property Damage Only (PDO)	Rear-end	Daylight	Rain	Wet	Inattention	42	63		V1 was traveling WB on Macy St stopped at a red light when it was rear-ended by WB V2. OP2 stated they were not paying attention and thought V1 was going to go.
34	4/27/2019	Friday	3:34 PM	Property Damage Only (PDO)	Rear-end	Daylight	Clody	Dry	Distracted	45	66		V2 was stopped in traffic on Macy St heading WB at a red light when it was rear ended by V1. OP1 stated they were not paying attention and did not brake in time.
35	5/7/2019	Tuesday	4:31 PM	Property Damage Only (PDO)	Angle	Daylight	Rain	Wet	Distracted	46	47	40	V1 and V2 were heading EB on Macy St waiting for the light to change to green when V3 rear ended V2 which then collided with V1. OP3 stated that their phone was going off and they were attempting to answer it.
36	5/8/2019	Wednesday	11:59 AM	Property Damage Only (PDO)	Sideswipe, same direction	Daylight	Clear	Dry	Unknown	70	30		V1 (vehicle towing a trailer) was taking a left turn onto Macy St from Elm St in the second left turn lane when V2, who was in the first left turning lane, V2 crossed into V1's lane and sideswiped them. Operator of V2 stated that V1 collided with them.
37	7/3/2019	Wednesday	3:36 PM	Property Damage Only (PDO)	Rear-end	Daylight	Clear	Dry	No improper driving	19	59		V2 and V1 were traveling west on Macy St. Due to traffic, the area was experiencing stop and go conditions. V1 attempted to move forward and the stop; however, they did not enact their brakes in time and collided with V2.
38	7/3/2019	Wednesday	3:45 PM	Property Damage Only (PDO)	Rear-end	Daylight	Clear	Dry	Inattention	77	21		V1 was stopped in traffic on Macy St in the far left travel lane, heading EB when V2 rear-ended V1.
39	9/6/2019	Friday	12:08 PM	Property Damage Only (PDO)	Sideswipe, same direction	Daylight	Clear	Dry	Failure to keep in proper lane or running off road	75	53		V1 and V2 were turning left from Elm St onto Macy St in the first and second left turn lanes respectively when V1 failed to stay in its lane and collided with V2.
40	10/16/2019	Wednesday	2:11 PM	Property Damage Only (PDO)	Rear-end	Daylight	Clear	Dry	Inattention	46	76		V2 came to a stop at the intersection of Elm St and Macy St while traveling WB. V1 was following behind V2 and failed to stop on time, causing the collision.
41	5/23/2021	Sunday	10:19 AM	Property Damage Only (PDO)	Rear-end	Daylight	Clear	Dry	Inattention	22	65		V1 and V2 were traveling EB on Macy St in the right hand passenger lane. V1 struck V2 in the rear. OP1 stated they had spilled their water and was looking down when the crash occurred.

Collision Data Summary Table: (2017-2021)													
Town of Amesbury: Macy Street (Route 110) at Clark's Road and Elm Street													
Crash Diagram #	Crash Date	Crash Day	Time of Day	Crash Severity	Manner of Collision	Light Condition	Weather Condition	Road Surface	Driver Contributing Code	D1 Age	D2 Age	D3 Age	Comment
42	5/30/2021	Sunday	12:51 PM	Non-Fatal Injury	Angle	Daylight	Rain	Wet	Failure to keep in proper lane or running off road	42	51		EB V2 was stopped at a red light and waiting to make a left turn. WB V1 was traveling straight ahead on Macy St, crossed over the median, and crashed into V2.
43	9/14/2021	Tuesday	3:10 PM	Property Damage Only (PDO)	Rear-end	Daylight	Clear	Dry	Followed too closely	19	17		V2 was stopped in WB traffic on Macy St. V1 was traveling the same direction into traffic. V1's collided with V2. OP1 stated they attempted to brake but the car failed to stop.
44	11/1/2021	Monday	9:55 AM	Non-Fatal Injury	Single Vehicle Crash	Daylight	Clear	Dry	Illness	27			V1 was traveling SB on Elm St when the driver suffered a medical emergency, crept forward through the intersection, and came to a rest on the median after striking a state highway sign
45	12/5/2021	Sunday	9:38 PM	Unknown	Rear-end	Dark - lighted roadway	Clear	Dry	Physical Impairment	38	27		V1 was traveling WB on Macy St when it stopped at the intersection for a red light. V2 struck V1 in the rear and fled the scene.

Collision Data Summary Charts (2017-2021)

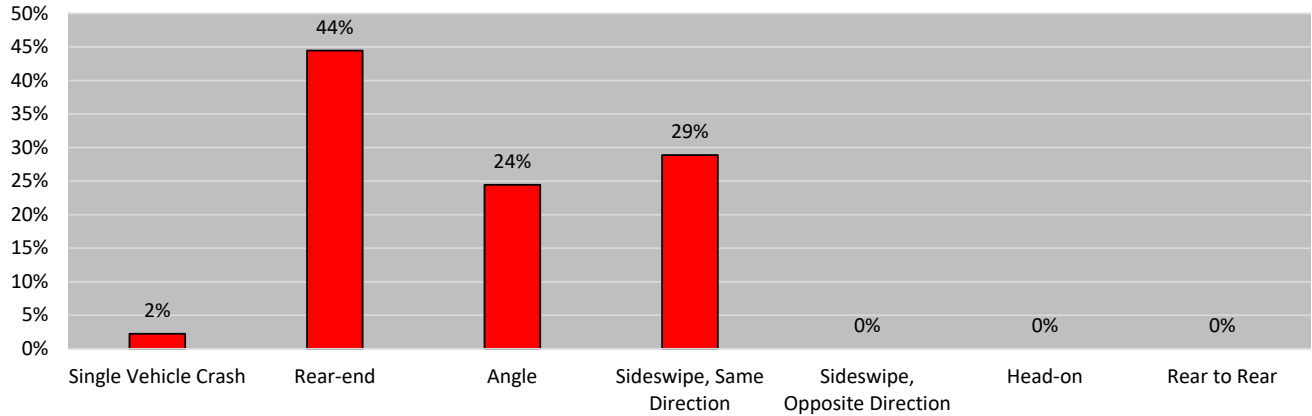
Town of Amesbury: Macy Street (Route 110) at Clark's Road and Elm Street



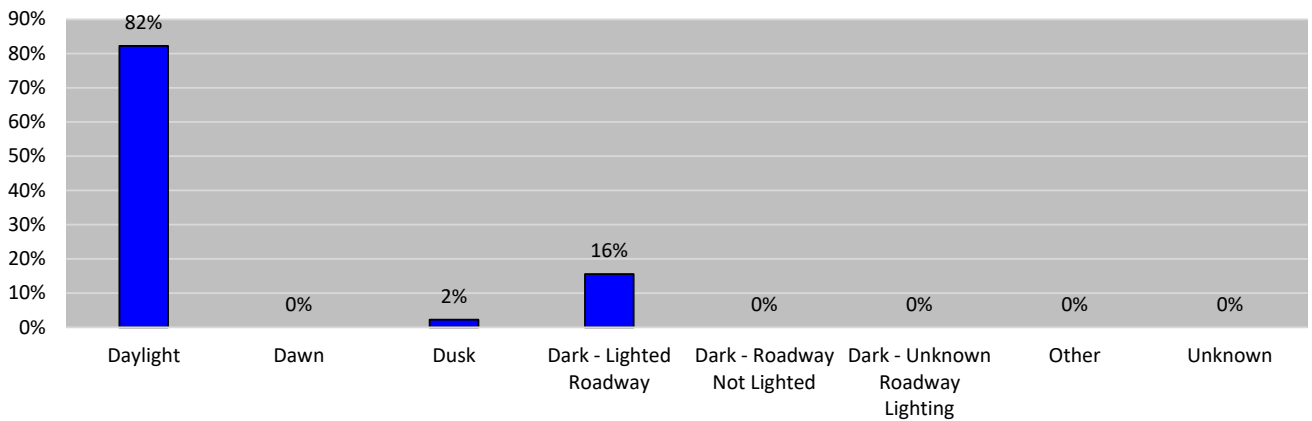
Collision Data Summary Charts (2017-2021)

Town of Amesbury: Macy Street (Route 110) at Clark's Road and Elm Street

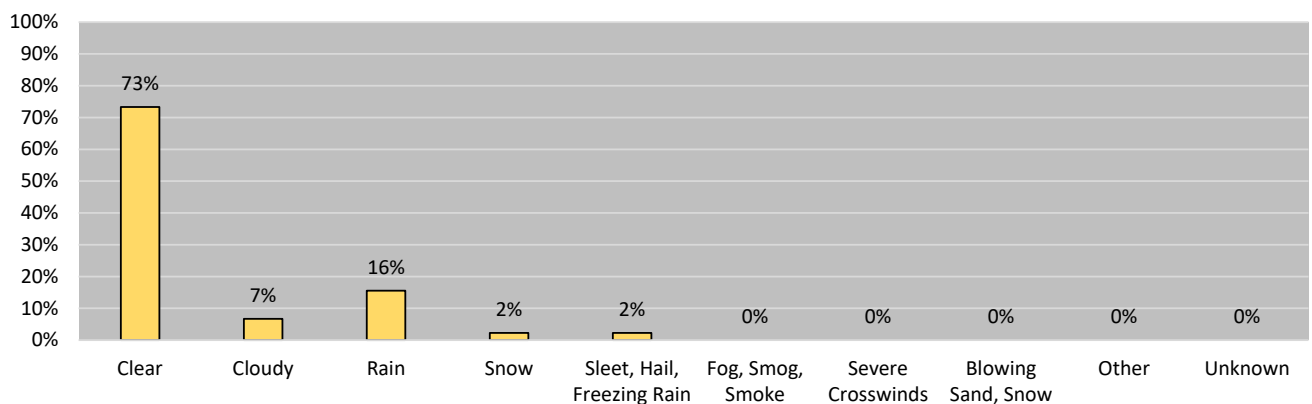
CRASH MANNER OF COLLISION



CRASH LIGHT CONDITION



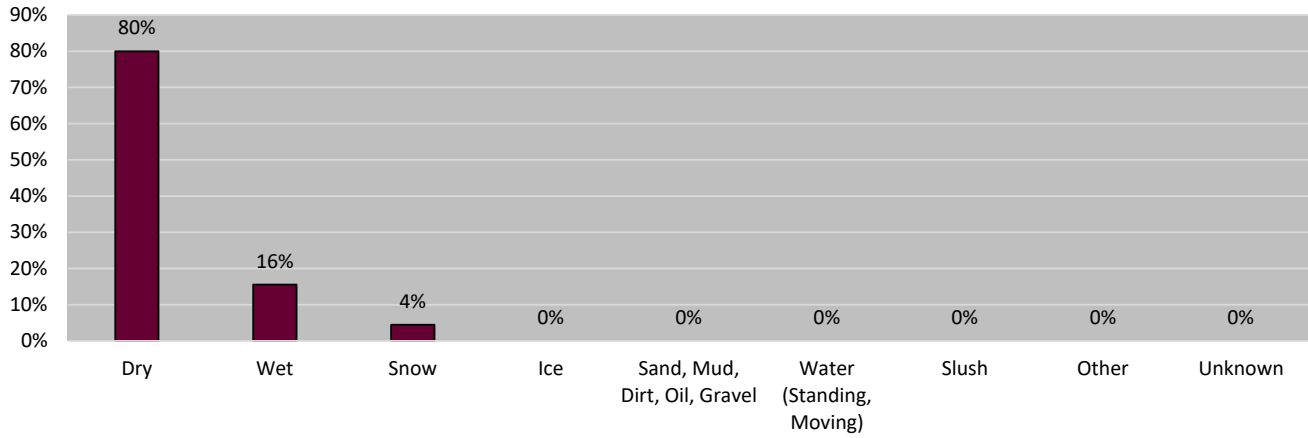
CRASH WEATHER CONDITION



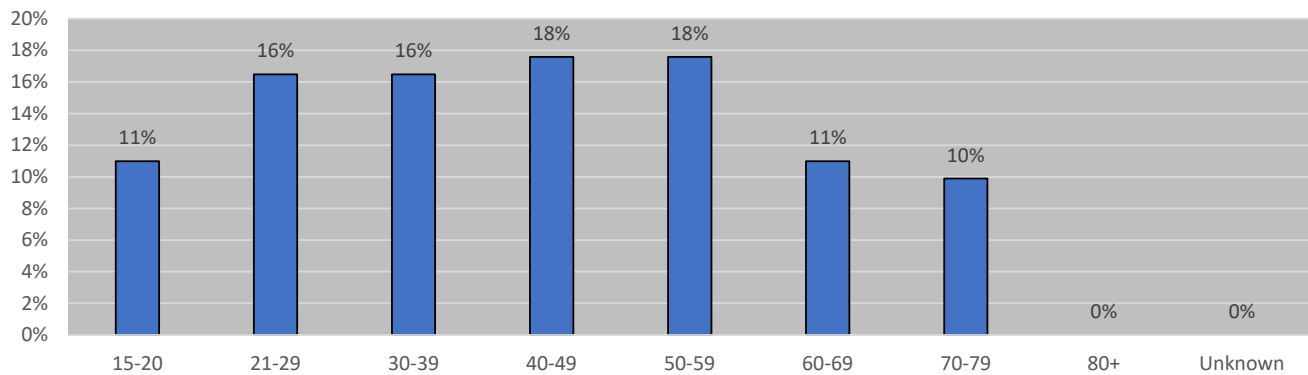
Collision Data Summary Charts (2017-2021)

Town of Amesbury: Macy Street (Route 110) at Clark's Road and Elm Street

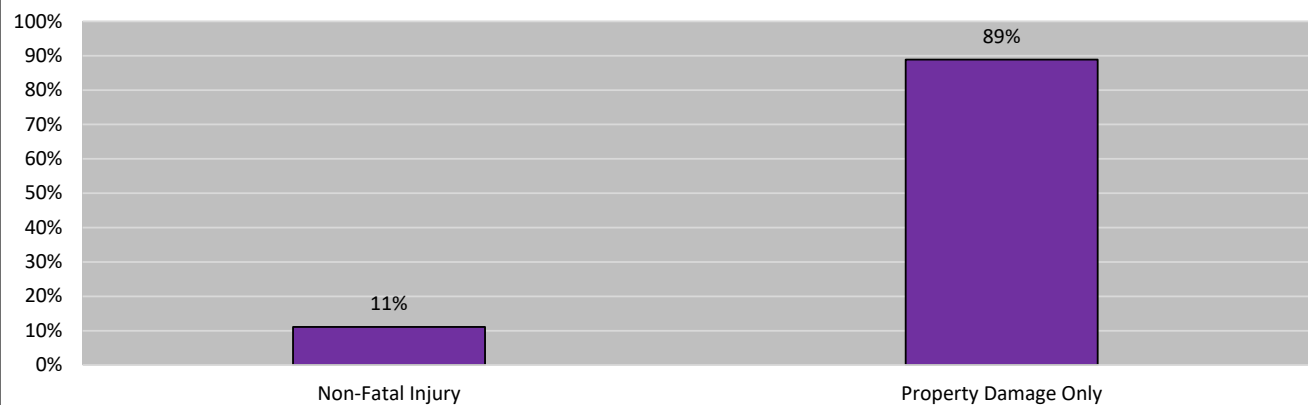
CRASH ROADWAY SURFACE



CRASH DRIVER AGE



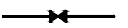
MAXIMUM CRASH INJURY SEVERITY





141 Tremont Street, 9th Floor, BOSTON, MA 02111
PHONE: 617.619.9910 FAX: 301.927.2800
www.tooledesign.com

COLLISION DIAGRAM

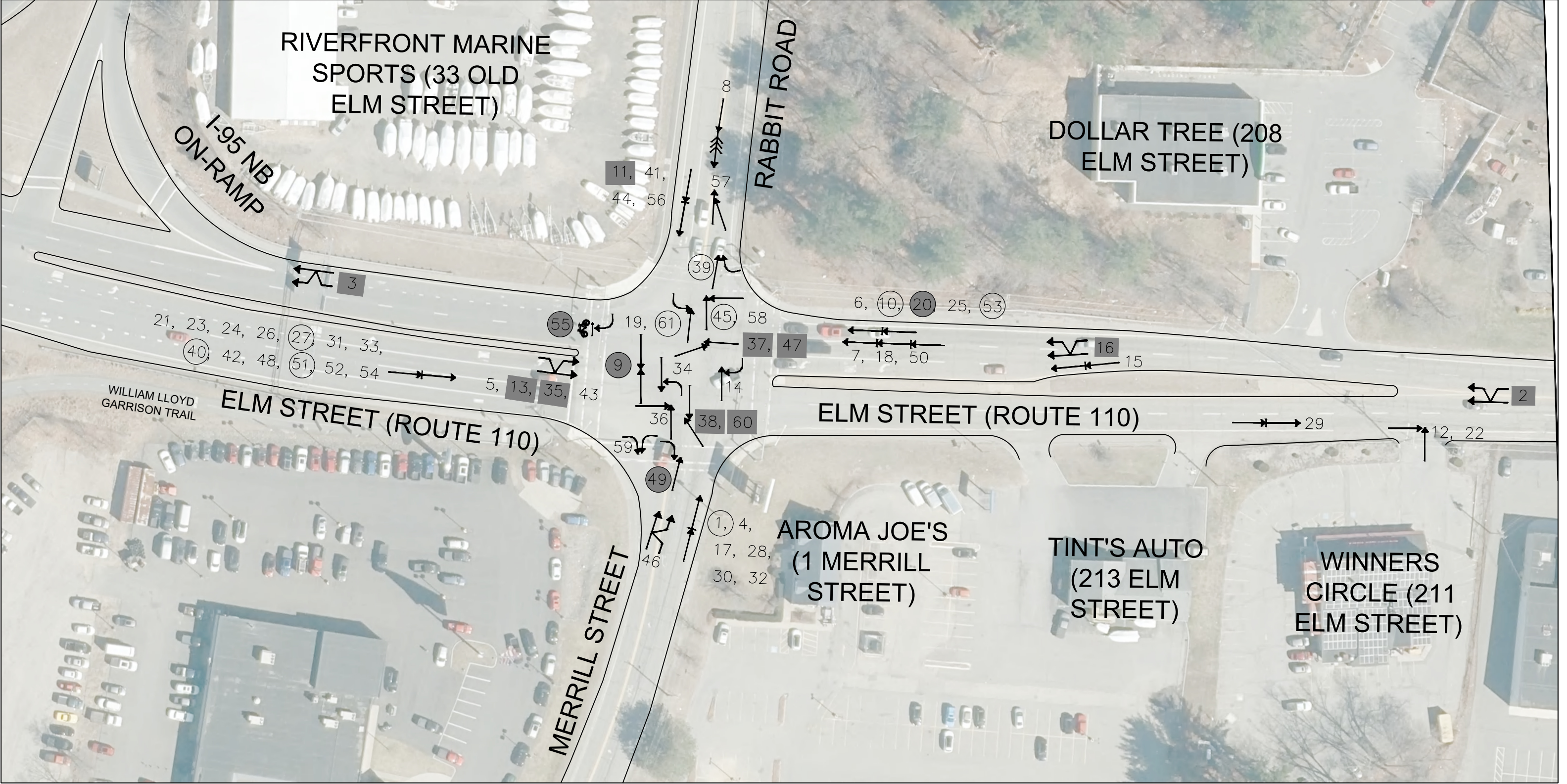
TYPE OF CRASH		SEVERITY
	Moving Vehicle	 Head on
	Backing Vehicle	
	Non-Involved Vehicle	
	Pedestrian	 Angle
	Bicycle	
	Animal	 Turning Movement
	Parked Vehicle	
	Fixed Object	 Sideswipe
		 Out of Control
		 Twilight/Night Time Crash
		 Injury
		 Fatal

SALISBURY, MA

REGION: MVPC

ELM STREET (ROUTE 110) AT MERRILL STREET AND RABBIT ROAD

TIME PERIOD ANALYZED: 2017-2021
SOURCE OF CRASH REPORTS: SALISBURY POLICE DEPARTMENT
DATE PREPARED: 04/18/2025
PREPARED BY: TOOLE DESIGN



Collision Data Summary Table: (2017-2021)													
Town of Salisbury: Elm Street (Route 110) at Merrill Street and Rabbit Road													
Crash Diagram #	Crash Date	Crash Day	Time of Day	Crash Severity	Manner of Collision	Light Condition	Weather Condition	Road Surface	Driver Contributing Code	D1 Age	D2 Age	D3 Age	Comment
1	1/17/2017	Tuesday	3:11 PM	Non-Fatal Injury	Rear-end	Daylight	Cloudy	Dry	Inattention	44	41		V1 was traveling NB and stopped in traffic at red light. V2 was traveling NB when it failed to see traffic stopped and rear ended V1.
2	2/21/2017	Tuesday	6:51 PM	Property Damage Only (PDO)	Sideswipe, same direction	Dark - lighted roadway	Clear	Dry	Inattention	19	42		V2 who was traveling WB on Elm Street was waiting to make a left turn into the Winners Circle parking lot when V1 sideswiped V2. OP1 admitted to not paying attention and being able to avoid colliding with V2.
3	4/5/2017	Wednesday	8:06 PM	Property Damage Only (PDO)	Sideswipe, same direction	Dark - lighted roadway	Clear	Dry	Unknown	37	69		V1 and V2 were both traveling WB on Elm St towards Amesbury. Both operators claimed to be in their respective lanes when the two collided. OP1 in the right lane stated they saw V2 begin to veer into their lane and OP2 stated V1 struck their vehicle.
4	4/23/2017	Sunday	4:28 PM	Property Damage Only (PDO)	Rear-end	Daylight	Clear	Dry	Inattention	24	56		V2 was traveling NB and waiting at the red light on Merrill St waiting to turn left onto Elm St when V1 rear-ended V2. The operator of V1 admitted that his inattention led to the accident.
5	4/30/2017	Sunday	12:44 PM	Property Damage Only (PDO)	Sideswipe, same direction	Daylight	Clear	Dry	Unknown	32	48		V1 was traveling on Elm St EB intending to turn left onto Rabbit Rd. V2 was traveling EB, had just exited I-95, and was in the right turning lane onto Merrill St when it collided with V1.
6	5/20/2017	Saturday	4:54 PM	Property Damage Only (PDO)	Rear-end	Daylight	Clear	Dry	Distracted	28	23		V2 was traveling WB on Elm St when it applied its breaks sharply. V1 did not expect this and could not stop in time, colliding with the rear of V2. OP2 stated they looked down at their phone to use the GPS or send a text (conflicting statements).
7	6/11/2017	Sunday	2:27 PM	Property Damage Only (PDO)	Rear-end	Daylight	Cloudy	Dry	Followed too closely	21	18	23	V2 and V3 were traveling WB on Elm Street in heavy traffic congestion when V1 struck V2 in the rear, causing V2 to strike V3. Report states crash was due to inattention of OP1.
8	7/11/2017	Tuesday	11:57 AM	Property Damage Only (PDO)	Unknown	Daylight	Cloudy	Wet	Unknown	35	36		V1 was traveling SB and in a stationary position on Rabbit Rd behind V2 (truck), who was also traveling SB, waiting for the light to turn green when V2 reversed, colliding with the front end of V1. OP2 states they reversed because they were too close to the intersection.
9	8/7/2017	Monday	11:09 PM	Non-Fatal Injury	Angle	Dark - lighted roadway	Rain	Wet	Unknown	50	66		SB V1 and NB V2 collided in the middle of the intersection. Both the operators of V1 and V2 claimed they had green lights. The operator of V1 admitted he was drinking prior to driving to a nearby bar.
10	8/24/2017	Thursday	3:00 PM	Non-Fatal Injury	Rear-end	Daylight	Clear	Dry	Inattention	43	54		V1 was traveling WB on Elm St when V2 did not stop and struck the rear of V1.
11	8/26/2017	Saturday	9:24 PM	Property Damage Only (PDO)	Rear-end	Dark - lighted roadway	Clear	Dry	Physical impairment	69	60		V2 was stopped at a red light heading SB on Rabbit Rd when V1 rear-ended him. OP1 OUI.
12	2/11/2018	Sunday	12:01 PM	Property Damage Only (PDO)	Angle	Daylight	Rain	Wet	No improper driving	54	34		V1 attempting to exit the Winner's Circle parking lot collided with EB V2. Both operators stated they did not see the other vehicle due to a trailer parked in the breakdown lane.
13	3/16/2018	Friday	10:35 PM	Property Damage Only (PDO)	Sideswipe, same direction	Dark - lighted roadway	Clear	Dry	Made an improper turn	19	22		EB V1 and EB V2 in the left turn only lane and left through lane respectively attempted to turn left onto Rabbit Rd simultaneously and collided. V2 was in a through only lane and made an incorrect turn.
14	5/7/2018	Monday	8:59 AM	Property Damage Only (PDO)	Angle	Daylight	Clear	Dry	Failed to yield right of way	71	34		V2 who was traveling NB had a green light and was making a left turn. V1, who was traveling SB, had a red light, slowed and stopped, then proceeded right-on-red. V1 failed to yield to V2 and sideswiped V2.
15	5/15/2018	Tuesday	4:09 PM	Property Damage Only (PDO)	Rear-end	Daylight	Clear	Dry	Failure to keep in proper lane or running off road	46	47		V1 attempted to get into the left turn only lane travelling WB on Elm Street and struck V2. V2 was waiting in traffic at the light in the through lane.
16	6/12/2018	Tuesday	8:39 PM	Property Damage Only (PDO)	Sideswipe, same direction	Dusk	Clear	Dry	Inattention	48	75		V1 attempted to change lanes from the right lane into the left lane heading WB on Elm St. Operator of V1 stated that because of the size of his truck he did not see V2. When V1 moved across lanes it made contact with the front side of V2.

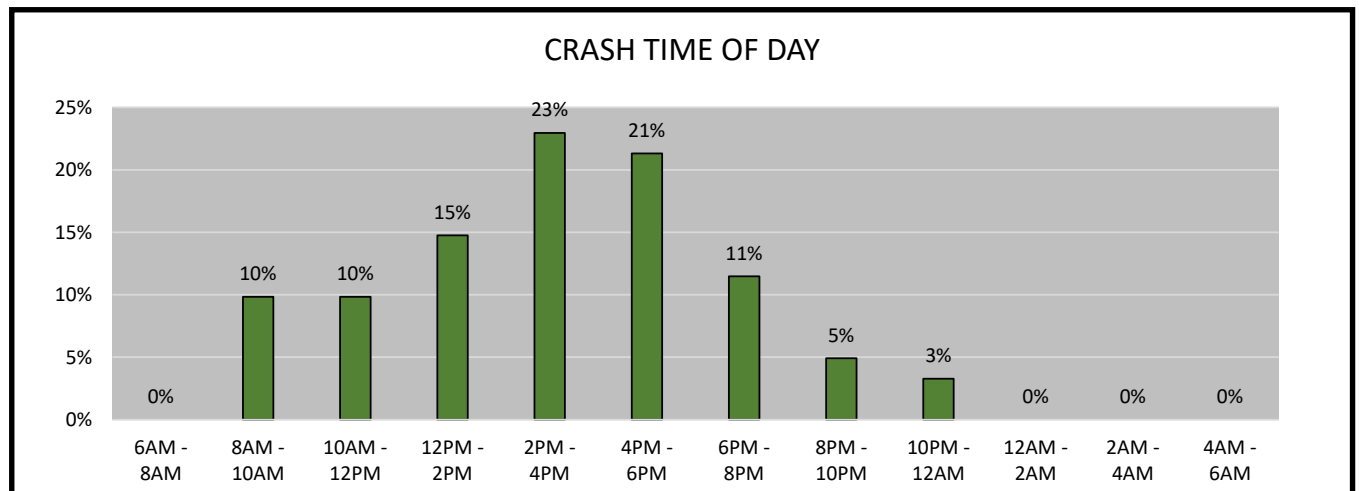
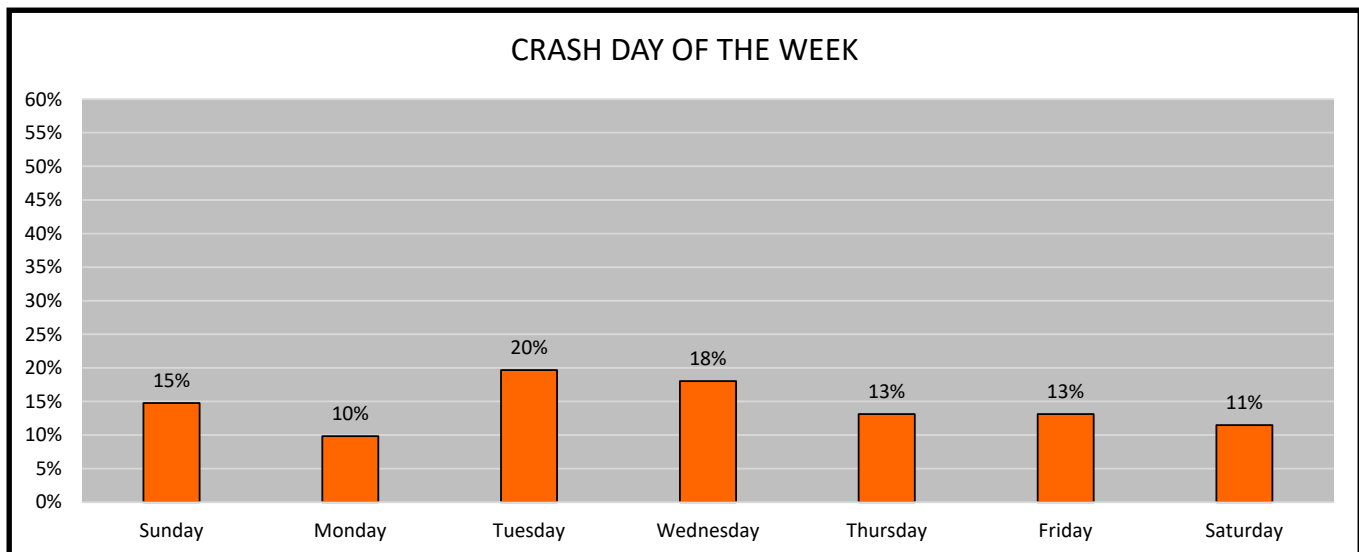
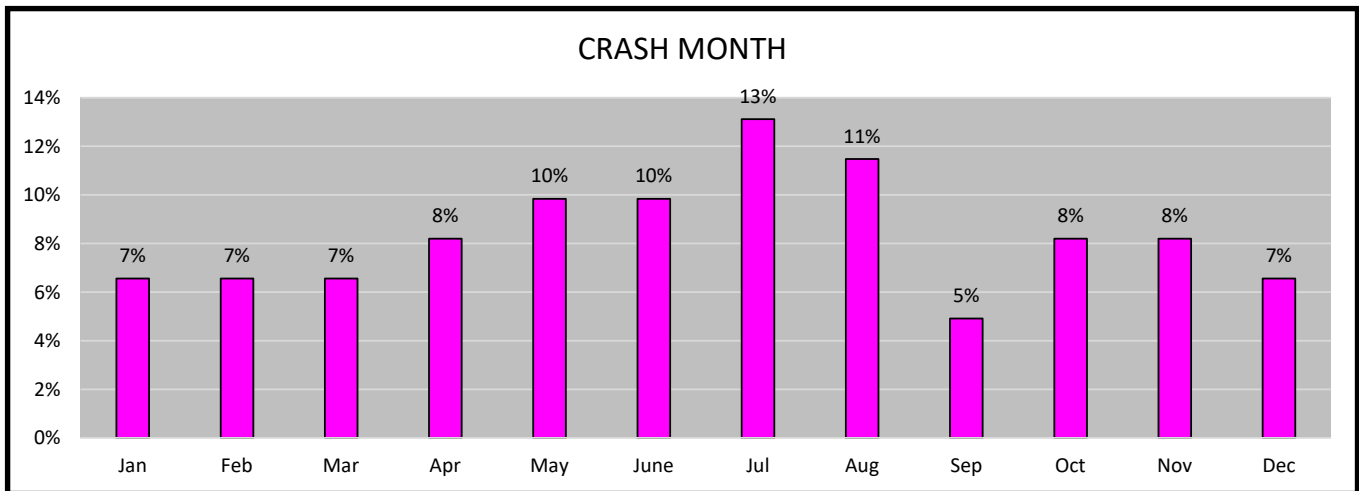
Collision Data Summary Table: (2017-2021)													
Town of Salisbury: Elm Street (Route 110) at Merrill Street and Rabbit Road													
Crash Diagram #	Crash Date	Crash Day	Time of Day	Crash Severity	Manner of Collision	Light Condition	Weather Condition	Road Surface	Driver Contributing Code	D1 Age	D2 Age	D3 Age	Comment
17	7/3/2018	Tuesday	11:17 AM	Property Damage Only (PDO)	Rear-end	Daylight	Clear	Dry	Physical impairment	43	42		V1 stopped at a red light heading NB on Merrill St. V2 failed to stop or slow and crashed into the rear of V1. OP2 OUI.
18	7/9/2018	Monday	3:23 PM	Property Damage Only (PDO)	Rear-end	Daylight	Clear	Dry	Inattention	59	16	40	All vehicles were heading WB on Elm St. V3 was waiting in traffic at the intersection when the operator of V1 rear ended V2, causing V2 to collide with V3.
19	7/25/2018	Wednesday	1:00 PM	Property Damage Only (PDO)	Angle	Daylight	Clear	Dry	Failed to yield right of way	66	17		NB V1 was traveling straight through the intersection when it was struck by SB V2 attempting a left turn. OP2 stated they did not see V1.
20	9/14/2018	Friday	6:56 PM	Non-Fatal Injury	Rear-end	Dark - lighted roadway	Cloudy	Dry	Operating vehicle in erratic, reckless, careless, negligent or aggressive manner	47	53		V1 was stopped at a red light on Elm St waiting to continue WB when V2 struck the rear of V1. V2 fled the scene and was later arrested for OUI-liquor.
21	10/24/2018	Wednesday	11:54 AM	Property Damage Only (PDO)	Rear-end	Daylight	Rain	Wet	Unknown	33	49		V2 was stopped at the red light heading EB on Elm St when V1 hit V2 from behind.
22	12/26/2018	Wednesday	2:35 PM	Property Damage Only (PDO)	Angle	Daylight	Clear	Dry	Failed to yield right of way	33	52		V1 was traveling EB on Elm Street when V2 failed to yield the right of way while attempting to make a left turn onto Elm Street out of the Winners Circle parking lot, colliding with V1.
23	2/12/2019	Saturday	3:54 PM	Property Damage Only (PDO)	Rear-end	Daylight	Snow	Snow	No improper driving	23	45		V1 was heading EB on Elm St when they stopped at a red light. V2 struck V1 from behind.
24	3/1/2019	Friday	11:57 AM	Property Damage Only (PDO)	Rear-end	Daylight	Clear	Dry	No improper driving	26	19		V1 was traveling behind V2 heading EB on Elm St when he struck V2 from behind.
25	3/15/2019	Friday	2:02 PM	Property Damage Only (PDO)	Rear-end	Daylight	Clear	Wet	Inattention	43	52		WB V1 struck WB V2 that was stopped at the red light. OP1 stated they were not paying attention and did not realize V2 was stopped.
26	3/29/2019	Friday	1:45 PM	Property Damage Only (PDO)	Rear-end	Daylight	Cloudy	Dry	Inattention	78	59		V1 stopped at a red light heading EB on Elm St. V2 approached from behind and struck V1 in the rear.
27	4/5/2019	Friday	3:43 PM	Non-Fatal Injury	Rear-end	Daylight	Clear	Dry	Inattention	62	51		Operator of EB V2 was queued to turn right onto Merrill St from Elm St when V1, who was aiming to do the same movement, collided with the rear of V2. OP2 stated they thought V1 was going to go but did not.
28	5/22/2019	Wednesday	8:00 AM	Property Damage Only (PDO)	Rear-end	Daylight	Clear	Dry	Unknown	48	32		V1 and V2 were traveling NB on Merrill St. As V2 slowed down upon reaching the traffic lights, V1 rear-ended V2.
29	6/8/2019	Saturday	1:30 PM	Property Damage Only (PDO)	Rear-end	Daylight	Clear	Dry	No improper driving	59	69		V1 and V2 were heading EB on Elm St after the intersection when V2 slowed for traffic and V1 struck V2 from behind.
30	7/8/2019	Monday	4:05 PM	Property Damage Only (PDO)	Rear-end	Daylight	Clear	Unknown	Inattention	20	18		NB V2 struck NB V1 from behind. OP2 stated they were looking at their GPS and accidentally hit the gas instead of the brake.
31	7/18/2019	Thursday	5:00 PM	Property Damage Only (PDO)	Rear-end	Daylight	Clear	Unknown	No improper driving	33	Unknown		V2 was traveling EB on Elm St approaching Rabbit Rd when V1 slowed down to let another vehicle merge. V2 struck V1 from the rear. V2 fled the scene.
32	7/23/2019	Tuesday	3:15 PM	Property Damage Only (PDO)	Rear-end	Daylight	Cloudy	Unknown	Followed too closely	21	34		NB V1 was behind NB V2 in traffic in the left hand turn lane on Merrill St when V1 rear-ended V2. The operator of V1 stated that their foot slipped off the brake.
33	9/5/2019	Thursday	8:21 AM	Property Damage Only (PDO)	Rear-end	Daylight	Clear	Dry	Fatigued/asleep	41	28		EB V1 was stopped at a red light when EB V2 crashed into the rear of his vehicle. The operator of V2 states that he fell asleep behind the wheel.

Collision Data Summary Table: (2017-2021)													
Town of Salisbury: Elm Street (Route 110) at Merrill Street and Rabbit Road													
Crash Diagram #	Crash Date	Crash Day	Time of Day	Crash Severity	Manner of Collision	Light Condition	Weather Condition	Road Surface	Driver Contributing Code	D1 Age	D2 Age	D3 Age	Comment
34	9/17/2019	Tuesday	8:49 AM	Property Damage Only (PDO)	Angle	Daylight	Clear	Dry	No improper driving	77	18		V1 who was traveling NB was taking a left turn onto Elm St from Merrill St when an unknown truck blinded the operators vision. Upon taking the left turn, the operator of V1 did not see SB V2 traveling straight from Rabbit Rd onto Merrill St, prompting a collision with V2.
35	1/18/2020	Saturday	5:27 PM	Property Damage Only (PDO)	Sideswipe, same direction	Dark - lighted roadway	Snow	Wet	Inattention	30	32		V1 and V2 were traveling EB on Elm St in the right and left through lanes respectively. V2 then changed lanes without notice, sideswiping V1. OP2 stated they did not see V1.
36	1/22/2020	Wednesday	3:44 PM	Property Damage Only (PDO)	Angle	Daylight	Clear	Dry	Inattention	46	36		V1 was traveling NB from Merrill St to Rabbit Rd and V2 was traveling EB on Elm St. V2 went through the red light and struck V1. OP2 stated they went through the red light and did not realize until it was too late.
37	2/20/2020	Thursday	6:41 PM	Property Damage Only (PDO)	Angle	Dark - lighted roadway	Clear	Dry	Disregarded traffic signs, signals, road markings	39	40		V1 was traveling WB on Elm St when V2, heading EB on Elm St, attempted to turn left and collided with V1. OP2 stated they did not have a red left turn arrow and got confused then the through signals turned green.
38	4/13/2020	Monday	5:50 PM	Property Damage Only (PDO)	Angle	Dusk	Rain	Wet	Inattention	70	26		V2 who was traveling NB was attempting to turn left onto Elm St from Merrill St. V1 who was traveling SB failed to stop at the red light and drove straight into the intersection striking V2.
39	5/13/2020	Wednesday	4:38 PM	Non-Fatal Injury	Angle	Daylight	Clear	Dry	Failed to yield right of way	62	51		V1 was heading NB onto on Rabbit Rd when WB V2 (a motorcycle) attempted to turn right on red and collided with V1. OP2 stated they did not see V1.
40	6/14/2020	Sunday	7:01 PM	Non-Fatal Injury	Rear-end	Daylight	Clear	Dry	Inattention	18	64		V1 was traveling EB and stopped in the left turn only lane when V2 failed to stop and rear-ended V1.
41	6/23/2020	Tuesday	9:09 AM	Property Damage Only (PDO)	Rear-end	Daylight	Clear	Dry	Inattention	77	60		V1 (SB) was stopped at the red light on Rabbit Rd waiting to turn left when V2 (SB) struck the rear of V1. The operator of V2 stated that his foot slipped off the brake.
42	7/13/2020	Monday	5:21 PM	Property Damage Only (PDO)	Rear-end	Daylight	Cloudy	Dry	Inattention	18	28		V2 was stopped at the red light traveling EB on Elm St. After coming to a stop, V2 was rear-ended by V1. OP1 stated they were not paying attention.
43	8/13/2020	Thursday	11:28 AM	Property Damage Only (PDO)	Sideswipe, same direction	Daylight	Clear	Dry	Inattention	42	57		V1 was traveling EB in the left lane on Elm St when EB V2 in the right lane suddenly merged and collided with V2.
44	8/13/2020	Thursday	4:00 PM	Property Damage Only (PDO)	Rear-end	Daylight	Clear	Dry	Unknown	89	33		SB V1 stopped at a red traffic light awaiting right-hand turn onto Elm St. V2 rear ended V1.
45	8/23/2020	Sunday	1:36 PM	Non-Fatal Injury	Angle	Daylight	Clear	Dry	Disregarded traffic signs, signals, road markings	51	19		WB V1 on Elm St collided with NB V2. OP2 claimed to have a green light. Witness traveling behind V1 confirms V1 failed to stop on the red light.
46	10/23/2020	Friday	5:53 PM	Property Damage Only (PDO)	Sideswipe, same direction	Daylight	Clear	Dry	Made an improper turn	44	19		NB V1 was stopped in traffic in the left-hand turn lane on Merrill St when NB V2 abruptly passed V1, causing a sideswipe collision.
47	11/1/2020	Sunday	6:54 PM	Property Damage Only (PDO)	Angle	Dark - lighted roadway	Clear	Wet	Failed to yield right of way	64	22		V1 was attempting to make a left turn onto Rabbit Rd from Elm St EB. V2 was heading WB on Elm St attempting to turn right onto Rabbit Rd when the two vehicles collided.
48	11/11/2020	Wednesday	11:23 AM	Property Damage Only (PDO)	Rear-end	Daylight	Cloudy	Dry	No improper driving	48	50		V1 was heading EB on Elm Street when V2 struck V1 from behind.

Collision Data Summary Table: (2017-2021)													
Town of Salisbury: Elm Street (Route 110) at Merrill Street and Rabbit Road													
Crash Diagram #	Crash Date	Crash Day	Time of Day	Crash Severity	Manner of Collision	Light Condition	Weather Condition	Road Surface	Driver Contributing Code	D1 Age	D2 Age	D3 Age	Comment
49	11/14/2020	Saturday	7:00 PM	Non-Fatal Injury	Angle	Dark - lighted roadway	Clear	Dry	Failure to keep in proper lane or running off road	21	63		V1 was traveling NB on Merrill St when V2 EB took a wide right hand turn at a high speed and collided with V1.
50	12/24/2020	Thursday	12:16 PM	Property Damage Only (PDO)	Rear-end	Daylight	Cloudy	Dry	No improper driving	64	31	23	V1, V2, and V3 were heading WB on Elm St when V1 stopped at the red light, creating a chain reaction crash involving V2 and V3.
51	1/10/2021	Sunday	4:21 PM	Non-Fatal Injury	Rear-end	Daylight	Clear	Dry	Operating vehicle in erratic, reckless, careless, negligent or aggressive manner	51	51		EB V2 was stopped at a red light when EB V1 struck from behind. V1 pushed V2 onto Merrill St, causing V2's tires to blow. Suspected OP1 OUI, and prior to the crash, PD was alerted that V1 was driving erratically.
52	5/27/2021	Thursday	3:22 PM	Property Damage Only (PDO)	Rear-end	Daylight	Clear	Dry	Unknown	24	57		V1 and V2 heading EB on Elm St in the middle lane when an unidentified vehicle slowed/stopped at the intersection. V2 failed to slow/stop resulting in a rear-end collision with V1.
53	6/16/2021	Wednesday	3:20 PM	Non-Fatal Injury	Rear-end	Daylight	Clear	Dry	Inattention	20	44		WB V1 was stopped behind WB V2 on Elm St when the operator accelerated, rear-ending V2.
54	8/11/2021	Wednesday	12:02 PM	Property Damage Only (PDO)	Rear-end	Daylight	Clear	Dry	Inattention	59	67		EB V1 was stopped at the red light, when EB V2 collided against the rear of V1. OP2 stated they were not paying attention.
55	10/2/2021	Saturday	7:17 PM	Non-Fatal Injury	Single Vehicle Crash	Dawn	Clear	Dry	Unknown	19			Cyclist was crossing the eastern crosswalk on Elm Street heading SB when SB V1 took a right turn from Rabbit Rd onto Elm St and collided with the cyclist.
56	10/5/2021	Tuesday	12:50 PM	Property Damage Only (PDO)	Rear-end	Daylight	Clear	Dry	Other improper action	49	51		V1 and V2 were traveling SB on Rabbit Rd. Both vehicles stopped at the light when V1 accelerated into the rear of V2.
57	10/31/2021	Sunday	10:46 AM	Property Damage Only (PDO)	Angle	Daylight	Cloudy	Dry	Unknown	29	31		V1 was attempting to pull left into traffic NB from the shoulder on Rabbit Rd. V2 was heading NB on Rabbit Rd when it was struck by V1.
58	11/6/2021	Saturday	3:53 PM	Property Damage Only (PDO)	Angle	Daylight	Clear	Dry	Unknown	82	86		V1 was heading WB on Elm St when V2 was heading NB from Merrill St when the vehicles collided. Witness states V1 ran the red light.
59	11/16/2021	Tuesday	8:40 AM	Property Damage Only (PDO)	Angle	Daylight	Clear	Dry	Failed to yield right of way	69	74		EB V2 attempted to turn right onto Merrill St and collided with WB V2 attempting to turn left into Merrill St. OP2 stated they had a green arrow to turn left onto Merrill Street.
60	12/22/2021	Wednesday	5:17 PM	Property Damage Only (PDO)	Angle	Dark - lighted roadway	Clear	Wet	Inattention	34	20		V1 failed to yield the right of way while turning left on to Elm St from Merrill St, resulting in a collision with SB V2.
61	12/24/2021	Friday	3:10 PM	Non-Fatal Injury	Angle	Daylight	Cloudy	Wet	Failed to yield right of way	43	58	80	V1 was traveling SB on Rabbit Rd attempting to make a left turn onto Elm St. V2 had right of way traveling NB from Merrill St. V1 traveled into the path of V2 resulting in a collision. Momentum from the collision caused V1 to veer to the right and collide with WB V3, who was stopped at the intersection waiting for the signal to change.

Collision Data Summary Charts (2017-2021)

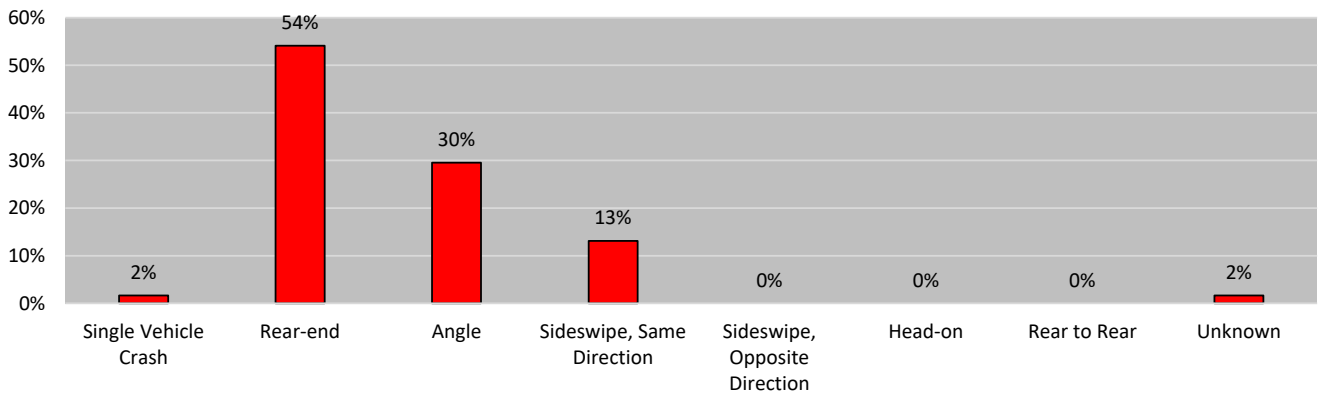
Town of Salisbury: Elm Street (Route 110) at Merrill Street and Rabbit Road



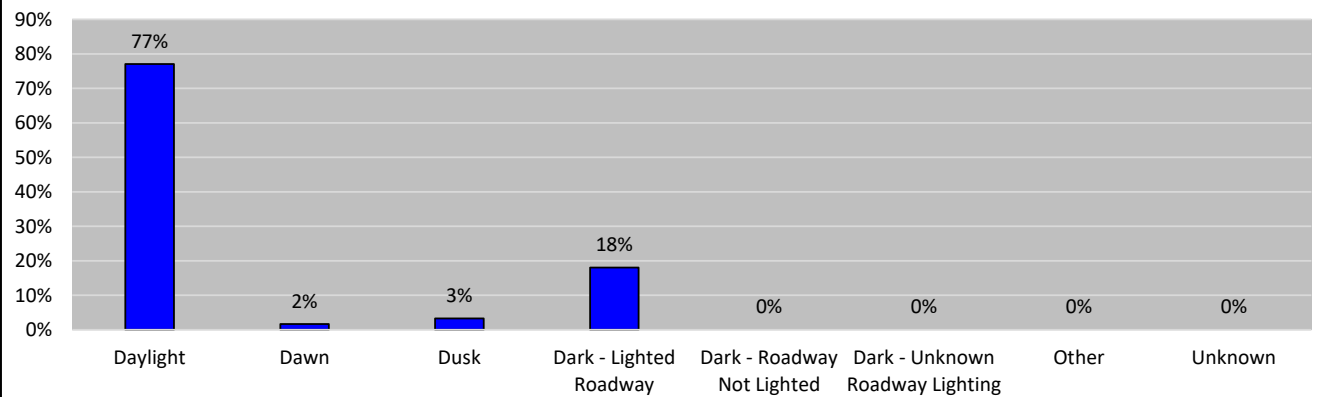
Collision Data Summary Charts (2017-2021)

Town of Salisbury: Elm Street (Route 110) at Merrill Street and Rabbit Road

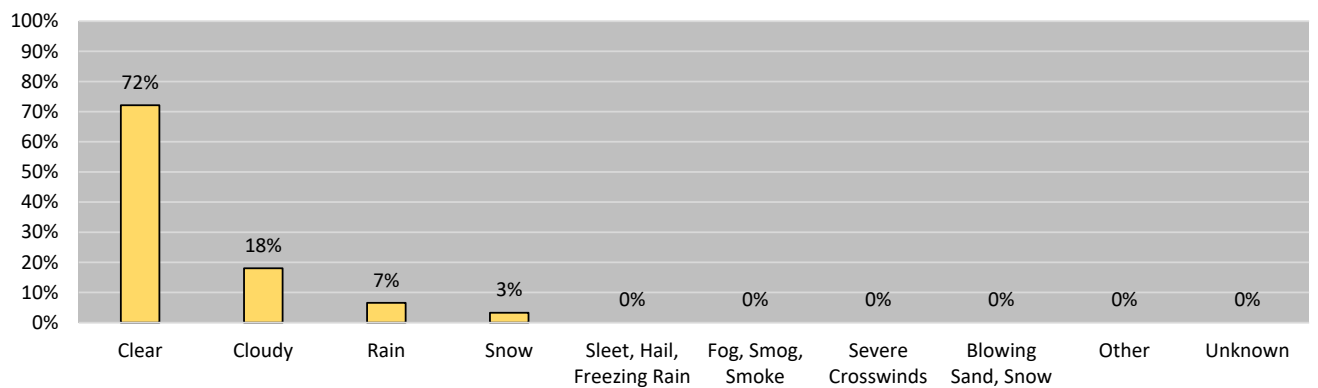
CRASH MANNER OF COLLISION



CRASH LIGHT CONDITION



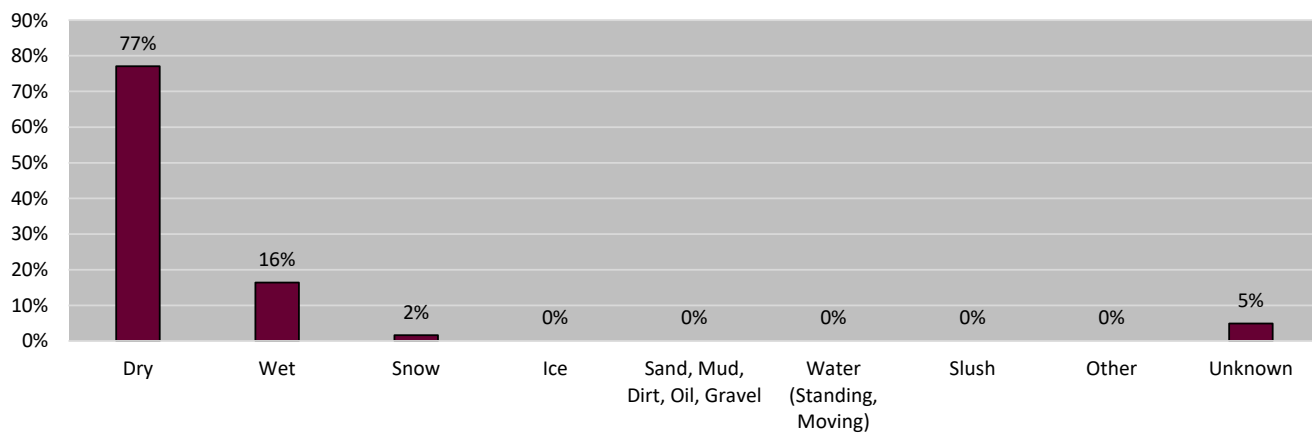
CRASH WEATHER CONDITION



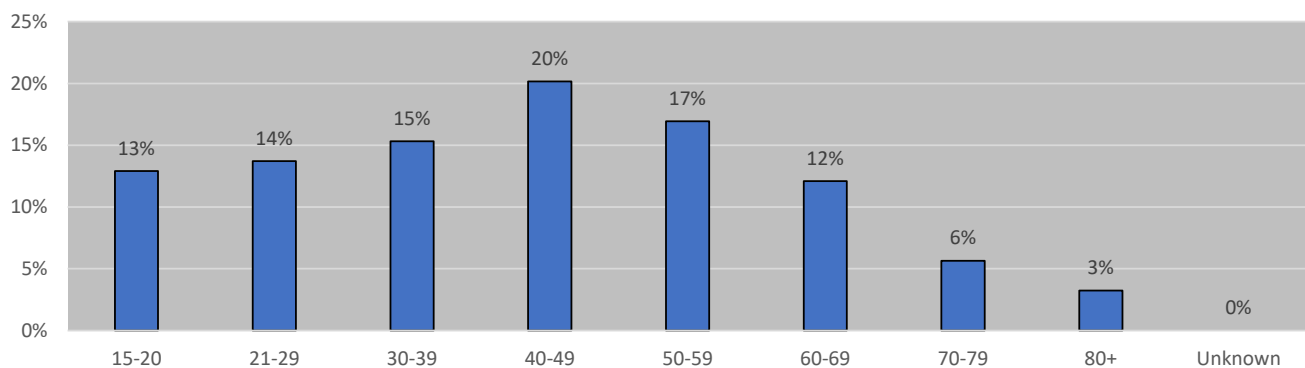
Collision Data Summary Charts (2017-2021)

Town of Salisbury: Elm Street (Route 110) at Merrill Street and Rabbit Road

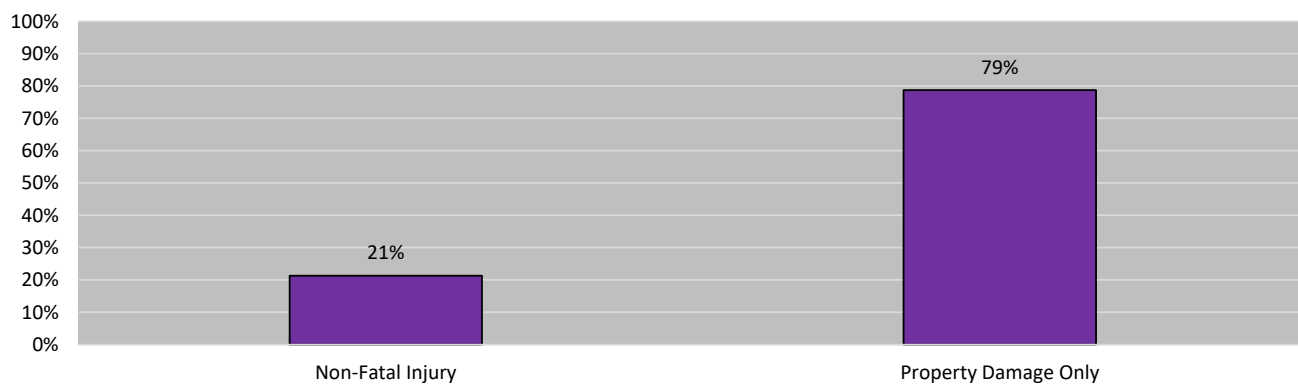
CRASH ROADWAY SURFACE



CRASH DRIVER AGE



MAXIMUM CRASH INJURY SEVERITY



Appendix D. Road Safety Audit References

Road Safety Audit References

FHWA Office of Safety – Proven Safety Countermeasures, U.S. Department of Transportation, Federal Highway Administration <https://safety.fhwa.dot.gov/provencountermeasures/>

Road Safety Audits, A Synthesis of Highway Practice. NCHRP Synthesis 336. Transportation Research Board, National Cooperative Highway Research Program, 2004.

Road Safety Audits. U.S. Department of Transportation, Federal Highway Administration, <https://safety.fhwa.dot.gov/rsa/>

FHWA Road Safety Audit Guidelines. U.S. Department of Transportation, Federal Highway Administration, 2006.

Road Safety Audit, 2nd edition. Austroads, 2000.

Road Safety Audits. ITE Technical Council Committee 4S-7. Institute of Transportation Engineers, February 1995.

Trip-Generation Calculations



Query

Filter

DATA SOURCE:

Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:

210



LAND USE GROUP:

(200-299) Residential

LAND USE :

210 - Single-Family Detached Housing

LAND USE SUBCATEGORY:

All Sites

SETTING/LOCATION:

General Urban/Suburban

INDEPENDENT VARIABLE (IV):

Dwelling Units

TIME PERIOD:

Weekday

TRIP TYPE:

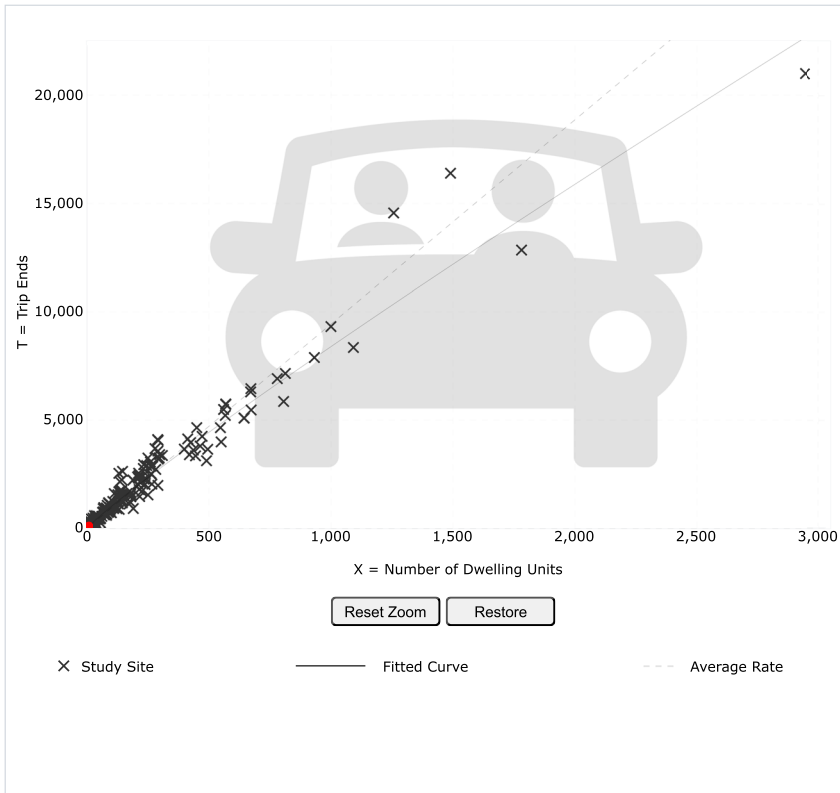
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:

8

Calculate

Data Plot and Equation



Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:

Single-Family Detached Housing (210) [Click for Description and Data Plots](#)

Independent Variable:

Dwelling Units

Time Period:

Weekday

Setting/Location:

General Urban/Suburban

Trip Type:

Vehicle

Number of Studies:

174

Avg. Num. of Dwelling Units:

246

Average Rate:

9.43

Range of Rates:

4.45 - 22.61

Standard Deviation:

2.13

Fitted Curve Equation:

$\ln(T) = 0.92 \ln(X) + 2.68$

R²:

0.95

Directional Distribution:

50% entering, 50% exiting

Calculated Trip Ends:

Average Rate: 75 (Total), 38 (Entry), 37 (Exit)

Fitted Curve: 99 (Total), 49 (Entry), 50 (Exit)



Query

Filter

DATA SOURCE:

Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:

210



LAND USE GROUP:

(200-299) Residential

LAND USE :

210 - Single-Family Detached Housing

LAND USE SUBCATEGORY:

All Sites

SETTING/LOCATION:

General Urban/Suburban

INDEPENDENT VARIABLE (IV):

Dwelling Units

TIME PERIOD:

Weekday, Peak Hour of Adjacent Street Traffic

TRIP TYPE:

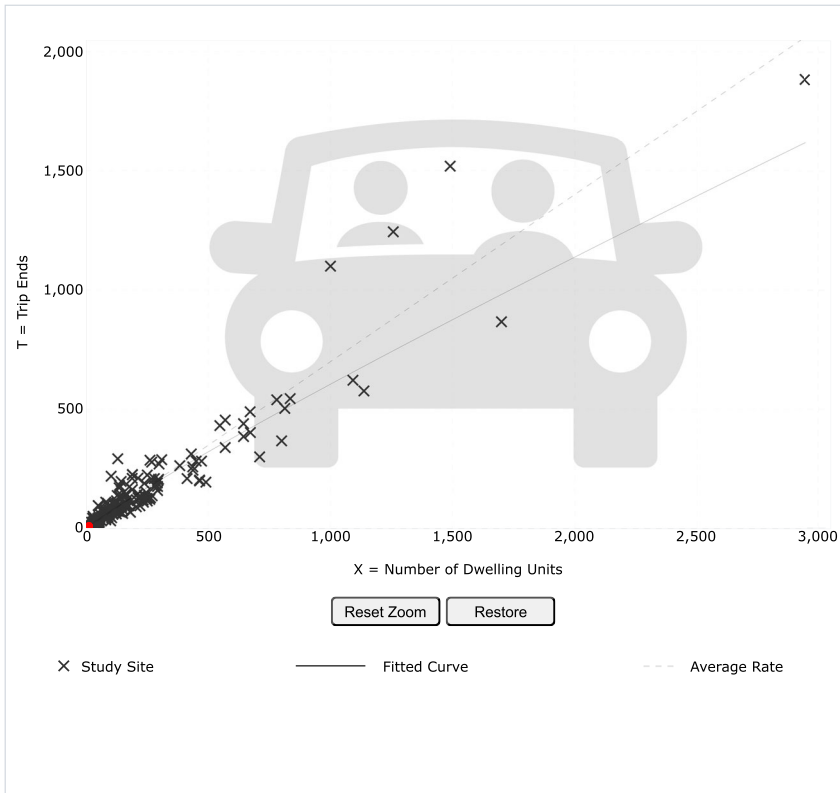
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:

8

Calculate

Data Plot and Equation



Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:

Single-Family Detached Housing (210) [Click for Description and Data Plots](#)

Independent Variable:

Dwelling Units

Time Period:

Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 7 and 9 a.m.

Setting/Location:

General Urban/Suburban

Trip Type:

Vehicle

Number of Studies:

192

Avg. Num. of Dwelling Units:

226

Average Rate:

0.70

Range of Rates:

0.27 - 2.27

Standard Deviation:

0.24

Fitted Curve Equation:

$\ln(T) = 0.91 \ln(X) + 0.12$

R²:

0.90

Directional Distribution:

25% entering, 75% exiting

Calculated Trip Ends:

Average Rate: 6 (Total), 1 (Entry), 5 (Exit)

Fitted Curve: 7 (Total), 2 (Entry), 5 (Exit)



Query

Filter

DATA SOURCE:

Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:

210



LAND USE GROUP:

(200-299) Residential

LAND USE :

210 - Single-Family Detached Housing

LAND USE SUBCATEGORY:

All Sites

SETTING/LOCATION:

General Urban/Suburban

INDEPENDENT VARIABLE (IV):

Dwelling Units

TIME PERIOD:

Weekday, Peak Hour of Adjacent Street Traffic

TRIP TYPE:

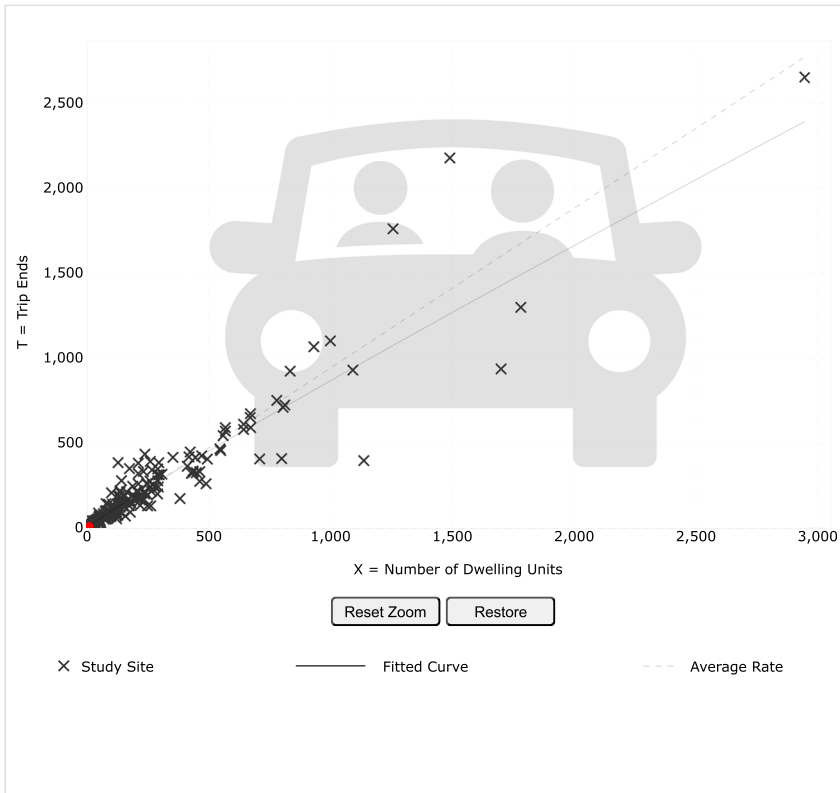
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:

8

Calculate

Data Plot and Equation



Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:

Single-Family Detached Housing (210) [Click for Description and Data Plots](#)

Independent Variable:

Dwelling Units

Time Period:

Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 4 and 6 p.m.

Setting/Location:

General Urban/Suburban

Trip Type:

Vehicle

Number of Studies:

208

Avg. Num. of Dwelling Units:

248

Average Rate:

0.94

Range of Rates:

0.35 - 2.98

Standard Deviation:

0.31

Fitted Curve Equation:

$\ln(T) = 0.94 \ln(X) + 0.27$

R²:

0.92

Directional Distribution:

63% entering, 37% exiting

Calculated Trip Ends:

Average Rate: 8 (Total), 5 (Entry), 3 (Exit)

Fitted Curve: 9 (Total), 6 (Entry), 3 (Exit)



Query

Filter

DATA SOURCE:

Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:

215



LAND USE GROUP:

(200-299) Residential

LAND USE :

215 - Single-Family Attached Housing

LAND USE SUBCATEGORY:

All Sites

SETTING/LOCATION:

General Urban/Suburban

INDEPENDENT VARIABLE (IV):

Dwelling Units

TIME PERIOD:

Weekday

TRIP TYPE:

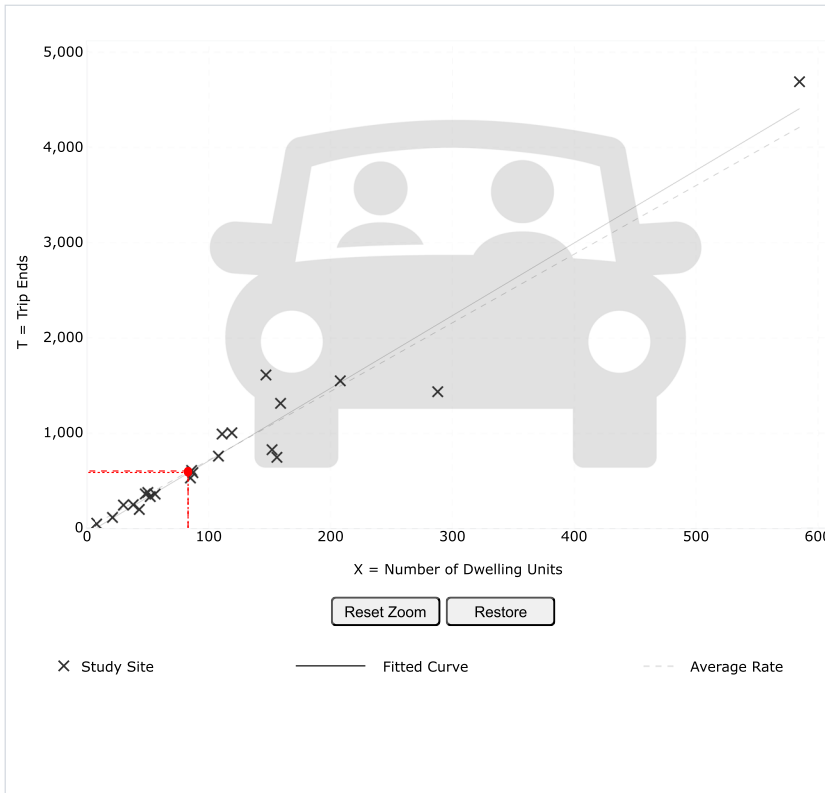
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:

83

Calculate

Data Plot and Equation



Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:

Single-Family Attached Housing (215) [Click for Description and Data Plots](#)

Independent Variable:

Dwelling Units

Time Period:

Weekday

Setting/Location:

General Urban/Suburban

Trip Type:

Vehicle

Number of Studies:

22

Avg. Num. of Dwelling Units:

120

Average Rate:

7.20

Range of Rates:

4.70 - 10.97

Standard Deviation:

1.61

Fitted Curve Equation:

$T = 7.62(X) - 50.48$

R^2 :

0.94

Directional Distribution:

50% entering, 50% exiting

Calculated Trip Ends:

Average Rate: 598 (Total), 299 (Entry), 299 (Exit)

Fitted Curve: 582 (Total), 291 (Entry), 291 (Exit)



Query

Filter

DATA SOURCE:

Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:

215



LAND USE GROUP:

(200-299) Residential

LAND USE :

215 - Single-Family Attached Housing

LAND USE SUBCATEGORY:

All Sites

SETTING/LOCATION:

General Urban/Suburban

INDEPENDENT VARIABLE (IV):

Dwelling Units

TIME PERIOD:

Weekday, Peak Hour of Adjacent Street Traffic

TRIP TYPE:

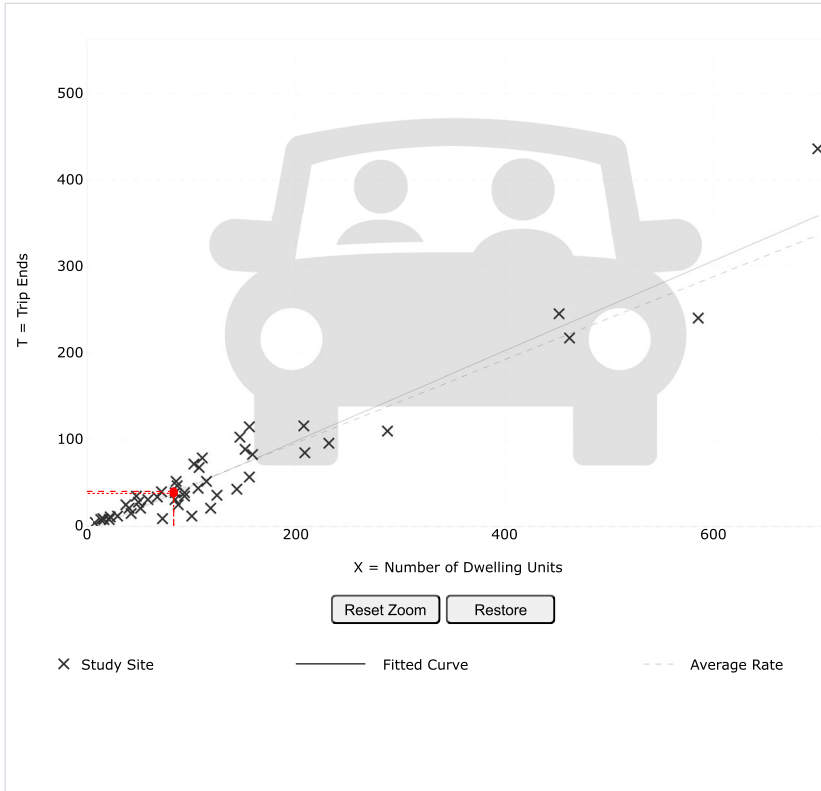
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:

83

Calculate

Data Plot and Equation



Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:

Single-Family Attached Housing (215) [Click for Description and Data Plots](#)

Independent Variable:

Dwelling Units

Time Period:

Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 7 and 9 a.m.

Setting/Location:

General Urban/Suburban

Trip Type:

Vehicle

Number of Studies:

46

Avg. Num. of Dwelling Units:

135

Average Rate:

0.48

Range of Rates:

0.12 - 0.74

Standard Deviation:

0.14

Fitted Curve Equation:

$T = 0.52(X) - 5.70$

R²:

0.92

Directional Distribution:

25% entering, 75% exiting

Calculated Trip Ends:

Average Rate: 40 (Total), 10 (Entry), 30 (Exit)

Fitted Curve: 37 (Total), 9 (Entry), 28 (Exit)



Query

Filter

DATA SOURCE:

Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:

215



LAND USE GROUP:

(200-299) Residential

LAND USE :

215 - Single-Family Attached Housing

LAND USE SUBCATEGORY:

All Sites

SETTING/LOCATION:

General Urban/Suburban

INDEPENDENT VARIABLE (IV):

Dwelling Units

TIME PERIOD:

Weekday, Peak Hour of Adjacent Street Traffic

TRIP TYPE:

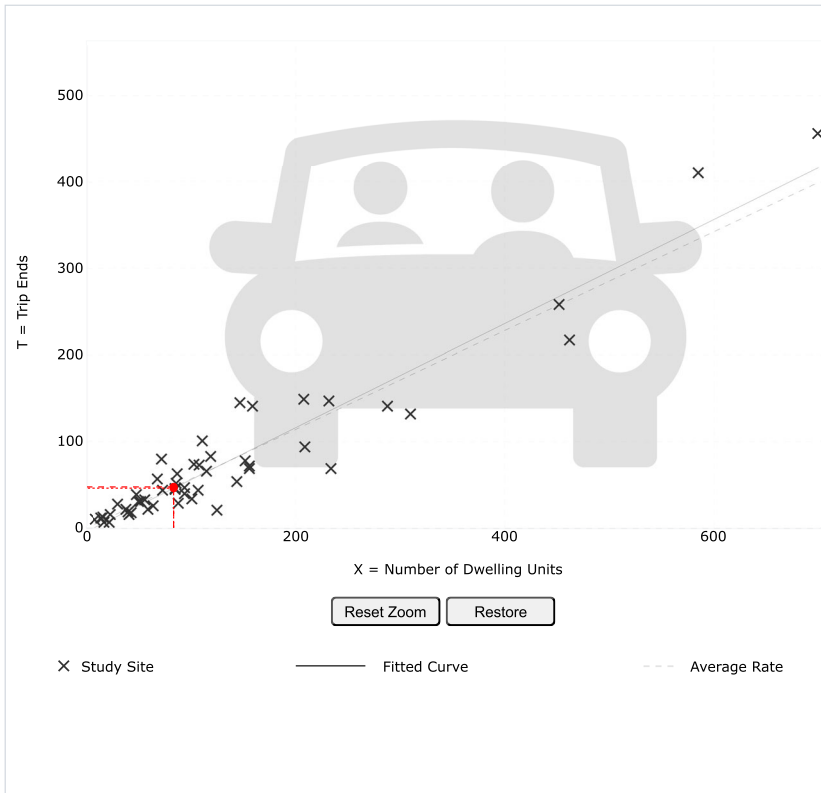
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:

83

Calculate

Data Plot and Equation



Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:

Single-Family Attached Housing (215) [Click for Description and Data Plots](#)

Independent Variable:

Dwelling Units

Time Period:

Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 4 and 6 p.m.

Setting/Location:

General Urban/Suburban

Trip Type:

Vehicle

Number of Studies:

51

Avg. Num. of Dwelling Units:

136

Average Rate:

0.57

Range of Rates:

0.17 - 1.25

Standard Deviation:

0.18

Fitted Curve Equation:

$T = 0.60(X) - 3.93$

R²:

0.91

Directional Distribution:

59% entering, 41% exiting

Calculated Trip Ends:

Average Rate: 47 (Total), 28 (Entry), 19 (Exit)

Fitted Curve: 46 (Total), 27 (Entry), 19 (Exit)

Graph Look Up



ITETripGen Web-based App

- Graph Look Up
- How to Use ITETripGen
- TGM Desk Reference
- TGM Appendices
- Support Documents
- Add Users
- Comments

Query Filter

DATA SOURCE:

Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:

220

LAND USE GROUP:

(200-299) Residential

LAND USE :

220 - Multifamily Housing (Low-Rise)

LAND USE SUBCATEGORY:

Not Close to Rail Transit

SETTING/LOCATION:

General Urban/Suburban

INDEPENDENT VARIABLE (IV):

Dwelling Units

TIME PERIOD:

Weekday

TRIP TYPE:

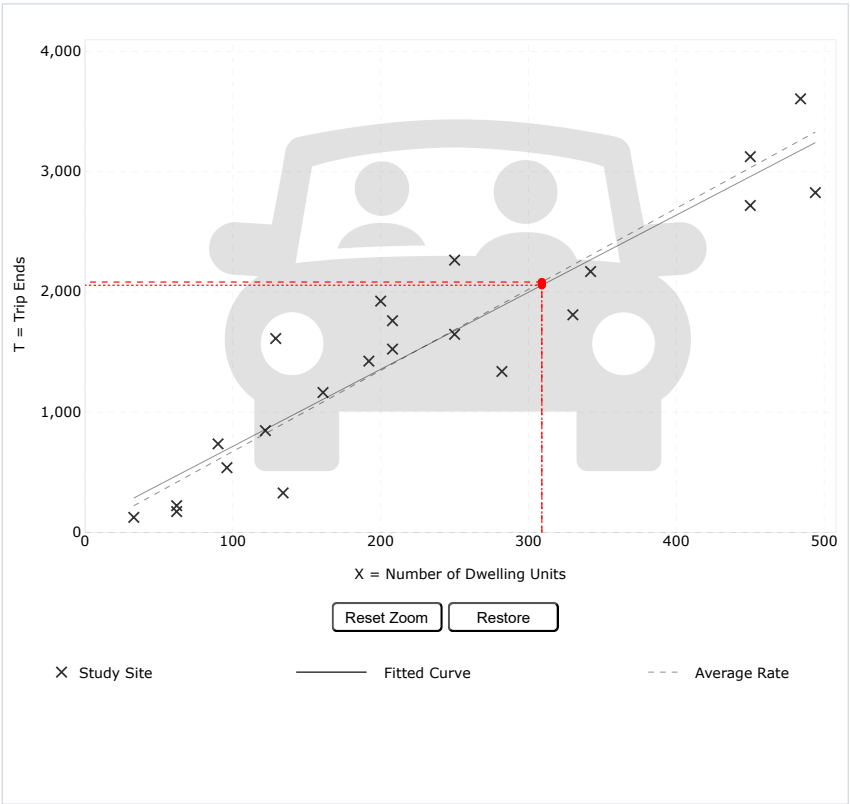
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:

309

Calculate

Data Plot and Equation



DATA STATISTICS

Land Use:
Multifamily Housing (Low-Rise) - Not Close to Rail Transit (220) [Click for Description and Data Plots](#)

Independent Variable:
Dwelling Units

Time Period:
Weekday

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
22

Avg. Num. of Dwelling Units:
229

Average Rate:
6.74

Range of Rates:
2.46 - 12.50

Standard Deviation:
1.79

Fitted Curve Equation:
 $T = 6.41(X) + 75.31$

R²:
0.86

Directional Distribution:
50% entering, 50% exiting

Calculated Trip Ends:
Average Rate: 2083 (Total), 1041 (Entry), 1042 (Exit)
Fitted Curve: 2056 (Total), 1028 (Entry), 1028 (Exit)

Add-ons to do more

Try OTISS Pro

Graph Look Up



ITETripGen Web-based App

- Graph Look Up
- How to Use ITETripGen
- TGM Desk Reference
- TGM Appendices
- Support Documents
- Add Users
- Comments

Query Filter

DATA SOURCE:

Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:

220

LAND USE GROUP:

(200-299) Residential

LAND USE :

220 - Multifamily Housing (Low-Rise)

LAND USE SUBCATEGORY:

Not Close to Rail Transit

SETTING/LOCATION:

General Urban/Suburban

INDEPENDENT VARIABLE (IV):

Dwelling Units

TIME PERIOD:

Weekday, Peak Hour of Adjacent Street Traffic

TRIP TYPE:

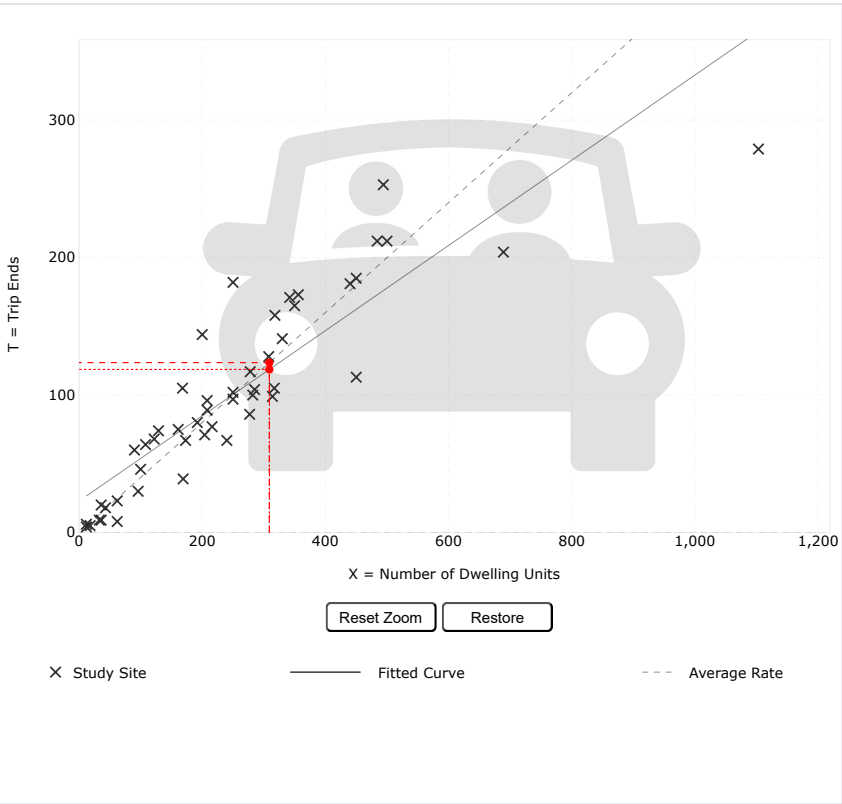
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:

309

Calculate

Data Plot and Equation



DATA STATISTICS

Land Use:
Multifamily Housing (Low-Rise) - Not Close to Rail Transit (220) [Click for Description and Data Plots](#)

Independent Variable:
Dwelling Units

Time Period:
Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 7 and 9 a.m.

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
49

Avg. Num. of Dwelling Units:
249

Average Rate:
0.40

Range of Rates:
0.13 - 0.73

Standard Deviation:
0.12

Fitted Curve Equation:
 $T = 0.31(X) + 22.85$

R²:
0.79

Directional Distribution:
24% entering, 76% exiting

Calculated Trip Ends:
Average Rate: 124 (Total), 30 (Entry), 94 (Exit)
Fitted Curve: 119 (Total), 28 (Entry), 91 (Exit)

Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

Add-ons to do more

Try OTISS Pro

 Graph Look Up

ITETripGen Web-based App

Graph Look Up

How to Use ITETripGen

TGM Desk Reference

TGM Appendices

Support Documents

Add Users

Comments

Query Filter

DATA SOURCE:

Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:

220



LAND USE GROUP:

(200-299) Residential

LAND USE:

220 - Multifamily Housing (Low-Rise)

LAND USE SUBCATEGORY:

Not Close to Rail Transit

SETTING/LOCATION:

General Urban/Suburban

INDEPENDENT VARIABLE (IV):

Dwelling Units

TIME PERIOD:

Weekday, Peak Hour of Adjacent Street Traffic

TRIP TYPE:

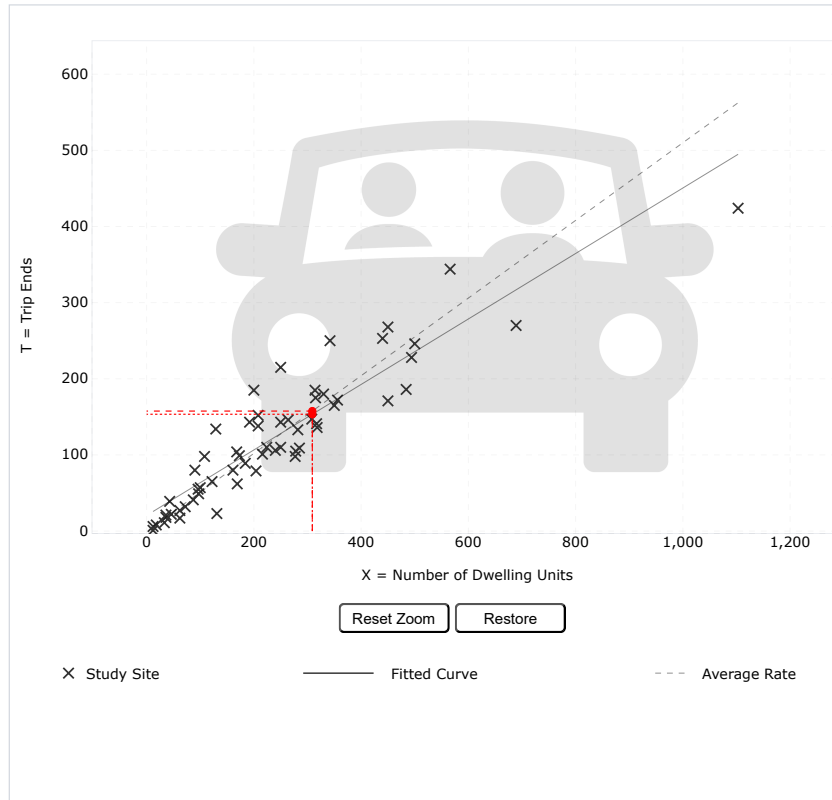
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:

309

Calculate

Data Plot and Equation



Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:

Multifamily Housing (Low-Rise) - Not Close to Rail Transit (220) [Click for Description and Data Plots](#)

Independent Variable:

Dwelling Units

Time Period:

Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 4 and 6 p.m.

Setting/Location:

General Urban/Suburban

Trip Type:

Vehicle

Number of Studies:

59

Avg. Num. of Dwelling Units:

241

Average Rate:

0.51

Range of Rates:

0.08 - 1.04

Standard Deviation:

0.15

Fitted Curve Equation:

 $T = 0.43(X) + 20.55$ R^2 :

0.84

Directional Distribution:

63% entering, 37% exiting

Calculated Trip Ends:

Average Rate: 158 (Total), 99 (Entry), 59 (Exit)

Fitted Curve: 153 (Total), 97 (Entry), 56 (Exit)

Add-ons to do more

Try OTISS Pro

2019-2023 ACS Census Tract 2663 Data

Commuting Characteristics by Sex		United States [®] Census Bureau
Note: The table shown may have been modified by user selections. Some information may be missing.		
DATA NOTES		
TABLE ID:	S0801	
SURVEY/PROGRAM:	American Community Survey	
VINTAGE:	2023	
DATASET:	ACSST5Y2023	
PRODUCT:	ACS 5-Year Estimates Subject Tables	
UNIVERSE:	None	
MLA:	U.S. Census Bureau, U.S. Department of Commerce. "Commuting Characteristics by Sex." American Community Survey, ACS 5-Year Estimates Subject Tables, Table S0801, 2023, . Accessed on March 10, 2025.	
FTP URL:	None	
API URL:	https://api.census.gov/data/2023/acs/acs5/subject	
USER SELECTIONS		
TABLES	S0801	
GEOS	Census Tract 2663; Essex County; Massachusetts	
EXCLUDED COLUMNS	None	
APPLIED FILTERS	None	
APPLIED SORTS	None	
PIVOT & GROUPING		
PIVOT COLUMNS	None	
PIVOT MODE	Off	
ROW GROUPS	None	
VALUE COLUMNS	None	
WEB ADDRESS	https://data.census.gov/table/ACSST5Y2023.S0801?q=s0801&g=1400000US25009266300	
TABLE NOTES		
	Although the American Community Survey (ACS) produces population, demographic and housing unit estimates, the decennial census is the official source of population totals for April 1st of each decennial year. In between censuses, the Census Bureau's Population Estimates Program produces and disseminates the official estimates of the population for the nation, states, counties, cities, and towns and estimates of housing units and the group quarters population for states and counties.	
	Information about the American Community Survey (ACS) can be found on the ACS website. Supporting documentation including code lists, subject definitions, data accuracy, and statistical testing, and a full list of ACS tables and table shells (without estimates) can be found on the Technical Documentation section of the ACS website. Sample size and data quality measures (including coverage rates, allocation rates, and response rates) can be found on the American Community Survey website in the Methodology section.	
	Source: U.S. Census Bureau, 2019-2023 American Community Survey 5-Year Estimates	
	ACS data generally reflect the geographic boundaries of legal and statistical areas as of January 1 of the estimate year. For more information, see Geography Boundaries by Year .	

	Data are based on a sample and are subject to sampling variability. The degree of uncertainty for an estimate arising from sampling variability is represented through the use of a margin of error. The value shown here is the 90 percent margin of error. The margin of error can be interpreted roughly as providing a 90 percent probability that the interval defined by the estimate minus the margin of error and the estimate plus the margin of error (the lower and upper confidence bounds) contains the true value. In addition to sampling variability, the ACS estimates are subject to nonsampling error (for a discussion of nonsampling variability, see ACS Technical Documentation). The effect of nonsampling error is not represented in these tables.
	Users must consider potential differences in geographic boundaries, questionnaire content or coding, or other methodological issues when comparing ACS data from different years. Statistically significant differences shown in ACS Comparison Profiles, or in data users' own analysis, may be the result of these differences and thus might not necessarily reflect changes to the social, economic, housing, or demographic characteristics being compared. For more information, see Comparing ACS Data.
	The 12 selected states are Connecticut, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Wisconsin.
	Workers include members of the Armed Forces and civilians who were at work last week.
	When information is missing or inconsistent, the Census Bureau logically assigns an acceptable value using the response to a related question or questions. If a logical assignment is not possible, data are filled using a statistical process called allocation, which uses a similar individual or household to provide a donor value. The "Allocated" section is the number of respondents who received an allocated value for a particular subject.
	Estimates of urban and rural populations, housing units, and characteristics reflect boundaries of urban areas defined based on 2020 Census data. As a result, data for urban and rural areas from the ACS do not necessarily reflect the results of ongoing urbanization.
	Explanation of Symbols:- The estimate could not be computed because there were an insufficient number of sample observations. For a ratio of medians estimate, one or both of the median estimates falls in the lowest interval or highest interval of an open-ended distribution. For a 5-year median estimate, the margin of error associated with a median was larger than the median itself.N The estimate or margin of error cannot be displayed because there were an insufficient number of sample cases in the selected geographic area. (X) The estimate or margin of error is not applicable or not available.median- The median falls in the lowest interval of an open-ended distribution (for example "2,500-")median+ The median falls in the highest interval of an open-ended distribution (for example "250,000+").** The margin of error could not be computed because there were an insufficient number of sample observations.*** The margin of error could not be computed because the median falls in the lowest interval or highest interval of an open-ended distribution.***** A margin of error is not appropriate because the corresponding estimate is controlled to an independent population or housing estimate. Effectively, the corresponding estimate has no sampling error and the margin of error may be treated as zero.
COLUMN NOTES	None

Table: ACSST5Y2023.S0801

	Census Tract 2663; Essex County;
	Total
Label	Estimate
Workers 16 years and over	2,309
MEANS OF TRANSPORTATION TO WORK	
Car, truck, or van	78.9%
Drove alone	73.9%
Carpooled	5.0%
In 2-person carpool	3.0%
In 3-person carpool	1.6%
In 4-or-more person carpool	0.4%
Workers per car, truck, or van	1.04
Public transportation (excluding taxicab)	0.5%
Walked	2.0%
Bicycle	0.3%
Taxicab, motorcycle, or other means	0.0%
Worked from home	18.2%

CAPACITY ANALYSIS WORKSHEETS

2031 Build

2031 Build (Mitigated)

2031 Build

2031 Build Weekday Morning Peak-Hour
2: I-495 Off Ramp & Route 110

03/10/2025

Intersection						
Int Delay, s/veh	0					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑↑		↑
Traffic Vol, veh/h	591	0	0	1102	0	1213
Future Vol, veh/h	591	0	0	1102	0	1213
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Free
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	85	85	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	616	0	0	1296	0	1378

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	-
Pot Cap-1 Maneuver	-	0	0
Stage 1	-	0	0
Stage 2	-	0	0
Platoon blocked, %	-		-
Mov Cap-1 Maneuver	-	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Ctrl Dly, s/v	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	WBT
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Ctrl Dly (s/v)	0	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	-	-	-

2031 Build Weekday Morning Peak-Hour
3: Rocky Hill Rd. & Route 110

03/10/2025

Intersection												
Int Delay, s/veh	1.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑				↑			↑
Traffic Vol, veh/h	0	1600	248	0	873	53	0	0	73	0	0	159
Future Vol, veh/h	0	1600	248	0	873	53	0	0	73	0	0	159
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	96	96	96	76	76	76	94	94	94
Heavy Vehicles, %	0	3	1	0	2	0	0	0	0	0	0	0
Mvmt Flow	0	1702	264	0	909	55	0	0	96	0	0	169

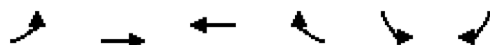
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	0	-	-	983	-	-	482
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	-	-	-	6.9	-	-	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	-	-	-	3.3	-	-	3.3
Pot Cap-1 Maneuver	0	-	-	0	-	-	0	0	252	0	0	536
Stage 1	0	-	-	0	-	-	0	0	-	0	0	-
Stage 2	0	-	-	0	-	-	0	0	-	0	0	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	-	-	-	252	-	-	536
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	0	0	27.89	14.79
HCM LOS			D	B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT	WBR	SBLn1
Capacity (veh/h)	252	-	-	-	-	536
HCM Lane V/C Ratio	0.382	-	-	-	-	0.316
HCM Ctrl Dly (s/v)	27.9	-	-	-	-	14.8
HCM Lane LOS	D	-	-	-	-	B
HCM 95th %tile Q(veh)	1.7	-	-	-	-	1.3

2031 Build Weekday Morning Peak-Hour
4: Route 110 & Carriagetown Marketplace Driveway

03/10/2025



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø9
Lane Configurations							
Traffic Volume (vph)	41	1394	936	29	40	39	
Future Volume (vph)	41	1394	936	29	40	39	
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00	
Frt			0.996			0.850	
Flt Protected	0.950				0.950		
Satd. Flow (prot)	1685	3471	3458	0	1752	1568	
Flt Permitted	0.950				0.950		
Satd. Flow (perm)	1685	3471	3458	0	1752	1568	
Satd. Flow (RTOR)			3			46	
Adj. Flow (vph)	46	1566	1006	31	48	46	
Lane Group Flow (vph)	46	1566	1037	0	48	46	
Turn Type	Prot	NA	NA		Prot	pm+ov	
Protected Phases	5	2	6		4	5	9
Permitted Phases						4	
Detector Phase	5	2	6		4	5	
Switch Phase							
Minimum Initial (s)	6.0	10.0	10.0		6.0	6.0	5.0
Minimum Split (s)	12.0	16.0	16.0		11.0	12.0	29.0
Total Split (s)	32.0	54.0	22.0		17.0	32.0	29.0
Total Split (%)	32.0%	54.0%	22.0%		17.0%	32.0%	29%
Maximum Green (s)	26.0	48.0	16.0		12.0	26.0	27.0
Yellow Time (s)	4.0	4.0	4.0		3.0	4.0	2.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	0.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0		-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0		4.0	5.0	
Lead/Lag	Lead		Lag			Lead	
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Min	C-Min		None	None	None
Walk Time (s)							6.0
Flash Don't Walk (s)							20.0
Pedestrian Calls (#/hr)							3
v/c Ratio	0.27	0.54	0.42		0.30	0.14	
Control Delay (s/veh)	44.6	8.0	3.6		46.4	9.4	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay (s/veh)	44.6	8.0	3.6		46.4	9.4	
Queue Length 50th (ft)	28	116	3		29	0	
Queue Length 95th (ft)	60	536	#450		59	23	
Internal Link Dist (ft)		951	1089		381		
Turn Bay Length (ft)	300						
Base Capacity (vph)	471	2892	2443		227	588	
Starvation Cap Reductn	0	0	0		0	0	
Spillback Cap Reductn	0	0	0		0	0	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.10	0.54	0.42		0.21	0.08	

Intersection Summary

Cycle Length: 100

2031 Build Weekday Morning Peak-Hour
4: Route 110 & Carriagetown Marketplace Driveway

03/10/2025

Actuated Cycle Length: 100

Offset: 27 (27%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow

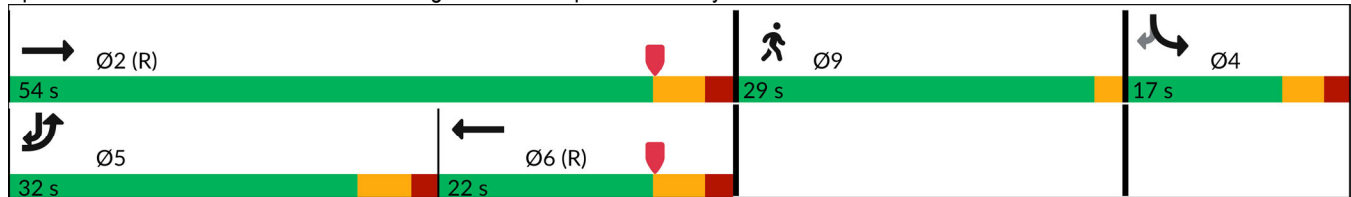
Natural Cycle: 80

Control Type: Actuated-Coordinated

95th percentile volume exceeds capacity, queue may be longer.

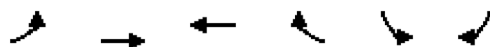
Queue shown is maximum after two cycles.

Splits and Phases: 4: Route 110 & Carriagetown Marketplace Driveway



2031 Build Weekday Morning Peak-Hour
4: Route 110 & Carriagetown Marketplace Driveway

03/10/2025



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	41	1394	936	29	40	39
Future Volume (vph)	41	1394	936	29	40	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	10	12	12	12	12	12
Total Lost time (s)	4.0	4.0	4.0		4.0	5.0
Lane Util. Factor	1.00	0.95	0.95		1.00	1.00
Frt	1.00	1.00	1.00		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1685	3471	3457		1752	1568
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1685	3471	3457		1752	1568
Peak-hour factor, PHF	0.89	0.89	0.93	0.93	0.84	0.84
Adj. Flow (vph)	46	1566	1006	31	48	46
RTOR Reduction (vph)	0	0	1	0	0	39
Lane Group Flow (vph)	46	1566	1036	0	48	7
Heavy Vehicles (%)	0%	4%	4%	3%	3%	3%
Turn Type	Prot	NA	NA		Prot	pm+ov
Protected Phases	5	2	6		4	5
Permitted Phases						4
Actuated Green, G (s)	7.1	76.1	63.0		5.7	12.8
Effective Green, g (s)	9.1	78.1	65.0		6.7	14.8
Actuated g/C Ratio	0.09	0.78	0.65		0.07	0.15
Clearance Time (s)	6.0	6.0	6.0		5.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	153	2710	2247		117	232
v/s Ratio Prot	0.03	c0.45	0.30		c0.03	0.00
v/s Ratio Perm						0.00
v/c Ratio	0.30	0.58	0.46		0.41	0.03
Uniform Delay, d1	42.5	4.4	8.7		44.8	36.5
Progression Factor	1.00	1.00	0.22		1.00	1.00
Incremental Delay, d2	1.1	0.9	0.4		2.3	0.1
Delay (s)	43.6	5.3	2.3		47.1	36.5
Level of Service	D	A	A		D	D
Approach Delay (s/veh)		6.4	2.3		41.9	
Approach LOS		A	A		D	
Intersection Summary						
HCM 2000 Control Delay (s/veh)			6.1		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.56			
Actuated Cycle Length (s)			100.0		Sum of lost time (s)	15.0
Intersection Capacity Utilization			50.2%		ICU Level of Service	A
Analysis Period (min)			15			

c Critical Lane Group

2031 Build Weekday Morning Peak-Hour

5: Clarks Road/Elm Street & Route 110

03/10/2025

												
Lane Group	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	1	63	1316	61	2	91	872	317	82	30	157	560
Future Volume (vph)	1	63	1316	61	2	91	872	317	82	30	157	560
Lane Util. Factor	0.95	1.00	0.95	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	0.97
Frt			0.993					0.850		0.874		
Flt Protected		0.950				0.950			0.950			0.950
Satd. Flow (prot)	0	1689	3453	0	0	1805	3471	1531	1745	1592	0	3319
Flt Permitted		0.950				0.950			0.950			0.950
Satd. Flow (perm)	0	1689	3453	0	0	1805	3471	1531	1745	1592	0	3319
Satd. Flow (RTOR)			5					337		194		
Adj. Flow (vph)	1	67	1400	65	2	97	928	337	101	37	194	596
Lane Group Flow (vph)	0	68	1465	0	0	99	928	337	101	231	0	596
Turn Type	Prot	Prot	NA		Prot	Prot	NA	pt+ov	Split	NA		Split
Protected Phases	5	5	2		1	1	6	6 3	4	4		3
Permitted Phases												
Detector Phase	5	5	2		1	1	6	6 3	4	4		3
Switch Phase												
Minimum Initial (s)	6.0	6.0	7.0		6.0	6.0	10.0		6.0	6.0		6.0
Minimum Split (s)	12.0	12.0	13.0		12.0	12.0	16.0		11.0	11.0		11.0
Total Split (s)	12.0	12.0	34.0		12.0	12.0	34.0		11.0	11.0		15.0
Total Split (%)	12.0%	12.0%	34.0%		12.0%	12.0%	34.0%		11.0%	11.0%		15.0%
Maximum Green (s)	6.0	6.0	28.0		6.0	6.0	28.0		6.0	6.0		10.0
Yellow Time (s)	4.0	4.0	4.0		4.0	4.0	4.0		3.0	3.0		3.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	2.0		2.0	2.0		2.0
Lost Time Adjust (s)		-2.0	-2.0			-2.0	-2.0		-1.0	-1.0		-2.0
Total Lost Time (s)		4.0	4.0			4.0	4.0		4.0	4.0		3.0
Lead/Lag	Lead	Lead	Lag		Lead	Lead	Lag		Lag	Lag		Lead
Lead-Lag Optimize?									Yes	Yes		Yes
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0		3.0	3.0		3.0
Recall Mode	None	None	C-Min		None	None	C-Min		None	None		None
Walk Time (s)												
Flash Don't Walk (s)												
Pedestrian Calls (#/hr)												
v/c Ratio		0.50	1.41			0.69	0.83	0.30	0.60	0.70		0.56
Control Delay (s/veh)		60.3	220.6			69.7	39.6	1.7	59.9	23.1		33.6
Queue Delay		0.0	0.0			0.0	0.0	0.0	0.0	0.0		0.0
Total Delay (s/veh)		60.3	220.6			69.7	39.6	1.7	59.9	23.1		33.6
Queue Length 50th (ft)		45	~653			63	296	0	61	21		154
Queue Length 95th (ft)		m87	#787			#140	#411	25	#135	#93		#369
Internal Link Dist (ft)			1089				423			469		
Turn Bay Length (ft)		400				115		200	240			300
Base Capacity (vph)		135	1039			144	1124	1131	168	328		1061
Starvation Cap Reductn		0	0			0	0	0	0	0		0
Spillback Cap Reductn		0	0			0	0	0	0	0		0
Storage Cap Reductn		0	0			0	0	0	0	0		0
Reduced v/c Ratio		0.50	1.41			0.69	0.83	0.30	0.60	0.70		0.56
Intersection Summary												
Cycle Length: 100												

2031 Build Weekday Morning Peak-Hour
5: Clarks Road/Elm Street & Route 110

03/10/2025



Lane Group	SBT	SBR	Ø9
Lane Configurations	↱		
Traffic Volume (vph)	53	42	
Future Volume (vph)	53	42	
Lane Util. Factor	1.00	1.00	
Frt	0.933		
Flt Protected			
Satd. Flow (prot)	1714	0	
Flt Permitted			
Satd. Flow (perm)	1714	0	
Satd. Flow (RTOR)	33		
Adj. Flow (vph)	56	45	
Lane Group Flow (vph)	101	0	
Turn Type	NA		
Protected Phases	3		9
Permitted Phases			
Detector Phase	3		
Switch Phase			
Minimum Initial (s)	6.0		5.0
Minimum Split (s)	11.0		28.0
Total Split (s)	15.0		28.0
Total Split (%)	15.0%		28%
Maximum Green (s)	10.0		26.0
Yellow Time (s)	3.0		2.0
All-Red Time (s)	2.0		0.0
Lost Time Adjust (s)	-2.0		
Total Lost Time (s)	3.0		
Lead/Lag	Lead		
Lead-Lag Optimize?	Yes		
Vehicle Extension (s)	3.0		3.0
Recall Mode	None		None
Walk Time (s)			7.0
Flash Don't Walk (s)			18.0
Pedestrian Calls (#/hr)			3
v/c Ratio	0.18		
Control Delay (s/veh)	21.5		
Queue Delay	0.0		
Total Delay (s/veh)	21.5		
Queue Length 50th (ft)	29		
Queue Length 95th (ft)	91		
Internal Link Dist (ft)	580		
Turn Bay Length (ft)			
Base Capacity (vph)	570		
Starvation Cap Reductn	0		
Spillback Cap Reductn	0		
Storage Cap Reductn	0		
Reduced v/c Ratio	0.18		
Intersection Summary			

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow, Master Intersection

Natural Cycle: 150

Control Type: Actuated-Coordinated

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Clarks Road/Elm Street & Route 110

 Ø1	 Ø2 (R)	 Ø9	 Ø3	 Ø4
12 s	34 s	28 s	15 s	11 s
 Ø5	 Ø6 (R)			
12 s	34 s			



Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	1	63	1316	61	2	91	872	317	82	30	157	560
Future Volume (vph)	1	63	1316	61	2	91	872	317	82	30	157	560
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	11	11	11	11	11
Total Lost time (s)		4.0	4.0			4.0	4.0	4.0	4.0	4.0		3.0
Lane Util. Factor		1.00	0.95			1.00	0.95	1.00	1.00	1.00		0.97
Frt		1.00	0.99			1.00	1.00	0.85	1.00	0.87		1.00
Flt Protected		0.95	1.00			0.95	1.00	1.00	0.95	1.00		0.95
Satd. Flow (prot)		1689	3454			1805	3471	1531	1745	1592		3319
Flt Permitted		0.95	1.00			0.95	1.00	1.00	0.95	1.00		0.95
Satd. Flow (perm)		1689	3454			1805	3471	1531	1745	1592		3319
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.81	0.81	0.81	0.94
Adj. Flow (vph)	1	67	1400	65	2	97	928	337	101	37	194	596
RTOR Reduction (vph)	0	0	4	0	0	0	0	129	0	175	0	0
Lane Group Flow (vph)	0	68	1461	0	0	99	928	208	101	56	0	596
Heavy Vehicles (%)	0%	7%	4%	0%	0%	0%	4%	2%	0%	0%	1%	2%
Turn Type	Prot	Prot	NA		Prot	Prot	NA	pt+ov	Split	NA		Split
Protected Phases	5	5	2		1	1	6	6.3	4	4		3
Permitted Phases												
Actuated Green, G (s)		4.8	26.4			6.0	27.6	57.6	8.6	8.6		30.0
Effective Green, g (s)		6.8	28.4			8.0	29.6	61.6	9.6	9.6		32.0
Actuated g/C Ratio		0.07	0.28			0.08	0.30	0.62	0.10	0.10		0.32
Clearance Time (s)		6.0	6.0			6.0	6.0		5.0	5.0		5.0
Vehicle Extension (s)		3.0	3.0			3.0	3.0		3.0	3.0		3.0
Lane Grp Cap (vph)		114	980			144	1027	943	167	152		1062
v/s Ratio Prot		0.04	c0.42			c0.05	0.27	0.14	c0.06	0.03		c0.18
v/s Ratio Perm												
v/c Ratio		0.60	1.49			0.69	0.90	0.22	0.60	0.37		0.56
Uniform Delay, d1		45.3	35.8			44.8	33.8	8.5	43.4	42.3		28.2
Progression Factor		1.10	1.07			1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2		7.0	225.7			12.8	12.7	0.1	6.1	1.5		0.7
Delay (s)		56.7	264.0			57.6	46.5	8.6	49.4	43.8		28.9
Level of Service		E	F			E	D	A	D	D		C
Approach Delay (s/veh)			254.8				38.0			45.5		
Approach LOS			F				D			D		

Intersection Summary

HCM 2000 Control Delay (s/veh)	121.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	84.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group



Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	53	42
Future Volume (vph)	53	42
Ideal Flow (vphpl)	1900	1900
Lane Width	11	12
Total Lost time (s)	3.0	
Lane Util. Factor	1.00	
Frt	0.93	
Flt Protected	1.00	
Satd. Flow (prot)	1714	
Flt Permitted	1.00	
Satd. Flow (perm)	1714	
Peak-hour factor, PHF	0.94	0.94
Adj. Flow (vph)	56	45
RTOR Reduction (vph)	22	0
Lane Group Flow (vph)	79	0
Heavy Vehicles (%)	0%	0%
Turn Type	NA	
Protected Phases	3	
Permitted Phases		
Actuated Green, G (s)	30.0	
Effective Green, g (s)	32.0	
Actuated g/C Ratio	0.32	
Clearance Time (s)	5.0	
Vehicle Extension (s)	3.0	
Lane Grp Cap (vph)	548	
v/s Ratio Prot	0.05	
v/s Ratio Perm		
v/c Ratio	0.14	
Uniform Delay, d1	24.2	
Progression Factor	1.00	
Incremental Delay, d2	0.1	
Delay (s)	24.4	
Level of Service	C	
Approach Delay (s/veh)	28.2	
Approach LOS	C	
Intersection Summary		

2031 Build Weekday Morning Peak-Hour
6: I-95 SB Ramps & Route 110

03/10/2025

Intersection												
Int Delay, s/veh	4.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑		↑↑	↑	↑		↑			
Traffic Vol, veh/h	0	871	1164	0	1230	199	52	0	149	0	0	0
Future Vol, veh/h	0	871	1164	0	1230	199	52	0	149	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Free	-	-	Free	-	-	Yield	-	-	None
Storage Length	-	-	300	-	-	0	0	-	350	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	91	91	91	72	72	72	25	25	25
Heavy Vehicles, %	0	3	2	0	4	4	0	0	2	0	0	0
Mvmt Flow	0	927	1238	0	1352	219	72	0	207	0	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	-	0	-	-	0	1602
Stage 1	-	-	-	-	-	927
Stage 2	-	-	-	-	-	676
Critical Hdwy	-	-	-	-	-	6.8
Critical Hdwy Stg 1	-	-	-	-	-	5.8
Critical Hdwy Stg 2	-	-	-	-	-	5.8
Follow-up Hdwy	-	-	-	-	-	3.5
Pot Cap-1 Maneuver	0	-	0	0	-	0
Stage 1	0	-	0	0	-	0
Stage 2	0	-	0	0	-	0
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	98
Mov Cap-2 Maneuver	-	-	-	-	-	98
Stage 1	-	-	-	-	-	351
Stage 2	-	-	-	-	-	472

Approach	EB	WB	NB
HCM Ctrl Dly, s/v	0	0	39.21
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	WBT
Capacity (veh/h)	98	545	-	-
HCM Lane V/C Ratio	0.734	0.379	-	-
HCM Ctrl Dly (s/v)	106.9	15.6	-	-
HCM Lane LOS	F	C	-	-
HCM 95th %tile Q(veh)	3.8	1.8	-	-

2031 Build Weekday Morning Peak-Hour
7: I-95 NB Ramps & Route 110

03/10/2025

Intersection													
Int Delay, s/veh	35.9												
Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔↔			↔↔	↔			↔			↔
Traffic Vol, veh/h	3	122	895	0	0	862	129	0	0	192	0	0	564
Future Vol, veh/h	3	122	895	0	0	862	129	0	0	192	0	0	564
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	-	None	-	-	Yield	-	-	Free	-	-	Yield
Storage Length	-	80	-	-	-	-	0	-	-	0	-	-	0
Veh in Median Storage, #	-	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	90	90	90	74	74	74	86	86	86
Heavy Vehicles, %	0	2	2	0	0	3	4	0	0	2	0	0	7
Mvmt Flow	3	133	973	0	0	958	143	0	0	259	0	0	656

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	958	958	0	-	-	-	0	-	-	-	-	479
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	6.4	4.14	-	-	-	-	-	-	-	-	-	7.04
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	2.5	2.22	-	-	-	-	-	-	-	-	-	3.37
Pot Cap-1 Maneuver	359	714	-	0	0	-	-	0	0	0	0	0 ~ 520
Stage 1	-	-	-	0	0	-	-	0	0	0	0	0
Stage 2	-	-	-	0	0	-	-	0	0	0	0	0
Platoon blocked, %			-			-	-					
Mov Cap-1 Maneuver	~ -94	~ -94	-	-	-	-	-	-	-	-	-	~ 520
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v		0	0	157.01
HCM LOS			A	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	+	-	-	-	520
HCM Lane V/C Ratio	-	-	-	-	-	1.262
HCM Ctrl Dly (s/v)	0	-	-	-	-	157
HCM Lane LOS	A	-	-	-	-	F
HCM 95th %tile Q(veh)	-	-	-	-	-	26.4

Notes	
~: Volume exceeds capacity	\$. Delay exceeds 300s
+: Computation Not Defined	*: All major volume in platoon

2031 Build Weekday Morning Peak-Hour
8: Merrill Street/Rabbit Road & Route 110

03/10/2025

												
Lane Group	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	3	100	675	309	2	107	579	20	318	75	118	55
Future Volume (vph)	3	100	675	309	2	107	579	20	318	75	118	55
Lane Util. Factor	0.95	1.00	0.95	1.00	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Frt				0.850			0.995			0.908		
Flt Protected		0.950				0.950			0.950			
Satd. Flow (prot)	0	1619	3421	1531	0	1787	3491	0	1752	1719	0	0
Flt Permitted		0.950				0.950			0.440			
Satd. Flow (perm)	0	1619	3421	1531	0	1787	3491	0	812	1719	0	0
Satd. Flow (RTOR)				355			3			73		
Adj. Flow (vph)	3	115	776	355	2	115	623	22	357	84	133	61
Lane Group Flow (vph)	0	118	776	355	0	117	645	0	357	217	0	0
Turn Type	Prot	Prot	NA	pt+ov	Prot	Prot	NA		pm+pt	NA		Perm
Protected Phases	5	5	2	2 3	1	1	6		3	8		
Permitted Phases									8			4
Detector Phase	5	5	2	2 3	1	1	6		3	8		4
Switch Phase												
Minimum Initial (s)	6.0	6.0	20.0		3.0	3.0	13.0		4.0	6.0		6.0
Minimum Split (s)	12.0	12.0	26.0		9.0	9.0	19.0		10.0	12.0		12.0
Total Split (s)	22.0	22.0	32.0		9.0	9.0	19.0		10.0	32.0		22.0
Total Split (%)	20.8%	20.8%	30.2%		8.5%	8.5%	17.9%		9.4%	30.2%		20.8%
Maximum Green (s)	16.0	16.0	26.0		3.0	3.0	13.0		4.0	26.0		16.0
Yellow Time (s)	4.0	4.0	4.0		4.0	4.0	4.0		3.0	3.0		3.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	2.0		3.0	3.0		3.0
Lost Time Adjust (s)		-2.0	-2.0			-2.0	-2.0		-2.0	-2.0		
Total Lost Time (s)		4.0	4.0			4.0	4.0		4.0	4.0		
Lead/Lag	Lead	Lead	Lag		Lead	Lead	Lag		Lead			Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0		3.0	3.0		3.0
Recall Mode	None	None	Min		None	None	Min		None	None		None
Walk Time (s)												
Flash Don't Walk (s)												
Pedestrian Calls (#/hr)												
v/c Ratio		0.43	0.64	0.38		0.94	0.73		0.99	0.34		
Control Delay (s/veh)		35.8	25.5	2.7		108.1	34.6		73.5	15.9		
Queue Delay		0.0	0.0	0.0		0.0	0.0		0.0	0.0		
Total Delay (s/veh)		35.8	25.5	2.7		108.1	34.6		73.5	15.9		
Queue Length 50th (ft)		45	134	0		51	126		118	41		
Queue Length 95th (ft)		125	#326	26		#222	#414		#489	148		
Internal Link Dist (ft)			409				535			650		
Turn Bay Length (ft)		380				150			270			
Base Capacity (vph)		407	1340	917		124	882		359	717		
Starvation Cap Reductn		0	0	0		0	0		0	0		
Spillback Cap Reductn		0	0	0		0	0		0	0		
Storage Cap Reductn		0	0	0		0	0		0	0		
Reduced v/c Ratio		0.29	0.58	0.39		0.94	0.73		0.99	0.30		
Intersection Summary												
Cycle Length: 106												



Lane Group	SBT	SBR	Ø9
Lane Configurations	↕	↗	
Traffic Volume (vph)	98	91	
Future Volume (vph)	98	91	
Lane Util. Factor	1.00	1.00	
Frt		0.850	
Flt Protected	0.982		
Satd. Flow (prot)	1808	1419	
Flt Permitted	0.805		
Satd. Flow (perm)	1482	1419	
Satd. Flow (RTOR)		113	
Adj. Flow (vph)	109	101	
Lane Group Flow (vph)	170	101	
Turn Type	NA	custom	
Protected Phases	4		9
Permitted Phases		4 5	
Detector Phase	4	4 5	
Switch Phase			
Minimum Initial (s)	6.0		5.0
Minimum Split (s)	12.0		33.0
Total Split (s)	22.0		33.0
Total Split (%)	20.8%		31%
Maximum Green (s)	16.0		31.0
Yellow Time (s)	3.0		2.0
All-Red Time (s)	3.0		0.0
Lost Time Adjust (s)	-2.0		
Total Lost Time (s)	4.0		
Lead/Lag	Lag		
Lead-Lag Optimize?			
Vehicle Extension (s)	3.0		3.0
Recall Mode	None		None
Walk Time (s)			7.0
Flash Don't Walk (s)			24.0
Pedestrian Calls (#/hr)			3
v/c Ratio	0.56	0.15	
Control Delay (s/veh)	37.5	3.8	
Queue Delay	0.0	0.0	
Total Delay (s/veh)	37.5	3.8	
Queue Length 50th (ft)	64	0	
Queue Length 95th (ft)	#199	28	
Internal Link Dist (ft)	251		
Turn Bay Length (ft)		120	
Base Capacity (vph)	373	764	
Starvation Cap Reductn	0	0	
Spillback Cap Reductn	0	0	
Storage Cap Reductn	0	0	
Reduced v/c Ratio	0.46	0.13	
Intersection Summary			

2031 Build Weekday Morning Peak-Hour
8: Merrill Street/Rabbit Road & Route 110

03/10/2025

Actuated Cycle Length: 74.4

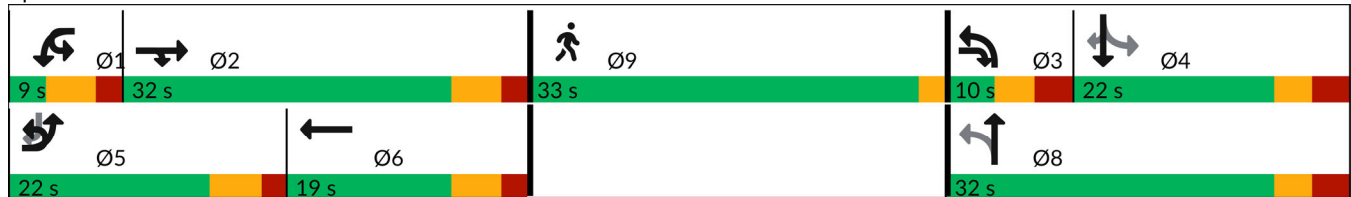
Natural Cycle: 110

Control Type: Actuated-Uncoordinated

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 8: Merrill Street/Rabbit Road & Route 110



2031 Build Weekday Morning Peak-Hour
8: Merrill Street/Rabbit Road & Route 110

03/10/2025

												
Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	3	100	675	309	2	107	579	20	318	75	118	55
Future Volume (vph)	3	100	675	309	2	107	579	20	318	75	118	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	11	12	12	12	12	12	12	12	12
Total Lost time (s)		4.0	4.0	4.0		4.0	4.0		4.0	4.0		
Lane Util. Factor		1.00	0.95	1.00		1.00	0.95		1.00	1.00		
Frt		1.00	1.00	0.85		1.00	0.99		1.00	0.91		
Flt Protected		0.95	1.00	1.00		0.95	1.00		0.95	1.00		
Satd. Flow (prot)		1619	3421	1531		1787	3490		1752	1719		
Flt Permitted		0.95	1.00	1.00		0.95	1.00		0.44	1.00		
Satd. Flow (perm)		1619	3421	1531		1787	3490		813	1719		
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.93	0.93	0.93	0.93	0.89	0.89	0.89	0.90
Adj. Flow (vph)	3	115	776	355	2	115	623	22	357	84	133	61
RTOR Reduction (vph)	0	0	0	202	0	0	2	0	0	48	0	0
Lane Group Flow (vph)	0	118	776	153	0	117	643	0	357	169	0	0
Heavy Vehicles (%)	0%	8%	2%	2%	0%	1%	3%	0%	3%	1%	0%	0%
Turn Type	Prot	Prot	NA	pt+ov	Prot	Prot	NA		pm+pt	NA		Perm
Protected Phases	5	5	2	2 3	1	1	6		3	8		
Permitted Phases									8			4
Actuated Green, G (s)		10.7	24.3	28.5		3.1	16.7		23.6	23.6		
Effective Green, g (s)		12.7	26.3	32.5		5.1	18.7		25.6	25.6		
Actuated g/C Ratio		0.17	0.35	0.43		0.07	0.25		0.34	0.34		
Clearance Time (s)		6.0	6.0			6.0	6.0		6.0	6.0		
Vehicle Extension (s)		3.0	3.0			3.0	3.0		3.0	3.0		
Lane Grp Cap (vph)		273	1194	660		121	866		353	584		
v/s Ratio Prot		0.07	c0.23	0.10		c0.07	c0.18		c0.08	0.10		
v/s Ratio Perm									c0.26			
v/c Ratio		0.43	0.65	0.23		0.97	0.74		1.01	0.29		
Uniform Delay, d1		28.1	20.6	13.5		35.0	26.1		24.6	18.2		
Progression Factor		1.00	1.00	1.00		1.00	1.00		1.00	1.00		
Incremental Delay, d2		1.1	1.2	0.2		70.8	3.5		50.8	0.3		
Delay (s)		29.2	21.9	13.7		105.8	29.5		75.3	18.5		
Level of Service		C	C	B		F	C		E	B		
Approach Delay (s/veh)			20.2				41.2			53.8		
Approach LOS			C				D			D		
Intersection Summary												
HCM 2000 Control Delay (s/veh)			32.9				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.85									
Actuated Cycle Length (s)			75.3				Sum of lost time (s)			20.0		
Intersection Capacity Utilization			63.8%				ICU Level of Service			B		
Analysis Period (min)			15									

c Critical Lane Group



Movement	SBT	SBR
Lane Configurations	 	
Traffic Volume (vph)	98	91
Future Volume (vph)	98	91
Ideal Flow (vphpl)	1900	1900
Lane Width	12	11
Total Lost time (s)	4.0	4.0
Lane Util. Factor	1.00	1.00
Frt	1.00	0.85
Flt Protected	0.98	1.00
Satd. Flow (prot)	1809	1419
Flt Permitted	0.81	1.00
Satd. Flow (perm)	1482	1419
Peak-hour factor, PHF	0.90	0.90
Adj. Flow (vph)	109	101
RTOR Reduction (vph)	0	58
Lane Group Flow (vph)	170	43
Heavy Vehicles (%)	5%	10%
Turn Type	NA	custom
Protected Phases	4	
Permitted Phases		4 5
Actuated Green, G (s)	13.4	30.1
Effective Green, g (s)	15.4	32.1
Actuated g/C Ratio	0.20	0.43
Clearance Time (s)	6.0	
Vehicle Extension (s)	3.0	
Lane Grp Cap (vph)	303	604
v/s Ratio Prot		
v/s Ratio Perm	0.11	0.03
v/c Ratio	0.56	0.07
Uniform Delay, d1	26.9	12.8
Progression Factor	1.00	1.00
Incremental Delay, d2	2.4	0.1
Delay (s)	29.3	12.8
Level of Service	C	B
Approach Delay (s/veh)	23.2	
Approach LOS	C	
Intersection Summary		

Intersection						
Int Delay, s/veh	2.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	32	39	33	362	605	113
Future Vol, veh/h	32	39	33	362	605	113
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	74	74	83	83	87	87
Heavy Vehicles, %	0	0	0	4	1	0
Mvmt Flow	43	53	40	436	695	130

Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1276	760	825	0	-	0
Stage 1	760	-	-	-	-	-
Stage 2	516	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	186	409	814	-	-	-
Stage 1	465	-	-	-	-	-
Stage 2	603	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	174	409	814	-	-	-
Mov Cap-2 Maneuver	174	-	-	-	-	-
Stage 1	435	-	-	-	-	-
Stage 2	603	-	-	-	-	-

Approach	EB	NB	SB
HCM Ctrl Dly, s/v	27.52	0.81	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	150	-	254	-	-
HCM Lane V/C Ratio	0.049	-	0.378	-	-
HCM Ctrl Dly (s/v)	9.6	0	27.5	-	-
HCM Lane LOS	A	A	D	-	-
HCM 95th %tile Q(veh)	0.2	-	1.7	-	-

Intersection						
Int Delay, s/veh	1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	22	18	23	326	584	35
Future Vol, veh/h	22	18	23	326	584	35
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	90	90	87	87
Heavy Vehicles, %	0	0	4	2	1	0
Mvmt Flow	24	20	26	362	671	40

Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1105	691	711	0	-	0
Stage 1	691	-	-	-	-	-
Stage 2	413	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.14	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.236	-	-	-
Pot Cap-1 Maneuver	235	448	879	-	-	-
Stage 1	501	-	-	-	-	-
Stage 2	672	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	227	448	879	-	-	-
Mov Cap-2 Maneuver	227	-	-	-	-	-
Stage 1	483	-	-	-	-	-
Stage 2	672	-	-	-	-	-

Approach	EB	NB	SB
HCM Ctrl Dly, s/v	19.53	0.61	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	119	-	292	-	-
HCM Lane V/C Ratio	0.029	-	0.151	-	-
HCM Ctrl Dly (s/v)	9.2	0	19.5	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.1	-	0.5	-	-

Intersection												
Int Delay, s/veh	4.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	0	8	72	0	40	3	382	31	4	612	1
Future Vol, veh/h	1	0	8	72	0	40	3	382	31	4	612	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	45	92	45	92	92	92	82	82	92	92	81	81
Heavy Vehicles, %	0	2	0	2	2	2	0	1	2	2	5	0
Mvmt Flow	2	0	18	78	0	43	4	466	34	4	756	1

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1238	1272	756	1254	1256	483	757	0	0	500	0	0
Stage 1	765	765	-	490	490	-	-	-	-	-	-	-
Stage 2	473	507	-	764	765	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.52	6.2	7.12	6.52	6.22	4.1	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4.018	3.3	3.518	4.018	3.318	2.2	-	-	2.218	-	-
Pot Cap-1 Maneuver	154	168	411	149	171	584	863	-	-	1065	-	-
Stage 1	399	412	-	560	549	-	-	-	-	-	-	-
Stage 2	576	539	-	396	412	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	141	165	411	140	169	584	863	-	-	1065	-	-
Mov Cap-2 Maneuver	141	165	-	140	169	-	-	-	-	-	-	-
Stage 1	396	409	-	557	545	-	-	-	-	-	-	-
Stage 2	530	536	-	376	409	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Ctrl Dly, s/v	16.29		51.24		0.07		0.05	
HCM LOS	C		F					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	13	-	-	339	193	10	-
HCM Lane V/C Ratio	0.004	-	-	0.059	0.632	0.004	-
HCM Ctrl Dly (s/v)	9.2	0	-	16.3	51.2	8.4	0
HCM Lane LOS	A	A	-	C	F	A	A
HCM 95th %tile Q(veh)	0	-	-	0.2	3.7	0	-

2031 Build Weekday Evening Peak-Hour
2: I-495 Off Ramp & Route 110

03/10/2025

Intersection						
Int Delay, s/veh	0					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑↑		↑
Traffic Vol, veh/h	630	0	0	1757	0	913
Future Vol, veh/h	630	0	0	1757	0	913
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Free
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	78	78	92	92	92	92
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	808	0	0	1910	0	992

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	-
Pot Cap-1 Maneuver	-	0	0
Stage 1	-	0	0
Stage 2	-	0	0
Platoon blocked, %	-		-
Mov Cap-1 Maneuver	-	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Ctrl Dly, s/v	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	WBT
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Ctrl Dly (s/v)	0	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	-	-	-

2031 Build Weekday Evening Peak-Hour
3: Rocky Hill Rd. & Route 110

03/10/2025

Intersection												
Int Delay, s/veh	5.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑				↑			↑
Traffic Vol, veh/h	0	1241	152	0	1614	42	0	0	101	0	0	138
Future Vol, veh/h	0	1241	152	0	1614	42	0	0	101	0	0	138
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	90	90	90	73	73	73	57	57	57
Heavy Vehicles, %	0	1	0	0	1	0	0	0	1	0	0	1
Mvmt Flow	0	1293	158	0	1793	47	0	0	138	0	0	242

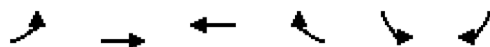
Major/Minor	Major1		Major2		Minor1		Minor2	
Conflicting Flow All	-	0	0	-	-	0	-	- 726
Stage 1	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	-	-	6.92
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	-	-	3.31
Pot Cap-1 Maneuver	0	-	-	0	-	-	0	0 370
Stage 1	0	-	-	0	-	-	0	0 -
Stage 2	0	-	-	0	-	-	0	0 -
Platoon blocked, %	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	-	-	370 -
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	0	0	20.46	68.09
HCM LOS			C	F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT	WBR	SBLn1
Capacity (veh/h)	370	-	-	-	-	275
HCM Lane V/C Ratio	0.374	-	-	-	-	0.881
HCM Ctrl Dly (s/v)	20.5	-	-	-	-	68.1
HCM Lane LOS	C	-	-	-	-	F
HCM 95th %tile Q(veh)	1.7	-	-	-	-	7.7

2031 Build Weekday Evening Peak-Hour
4: Route 110 & Carriagetown Marketplace Driveway

03/10/2025



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø9
Lane Configurations							
Traffic Volume (vph)	127	1306	1504	80	84	138	
Future Volume (vph)	127	1306	1504	80	84	138	
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00	
Frt			0.992			0.850	
Flt Protected	0.950				0.950		
Satd. Flow (prot)	1668	3539	3513	0	1787	1599	
Flt Permitted	0.950				0.950		
Satd. Flow (perm)	1668	3539	3513	0	1787	1599	
Satd. Flow (RTOR)			7			160	
Adj. Flow (vph)	140	1435	1551	82	98	160	
Lane Group Flow (vph)	140	1435	1633	0	98	160	
Turn Type	Prot	NA	NA		Prot	pm+ov	
Protected Phases	5	2	6		4	5	9
Permitted Phases						4	
Detector Phase	5	2	6		4	5	
Switch Phase							
Minimum Initial (s)	6.0	10.0	10.0		6.0	6.0	5.0
Minimum Split (s)	12.0	16.0	16.0		11.0	12.0	29.0
Total Split (s)	13.0	60.0	47.0		11.0	13.0	29.0
Total Split (%)	13.0%	60.0%	47.0%		11.0%	13.0%	29%
Maximum Green (s)	7.0	54.0	41.0		6.0	7.0	27.0
Yellow Time (s)	4.0	4.0	4.0		3.0	4.0	2.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	0.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0		-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0		4.0	5.0	
Lead/Lag	Lead		Lag			Lead	
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Min	C-Min		None	None	None
Walk Time (s)							6.0
Flash Don't Walk (s)							20.0
Pedestrian Calls (#/hr)							3
v/c Ratio	0.56	0.54	0.82		0.51	0.28	
Control Delay (s/veh)	50.3	7.8	9.8		52.4	6.4	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay (s/veh)	50.3	7.8	9.8		52.4	6.4	
Queue Length 50th (ft)	81	130	116		59	0	
Queue Length 95th (ft)	#208	419	m45		#130	46	
Internal Link Dist (ft)		951	1089		381		
Turn Bay Length (ft)	300						
Base Capacity (vph)	250	2671	1986		194	576	
Starvation Cap Reductn	0	0	0		0	0	
Spillback Cap Reductn	0	0	0		0	0	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.56	0.54	0.82		0.51	0.28	
Intersection Summary							
Cycle Length: 100							

2031 Build Weekday Evening Peak-Hour
4: Route 110 & Carriagetown Marketplace Driveway

03/10/2025

Actuated Cycle Length: 100

Offset: 27 (27%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow

Natural Cycle: 100

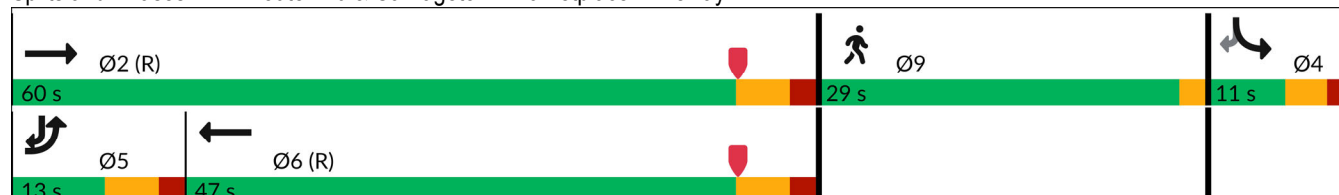
Control Type: Actuated-Coordinated

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

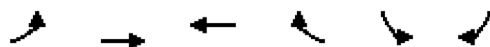
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Route 110 & Carriagetown Marketplace Driveway



2031 Build Weekday Evening Peak-Hour
4: Route 110 & Carriagetown Marketplace Driveway

03/10/2025



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	127	1306	1504	80	84	138
Future Volume (vph)	127	1306	1504	80	84	138
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	10	12	12	12	12	12
Total Lost time (s)	4.0	4.0	4.0		4.0	5.0
Lane Util. Factor	1.00	0.95	0.95		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1668	3539	3514		1787	1599
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1668	3539	3514		1787	1599
Peak-hour factor, PHF	0.91	0.91	0.97	0.97	0.86	0.86
Adj. Flow (vph)	140	1435	1551	82	98	160
RTOR Reduction (vph)	0	0	3	0	0	120
Lane Group Flow (vph)	140	1435	1630	0	98	40
Heavy Vehicles (%)	1%	2%	2%	1%	1%	1%
Turn Type	Prot	NA	NA		Prot	pm+ov
Protected Phases	5	2	6		4	5
Permitted Phases						4
Actuated Green, G (s)	13.0	71.9	52.9		9.9	22.9
Effective Green, g (s)	15.0	73.9	54.9		10.9	24.9
Actuated g/C Ratio	0.15	0.74	0.55		0.11	0.25
Clearance Time (s)	6.0	6.0	6.0		5.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	250	2615	1929		194	398
v/s Ratio Prot	0.08	c0.41	c0.46		c0.05	0.01
v/s Ratio Perm						0.01
v/c Ratio	0.56	0.55	0.84		0.51	0.10
Uniform Delay, d1	39.4	5.7	19.0		42.0	28.9
Progression Factor	1.00	1.00	0.37		1.00	1.00
Incremental Delay, d2	2.9	0.8	0.5		2.1	0.1
Delay (s)	42.3	6.6	7.4		44.1	29.0
Level of Service	D	A	A		D	C
Approach Delay (s/veh)		9.7	7.4		34.7	
Approach LOS		A	A		C	
Intersection Summary						
HCM 2000 Control Delay (s/veh)			10.5		HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.72			
Actuated Cycle Length (s)			100.0		Sum of lost time (s)	15.0
Intersection Capacity Utilization			66.2%		ICU Level of Service	C
Analysis Period (min)			15			

c Critical Lane Group

2031 Build Weekday Evening Peak-Hour

5: Clarks Road/Elm Street & Route 110

03/10/2025

												
Lane Group	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	1	143	1251	49	1	108	1480	586	86	72	85	383
Future Volume (vph)	1	143	1251	49	1	108	1480	586	86	72	85	383
Lane Util. Factor	0.95	1.00	0.95	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	0.97
Frt			0.994					0.850		0.919		
Flt Protected		0.950				0.950			0.950			0.950
Satd. Flow (prot)	0	1805	3521	0	0	1805	3574	1546	1711	1688	0	3351
Flt Permitted		0.950				0.950			0.950			0.950
Satd. Flow (perm)	0	1805	3521	0	0	1805	3574	1546	1711	1688	0	3351
Satd. Flow (RTOR)			4					413		46		
Adj. Flow (vph)	1	152	1331	52	1	113	1542	610	108	90	106	416
Lane Group Flow (vph)	0	153	1383	0	0	114	1542	610	108	196	0	416
Turn Type	Prot	Prot	NA		Prot	Prot	NA	pt+ov	Split	NA		Split
Protected Phases	5	5	2		1	1	6	6 3	4	4		3
Permitted Phases												
Detector Phase	5	5	2		1	1	6	6 3	4	4		3
Switch Phase												
Minimum Initial (s)	6.0	6.0	7.0		6.0	6.0	10.0		6.0	6.0		6.0
Minimum Split (s)	12.0	12.0	13.0		12.0	12.0	16.0		11.0	11.0		11.0
Total Split (s)	12.0	12.0	37.0		12.0	12.0	37.0		11.0	11.0		12.0
Total Split (%)	12.0%	12.0%	37.0%		12.0%	12.0%	37.0%		11.0%	11.0%		12.0%
Maximum Green (s)	6.0	6.0	31.0		6.0	6.0	31.0		6.0	6.0		7.0
Yellow Time (s)	4.0	4.0	4.0		4.0	4.0	4.0		3.0	3.0		3.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	2.0		2.0	2.0		2.0
Lost Time Adjust (s)		-2.0	-2.0			-2.0	-2.0		-1.0	-1.0		-2.0
Total Lost Time (s)		4.0	4.0			4.0	4.0		4.0	4.0		3.0
Lead/Lag	Lead	Lead	Lag		Lead	Lead	Lag		Lag	Lag		Lead
Lead-Lag Optimize?									Yes	Yes		Yes
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0		3.0	3.0		3.0
Recall Mode	None	None	C-Min		None	None	C-Min		None	None		None
Walk Time (s)												
Flash Don't Walk (s)												
Pedestrian Calls (#/hr)												
v/c Ratio		1.06	1.19			0.79	1.31	0.55	0.54	0.83		0.46
Control Delay (s/veh)		138.0	124.0			81.4	175.1	5.7	54.1	61.9		35.5
Queue Delay		0.0	0.0			0.0	0.0	0.0	0.0	0.0		0.0
Total Delay (s/veh)		138.0	124.0			81.4	175.1	5.7	54.1	61.9		35.5
Queue Length 50th (ft)		~112	~334			73	~668	44	64	92		109
Queue Length 95th (ft)		#244	#624			#167	#805	126	#146	#222		#266
Internal Link Dist (ft)			1089				423			469		
Turn Bay Length (ft)		400				115		200	240			300
Base Capacity (vph)		144	1164			144	1179	1116	199	237		903
Starvation Cap Reductn		0	0			0	0	0	0	0		0
Spillback Cap Reductn		0	0			0	0	0	0	0		0
Storage Cap Reductn		0	0			0	0	0	0	0		0
Reduced v/c Ratio		1.06	1.19			0.79	1.31	0.55	0.54	0.83		0.46
Intersection Summary												
Cycle Length: 100												

2031 Build Weekday Evening Peak-Hour
5: Clarks Road/Elm Street & Route 110

03/10/2025



Lane Group	SBT	SBR	Ø9
Lane Configurations	↶		
Traffic Volume (vph)	78	56	
Future Volume (vph)	78	56	
Lane Util. Factor	1.00	1.00	
Frt	0.937		
Flt Protected			
Satd. Flow (prot)	1721	0	
Flt Permitted			
Satd. Flow (perm)	1721	0	
Satd. Flow (RTOR)	28		
Adj. Flow (vph)	85	61	
Lane Group Flow (vph)	146	0	
Turn Type	NA		
Protected Phases	3		9
Permitted Phases			
Detector Phase	3		
Switch Phase			
Minimum Initial (s)	6.0		5.0
Minimum Split (s)	11.0		28.0
Total Split (s)	12.0		28.0
Total Split (%)	12.0%		28%
Maximum Green (s)	7.0		26.0
Yellow Time (s)	3.0		2.0
All-Red Time (s)	2.0		0.0
Lost Time Adjust (s)	-2.0		
Total Lost Time (s)	3.0		
Lead/Lag	Lead		
Lead-Lag Optimize?	Yes		
Vehicle Extension (s)	3.0		3.0
Recall Mode	None		None
Walk Time (s)			7.0
Flash Don't Walk (s)			18.0
Pedestrian Calls (#/hr)			3
v/c Ratio	0.30		
Control Delay (s/veh)	29.0		
Queue Delay	0.0		
Total Delay (s/veh)	29.0		
Queue Length 50th (ft)	57		
Queue Length 95th (ft)	#171		
Internal Link Dist (ft)	580		
Turn Bay Length (ft)			
Base Capacity (vph)	484		
Starvation Cap Reductn	0		
Spillback Cap Reductn	0		
Storage Cap Reductn	0		
Reduced v/c Ratio	0.30		
Intersection Summary			

2031 Build Weekday Evening Peak-Hour

5: Clarks Road/Elm Street & Route 110

03/10/2025

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow, Master Intersection

Natural Cycle: 150

Control Type: Actuated-Coordinated

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Clarks Road/Elm Street & Route 110

 Ø1	 Ø2 (R)	 Ø9	 Ø3	 Ø4
12 s	37 s	28 s	12 s	11 s
 Ø5	 Ø6 (R)			
12 s	37 s			

2031 Build Weekday Evening Peak-Hour
5: Clarks Road/Elm Street & Route 110

03/10/2025

												
Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	1	143	1251	49	1	108	1480	586	86	72	85	383
Future Volume (vph)	1	143	1251	49	1	108	1480	586	86	72	85	383
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	11	11	11	11	11
Total Lost time (s)		4.0	4.0			4.0	4.0	4.0	4.0	4.0		3.0
Lane Util. Factor		1.00	0.95			1.00	0.95	1.00	1.00	1.00		0.97
Frt		1.00	0.99			1.00	1.00	0.85	1.00	0.92		1.00
Flt Protected		0.95	1.00			0.95	1.00	1.00	0.95	1.00		0.95
Satd. Flow (prot)		1805	3522			1805	3574	1546	1711	1688		3351
Flt Permitted		0.95	1.00			0.95	1.00	1.00	0.95	1.00		0.95
Satd. Flow (perm)		1805	3522			1805	3574	1546	1711	1688		3351
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.96	0.96	0.96	0.96	0.80	0.80	0.80	0.92
Adj. Flow (vph)	1	152	1331	52	1	112	1542	610	108	90	106	416
RTOR Reduction (vph)	0	0	3	0	0	0	0	172	0	41	0	0
Lane Group Flow (vph)	0	153	1380	0	0	114	1542	438	108	155	0	416
Heavy Vehicles (%)	0%	0%	2%	0%	0%	0%	1%	1%	2%	0%	0%	1%
Turn Type	Prot	Prot	NA		Prot	Prot	NA	pt+ov	Split	NA		Split
Protected Phases	5	5	2		1	1	6	6 3	4	4		3
Permitted Phases												
Actuated Green, G (s)		6.0	29.4			6.0	29.4	54.3	10.7	10.7		24.9
Effective Green, g (s)		8.0	31.4			8.0	31.4	58.3	11.7	11.7		26.9
Actuated g/C Ratio		0.08	0.31			0.08	0.31	0.58	0.12	0.12		0.27
Clearance Time (s)		6.0	6.0			6.0	6.0		5.0	5.0		5.0
Vehicle Extension (s)		3.0	3.0			3.0	3.0		3.0	3.0		3.0
Lane Grp Cap (vph)		144	1105			144	1122	901	200	197		901
v/s Ratio Prot		c0.08	0.39			0.06	c0.43	c0.28	0.06	c0.09		0.12
v/s Ratio Perm												
v/c Ratio		1.06	1.25			0.79	1.37	0.49	0.54	0.79		0.46
Uniform Delay, d1		46.0	34.3			45.2	34.3	12.1	41.6	42.9		30.5
Progression Factor		1.16	1.00			1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2		86.9	118.7			25.0	174.1	0.4	3.0	18.6		0.4
Delay (s)		140.1	153.0			70.2	208.4	12.5	44.6	61.5		30.9
Level of Service		F	F			E	F	B	D	E		C
Approach Delay (s/veh)			151.7				148.8			55.5		
Approach LOS			F				F			E		
Intersection Summary												
HCM 2000 Control Delay (s/veh)			129.4				HCM 2000 Level of Service			F		
HCM 2000 Volume to Capacity ratio			0.91									
Actuated Cycle Length (s)			100.0				Sum of lost time (s)			19.0		
Intersection Capacity Utilization			82.1%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												



Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	78	56
Future Volume (vph)	78	56
Ideal Flow (vphpl)	1900	1900
Lane Width	11	12
Total Lost time (s)	3.0	
Lane Util. Factor	1.00	
Frt	0.94	
Flt Protected	1.00	
Satd. Flow (prot)	1722	
Flt Permitted	1.00	
Satd. Flow (perm)	1722	
Peak-hour factor, PHF	0.92	0.92
Adj. Flow (vph)	85	61
RTOR Reduction (vph)	20	0
Lane Group Flow (vph)	126	0
Heavy Vehicles (%)	0%	0%
Turn Type	NA	
Protected Phases	3	
Permitted Phases		
Actuated Green, G (s)	24.9	
Effective Green, g (s)	26.9	
Actuated g/C Ratio	0.27	
Clearance Time (s)	5.0	
Vehicle Extension (s)	3.0	
Lane Grp Cap (vph)	463	
v/s Ratio Prot	0.07	
v/s Ratio Perm		
v/c Ratio	0.27	
Uniform Delay, d1	28.8	
Progression Factor	1.00	
Incremental Delay, d2	0.3	
Delay (s)	29.1	
Level of Service	C	
Approach Delay (s/veh)	30.4	
Approach LOS	C	
Intersection Summary		

2031 Build Weekday Evening Peak-Hour
6: I-95 SB Ramps & Route 110

03/10/2025

Intersection												
Int Delay, s/veh	31.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑		↑↑	↑	↑		↑			
Traffic Vol, veh/h	0	1045	671	0	2081	208	94	0	183	0	0	0
Future Vol, veh/h	0	1045	671	0	2081	208	94	0	183	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Free	-	-	Free	-	-	Yield	-	-	None
Storage Length	-	-	300	-	-	0	0	-	350	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	96	96	96	89	89	89	25	25	25
Heavy Vehicles, %	0	1	1	0	1	2	1	0	1	0	0	0
Mvmt Flow	0	1136	729	0	2168	217	106	0	206	0	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	-	0	-	-	0	2220
Stage 1	-	-	-	-	-	1136
Stage 2	-	-	-	-	-	1084
Critical Hdwy	-	-	-	-	-	6.82
Critical Hdwy Stg 1	-	-	-	-	-	5.82
Critical Hdwy Stg 2	-	-	-	-	-	5.82
Follow-up Hdwy	-	-	-	-	-	3.51
Pot Cap-1 Maneuver	0	-	0	0	-	0 ~ 37
Stage 1	0	-	0	0	-	0 270
Stage 2	0	-	0	0	-	0 288
Platoon blocked, %	-		-		-	
Mov Cap-1 Maneuver	-	-	-	-	-	~ 37 0
Mov Cap-2 Maneuver	-	-	-	-	-	~ 37 0
Stage 1	-	-	-	-	-	270 0
Stage 2	-	-	-	-	-	288 0

Approach	EB	WB	NB
HCM Ctrl Dly, s/v	0	0	\$ 368.72
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	WBT
Capacity (veh/h)	37	469	-	-
HCM Lane V/C Ratio	2.823	0.439	-	-
HCM Ctrl Dly (s/v)	\$ 1050.4	18.6	-	-
HCM Lane LOS	F	C	-	-
HCM 95th %tile Q(veh)	11.9	2.2	-	-

Notes	
~: Volume exceeds capacity	\$: Delay exceeds 300s
+: Computation Not Defined	*: All major volume in platoon

2031 Build Weekday Evening Peak-Hour
7: I-95 NB Ramps & Route 110

03/10/2025

Intersection													
Int Delay, s/veh	246.4												
Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔↔			↔↔	↔			↔			↔
Traffic Vol, veh/h	4	172	1052	0	0	1197	219	0	0	333	0	0	1088
Future Vol, veh/h	4	172	1052	0	0	1197	219	0	0	333	0	0	1088
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	-	None	-	-	Yield	-	-	Free	-	-	Yield
Storage Length	-	80	-	-	-	-	0	-	-	0	-	-	0
Veh in Median Storage, #	-	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	96	96	96	81	81	81	91	91	91
Heavy Vehicles, %	0	1	1	0	0	1	1	0	0	1	0	0	2
Mvmt Flow	4	191	1169	0	0	1247	228	0	0	411	0	0	1196

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1247	1247	0	-	-	-	0	-	-	-	-	623
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	6.4	4.12	-	-	-	-	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	2.5	2.21	-	-	-	-	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	235	560	-	0	0	-	-	0	0	0	0	~ 429
Stage 1	-	-	-	0	0	-	-	0	0	0	0	-
Stage 2	-	-	-	0	0	-	-	0	0	0	0	-
Platoon blocked, %			-			-	-					
Mov Cap-1 Maneuver ~ -104 ~ -104			-	-	-	-	-	-	-	-	-	~ 429
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v		0	0	\$ 831.47
HCM LOS			A	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	+	-	-	-	429
HCM Lane V/C Ratio	-	-	-	-	-	2.789
HCM Ctrl Dly (s/v)	0	-	-	-	-	\$ 831.5
HCM Lane LOS	A	-	-	-	-	F
HCM 95th %tile Q(veh)	-	-	-	-	-	100.3

Notes	
~: Volume exceeds capacity	\$. Delay exceeds 300s
+: Computation Not Defined	*: All major volume in platoon

2031 Build Weekday Evening Peak-Hour
8: Merrill Street/Rabbit Road & Route 110

03/10/2025

												
Lane Group	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	6	148	880	351	3	111	820	41	436	139	122	99
Future Volume (vph)	6	148	880	351	3	111	820	41	436	139	122	99
Lane Util. Factor	0.95	1.00	0.95	1.00	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Frt				0.850			0.993			0.930		
Flt Protected		0.950				0.950			0.950			
Satd. Flow (prot)	0	1745	3455	1546	0	1805	3551	0	1787	1767	0	0
Flt Permitted		0.950				0.950			0.319			
Satd. Flow (perm)	0	1745	3455	1546	0	1805	3551	0	600	1767	0	0
Satd. Flow (RTOR)				369			4			44		
Adj. Flow (vph)	6	156	926	369	3	113	837	42	479	153	134	115
Lane Group Flow (vph)	0	162	926	369	0	116	879	0	479	287	0	0
Turn Type	Prot	Prot	NA	pt+ov	Prot	Prot	NA		pm+pt	NA		Perm
Protected Phases	5	5	2	2 3	1	1	6		3	8		
Permitted Phases									8			4
Detector Phase	5	5	2	2 3	1	1	6		3	8		4
Switch Phase												
Minimum Initial (s)	5.0	5.0	20.0		3.0	3.0	13.0		4.0	6.0		6.0
Minimum Split (s)	11.0	11.0	26.0		9.0	9.0	19.0		10.0	12.0		12.0
Total Split (s)	11.0	11.0	26.0		9.0	9.0	24.0		15.0	38.0		23.0
Total Split (%)	10.4%	10.4%	24.5%		8.5%	8.5%	22.6%		14.2%	35.8%		21.7%
Maximum Green (s)	5.0	5.0	20.0		3.0	3.0	18.0		9.0	32.0		17.0
Yellow Time (s)	4.0	4.0	4.0		4.0	4.0	4.0		3.0	3.0		3.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	2.0		3.0	3.0		3.0
Lost Time Adjust (s)		-2.0	-2.0			-2.0	-2.0		-2.0	-2.0		
Total Lost Time (s)		4.0	4.0			4.0	4.0		4.0	4.0		
Lead/Lag	Lead	Lead	Lag		Lead	Lead	Lag		Lead			Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0		3.0	3.0		3.0
Recall Mode	None	None	Min		None	None	Min		None	None		None
Walk Time (s)												
Flash Don't Walk (s)												
Pedestrian Calls (#/hr)												
v/c Ratio		1.03	0.95	0.40		1.01	0.96		1.12	0.36		
Control Delay (s/veh)		121.3	49.0	2.8		127.8	53.0		101.3	16.5		
Queue Delay		0.0	0.0	0.0		0.0	0.0		0.0	0.0		
Total Delay (s/veh)		121.3	49.0	2.8		127.8	53.0		101.3	16.5		
Queue Length 50th (ft)		74	207	0		53	200		~162	65		
Queue Length 95th (ft)		#281	#550	30		#219	#534		#655	212		
Internal Link Dist (ft)			409				535			650		
Turn Bay Length (ft)		380				150			270			
Base Capacity (vph)		157	976	919		115	915		429	796		
Starvation Cap Reductn		0	0	0		0	0		0	0		
Spillback Cap Reductn		0	0	0		0	0		0	0		
Storage Cap Reductn		0	0	0		0	0		0	0		
Reduced v/c Ratio		1.03	0.95	0.40		1.01	0.96		1.12	0.36		
Intersection Summary												
Cycle Length: 106												

2031 Build Weekday Evening Peak-Hour
8: Merrill Street/Rabbit Road & Route 110

03/10/2025



Lane Group	SBT	SBR	Ø9
Lane Configurations	↕	↗	
Traffic Volume (vph)	133	154	
Future Volume (vph)	133	154	
Lane Util. Factor	1.00	1.00	
Frt		0.850	
Flt Protected	0.979		
Satd. Flow (prot)	1852	1531	
Flt Permitted	0.733		
Satd. Flow (perm)	1387	1531	
Satd. Flow (RTOR)		179	
Adj. Flow (vph)	155	179	
Lane Group Flow (vph)	270	179	
Turn Type	NA	custom	
Protected Phases	4		9
Permitted Phases		4 5	
Detector Phase	4	4 5	
Switch Phase			
Minimum Initial (s)	6.0		5.0
Minimum Split (s)	12.0		33.0
Total Split (s)	23.0		33.0
Total Split (%)	21.7%		31%
Maximum Green (s)	17.0		31.0
Yellow Time (s)	3.0		2.0
All-Red Time (s)	3.0		0.0
Lost Time Adjust (s)	-2.0		
Total Lost Time (s)	4.0		
Lead/Lag	Lag		
Lead-Lag Optimize?			
Vehicle Extension (s)	3.0		3.0
Recall Mode	None		None
Walk Time (s)			7.0
Flash Don't Walk (s)			24.0
Pedestrian Calls (#/hr)			3
v/c Ratio	0.80	0.26	
Control Delay (s/veh)	49.6	5.0	
Queue Delay	0.0	0.0	
Total Delay (s/veh)	49.6	5.0	
Queue Length 50th (ft)	112	0	
Queue Length 95th (ft)	#345	44	
Internal Link Dist (ft)	251		
Turn Bay Length (ft)		120	
Base Capacity (vph)	338	699	
Starvation Cap Reductn	0	0	
Spillback Cap Reductn	0	0	
Storage Cap Reductn	0	0	
Reduced v/c Ratio	0.80	0.26	
Intersection Summary			

2031 Build Weekday Evening Peak-Hour
8: Merrill Street/Rabbit Road & Route 110

03/10/2025

Actuated Cycle Length: 79.6

Natural Cycle: 150

Control Type: Actuated-Uncoordinated

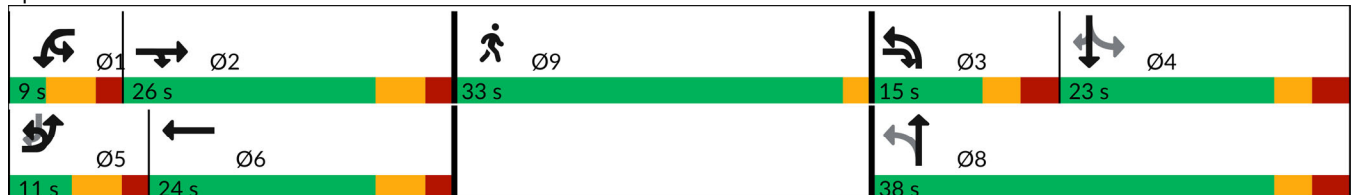
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 8: Merrill Street/Rabbit Road & Route 110



2031 Build Weekday Evening Peak-Hour
8: Merrill Street/Rabbit Road & Route 110

03/10/2025

												
Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	6	148	880	351	3	111	820	41	436	139	122	99
Future Volume (vph)	6	148	880	351	3	111	820	41	436	139	122	99
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	11	12	12	12	12	12	12	12	12
Total Lost time (s)		4.0	4.0	4.0		4.0	4.0		4.0	4.0		
Lane Util. Factor		1.00	0.95	1.00		1.00	0.95		1.00	1.00		
Frt		1.00	1.00	0.85		1.00	0.99		1.00	0.93		
Flt Protected		0.95	1.00	1.00		0.95	1.00		0.95	1.00		
Satd. Flow (prot)		1745	3455	1546		1805	3550		1787	1767		
Flt Permitted		0.95	1.00	1.00		0.95	1.00		0.32	1.00		
Satd. Flow (perm)		1745	3455	1546		1805	3550		600	1767		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.98	0.98	0.98	0.98	0.91	0.91	0.91	0.86
Adj. Flow (vph)	6	156	926	369	3	113	837	42	479	153	134	115
RTOR Reduction (vph)	0	0	0	215	0	0	3	0	0	25	0	0
Lane Group Flow (vph)	0	162	926	154	0	116	876	0	479	262	0	0
Heavy Vehicles (%)	0%	0%	1%	1%	0%	0%	1%	0%	1%	0%	0%	1%
Turn Type	Prot	Prot	NA	pt+ov	Prot	Prot	NA		pm+pt	NA		Perm
Protected Phases	5	5	2	2 3	1	1	6		3	8		
Permitted Phases									8			4
Actuated Green, G (s)		5.1	20.5	29.7		3.1	18.5		32.7	32.7		
Effective Green, g (s)		7.1	22.5	33.7		5.1	20.5		34.7	34.7		
Actuated g/C Ratio		0.09	0.28	0.42		0.06	0.25		0.43	0.43		
Clearance Time (s)		6.0	6.0			6.0	6.0		6.0	6.0		
Vehicle Extension (s)		3.0	3.0			3.0	3.0		3.0	3.0		
Lane Grp Cap (vph)		152	959	643		113	898		421	756		
v/s Ratio Prot		c0.09	c0.27	0.10		0.06	0.25		c0.16	0.15		
v/s Ratio Perm									c0.33			
v/c Ratio		1.07	0.97	0.24		1.03	0.98		1.14	0.35		
Uniform Delay, d1		36.9	28.9	15.3		37.9	30.0		20.8	15.5		
Progression Factor		1.00	1.00	1.00		1.00	1.00		1.00	1.00		
Incremental Delay, d2		91.6	21.0	0.2		92.0	24.0		87.1	0.3		
Delay (s)		128.6	49.8	15.5		129.9	54.0		107.9	15.8		
Level of Service		F	D	B		F	D		F	B		
Approach Delay (s/veh)			49.9				62.8			73.4		
Approach LOS			D				E			E		
Intersection Summary												
HCM 2000 Control Delay (s/veh)			56.2				HCM 2000 Level of Service			E		
HCM 2000 Volume to Capacity ratio			1.10									
Actuated Cycle Length (s)			81.0				Sum of lost time (s)			20.0		
Intersection Capacity Utilization			82.5%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												



Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	133	154
Future Volume (vph)	133	154
Ideal Flow (vphpl)	1900	1900
Lane Width	12	11
Total Lost time (s)	4.0	4.0
Lane Util. Factor	1.00	1.00
Frt	1.00	0.85
Flt Protected	0.98	1.00
Satd. Flow (prot)	1852	1531
Flt Permitted	0.73	1.00
Satd. Flow (perm)	1386	1531
Peak-hour factor, PHF	0.86	0.86
Adj. Flow (vph)	155	179
RTOR Reduction (vph)	0	111
Lane Group Flow (vph)	270	68
Heavy Vehicles (%)	0%	2%
Turn Type	NA	custom
Protected Phases	4	
Permitted Phases		4 5
Actuated Green, G (s)	17.5	28.6
Effective Green, g (s)	19.5	30.6
Actuated g/C Ratio	0.24	0.38
Clearance Time (s)	6.0	
Vehicle Extension (s)	3.0	
Lane Grp Cap (vph)	333	578
v/s Ratio Prot		
v/s Ratio Perm	0.19	0.04
v/c Ratio	0.81	0.12
Uniform Delay, d1	29.0	16.4
Progression Factor	1.00	1.00
Incremental Delay, d2	13.9	0.1
Delay (s)	42.9	16.5
Level of Service	D	B
Approach Delay (s/veh)	32.4	
Approach LOS	C	
Intersection Summary		

Intersection						
Int Delay, s/veh	1.7					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	31	23	29	765	519	105
Future Vol, veh/h	31	23	29	765	519	105
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	84	84	89	89	88	88
Heavy Vehicles, %	0	0	0	1	1	0
Mvmt Flow	37	27	33	860	590	119

Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1574	649	709	0	-	0
Stage 1	649	-	-	-	-	-
Stage 2	925	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	122	473	899	-	-	-
Stage 1	524	-	-	-	-	-
Stage 2	390	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	114	473	899	-	-	-
Mov Cap-2 Maneuver	114	-	-	-	-	-
Stage 1	487	-	-	-	-	-
Stage 2	390	-	-	-	-	-

Approach	EB	NB	SB
HCM Ctrl Dly, s/v	39.04	0.33	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	66	-	168	-	-
HCM Lane V/C Ratio	0.036	-	0.382	-	-
HCM Ctrl Dly (s/v)	9.2	0	39	-	-
HCM Lane LOS	A	A	E	-	-
HCM 95th %tile Q(veh)	0.1	-	1.6	-	-

Intersection						
Int Delay, s/veh	10.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	105	44	48	649	444	83
Future Vol, veh/h	105	44	48	649	444	83
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	83	83	97	97	90	90
Heavy Vehicles, %	0	0	4	1	1	0
Mvmt Flow	127	53	49	669	493	92

Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1307	539	586	0	-	0
Stage 1	539	-	-	-	-	-
Stage 2	768	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.14	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.236	-	-	-
Pot Cap-1 Maneuver	178	546	979	-	-	-
Stage 1	588	-	-	-	-	-
Stage 2	461	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	164	546	979	-	-	-
Mov Cap-2 Maneuver	164	-	-	-	-	-
Stage 1	541	-	-	-	-	-
Stage 2	461	-	-	-	-	-

Approach	EB	NB	SB
HCM Ctrl Dly, s/v	81.08	0.61	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	124	-	206	-	-
HCM Lane V/C Ratio	0.051	-	0.871	-	-
HCM Ctrl Dly (s/v)	8.9	0	81.1	-	-
HCM Lane LOS	A	A	F	-	-
HCM 95th %tile Q(veh)	0.2	-	6.7	-	-

Intersection												
Int Delay, s/veh	3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	0	5	45	0	25	7	697	103	14	502	4
Future Vol, veh/h	1	0	5	45	0	25	7	697	103	14	502	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	50	92	50	92	92	92	89	89	92	92	93	93
Heavy Vehicles, %	0	2	0	2	2	2	0	1	2	2	1	0
Mvmt Flow	2	0	10	49	0	27	8	783	112	15	540	4

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1371	1483	542	1425	1429	839	544	0	0	895	0	0
Stage 1	572	572	-	855	855	-	-	-	-	-	-	-
Stage 2	799	911	-	570	575	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.52	6.2	7.12	6.52	6.22	4.1	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4.018	3.3	3.518	4.018	3.318	2.2	-	-	2.218	-	-
Pot Cap-1 Maneuver	125	125	544	113	135	366	1035	-	-	758	-	-
Stage 1	508	504	-	353	375	-	-	-	-	-	-	-
Stage 2	382	353	-	506	503	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	110	119	544	106	129	366	1035	-	-	758	-	-
Mov Cap-2 Maneuver	110	119	-	106	129	-	-	-	-	-	-	-
Stage 1	494	490	-	347	369	-	-	-	-	-	-	-
Stage 2	348	348	-	483	488	-	-	-	-	-	-	-

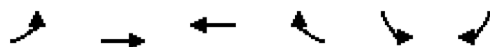
Approach	EB		WB		NB		SB	
HCM Ctrl Dly, s/v	16.37		56.18		0.07		0.27	
HCM LOS	C		F					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	15	-	-	329	142	49	-
HCM Lane V/C Ratio	0.008	-	-	0.037	0.535	0.02	-
HCM Ctrl Dly (s/v)	8.5	0	-	16.4	56.2	9.8	0
HCM Lane LOS	A	A	-	C	F	A	A
HCM 95th %tile Q(veh)	0	-	-	0.1	2.6	0.1	-

2031 Build (Mitigated)

2031 Build Weekday Morning Peak-Hour (Mitigated)
4: Route 110 & Carriagetown Marketplace Driveway

03/10/2025



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø9
Lane Configurations							
Traffic Volume (vph)	41	1394	936	29	40	39	
Future Volume (vph)	41	1394	936	29	40	39	
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00	
Frt			0.996			0.850	
Flt Protected	0.950				0.950		
Satd. Flow (prot)	1685	3471	3458	0	1752	1568	
Flt Permitted	0.950				0.950		
Satd. Flow (perm)	1685	3471	3458	0	1752	1568	
Satd. Flow (RTOR)			3			46	
Adj. Flow (vph)	46	1566	1006	31	48	46	
Lane Group Flow (vph)	46	1566	1037	0	48	46	
Turn Type	Prot	NA	NA		Prot	pm+ov	
Protected Phases	5	2	6		4	5	9
Permitted Phases						4	
Detector Phase	5	2	6		4	5	
Switch Phase							
Minimum Initial (s)	6.0	10.0	10.0		6.0	6.0	5.0
Minimum Split (s)	12.0	16.0	16.0		11.0	12.0	29.0
Total Split (s)	12.0	54.0	42.0		17.0	12.0	29.0
Total Split (%)	12.0%	54.0%	42.0%		17.0%	12.0%	29%
Maximum Green (s)	6.0	48.0	36.0		12.0	6.0	27.0
Yellow Time (s)	4.0	4.0	4.0		3.0	4.0	2.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	0.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0		-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0		4.0	5.0	
Lead/Lag	Lead		Lag			Lead	
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Min	C-Min		None	None	None
Walk Time (s)							6.0
Flash Don't Walk (s)							20.0
Pedestrian Calls (#/hr)							3
v/c Ratio	0.28	0.54	0.42		0.30	0.15	
Control Delay (s/veh)	46.4	8.0	5.4		46.4	10.0	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay (s/veh)	46.4	8.0	5.4		46.4	10.0	
Queue Length 50th (ft)	28	116	86		29	0	
Queue Length 95th (ft)	63	536	445		59	24	
Internal Link Dist (ft)		951	1089		381		
Turn Bay Length (ft)	300						
Base Capacity (vph)	162	2892	2465		227	309	
Starvation Cap Reductn	0	0	0		0	0	
Spillback Cap Reductn	0	0	0		0	0	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.28	0.54	0.42		0.21	0.15	

Intersection Summary

Cycle Length: 100

2031 Build Weekday Morning Peak-Hour (Mitigated)
4: Route 110 & Carriagetown Marketplace Driveway

03/10/2025

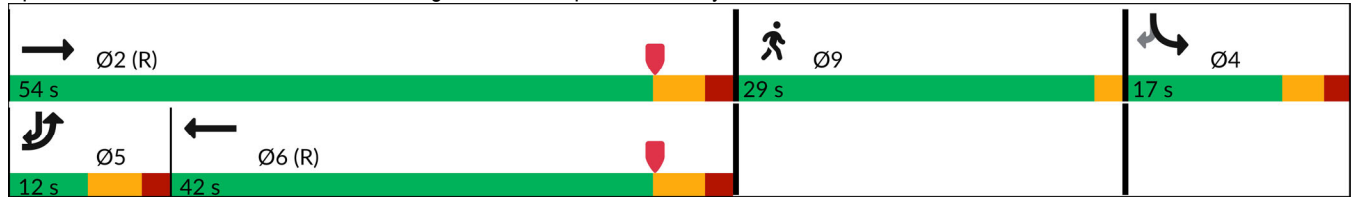
Actuated Cycle Length: 100

Offset: 30 (30%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow

Natural Cycle: 80

Control Type: Actuated-Coordinated

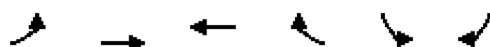
Splits and Phases: 4: Route 110 & Carriagetown Marketplace Driveway



2031 Build Weekday Morning Peak-Hour (Mitigated)

4: Route 110 & Carriagetown Marketplace Driveway

03/10/2025



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	41	1394	936	29	40	39
Future Volume (vph)	41	1394	936	29	40	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	10	12	12	12	12	12
Total Lost time (s)	4.0	4.0	4.0		4.0	5.0
Lane Util. Factor	1.00	0.95	0.95		1.00	1.00
Frt	1.00	1.00	1.00		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1685	3471	3457		1752	1568
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1685	3471	3457		1752	1568
Peak-hour factor, PHF	0.89	0.89	0.93	0.93	0.84	0.84
Adj. Flow (vph)	46	1566	1006	31	48	46
RTOR Reduction (vph)	0	0	1	0	0	39
Lane Group Flow (vph)	46	1566	1036	0	48	7
Heavy Vehicles (%)	0%	4%	4%	3%	3%	3%
Turn Type	Prot	NA	NA		Prot	pm+ov
Protected Phases	5	2	6		4	5
Permitted Phases						4
Actuated Green, G (s)	6.5	76.1	63.6		5.7	12.2
Effective Green, g (s)	8.5	78.1	65.6		6.7	14.2
Actuated g/C Ratio	0.09	0.78	0.66		0.07	0.14
Clearance Time (s)	6.0	6.0	6.0		5.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	143	2710	2267		117	222
v/s Ratio Prot	0.03	c0.45	0.30		c0.03	0.00
v/s Ratio Perm						0.00
v/c Ratio	0.32	0.58	0.46		0.41	0.03
Uniform Delay, d1	43.0	4.4	8.4		44.8	37.0
Progression Factor	1.00	1.00	0.45		1.00	1.00
Incremental Delay, d2	1.3	0.9	0.5		2.3	0.1
Delay (s)	44.3	5.3	4.3		47.1	37.0
Level of Service	D	A	A		D	D
Approach Delay (s/veh)		6.4	4.3		42.2	
Approach LOS		A	A		D	
Intersection Summary						
HCM 2000 Control Delay (s/veh)			6.8		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.56			
Actuated Cycle Length (s)			100.0		Sum of lost time (s)	15.0
Intersection Capacity Utilization			50.2%		ICU Level of Service	A
Analysis Period (min)			15			

c Critical Lane Group

2031 Build Weekday Morning Peak-Hour (Mitigated)

5: Clarks Road/Elm Street & Route 110

03/10/2025

												
Lane Group	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	1	63	1316	61	2	91	872	317	82	30	157	560
Future Volume (vph)	1	63	1316	61	2	91	872	317	82	30	157	560
Lane Util. Factor	0.95	1.00	0.95	0.95	0.91	1.00	0.91	1.00	1.00	1.00	1.00	0.97
Frt			0.993					0.850		0.874		
Flt Protected		0.950				0.950			0.950			0.950
Satd. Flow (prot)	0	1689	3453	0	0	1805	4988	1531	1745	1592	0	3319
Flt Permitted		0.950				0.950			0.950			0.950
Satd. Flow (perm)	0	1689	3453	0	0	1805	4988	1531	1745	1592	0	3319
Satd. Flow (RTOR)			5					337		194		
Adj. Flow (vph)	1	67	1400	65	2	97	928	337	101	37	194	596
Lane Group Flow (vph)	0	68	1465	0	0	99	928	337	101	231	0	596
Turn Type	Prot	Prot	NA		Prot	Prot	NA	pt+ov	Split	NA		Split
Protected Phases	5	5	2		1	1	6	6 3	4	4		3
Permitted Phases												
Detector Phase	5	5	2		1	1	6	6 3	4	4		3
Switch Phase												
Minimum Initial (s)	6.0	6.0	7.0		6.0	6.0	10.0		6.0	6.0		6.0
Minimum Split (s)	12.0	12.0	13.0		12.0	12.0	16.0		11.0	11.0		11.0
Total Split (s)	13.0	13.0	31.0		12.0	12.0	30.0		11.0	11.0		18.0
Total Split (%)	13.0%	13.0%	31.0%		12.0%	12.0%	30.0%		11.0%	11.0%		18.0%
Maximum Green (s)	7.0	7.0	25.0		6.0	6.0	24.0		6.0	6.0		13.0
Yellow Time (s)	4.0	4.0	4.0		4.0	4.0	4.0		3.0	3.0		3.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	2.0		2.0	2.0		2.0
Lost Time Adjust (s)		-2.0	-2.0			-2.0	-2.0		-1.0	-1.0		-2.0
Total Lost Time (s)		4.0	4.0			4.0	4.0		4.0	4.0		3.0
Lead/Lag	Lead	Lead	Lag		Lead	Lead	Lag		Lag	Lag		Lead
Lead-Lag Optimize?									Yes	Yes		Yes
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0		3.0	3.0		3.0
Recall Mode	None	None	C-Min		None	None	C-Min		None	None		None
Walk Time (s)												
Flash Don't Walk (s)												
Pedestrian Calls (#/hr)												
v/c Ratio		0.41	1.52			0.55	0.61	0.31	0.52	0.66		0.59
Control Delay (s/veh)		49.6	268.6			56.1	32.9	1.8	53.1	20.3		34.5
Queue Delay		0.0	0.0			0.0	0.0	0.0	0.0	0.0		0.0
Total Delay (s/veh)		49.6	268.6			56.1	32.9	1.8	53.1	20.3		34.5
Queue Length 50th (ft)		34	~644			60	193	0	60	21		159
Queue Length 95th (ft)		m87	#846			#140	245	25	#135	#93		#335
Internal Link Dist (ft)			1089				423			469		
Turn Bay Length (ft)		400				115		200	240			300
Base Capacity (vph)		168	964			180	1520	1091	195	350		1013
Starvation Cap Reductn		0	0			0	0	0	0	0		0
Spillback Cap Reductn		0	0			0	0	0	0	0		0
Storage Cap Reductn		0	0			0	0	0	0	0		0
Reduced v/c Ratio		0.40	1.52			0.55	0.61	0.31	0.52	0.66		0.59
Intersection Summary												
Cycle Length: 100												



Lane Group	SBT	SBR	Ø9
Lane Configurations	↱		
Traffic Volume (vph)	53	42	
Future Volume (vph)	53	42	
Lane Util. Factor	1.00	1.00	
Frt	0.933		
Flt Protected			
Satd. Flow (prot)	1714	0	
Flt Permitted			
Satd. Flow (perm)	1714	0	
Satd. Flow (RTOR)	34		
Adj. Flow (vph)	56	45	
Lane Group Flow (vph)	101	0	
Turn Type	NA		
Protected Phases	3		9
Permitted Phases			
Detector Phase	3		
Switch Phase			
Minimum Initial (s)	6.0		5.0
Minimum Split (s)	11.0		28.0
Total Split (s)	18.0		28.0
Total Split (%)	18.0%		28%
Maximum Green (s)	13.0		26.0
Yellow Time (s)	3.0		2.0
All-Red Time (s)	2.0		0.0
Lost Time Adjust (s)	-2.0		
Total Lost Time (s)	3.0		
Lead/Lag	Lead		
Lead-Lag Optimize?	Yes		
Vehicle Extension (s)	3.0		3.0
Recall Mode	None		None
Walk Time (s)			7.0
Flash Don't Walk (s)			18.0
Pedestrian Calls (#/hr)			3
v/c Ratio	0.18		
Control Delay (s/veh)	21.0		
Queue Delay	0.0		
Total Delay (s/veh)	21.0		
Queue Length 50th (ft)	30		
Queue Length 95th (ft)	87		
Internal Link Dist (ft)	580		
Turn Bay Length (ft)			
Base Capacity (vph)	547		
Starvation Cap Reductn	0		
Spillback Cap Reductn	0		
Storage Cap Reductn	0		
Reduced v/c Ratio	0.18		
Intersection Summary			

2031 Build Weekday Morning Peak-Hour (Mitigated)

5: Clarks Road/Elm Street & Route 110

03/10/2025

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow, Master Intersection

Natural Cycle: 150

Control Type: Actuated-Coordinated

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Clarks Road/Elm Street & Route 110

 Ø1 12 s	 Ø2 (R) 31 s	 Ø9 28 s	 Ø3 18 s	 Ø4 11 s
 Ø5 13 s	 Ø6 (R) 30 s			

2031 Build Weekday Morning Peak-Hour (Mitigated)

5: Clarks Road/Elm Street & Route 110

03/10/2025

												
Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	1	63	1316	61	2	91	872	317	82	30	157	560
Future Volume (vph)	1	63	1316	61	2	91	872	317	82	30	157	560
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	11	11	11	11	11
Total Lost time (s)		4.0	4.0			4.0	4.0	4.0	4.0	4.0		3.0
Lane Util. Factor		1.00	0.95			1.00	0.91	1.00	1.00	1.00		0.97
Frt		1.00	0.99			1.00	1.00	0.85	1.00	0.87		1.00
Flt Protected		0.95	1.00			0.95	1.00	1.00	0.95	1.00		0.95
Satd. Flow (prot)		1689	3454			1805	4988	1531	1745	1592		3319
Flt Permitted		0.95	1.00			0.95	1.00	1.00	0.95	1.00		0.95
Satd. Flow (perm)		1689	3454			1805	4988	1531	1745	1592		3319
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.81	0.81	0.81	0.94
Adj. Flow (vph)	1	67	1400	65	2	97	928	337	101	37	194	596
RTOR Reduction (vph)	0	0	4	0	0	0	0	141	0	172	0	0
Lane Group Flow (vph)	0	68	1461	0	0	99	928	196	101	59	0	596
Heavy Vehicles (%)	0%	7%	4%	0%	0%	0%	4%	2%	0%	0%	1%	2%
Turn Type	Prot	Prot	NA		Prot	Prot	NA	pt+ov	Split	NA		Split
Protected Phases	5	5	2		1	1	6	6 3	4	4		3
Permitted Phases												
Actuated Green, G (s)		6.6	24.3			8.0	25.7	54.2	10.2	10.2		28.5
Effective Green, g (s)		8.6	26.3			10.0	27.7	58.2	11.2	11.2		30.5
Actuated g/C Ratio		0.09	0.26			0.10	0.28	0.58	0.11	0.11		0.31
Clearance Time (s)		6.0	6.0			6.0	6.0		5.0	5.0		5.0
Vehicle Extension (s)		3.0	3.0			3.0	3.0		3.0	3.0		3.0
Lane Grp Cap (vph)		145	908			180	1381	891	195	178		1012
v/s Ratio Prot		0.04	c0.42			c0.05	0.19	0.13	c0.06	0.04		c0.18
v/s Ratio Perm												
v/c Ratio		0.47	1.61			0.55	0.67	0.22	0.52	0.33		0.59
Uniform Delay, d1		43.5	36.9			42.9	32.1	10.0	41.9	40.9		29.4
Progression Factor		1.00	1.08			1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2		2.0	278.6			3.6	2.6	0.1	2.3	1.1		0.9
Delay (s)		45.8	318.6			46.5	34.7	10.1	44.2	42.0		30.3
Level of Service		D	F			D	C	B	D	D		C
Approach Delay (s/veh)			306.5				29.5			42.7		
Approach LOS			F				C			D		
Intersection Summary												
HCM 2000 Control Delay (s/veh)			138.8				HCM 2000 Level of Service			F		
HCM 2000 Volume to Capacity ratio			0.88									
Actuated Cycle Length (s)			100.0				Sum of lost time (s)			19.0		
Intersection Capacity Utilization			84.0%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												



Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	53	42
Future Volume (vph)	53	42
Ideal Flow (vphpl)	1900	1900
Lane Width	11	12
Total Lost time (s)	3.0	
Lane Util. Factor	1.00	
Frt	0.93	
Flt Protected	1.00	
Satd. Flow (prot)	1714	
Flt Permitted	1.00	
Satd. Flow (perm)	1714	
Peak-hour factor, PHF	0.94	0.94
Adj. Flow (vph)	56	45
RTOR Reduction (vph)	24	0
Lane Group Flow (vph)	77	0
Heavy Vehicles (%)	0%	0%
Turn Type	NA	
Protected Phases	3	
Permitted Phases		
Actuated Green, G (s)	28.5	
Effective Green, g (s)	30.5	
Actuated g/C Ratio	0.31	
Clearance Time (s)	5.0	
Vehicle Extension (s)	3.0	
Lane Grp Cap (vph)	522	
v/s Ratio Prot	0.05	
v/s Ratio Perm		
v/c Ratio	0.15	
Uniform Delay, d1	25.3	
Progression Factor	1.00	
Incremental Delay, d2	0.1	
Delay (s)	25.4	
Level of Service	C	
Approach Delay (s/veh)	29.6	
Approach LOS	C	
Intersection Summary		

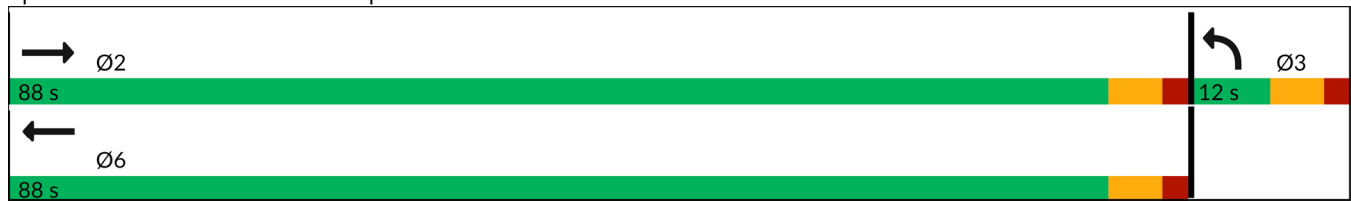
2031 Build Weekday Morning Peak-Hour (Mitigated)

6: I-95 SB Ramps & Route 110

03/10/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↗		↑↑	↗	↗		↗			
Traffic Volume (vph)	0	871	1164	0	1230	199	52	0	149	0	0	0
Future Volume (vph)	0	871	1164	0	1230	199	52	0	149	0	0	0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			
Flt Protected							0.950					
Satd. Flow (prot)	0	3505	1583	0	3471	1553	1805	0	1583	0	0	0
Flt Permitted							0.950					
Satd. Flow (perm)	0	3505	1583	0	3471	1553	1805	0	1583	0	0	0
Satd. Flow (RTOR)			1091			122			207			
Adj. Flow (vph)	0	927	1238	0	1352	219	72	0	207	0	0	0
Lane Group Flow (vph)	0	927	1238	0	1352	219	72	0	207	0	0	0
Turn Type		NA	Free		NA	Free	Prot		Free			
Protected Phases		2			6		3					
Permitted Phases			Free			Free			Free			
Detector Phase		2			6		3					
Switch Phase												
Minimum Initial (s)		10.0			10.0		6.0					
Minimum Split (s)		16.0			16.0		12.0					
Total Split (s)		88.0			88.0		12.0					
Total Split (%)		88.0%			88.0%		12.0%					
Maximum Green (s)		82.0			82.0		6.0					
Yellow Time (s)		4.0			4.0		4.0					
All-Red Time (s)		2.0			2.0		2.0					
Lost Time Adjust (s)		-2.0			-2.0		-2.0					
Total Lost Time (s)		4.0			4.0		4.0					
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0			3.0		3.0					
Recall Mode		Min			Min		None					
v/c Ratio		0.32	0.78		0.47	0.14	0.24		0.13			
Control Delay (s/veh)		2.7	4.1		3.4	0.2	23.0		0.2			
Queue Delay		0.0	0.0		0.0	0.0	0.0		0.0			
Total Delay (s/veh)		2.7	4.1		3.4	0.2	23.0		0.2			
Queue Length 50th (ft)		46	0		81	0	23		0			
Queue Length 95th (ft)		66	0		116	0	41		0			
Internal Link Dist (ft)		423			423			419			248	
Turn Bay Length (ft)			300						350			
Base Capacity (vph)		3505	1583		3471	1553	305		1583			
Starvation Cap Reductn		357	0		0	0	0		0			
Spillback Cap Reductn		0	0		0	0	0		0			
Storage Cap Reductn		0	0		0	0	0		0			
Reduced v/c Ratio		0.29	0.78		0.39	0.14	0.24		0.13			
Intersection Summary												
Cycle Length: 100												
Actuated Cycle Length: 49.1												
Natural Cycle: 40												
Control Type: Actuated-Uncoordinated												

Splits and Phases: 6: I-95 SB Ramps & Route 110



2031 Build Weekday Morning Peak-Hour (Mitigated)

6: I-95 SB Ramps & Route 110

03/10/2025

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↗		↑↑	↗	↗		↗			
Traffic Volume (vph)	0	871	1164	0	1230	199	52	0	149	0	0	0
Future Volume (vph)	0	871	1164	0	1230	199	52	0	149	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0		4.0			
Lane Util. Factor		0.95	1.00		0.95	1.00	1.00		1.00			
Frt		1.00	0.85		1.00	0.85	1.00		0.85			
Flt Protected		1.00	1.00		1.00	1.00	0.95		1.00			
Satd. Flow (prot)		3505	1583		3471	1553	1805		1583			
Flt Permitted		1.00	1.00		1.00	1.00	0.95		1.00			
Satd. Flow (perm)		3505	1583		3471	1553	1805		1583			
Peak-hour factor, PHF	0.94	0.94	0.94	0.91	0.91	0.91	0.72	0.72	0.72	0.25	0.25	0.25
Adj. Flow (vph)	0	927	1238	0	1352	219	72	0	207	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	927	1238	0	1352	219	72	0	207	0	0	0
Heavy Vehicles (%)	0%	3%	2%	0%	4%	4%	0%	0%	2%	0%	0%	0%
Turn Type		NA	Free		NA	Free	Prot		Free			
Protected Phases		2			6		3					
Permitted Phases			Free			Free			Free			
Actuated Green, G (s)		36.5	51.7		36.5	51.7	3.2		51.7			
Effective Green, g (s)		38.5	51.7		38.5	51.7	5.2		51.7			
Actuated g/C Ratio		0.74	1.00		0.74	1.00	0.10		1.00			
Clearance Time (s)		6.0			6.0		6.0					
Vehicle Extension (s)		3.0			3.0		3.0					
Lane Grp Cap (vph)		2610	1583		2584	1553	181		1583			
v/s Ratio Prot		0.26			0.39		0.04					
v/s Ratio Perm			c0.78			0.14			0.13			
v/c Ratio		0.36	0.78		0.52	0.14	0.40		0.13			
Uniform Delay, d1		2.3	0.0		2.8	0.0	21.8		0.0			
Progression Factor		1.00	1.00		1.00	1.00	1.00		1.00			
Incremental Delay, d2		0.1	3.9		0.2	0.2	1.4		0.2			
Delay (s)		2.4	3.9		3.0	0.2	23.2		0.2			
Level of Service		A	A		A	A	C		A			
Approach Delay (s/veh)		3.3			2.6			6.1			0.0	
Approach LOS		A			A			A			A	
Intersection Summary												
HCM 2000 Control Delay (s/veh)			3.2									A
HCM 2000 Volume to Capacity ratio			0.93									
Actuated Cycle Length (s)			51.7									8.0
Intersection Capacity Utilization			44.0%									A
ICU Level of Service												
Analysis Period (min)			15									
c Critical Lane Group												

2031 Build Weekday Morning Peak-Hour (Mitigated)
7: I-95 NB Ramps & Route 110

03/10/2025

Intersection													
Int Delay, s/veh	0.7												
Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Vol, veh/h	3	122	895	0	0	862	129	0	0	192	0	0	564
Future Vol, veh/h	3	122	895	0	0	862	129	0	0	192	0	0	564
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	-	None	-	-	Yield	-	-	Free	-	-	Free
Storage Length	-	80	-	-	-	-	0	-	-	0	-	-	0
Veh in Median Storage, #	-	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	90	90	90	74	74	74	86	86	86
Heavy Vehicles, %	0	2	2	0	0	3	4	0	0	2	0	0	7
Mvmt Flow	3	133	973	0	0	958	143	0	0	259	0	0	656

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	958	958	0	-	-	-	0	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	6.4	4.14	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	2.5	2.22	-	-	-	-	-	-	-	-	-	-
Pot Cap-1 Maneuver	359	714	-	0	0	-	-	0	0	0	0	0
Stage 1	-	-	-	0	0	-	-	0	0	0	0	0
Stage 2	-	-	-	0	0	-	-	0	0	0	0	0
Platoon blocked, %			-			-	-					
Mov Cap-1 Maneuver	697	697	-	-	-	-	-	-	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	1.4	0	0	0
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	697	-	-	-	-
HCM Lane V/C Ratio	-	0.195	-	-	-	-
HCM Ctrl Dly (s/v)	0	11.4	-	-	-	0
HCM Lane LOS	A	B	-	-	-	A
HCM 95th %tile Q(veh)	-	0.7	-	-	-	-

2031 Build Weekday Morning Peak-Hour (Mitigated)

8: Merrill Street/Rabbit Road & Route 110

03/10/2025

												
Lane Group	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	3	100	675	309	2	107	579	20	318	75	118	55
Future Volume (vph)	3	100	675	309	2	107	579	20	318	75	118	55
Lane Util. Factor	0.95	1.00	0.95	1.00	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Frt				0.850			0.995			0.908		
Flt Protected		0.950				0.950			0.950			
Satd. Flow (prot)	0	1619	3421	1531	0	1787	3491	0	1752	1719	0	0
Flt Permitted		0.950				0.950			0.348			
Satd. Flow (perm)	0	1619	3421	1531	0	1787	3491	0	642	1719	0	0
Satd. Flow (RTOR)				355			3			73		
Adj. Flow (vph)	3	115	776	355	2	115	623	22	357	84	133	61
Lane Group Flow (vph)	0	118	776	355	0	117	645	0	357	217	0	0
Turn Type	Prot	Prot	NA	pt+ov	Prot	Prot	NA		pm+pt	NA		Perm
Protected Phases	5	5	2	2 3	1	1	6		3	8		
Permitted Phases									8			4
Detector Phase	5	5	2	2 3	1	1	6		3	8		4
Switch Phase												
Minimum Initial (s)	5.0	5.0	20.0		3.0	3.0	13.0		4.0	6.0		6.0
Minimum Split (s)	11.0	11.0	26.0		9.0	9.0	19.0		10.0	12.0		12.0
Total Split (s)	13.0	13.0	29.0		12.0	12.0	28.0		20.0	36.0		16.0
Total Split (%)	11.8%	11.8%	26.4%		10.9%	10.9%	25.5%		18.2%	32.7%		14.5%
Maximum Green (s)	7.0	7.0	23.0		6.0	6.0	22.0		14.0	30.0		10.0
Yellow Time (s)	4.0	4.0	4.0		4.0	4.0	4.0		3.0	3.0		3.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	2.0		3.0	3.0		3.0
Lost Time Adjust (s)		-2.0	-2.0			-2.0	-2.0		-2.0	-2.0		
Total Lost Time (s)		4.0	4.0			4.0	4.0		4.0	4.0		
Lead/Lag	Lead	Lead	Lag		Lead	Lead	Lag		Lead			Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0		3.0	3.0		3.0
Recall Mode	None	None	Min		None	None	Min		None	None		None
Walk Time (s)												
Flash Don't Walk (s)												
Pedestrian Calls (#/hr)												
v/c Ratio		0.66	0.74	0.36		0.67	0.63		0.76	0.30		
Control Delay (s/veh)		57.7	33.3	2.3		59.2	30.7		35.1	14.9		
Queue Delay		0.0	0.0	0.0		0.0	0.0		0.0	0.0		
Total Delay (s/veh)		57.7	33.3	2.3		59.2	30.7		35.1	14.9		
Queue Length 50th (ft)		55	168	0		55	135		122	43		
Queue Length 95th (ft)		#184	#398	25		#194	#320		#374	146		
Internal Link Dist (ft)			409				535			650		
Turn Bay Length (ft)		380				150			270			
Base Capacity (vph)		178	1043	992		174	1025		467	716		
Starvation Cap Reductn		0	0	0		0	0		0	0		
Spillback Cap Reductn		0	0	0		0	0		0	0		
Storage Cap Reductn		0	0	0		0	0		0	0		
Reduced v/c Ratio		0.66	0.74	0.36		0.67	0.63		0.76	0.30		
Intersection Summary												
Cycle Length: 110												



Lane Group	SBT	SBR	Ø9
Lane Configurations	↕	↗	
Traffic Volume (vph)	98	91	
Future Volume (vph)	98	91	
Lane Util. Factor	1.00	1.00	
Frt		0.850	
Flt Protected	0.982		
Satd. Flow (prot)	1808	1419	
Flt Permitted	0.793		
Satd. Flow (perm)	1460	1419	
Satd. Flow (RTOR)		109	
Adj. Flow (vph)	109	101	
Lane Group Flow (vph)	170	101	
Turn Type	NA	custom	
Protected Phases	4		9
Permitted Phases		4 5	
Detector Phase	4	4 5	
Switch Phase			
Minimum Initial (s)	6.0		5.0
Minimum Split (s)	12.0		33.0
Total Split (s)	16.0		33.0
Total Split (%)	14.5%		30%
Maximum Green (s)	10.0		31.0
Yellow Time (s)	3.0		2.0
All-Red Time (s)	3.0		0.0
Lost Time Adjust (s)	-2.0		
Total Lost Time (s)	4.0		
Lead/Lag	Lag		
Lead-Lag Optimize?			
Vehicle Extension (s)	3.0		3.0
Recall Mode	None		None
Walk Time (s)			7.0
Flash Don't Walk (s)			24.0
Pedestrian Calls (#/hr)			3
v/c Ratio	0.80	0.20	
Control Delay (s/veh)	63.9	6.5	
Queue Delay	0.0	0.0	
Total Delay (s/veh)	63.9	6.5	
Queue Length 50th (ft)	79	0	
Queue Length 95th (ft)	#272	39	
Internal Link Dist (ft)	251		
Turn Bay Length (ft)		120	
Base Capacity (vph)	213	508	
Starvation Cap Reductn	0	0	
Spillback Cap Reductn	0	0	
Storage Cap Reductn	0	0	
Reduced v/c Ratio	0.80	0.20	
Intersection Summary			

2031 Build Weekday Morning Peak-Hour (Mitigated)

8: Merrill Street/Rabbit Road & Route 110

03/10/2025

Actuated Cycle Length: 83.6

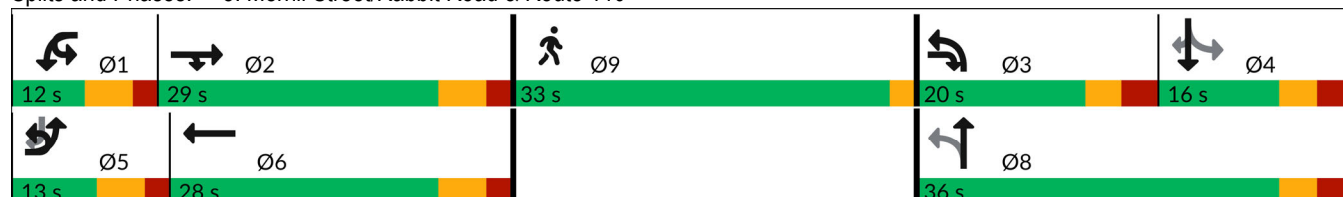
Natural Cycle: 110

Control Type: Actuated-Uncoordinated

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 8: Merrill Street/Rabbit Road & Route 110



2031 Build Weekday Morning Peak-Hour (Mitigated)

8: Merrill Street/Rabbit Road & Route 110

03/10/2025

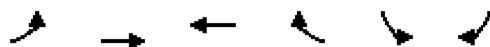
												
Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	3	100	675	309	2	107	579	20	318	75	118	55
Future Volume (vph)	3	100	675	309	2	107	579	20	318	75	118	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	11	12	12	12	12	12	12	12	12
Total Lost time (s)		4.0	4.0	4.0		4.0	4.0		4.0	4.0		
Lane Util. Factor		1.00	0.95	1.00		1.00	0.95		1.00	1.00		
Frt		1.00	1.00	0.85		1.00	0.99		1.00	0.91		
Flt Protected		0.95	1.00	1.00		0.95	1.00		0.95	1.00		
Satd. Flow (prot)		1619	3421	1531		1787	3490		1752	1719		
Flt Permitted		0.95	1.00	1.00		0.95	1.00		0.35	1.00		
Satd. Flow (perm)		1619	3421	1531		1787	3490		642	1719		
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.93	0.93	0.93	0.93	0.89	0.89	0.89	0.90
Adj. Flow (vph)	3	115	776	355	2	115	623	22	357	84	133	61
RTOR Reduction (vph)	0	0	0	180	0	0	2	0	0	45	0	0
Lane Group Flow (vph)	0	118	776	175	0	117	643	0	357	172	0	0
Heavy Vehicles (%)	0%	8%	2%	2%	0%	1%	3%	0%	3%	1%	0%	0%
Turn Type	Prot	Prot	NA	pt+ov	Prot	Prot	NA		pm+pt	NA		Perm
Protected Phases	5	5	2	2 3	1	1	6		3	8		
Permitted Phases									8			4
Actuated Green, G (s)		7.1	23.5	37.8		6.1	22.5		30.6	30.6		
Effective Green, g (s)		9.1	25.5	41.8		8.1	24.5		32.6	32.6		
Actuated g/C Ratio		0.11	0.30	0.49		0.10	0.29		0.38	0.38		
Clearance Time (s)		6.0	6.0			6.0	6.0		6.0	6.0		
Vehicle Extension (s)		3.0	3.0			3.0	3.0		3.0	3.0		
Lane Grp Cap (vph)		173	1027	753		170	1007		459	660		
v/s Ratio Prot		c0.07	c0.23	0.11		0.07	0.18		c0.15	0.10		
v/s Ratio Perm									c0.15			
v/c Ratio		0.68	0.76	0.23		0.69	0.64		0.78	0.26		
Uniform Delay, d1		36.5	26.9	12.4		37.2	26.3		20.7	17.9		
Progression Factor		1.00	1.00	1.00		1.00	1.00		1.00	1.00		
Incremental Delay, d2		10.6	3.2	0.2		11.0	1.3		8.1	0.2		
Delay (s)		47.1	30.1	12.5		48.2	27.7		28.8	18.1		
Level of Service		D	C	B		D	C		C	B		
Approach Delay (s/veh)			26.7				30.8			24.8		
Approach LOS			C				C			C		
Intersection Summary												
HCM 2000 Control Delay (s/veh)			28.9				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.77									
Actuated Cycle Length (s)			84.9				Sum of lost time (s)			20.0		
Intersection Capacity Utilization			63.8%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												



Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	98	91
Future Volume (vph)	98	91
Ideal Flow (vphpl)	1900	1900
Lane Width	12	11
Total Lost time (s)	4.0	4.0
Lane Util. Factor	1.00	1.00
Frt	1.00	0.85
Flt Protected	0.98	1.00
Satd. Flow (prot)	1809	1419
Flt Permitted	0.79	1.00
Satd. Flow (perm)	1460	1419
Peak-hour factor, PHF	0.90	0.90
Adj. Flow (vph)	109	101
RTOR Reduction (vph)	0	71
Lane Group Flow (vph)	170	30
Heavy Vehicles (%)	5%	10%
Turn Type	NA	custom
Protected Phases	4	
Permitted Phases		4 5
Actuated Green, G (s)	10.3	23.4
Effective Green, g (s)	12.3	25.4
Actuated g/C Ratio	0.14	0.30
Clearance Time (s)	6.0	
Vehicle Extension (s)	3.0	
Lane Grp Cap (vph)	211	424
v/s Ratio Prot		
v/s Ratio Perm	0.12	0.02
v/c Ratio	0.81	0.07
Uniform Delay, d1	35.1	21.3
Progression Factor	1.00	1.00
Incremental Delay, d2	19.6	0.1
Delay (s)	54.8	21.4
Level of Service	D	C
Approach Delay (s/veh)	42.3	
Approach LOS	D	
Intersection Summary		

2031 Build Weekday Evening Peak-Hour (Mitigated)
4: Route 110 & Carriagetown Marketplace Driveway

03/10/2025



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø9
Lane Configurations							
Traffic Volume (vph)	127	1306	1504	80	84	138	
Future Volume (vph)	127	1306	1504	80	84	138	
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00	
Frt			0.992			0.850	
Flt Protected	0.950				0.950		
Satd. Flow (prot)	1668	3539	3513	0	1787	1599	
Flt Permitted	0.950				0.950		
Satd. Flow (perm)	1668	3539	3513	0	1787	1599	
Satd. Flow (RTOR)			7			160	
Adj. Flow (vph)	140	1435	1551	82	98	160	
Lane Group Flow (vph)	140	1435	1633	0	98	160	
Turn Type	Prot	NA	NA		Prot	pm+ov	
Protected Phases	5	2	6		4	5	9
Permitted Phases						4	
Detector Phase	5	2	6		4	5	
Switch Phase							
Minimum Initial (s)	6.0	10.0	10.0		6.0	6.0	5.0
Minimum Split (s)	12.0	16.0	16.0		11.0	12.0	29.0
Total Split (s)	13.0	60.0	47.0		11.0	13.0	29.0
Total Split (%)	13.0%	60.0%	47.0%		11.0%	13.0%	29%
Maximum Green (s)	7.0	54.0	41.0		6.0	7.0	27.0
Yellow Time (s)	4.0	4.0	4.0		3.0	4.0	2.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	0.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0		-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0		4.0	5.0	
Lead/Lag	Lead		Lag			Lead	
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Min	C-Min		None	None	None
Walk Time (s)							6.0
Flash Don't Walk (s)							20.0
Pedestrian Calls (#/hr)							3
v/c Ratio	0.56	0.54	0.82		0.51	0.28	
Control Delay (s/veh)	50.3	7.8	12.1		52.4	6.4	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay (s/veh)	50.3	7.8	12.1		52.4	6.4	
Queue Length 50th (ft)	81	130	175		59	0	
Queue Length 95th (ft)	#208	419	#783		#130	46	
Internal Link Dist (ft)		951	1089		381		
Turn Bay Length (ft)	300						
Base Capacity (vph)	250	2671	1986		194	576	
Starvation Cap Reductn	0	0	0		0	0	
Spillback Cap Reductn	0	0	0		0	0	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.56	0.54	0.82		0.51	0.28	
Intersection Summary							
Cycle Length: 100							

2031 Build Weekday Evening Peak-Hour (Mitigated)
4: Route 110 & Carriagetown Marketplace Driveway

03/10/2025

Actuated Cycle Length: 100

Offset: 29 (29%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow

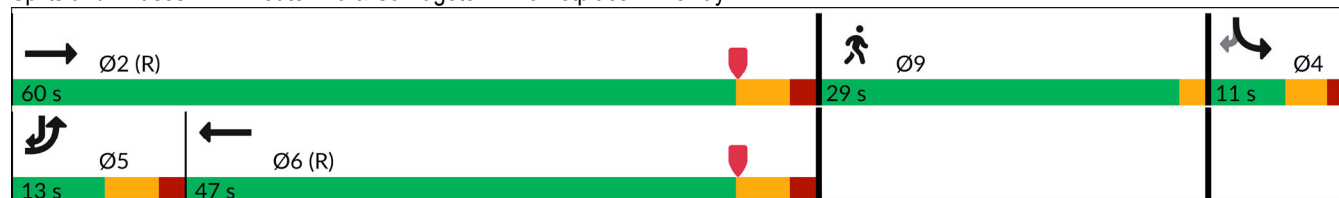
Natural Cycle: 100

Control Type: Actuated-Coordinated

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

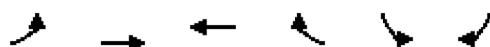
Splits and Phases: 4: Route 110 & Carriagetown Marketplace Driveway



2031 Build Weekday Evening Peak-Hour (Mitigated)

4: Route 110 & Carriagetown Marketplace Driveway

03/10/2025



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	127	1306	1504	80	84	138
Future Volume (vph)	127	1306	1504	80	84	138
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	10	12	12	12	12	12
Total Lost time (s)	4.0	4.0	4.0		4.0	5.0
Lane Util. Factor	1.00	0.95	0.95		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1668	3539	3514		1787	1599
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1668	3539	3514		1787	1599
Peak-hour factor, PHF	0.91	0.91	0.97	0.97	0.86	0.86
Adj. Flow (vph)	140	1435	1551	82	98	160
RTOR Reduction (vph)	0	0	3	0	0	120
Lane Group Flow (vph)	140	1435	1630	0	98	40
Heavy Vehicles (%)	1%	2%	2%	1%	1%	1%
Turn Type	Prot	NA	NA		Prot	pm+ov
Protected Phases	5	2	6		4	5
Permitted Phases						4
Actuated Green, G (s)	13.0	71.9	52.9		9.9	22.9
Effective Green, g (s)	15.0	73.9	54.9		10.9	24.9
Actuated g/C Ratio	0.15	0.74	0.55		0.11	0.25
Clearance Time (s)	6.0	6.0	6.0		5.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	250	2615	1929		194	398
v/s Ratio Prot	0.08	c0.41	c0.46		c0.05	0.01
v/s Ratio Perm						0.01
v/c Ratio	0.56	0.55	0.84		0.51	0.10
Uniform Delay, d1	39.4	5.7	19.0		42.0	28.9
Progression Factor	1.00	1.00	0.40		1.00	1.00
Incremental Delay, d2	2.9	0.8	2.5		2.1	0.1
Delay (s)	42.3	6.6	10.1		44.1	29.0
Level of Service	D	A	B		D	C
Approach Delay (s/veh)		9.7	10.1		34.7	
Approach LOS		A	B		C	
Intersection Summary						
HCM 2000 Control Delay (s/veh)			11.8		HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.72			
Actuated Cycle Length (s)			100.0		Sum of lost time (s)	15.0
Intersection Capacity Utilization			66.2%		ICU Level of Service	C
Analysis Period (min)			15			

c Critical Lane Group

2031 Build Weekday Evening Peak-Hour (Mitigated)

5: Clarks Road/Elm Street & Route 110

03/10/2025

												
Lane Group	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	1	143	1251	49	1	108	1480	586	86	72	85	379
Future Volume (vph)	1	143	1251	49	1	108	1480	586	86	72	85	379
Lane Util. Factor	0.95	1.00	0.95	0.95	0.91	1.00	0.91	1.00	1.00	1.00	1.00	0.97
Frt			0.994					0.850		0.919		
Flt Protected		0.950				0.950			0.950			0.950
Satd. Flow (prot)	0	1805	3521	0	0	1805	5136	1546	1711	1688	0	3351
Flt Permitted		0.950				0.950			0.950			0.950
Satd. Flow (perm)	0	1805	3521	0	0	1805	5136	1546	1711	1688	0	3351
Satd. Flow (RTOR)			4					593		46		
Adj. Flow (vph)	1	152	1331	52	1	113	1542	610	108	90	106	412
Lane Group Flow (vph)	0	153	1383	0	0	114	1542	610	108	196	0	412
Turn Type	Prot	Prot	NA		Prot	Prot	NA	pt+ov	Split	NA		Split
Protected Phases	5	5	2		1	1	6	6 3	4	4		3
Permitted Phases												
Detector Phase	5	5	2		1	1	6	6 3	4	4		3
Switch Phase												
Minimum Initial (s)	6.0	6.0	7.0		6.0	6.0	10.0		6.0	6.0		6.0
Minimum Split (s)	12.0	12.0	13.0		12.0	12.0	16.0		11.0	11.0		11.0
Total Split (s)	12.0	12.0	38.0		12.0	12.0	38.0		11.0	11.0		11.0
Total Split (%)	12.0%	12.0%	38.0%		12.0%	12.0%	38.0%		11.0%	11.0%		11.0%
Maximum Green (s)	6.0	6.0	32.0		6.0	6.0	32.0		6.0	6.0		6.0
Yellow Time (s)	4.0	4.0	4.0		4.0	4.0	4.0		3.0	3.0		3.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	2.0		2.0	2.0		2.0
Lost Time Adjust (s)		-2.0	-2.0			-2.0	-2.0		-1.0	-1.0		-2.0
Total Lost Time (s)		4.0	4.0			4.0	4.0		4.0	4.0		3.0
Lead/Lag	Lead	Lead	Lag		Lead	Lead	Lag		Lag	Lag		Lead
Lead-Lag Optimize?									Yes	Yes		Yes
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0		3.0	3.0		3.0
Recall Mode	None	None	C-Min		None	None	C-Min		None	None		None
Walk Time (s)												
Flash Don't Walk (s)												
Pedestrian Calls (#/hr)												
v/c Ratio		1.06	1.15			0.79	0.88	0.51	0.60	0.90		0.45
Control Delay (s/veh)		135.8	109.6			78.4	33.3	2.3	58.7	74.8		35.5
Queue Delay		0.0	0.0			0.0	0.1	0.3	0.0	0.0		0.0
Total Delay (s/veh)		135.8	109.6			78.4	33.5	2.6	58.7	74.8		35.5
Queue Length 50th (ft)		~112	~331			69	337	20	64	92		108
Queue Length 95th (ft)		#244	#668			m#114	374	44	#146	#222		#275
Internal Link Dist (ft)			1089				423			469		
Turn Bay Length (ft)		400				115		200	240			300
Base Capacity (vph)		144	1199			144	1746	1196	179	218		907
Starvation Cap Reductn		0	0			0	11	159	0	0		0
Spillback Cap Reductn		0	0			0	0	0	0	0		0
Storage Cap Reductn		0	0			0	0	0	0	0		0
Reduced v/c Ratio		1.06	1.15			0.79	0.89	0.59	0.60	0.90		0.45
Intersection Summary												
Cycle Length: 100												



Lane Group	SBT	SBR	Ø9
Lane Configurations	↱		
Traffic Volume (vph)	79	54	
Future Volume (vph)	79	54	
Lane Util. Factor	1.00	1.00	
Frt	0.939		
Flt Protected			
Satd. Flow (prot)	1725	0	
Flt Permitted			
Satd. Flow (perm)	1725	0	
Satd. Flow (RTOR)	27		
Adj. Flow (vph)	86	59	
Lane Group Flow (vph)	145	0	
Turn Type	NA		
Protected Phases	3		9
Permitted Phases			
Detector Phase	3		
Switch Phase			
Minimum Initial (s)	6.0		5.0
Minimum Split (s)	11.0		28.0
Total Split (s)	11.0		28.0
Total Split (%)	11.0%		28%
Maximum Green (s)	6.0		26.0
Yellow Time (s)	3.0		2.0
All-Red Time (s)	2.0		0.0
Lost Time Adjust (s)	-2.0		
Total Lost Time (s)	3.0		
Lead/Lag	Lead		
Lead-Lag Optimize?	Yes		
Vehicle Extension (s)	3.0		3.0
Recall Mode	None		None
Walk Time (s)			7.0
Flash Don't Walk (s)			18.0
Pedestrian Calls (#/hr)			3
v/c Ratio	0.30		
Control Delay (s/veh)	29.6		
Queue Delay	0.0		
Total Delay (s/veh)	29.6		
Queue Length 50th (ft)	57		
Queue Length 95th (ft)	#182		
Internal Link Dist (ft)	580		
Turn Bay Length (ft)			
Base Capacity (vph)	486		
Starvation Cap Reductn	0		
Spillback Cap Reductn	0		
Storage Cap Reductn	0		
Reduced v/c Ratio	0.30		
Intersection Summary			

2031 Build Weekday Evening Peak-Hour (Mitigated)

5: Clarks Road/Elm Street & Route 110

03/10/2025

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow, Master Intersection

Natural Cycle: 130

Control Type: Actuated-Coordinated

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Clarks Road/Elm Street & Route 110

 Ø1 12 s	 Ø2 (R) 38 s	 Ø9 28 s	 Ø3 11 s	 Ø4 11 s
 Ø5 12 s	 Ø6 (R) 38 s			

2031 Build Weekday Evening Peak-Hour (Mitigated)

5: Clarks Road/Elm Street & Route 110

03/10/2025

												
Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	1	143	1251	49	1	108	1480	586	86	72	85	379
Future Volume (vph)	1	143	1251	49	1	108	1480	586	86	72	85	379
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	11	11	11	11	11
Total Lost time (s)		4.0	4.0			4.0	4.0	4.0	4.0	4.0		3.0
Lane Util. Factor		1.00	0.95			1.00	0.91	1.00	1.00	1.00		0.97
Frt		1.00	0.99			1.00	1.00	0.85	1.00	0.92		1.00
Flt Protected		0.95	1.00			0.95	1.00	1.00	0.95	1.00		0.95
Satd. Flow (prot)		1805	3522			1805	5136	1546	1711	1688		3351
Flt Permitted		0.95	1.00			0.95	1.00	1.00	0.95	1.00		0.95
Satd. Flow (perm)		1805	3522			1805	5136	1546	1711	1688		3351
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.96	0.96	0.96	0.96	0.80	0.80	0.80	0.92
Adj. Flow (vph)	1	152	1331	52	1	112	1542	610	108	90	106	412
RTOR Reduction (vph)	0	0	3	0	0	0	0	240	0	41	0	0
Lane Group Flow (vph)	0	153	1380	0	0	114	1542	370	108	155	0	412
Heavy Vehicles (%)	0%	0%	2%	0%	0%	0%	1%	1%	2%	0%	0%	1%
Turn Type	Prot	Prot	NA		Prot	Prot	NA	pt+ov	Split	NA		Split
Protected Phases	5	5	2		1	1	6	6 3	4	4		3
Permitted Phases												
Actuated Green, G (s)		6.0	30.4			6.0	30.4	55.5	9.5	9.5		25.1
Effective Green, g (s)		8.0	32.4			8.0	32.4	59.5	10.5	10.5		27.1
Actuated g/C Ratio		0.08	0.32			0.08	0.32	0.60	0.11	0.11		0.27
Clearance Time (s)		6.0	6.0			6.0	6.0		5.0	5.0		5.0
Vehicle Extension (s)		3.0	3.0			3.0	3.0		3.0	3.0		3.0
Lane Grp Cap (vph)		144	1141			144	1664	919	179	177		908
v/s Ratio Prot		c0.08	c0.39			0.06	0.30	0.24	0.06	c0.09		c0.12
v/s Ratio Perm												
v/c Ratio		1.06	1.21			0.79	0.93	0.40	0.60	0.87		0.45
Uniform Delay, d1		46.0	33.8			45.2	32.7	10.8	42.8	44.1		30.3
Progression Factor		1.09	1.01			1.17	0.90	1.29	1.00	1.00		1.00
Incremental Delay, d2		86.9	101.6			17.6	7.4	0.2	5.6	34.8		0.4
Delay (s)		137.2	135.7			70.3	36.9	14.1	48.4	78.9		30.7
Level of Service		F	F			E	D	B	D	E		C
Approach Delay (s/veh)			135.8				32.4			68.1		
Approach LOS			F				C			E		
Intersection Summary												
HCM 2000 Control Delay (s/veh)			68.5				HCM 2000 Level of Service			E		
HCM 2000 Volume to Capacity ratio			0.85									
Actuated Cycle Length (s)			100.0				Sum of lost time (s)			19.0		
Intersection Capacity Utilization			75.3%				ICU Level of Service			D		
Analysis Period (min)			15									
c Critical Lane Group												



Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	79	54
Future Volume (vph)	79	54
Ideal Flow (vphpl)	1900	1900
Lane Width	11	12
Total Lost time (s)	3.0	
Lane Util. Factor	1.00	
Frt	0.94	
Flt Protected	1.00	
Satd. Flow (prot)	1725	
Flt Permitted	1.00	
Satd. Flow (perm)	1725	
Peak-hour factor, PHF	0.92	0.92
Adj. Flow (vph)	86	59
RTOR Reduction (vph)	20	0
Lane Group Flow (vph)	125	0
Heavy Vehicles (%)	0%	0%
Turn Type	NA	
Protected Phases	3	
Permitted Phases		
Actuated Green, G (s)	25.1	
Effective Green, g (s)	27.1	
Actuated g/C Ratio	0.27	
Clearance Time (s)	5.0	
Vehicle Extension (s)	3.0	
Lane Grp Cap (vph)	467	
v/s Ratio Prot	0.07	
v/s Ratio Perm		
v/c Ratio	0.27	
Uniform Delay, d1	28.7	
Progression Factor	1.00	
Incremental Delay, d2	0.3	
Delay (s)	29.0	
Level of Service	C	
Approach Delay (s/veh)	30.2	
Approach LOS	C	
Intersection Summary		

2031 Build Weekday Evening Peak-Hour (Mitigated)

6: I-95 SB Ramps & Route 110

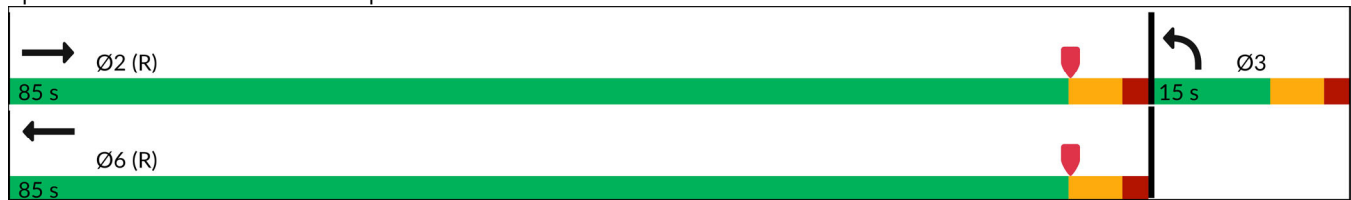
03/10/2025

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↗		↑↑	↗	↗		↗			
Traffic Volume (vph)	0	1045	671	0	2081	208	94	0	183	0	0	0
Future Volume (vph)	0	1045	671	0	2081	208	94	0	183	0	0	0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			
Flt Protected							0.950					
Satd. Flow (prot)	0	3574	1599	0	3574	1583	1787	0	1599	0	0	0
Flt Permitted							0.950					
Satd. Flow (perm)	0	3574	1599	0	3574	1583	1787	0	1599	0	0	0
Satd. Flow (RTOR)			571			98			206			
Adj. Flow (vph)	0	1136	729	0	2168	217	106	0	206	0	0	0
Lane Group Flow (vph)	0	1136	729	0	2168	217	106	0	206	0	0	0
Turn Type		NA	Free		NA	Free	Prot		Free			
Protected Phases		2			6		3					
Permitted Phases			Free			Free			Free			
Detector Phase		2			6		3					
Switch Phase												
Minimum Initial (s)		10.0			10.0		6.0					
Minimum Split (s)		16.0			16.0		12.0					
Total Split (s)		85.0			85.0		15.0					
Total Split (%)		85.0%			85.0%		15.0%					
Maximum Green (s)		79.0			79.0		9.0					
Yellow Time (s)		4.0			4.0		4.0					
All-Red Time (s)		2.0			2.0		2.0					
Lost Time Adjust (s)		-2.0			-2.0		-2.0					
Total Lost Time (s)		4.0			4.0		4.0					
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0			3.0		3.0					
Recall Mode		C-Min			C-Min		None					
v/c Ratio		0.39	0.46		0.75	0.14	0.54		0.13			
Control Delay (s/veh)		2.7	1.4		6.8	0.2	52.4		0.2			
Queue Delay		0.3	0.0		0.0	0.0	0.0		0.0			
Total Delay (s/veh)		2.9	1.4		6.9	0.2	52.4		0.2			
Queue Length 50th (ft)		16	0		306	0	63		0			
Queue Length 95th (ft)		m95	m4		333	0	119		0			
Internal Link Dist (ft)		423			423			419			248	
Turn Bay Length (ft)			300						350			
Base Capacity (vph)		2909	1599		2909	1583	206		1599			
Starvation Cap Reductn		957	0		0	0	0		0			
Spillback Cap Reductn		0	0		51	0	0		0			
Storage Cap Reductn		0	0		0	0	0		0			
Reduced v/c Ratio		0.58	0.46		0.76	0.14	0.51		0.13			
Intersection Summary												
Cycle Length: 100												
Actuated Cycle Length: 100												
Offset: 34 (34%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow												
Natural Cycle: 60												

Control Type: Actuated-Coordinated

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: I-95 SB Ramps & Route 110



2031 Build Weekday Evening Peak-Hour (Mitigated)

6: I-95 SB Ramps & Route 110

03/10/2025

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑		↑↑	↑	↑		↑			
Traffic Volume (vph)	0	1045	671	0	2081	208	94	0	183	0	0	0
Future Volume (vph)	0	1045	671	0	2081	208	94	0	183	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0		4.0			
Lane Util. Factor		0.95	1.00		0.95	1.00	1.00		1.00			
Frt		1.00	0.85		1.00	0.85	1.00		0.85			
Flt Protected		1.00	1.00		1.00	1.00	0.95		1.00			
Satd. Flow (prot)		3574	1599		3574	1583	1787		1599			
Flt Permitted		1.00	1.00		1.00	1.00	0.95		1.00			
Satd. Flow (perm)		3574	1599		3574	1583	1787		1599			
Peak-hour factor, PHF	0.92	0.92	0.92	0.96	0.96	0.96	0.89	0.89	0.89	0.25	0.25	0.25
Adj. Flow (vph)	0	1136	729	0	2168	217	106	0	206	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1136	729	0	2168	217	106	0	206	0	0	0
Heavy Vehicles (%)	0%	1%	1%	0%	1%	2%	1%	0%	1%	0%	0%	0%
Turn Type		NA	Free		NA	Free	Prot		Free			
Protected Phases		2			6		3					
Permitted Phases			Free			Free			Free			
Actuated Green, G (s)		78.9	100.0		78.9	100.0	9.1		100.0			
Effective Green, g (s)		80.9	100.0		80.9	100.0	11.1		100.0			
Actuated g/C Ratio		0.81	1.00		0.81	1.00	0.11		1.00			
Clearance Time (s)		6.0			6.0		6.0					
Vehicle Extension (s)		3.0			3.0		3.0					
Lane Grp Cap (vph)		2891	1599		2891	1583	198		1599			
v/s Ratio Prot		0.32			0.61		0.06					
v/s Ratio Perm			0.46			0.14			0.13			
v/c Ratio		0.39	0.46		0.75	0.14	0.54		0.13			
Uniform Delay, d1		2.7	0.0		4.6	0.0	42.0		0.0			
Progression Factor		0.92	1.00		1.00	1.00	1.00		1.00			
Incremental Delay, d2		0.1	0.3		1.8	0.2	2.8		0.2			
Delay (s)		2.6	0.3		6.5	0.2	44.8		0.2			
Level of Service		A	A		A	A	D		A			
Approach Delay (s/veh)		1.7			5.9			15.3			0.0	
Approach LOS		A			A			B			A	
Intersection Summary												
HCM 2000 Control Delay (s/veh)			4.8									A
HCM 2000 Volume to Capacity ratio			0.73									
Actuated Cycle Length (s)			100.0									8.0
Intersection Capacity Utilization			69.4%									C
ICU Level of Service												
Analysis Period (min)			15									
c Critical Lane Group												

2031 Build Weekday Evening Peak-Hour (Mitigated)

7: I-95 NB Ramps & Route 110

03/10/2025

Intersection													
Int Delay, s/veh	1.1												
Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Vol, veh/h	4	172	1052	0	0	1197	219	0	0	333	0	0	1088
Future Vol, veh/h	4	172	1052	0	0	1197	219	0	0	333	0	0	1088
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	-	None	-	-	Yield	-	-	Free	-	-	Free
Storage Length	-	80	-	-	-	-	0	-	-	0	-	-	0
Veh in Median Storage, #	-	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	96	96	96	81	81	81	91	91	91
Heavy Vehicles, %	0	1	1	0	0	1	1	0	0	1	0	0	2
Mvmt Flow	4	191	1169	0	0	1247	228	0	0	411	0	0	1196
Major/Minor	Major1			Major2			Minor1			Minor2			
Conflicting Flow All	1247	1247	0	-	-	-	0	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	6.4	4.12	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	2.5	2.21	-	-	-	-	-	-	-	-	-	-	-
Pot Cap-1 Maneuver	235	560	-	0	0	-	-	0	0	0	0	0	0
Stage 1	-	-	-	0	0	-	-	0	0	0	0	0	0
Stage 2	-	-	-	0	0	-	-	0	0	0	0	0	0
Platoon blocked, %			-			-	-						
Mov Cap-1 Maneuver	542	542	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-	-
Approach	EB			WB			NB			SB			
HCM Ctrl Dly, s/v	2.2			0			0			0			
HCM LOS							A			A			
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	WBT	WBR	SBLn1							
Capacity (veh/h)	-	542	-	-	-	-							
HCM Lane V/C Ratio	-	0.36	-	-	-	-							
HCM Ctrl Dly (s/v)	0	15.3	-	-	-	0							
HCM Lane LOS	A	C	-	-	-	A							
HCM 95th %tile Q(veh)	-	1.6	-	-	-	-							

2031 Build Weekday Evening Peak-Hour (Mitigated)

8: Merrill Street/Rabbit Road & Route 110

03/10/2025

												
Lane Group	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	6	148	880	351	3	111	820	41	436	139	122	99
Future Volume (vph)	6	148	880	351	3	111	820	41	436	139	122	99
Lane Util. Factor	0.95	1.00	0.95	1.00	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Frt				0.850			0.993			0.930		
Flt Protected		0.950				0.950			0.950			
Satd. Flow (prot)	0	1745	3455	1546	0	1805	3551	0	1787	1767	0	0
Flt Permitted		0.950				0.950			0.235			
Satd. Flow (perm)	0	1745	3455	1546	0	1805	3551	0	442	1767	0	0
Satd. Flow (RTOR)				369			3			34		
Adj. Flow (vph)	6	156	926	369	3	113	837	42	479	153	134	115
Lane Group Flow (vph)	0	162	926	369	0	116	879	0	479	287	0	0
Turn Type	Prot	Prot	NA	pt+ov	Prot	Prot	NA		pm+pt	NA		Perm
Protected Phases	5	5	2	2 3	1	1	6		3	8		
Permitted Phases									8			4
Detector Phase	5	5	2	2 3	1	1	6		3	8		4
Switch Phase												
Minimum Initial (s)	5.0	5.0	20.0		3.0	3.0	13.0		4.0	6.0		6.0
Minimum Split (s)	11.0	11.0	26.0		9.0	9.0	19.0		10.0	12.0		12.0
Total Split (s)	16.0	16.0	45.0		11.0	11.0	40.0		32.0	61.0		29.0
Total Split (%)	10.7%	10.7%	30.0%		7.3%	7.3%	26.7%		21.3%	40.7%		19.3%
Maximum Green (s)	10.0	10.0	39.0		5.0	5.0	34.0		26.0	55.0		23.0
Yellow Time (s)	4.0	4.0	4.0		4.0	4.0	4.0		3.0	3.0		3.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	2.0		3.0	3.0		3.0
Lost Time Adjust (s)		-2.0	-2.0			-2.0	-2.0		-2.0	-2.0		
Total Lost Time (s)		4.0	4.0			4.0	4.0		4.0	4.0		
Lead/Lag	Lead	Lead	Lag		Lead	Lead	Lag		Lead			Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0		3.0	3.0		3.0
Recall Mode	None	None	Min		None	None	Min		None	None		None
Walk Time (s)												
Flash Don't Walk (s)												
Pedestrian Calls (#/hr)												
v/c Ratio		0.95	0.80	0.35		1.14	0.84		0.93	0.34		
Control Delay (s/veh)		113.1	44.5	2.0		180.7	49.8		54.6	21.5		
Queue Delay		0.0	0.0	0.0		0.0	0.0		0.0	0.0		
Total Delay (s/veh)		113.1	44.5	2.0		180.7	49.8		54.6	21.5		
Queue Length 50th (ft)		123	323	0		~97	318		255	112		
Queue Length 95th (ft)		#343	#621	29		#286	#618		#687	267		
Internal Link Dist (ft)			409				535			650		
Turn Bay Length (ft)		380				150			270			
Base Capacity (vph)		170	1157	1064		102	1046		513	841		
Starvation Cap Reductn		0	0	0		0	0		0	0		
Spillback Cap Reductn		0	0	0		0	0		0	0		
Storage Cap Reductn		0	0	0		0	0		0	0		
Reduced v/c Ratio		0.95	0.80	0.35		1.14	0.84		0.93	0.34		
Intersection Summary												
Cycle Length: 150												



Lane Group	SBT	SBR	Ø9
Lane Configurations	↕	↗	
Traffic Volume (vph)	133	154	
Future Volume (vph)	133	154	
Lane Util. Factor	1.00	1.00	
Frt		0.850	
Flt Protected	0.979		
Satd. Flow (prot)	1852	1531	
Flt Permitted	0.733		
Satd. Flow (perm)	1387	1531	
Satd. Flow (RTOR)		127	
Adj. Flow (vph)	155	179	
Lane Group Flow (vph)	270	179	
Turn Type	NA	custom	
Protected Phases	4		9
Permitted Phases		4 5	
Detector Phase	4	4 5	
Switch Phase			
Minimum Initial (s)	6.0		5.0
Minimum Split (s)	12.0		33.0
Total Split (s)	29.0		33.0
Total Split (%)	19.3%		22%
Maximum Green (s)	23.0		31.0
Yellow Time (s)	3.0		2.0
All-Red Time (s)	3.0		0.0
Lost Time Adjust (s)	-2.0		
Total Lost Time (s)	4.0		
Lead/Lag	Lag		
Lead-Lag Optimize?			
Vehicle Extension (s)	3.0		3.0
Recall Mode	None		None
Walk Time (s)			7.0
Flash Don't Walk (s)			24.0
Pedestrian Calls (#/hr)			3
v/c Ratio	0.95	0.30	
Control Delay (s/veh)	92.2	12.6	
Queue Delay	0.0	0.0	
Total Delay (s/veh)	92.2	12.6	
Queue Length 50th (ft)	200	26	
Queue Length 95th (ft)	#467	96	
Internal Link Dist (ft)	251		
Turn Bay Length (ft)		120	
Base Capacity (vph)	283	597	
Starvation Cap Reductn	0	0	
Spillback Cap Reductn	0	0	
Storage Cap Reductn	0	0	
Reduced v/c Ratio	0.95	0.30	
Intersection Summary			

Actuated Cycle Length: 123.6

Natural Cycle: 150

Control Type: Actuated-Uncoordinated

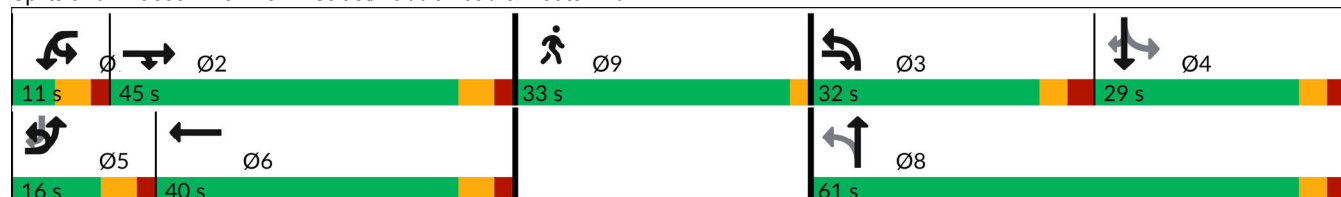
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 8: Merrill Street/Rabbit Road & Route 110



2031 Build Weekday Evening Peak-Hour (Mitigated)

8: Merrill Street/Rabbit Road & Route 110

03/10/2025

												
Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	6	148	880	351	3	111	820	41	436	139	122	99
Future Volume (vph)	6	148	880	351	3	111	820	41	436	139	122	99
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	11	12	12	12	12	12	12	12	12
Total Lost time (s)		4.0	4.0	4.0		4.0	4.0		4.0	4.0		
Lane Util. Factor		1.00	0.95	1.00		1.00	0.95		1.00	1.00		
Frt		1.00	1.00	0.85		1.00	0.99		1.00	0.93		
Flt Protected		0.95	1.00	1.00		0.95	1.00		0.95	1.00		
Satd. Flow (prot)		1745	3455	1546		1805	3550		1787	1767		
Flt Permitted		0.95	1.00	1.00		0.95	1.00		0.24	1.00		
Satd. Flow (perm)		1745	3455	1546		1805	3550		443	1767		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.98	0.98	0.98	0.98	0.91	0.91	0.91	0.86
Adj. Flow (vph)	6	156	926	369	3	113	837	42	479	153	134	115
RTOR Reduction (vph)	0	0	0	163	0	0	2	0	0	18	0	0
Lane Group Flow (vph)	0	162	926	206	0	116	877	0	479	269	0	0
Heavy Vehicles (%)	0%	0%	1%	1%	0%	0%	1%	0%	1%	0%	0%	1%
Turn Type	Prot	Prot	NA	pt+ov	Prot	Prot	NA		pm+pt	NA		Perm
Protected Phases	5	5	2	2 3	1	1	6			8		
Permitted Phases									8			4
Actuated Green, G (s)		10.1	39.4	65.7		5.0	34.3		55.5	55.5		
Effective Green, g (s)		12.1	41.4	69.7		7.0	36.3		57.5	57.5		
Actuated g/C Ratio		0.10	0.33	0.56		0.06	0.29		0.46	0.46		
Clearance Time (s)		6.0	6.0			6.0	6.0		6.0	6.0		
Vehicle Extension (s)		3.0	3.0			3.0	3.0		3.0	3.0		
Lane Grp Cap (vph)		168	1144	862		101	1030		508	812		
v/s Ratio Prot		c0.09	c0.27	0.13		0.06	0.25		c0.21	0.15		
v/s Ratio Perm									c0.22			
v/c Ratio		0.96	0.81	0.24		1.15	0.85		0.94	0.33		
Uniform Delay, d1		56.2	38.2	14.1		59.0	41.8		28.7	21.5		
Progression Factor		1.00	1.00	1.00		1.00	1.00		1.00	1.00		
Incremental Delay, d2		58.4	4.3	0.1		135.0	6.9		26.2	0.2		
Delay (s)		114.7	42.5	14.3		194.0	48.7		54.9	21.7		
Level of Service		F	D	B		F	D		D	C		
Approach Delay (s/veh)			43.4				65.6			42.5		
Approach LOS			D				E			D		
Intersection Summary												
HCM 2000 Control Delay (s/veh)			52.3				HCM 2000 Level of Service			D		
HCM 2000 Volume to Capacity ratio			0.92									
Actuated Cycle Length (s)			125.0				Sum of lost time (s)			20.0		
Intersection Capacity Utilization			82.5%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												



Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	133	154
Future Volume (vph)	133	154
Ideal Flow (vphpl)	1900	1900
Lane Width	12	11
Total Lost time (s)	4.0	4.0
Lane Util. Factor	1.00	1.00
Frt	1.00	0.85
Flt Protected	0.98	1.00
Satd. Flow (prot)	1852	1531
Flt Permitted	0.73	1.00
Satd. Flow (perm)	1386	1531
Peak-hour factor, PHF	0.86	0.86
Adj. Flow (vph)	155	179
RTOR Reduction (vph)	0	85
Lane Group Flow (vph)	270	94
Heavy Vehicles (%)	0%	2%
Turn Type	NA	custom
Protected Phases	4	
Permitted Phases		4 5
Actuated Green, G (s)	23.2	39.3
Effective Green, g (s)	25.2	41.3
Actuated g/C Ratio	0.20	0.33
Clearance Time (s)	6.0	
Vehicle Extension (s)	3.0	
Lane Grp Cap (vph)	279	505
v/s Ratio Prot		
v/s Ratio Perm	0.19	0.06
v/c Ratio	0.97	0.19
Uniform Delay, d1	49.5	29.9
Progression Factor	1.00	1.00
Incremental Delay, d2	44.5	0.2
Delay (s)	94.0	30.0
Level of Service	F	C
Approach Delay (s/veh)	68.5	
Approach LOS	E	
Intersection Summary		