

# ROAD SAFETY AUDIT

Main Street at Forest Avenue

Brockton, Massachusetts

July 21, 2021

Prepared through Old Colony MPO FFY 2021 Unified Planning  
Work Program – Road Safety Audits at Multiple Locations:  
Under Contract with MassDOT



Prepared By:  
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70 School Street, Brockton, MA. 02301



**OLD COLONY**  
PLANNING COUNCIL

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## Background

This Road Safety Audit for the intersection of Main Street at Forest Avenue was prepared as part of the Old Colony Metropolitan Planning Organization's (MPO) Road Safety Audits at Multiple Locations project in the MPO's FFY 2021 Unified Planning Work Program and conducted in conjunction with Road Safety Audits for Forest Avenue between Belmont Street (Route 123) and Gordon Street, and the intersection of Main Street at Nilsson Street and East Nilsson Street. The objective of the Road Safety Audits at Multiple Locations program is to identify known issues and potential improvements that can be implemented at high crash locations in a continuing effort to achieve safety performance targets for reducing serious injuries and fatalities on the regional highway network. Locations were selected through a data driven process as part of the MPO's Safety Management System and consultation with the communities of the Old Colony MPO.

## Project Data

This Road Safety Audit was conducted on July 21, 2021. For the health and safety of all participants, this Road Safety Audit was conducted virtually through a webinar format. Participants were provided crash data and associated analysis (crash characteristics charts, collision diagrams) prior to the Audit for review, and background traffic data (traffic volumes, speeds, heavy vehicle traffic) along with surrounding land use were discussed during the Audit.

Photographs of the intersection from each approach were provided. There was an Old Colony Planning Council staff planner on site at the intersection, providing live video links and commentary for each location, and responding to on-demand inquiries.

The RSA participants formed a multidisciplinary team representing many fields, including planning, engineering, the school department, and emergency response. A list of RSA attendees is shown in Table 1.

**Table 1: Participating Audit Team Members**

<b>Audit Team Member</b>	<b>Agency/Affiliation</b>
Bill McNulty	Old Colony Planning Council
Mary Waldron	Old Colony Planning Council
Charles Kilmer, AICP	Old Colony Planning Council
Guoqiang Li	Old Colony Planning Council
Ray Guarino	Old Colony Planning Council
Shawn Bailey	Old Colony Planning Council
Kyle Mowatt	Old Colony Planning Council
Captain Mark Porcaro	Brockton Police Department
Damon Rivard	Brockton Area Transit Authority
Glenn Geiler	Brockton Area Transit Authority
Deputy Chief Joseph Solomon	Brockton Fire Department
Rob May	Director of Planning and Development, City of Brockton
Brady Winston	Office of Mayor Robert Sullivan – City of Brockton
Dr. James Cobbs	Brockton Public Schools
Michael Munchbach	Office of Senator Michael brady
Ben Mueller	MassDOT Office of Transportation Planning
Bianca Marshall	MassDOT District Five Traffic
Jason Walters	MassDOT District Five Projects
Dakota DelSignore	MassDOT Traffic and Safety Section
Jonathan Brown	MassDOT Traffic and Safety Section
Iten Beshay	MassDOT Traffic and Safety Section
Vivian Ortiz	Massachusetts Safe Routes to School
David Soares	MassDOT District Five Traffic Operations
Nathan Shea	CDM Smith
Lisa Sherman	CDM Smith
Kim Tran	CDM Smith
Gloria Anderson Armstrong	Resident

## Project Location and Description

[The intersection of Main Street at Forest Avenue is a three-legged, unsignalized intersection located in Brockton. Forest Avenue is controlled by a STOP sign, supplemented by a stop bar and “STOP” painted on the pavement It is a densely developed area, featuring a mix of multi-family residential and commercial businesses. Businesses in this area generate a high volume of pedestrian activity.

Martin Place is a private driveway directly opposite of Forest Avenue. It serves a number of residential addresses and a commercial business.

The intersection was included in the 2020 Brockton Main Street Corridor Study, prepared by Old Colony Planning Council.

There is a Dunkin restaurant on the northwest corner of the intersection. This is a high-volume business that generates a large volume of both vehicular and pedestrian trips, particularly during the morning peak hours.

**Main Street:** Main Street is a major north-south roadway through the city of Brockton, serving residential and commercial areas, connecting to Route 28 to the south and Downtown Brockton to the north. It is a two-lane roadway under local jurisdiction of the City of Brockton, functionally classified as an Urban Minor Arterial. There are sidewalks on both sides of Main Street. A crosswalk crosses Forest Avenue connecting the sidewalks on the southbound side of Main Street. Main Street does not have any bicycle accommodations, although there is a shoulder that is used by both bicyclists and for on-street parking away from the intersection. There are no posted speed limits. Brockton Area Transit Route 2 runs along the roadway. The closest marked stops are on the northwest corner of the intersection, and opposite of Packard Street south of the intersection. Drivers are instructed not to stop so close to the intersection as to interfere with turning movements or create a hazard.

**Forest Avenue:** Forest Avenue is a major east-west connection connecting Main Street to Belmont Street (Route 123) and providing direct connections to Brockton High School and the Massachusetts registry of Motor Vehicles (RMV). It is a two-lane roadway functionally classified as an Urban Collector under local jurisdiction of the City of Brockton. The roadway has sidewalks on both sides of the roadway. There are no bicycle accommodations nor transit stops. There is no posted speed limit.

MassDOT's Top Crash Locations viewer indicates the intersection was an HSIP eligible crash cluster (Top 5% of most hazardous locations in the region) for the 2015 through 2017 period. It was also a top pedestrian crash cluster from 2006 through 2015, 2007 through 2016, and 2008 through 2017, and a bicycle crash cluster for the same time periods.

Figure 1 shows an aerial photograph of the intersection and study area.

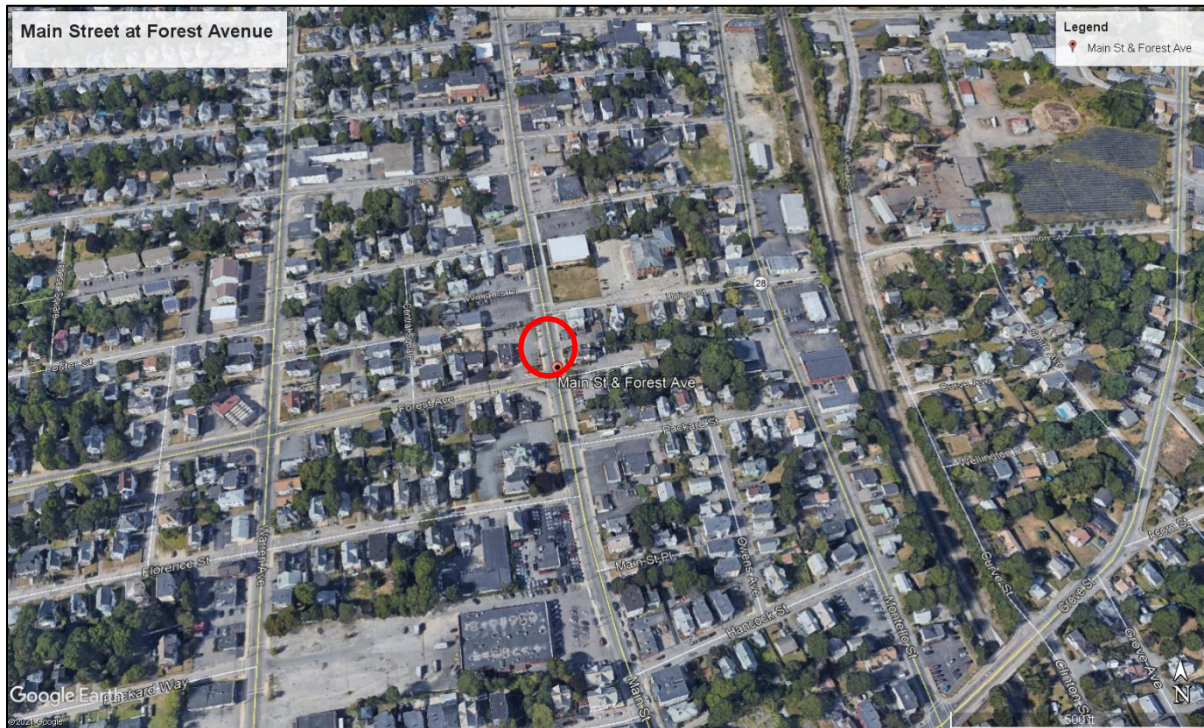


Figure 1: Locus Map

## Audit Observations and Potential Safety Enhancements

**Drivers from Forest Avenue forcing their way into traffic flow on Main Street without adequate gaps:** The intersection experiences “forced flow” congested conditions, particularly during peak hours with a Level of Service of “F” during both the morning and afternoon peak time frames. Nearly 40% of the crashes analyzed in the 2017-2000 time frame occurred between the hours of 4:00 to 6:00 PM coinciding with the afternoon peak. Analysis of reported crashes indicates this driver behavior may have been a factor in thirteen of the eighteen crashes. It is likely that with increasingly congested conditions with lengthy delays, drivers become frustrated and attempt to force their way onto Main Street.

Potential Safety Enhancements:



**Image 1: Even at off-peak times, a continuous flow of traffic on Main Street makes entering from Forest Avenue difficult.**

1. Reconstruction of the intersection with the installation of traffic signals could improve safety by creating gaps for Forest Avenue traffic to enter onto Main Street, as well as potentially improve safety for pedestrians.
2. As an interim measure, installation of advance warning signage could improve safety.
3. Add turning lanes on Main Street, particularly for left turns from Main Street northbound onto Forest Avenue. This could be accomplished by reallocating the right-of-way with restriping and would provide refuge for drivers and potentially reduce frequency of drivers making risky turning maneuvers.

**Pedestrian crossing is challenging:** The area features a high volume of pedestrian trips, supported by businesses along Main Street near dense residential development and a transit line (Brockton Area Transit Route 2) along the roadway. Pedestrians frequently cross Main Street. There are no marked crosswalks on Main Street at the intersection, and the closest one is 220 feet to the north at Union Street. Furthermore, pedestrian crossings are not properly signed and there are no ADA compliant ramps on the Forest Avenue crosswalk.

Potential Safety Enhancements:

1. Enhance existing crosswalk north of the intersection with higher visibility markings (ladder style vs. parallel bars).
2. Use curb bump-outs to increase visibility of pedestrians around on-street parking and shorten crossing distance.
3. Consider the installation of either a Rectangular Rapid Flashing Beacon (RRFB) or Pedestrian Hybrid Beacon (PHB) at crosswalk.
4. Consider adding additional pedestrian crossings, particularly at intersection and south of intersection, while considering these treatments at new crossings as well. Ensure all crossings are fully ADA accessible.

**No speed limit signs posted:** There were no speed limit signs noted on any of the approaches.

Potential Safety Enhancement:

1. Post speed limits.

**Area is dark at night:** Audit participants noted that the area is rather dark at night, despite the presence of overhead streetlights on utility poles in the area. Crash data during the study period indicates that 40% of all crashes occurred in dark conditions.

Potential Safety Enhancements:

1. Coordinate with electric utility on the conversion of existing street lighting to LED lighting.
2. Consider the installation of supplemental streetscape lighting to further enhance nighttime visibility and safety, particularly for pedestrians.

**Crashes in wet conditions:** Twenty-eight percent (28%) of crashes occurred in wet conditions. It was observed during the Audit that there are no catch basins on drainage facilities in the area of the intersection. The lack of catch basins could result in standing water and ponding water on the roadway, making vehicle control difficult for drivers during heavy rain events.



**Image 2: There are no drainage or stormwater facilities at the intersection.**

Potential Safety Enhancements:

1. Improve drainage and stormwater management in the area of the intersection.
2. Using a high friction surface treatment can also reduce the occurrence of skidding and loss of control in wet conditions.

**Wide travel lanes and shoulders:** It was noted during the Audit it appeared travel lanes on Main Street were rather wide, as were shoulders. Shoulders are used for on-street parking along much of Main Street, although on-street parking is prohibited near the intersection.

Potential Safety Enhancements:

1. Consider conversion of Main Street to a “Complete Street”, with reduction in travel lane widths and the inclusion of bicycle lanes, along with enhanced pedestrian access and safety.

**No bus “pull-out” area or pedestrian crossings for passengers:** It was noted during the Audit there is a bus stop on Main Street, just south of the intersection, signed by a marking on a utility pole. While Brockton Area Transit operates as a “flag stop” system (passengers can flag down a bus for a pick-up in any area long the route as long as conditions are safe to do so), there are designated bus stops, typically marked by bands on utility poles. There is no “pull out” area for a bus here, so the bus largely remains in the travel lane for stops. There is also an absence of a safe pedestrian crossing near this bus stop.



Potential Safety Enhancements:

1. Consider the installation of “pull out” areas for busses.
2. Add a safe pedestrian crossing with a crosswalk, signage, and potentially curb bump-outs and beacons where transit riders cross the roadway.

**Lack of bicycle infrastructure:** There is a large volume of bicycle travel in the area. While there are shoulders that bicyclists, there are no specific bicycle lanes for bicyclists.

Potential Safety Enhancements:

1. Consider the installation of dedicated bicycle lanes on both Main Street and Forest Avenue. This could be accomplished with the implementation of Complete Street roadway designs.

## Summary of Road Safety Audit

Based on the review of data, observations of the intersection made in the field, and group discussion, the RSA team identified possible enhancements that could improve safety at the intersection. Further study and design work will need to be conducted to determine the feasibility of improvements. Table 2 summarizes the estimated time frame and costs, and Table 3 summarizes the safety issues, possible enhancements, estimated safety payoff, time frame, cost, and jurisdiction responsibility. Safety payoff estimates are based on engineering judgment and are categorized as low, medium, and high. The time frame is categorized as short-term (<1 year), midterm (1 to 3 years), or long-term (typically >3 years). Long-term improvements are typically considered to be substantial improvements with an expected time frame for implementation greater than 3 years. The costs are categorized as low (<\$10,000), medium (\$10,001 to \$50,000), or high (>\$50,000).”

Table 2: 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 3: Potential Safety Enhancement Summary**

Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Jurisdiction
Drivers forcing their way into traffic flow without adequate gaps	Reconstruct intersection with the installation of traffic signals	High	Long-Term	High	City of Brockton
Pedestrian crossing is challenging	Add pedestrian crossings south of intersection. Consider curb bump outs, Rectangular Rapid Flashing Beacons (RRFBs), or Pedestrian Hybrid Beacons (PHBs) to enhance crosswalk safety. Consider ladder design crosswalks	High	Mid-Term / Long-Term	Medium	City of Brockton
No speed limit signs posted	Post speed limit signs	Moderate	Short Term	Low	City of Brockton
Area is dark at night	Replace existing overhead street lights with LED. Consider enhancing lighting with streetscaping	High	Mid-Term	Low (Utility may pay for LED conversion)	City of Brockton
Crashes in wet conditions	Improve drainage. Install high friction surfaces.	High	Long-Term	High	City of Brockton
Wide travel lanes and shoulders	Consider making Main Street a Complete Street with narrower travel lanes, bicycle lanes, or a bus lane.	High	Mid-Term	Medium	City of Brockton
No dedicated pull out area for bus stop, and no signed pedestrian crossing in area of bus stop	Consider better signage to designate bus stops. Consider bus pull out areas	High	Long-Term	High	City of Brockton
Lack of bicycle specific infrastructure	Modify layout of Main Street and Forest Avenue to include bicycle lanes	High	Mid-Term	Medium	City of Brockton

## Appendix A. RSA Meeting Agenda

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<p><b>Agenda</b></p>	<p><b>Virtual Road Safety Audit for Forest Avenue and Main Street, Brockton</b></p> <ul style="list-style-type: none"> <li>• <b>Forest Avenue, from Belmont Street (Route 123) to Gordon Street</b> <ul style="list-style-type: none"> <li>• <b>Intersection of Main Street and Forest Avenue</b></li> <li>• <b>Intersection of Main Street at Nilsson Street</b></li> </ul> </li> </ul> <p style="text-align: right;"><b>Brockton, MA</b> <b>Wednesday, July 21, 2021</b> <b>1:00 PM – 3:00 PM</b></p>
<p><b>Contact:</b></p>	<p>Bill McNulty, Old Colony Planning Council (508) 583-1833 ext. 207 wmcnulty@ocpcrpa.org</p>
<p><b>Attendees:</b></p>	<p>Invited Participants Include a Multidisciplinary Team including Brockton Officials (Chief Elected Officials, DPW, Police, Fire, Schools, Administration, Planning), Brockton Area Transit Authority, MassDOT, FHWA, Legislative Delegation</p>
<p><b>Please Bring:</b></p>	<p>Thoughts and Suggestions</p>
<p><b>Meeting Location:</b></p>	<p><b>Virtual Meeting (Zoom):</b> <a href="https://us02web.zoom.us/j/86978966259?pwd=ZmFsSFZmcFIJQWMzYmU1bkxQQmhvdz09">https://us02web.zoom.us/j/86978966259?pwd=ZmFsSFZmcFIJQWMzYmU1bkxQQmhvdz09</a> <b>Webinar ID:</b> 869 7896 6259 <b>Password:</b> 467803</p>
<p><b>1:00 PM</b></p>	<p>Welcome and Introductions</p>
<p><b>1:05 PM</b></p>	<p>Study Background and Review of Study Area</p>
<p><b>1:10 PM</b></p>	<p>Virtual Road Safety Audit of Forest Avenue, from Belmont Street (Route 123) to Gordon Street</p> <ul style="list-style-type: none"> <li>• Review of Crash Data</li> <li>• Existing Conditions and Known Challenges</li> <li>• Identification of Potential Safety Improvements</li> </ul>
<p><b>2:00 PM</b></p>	<p>Virtual Road Safety Audit of Main Street at Forest Avenue</p> <ul style="list-style-type: none"> <li>• Review of Crash Data</li> <li>• Existing Conditions and Known Challenges</li> <li>• Identification of Potential Safety Improvements</li> </ul>
<p><b>2:25 PM</b></p>	<p>Virtual Road Safety Audit of Main Street at Nilsson Street / East Nilsson Street</p> <ul style="list-style-type: none"> <li>• Review of Crash Data</li> <li>• Existing Conditions and Known Challenges</li> <li>• Identification of Potential Safety Improvements</li> </ul>
<p><b>2:50 PM</b></p>	<p>Wrap-Up Site Audit; Discussion of Next Steps</p>
<p><b>Instructions For Participants:</b></p> <ul style="list-style-type: none"> <li>• Before attending the Road Safety Audit, participants are encouraged to familiarize themselves with the study area, and make note of existing conditions and any deficiencies they observe</li> <li>• 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 Road Safety Audit process</li> <li>• After the meeting, participants will be asked to comment and respond to the document materials to ensure it is reflective of the Road Safety Audit completed by the multidisciplinary team</li> </ul>	

## Appendix B. RSA Audit Team Contact List

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## Participating Audit Team Members

Date:	July 21, 2021	Location:	Main Street at Forest Avenue, Brockton
Audit Team Members		Agency/Affiliation	
Bill McNulty		Old Colony Planning Council	
Mary Waldron		Old Colony Planning Council	
Charles Kilmer, AICP		Old Colony Planning Council	
Guoqiang Li		Old Colony Planning Council	
Ray Guarino		Old Colony Planning Council	
Shawn Bailey		Old Colony Planning Council	
Kyle Mowatt		Old Colony Planning Council	
Captain Mark Porcaro		Brockton Police Department	
Damon Rivard		Brockton Area Transit Authority	
Glenn Geiler		Brockton Area Transit Authority	
Deputy Chief Joseph Solomon		Brockton Fire Department	
Rob May		Director of Planning and Development, City of Brockton	
Brady Winston		Office of Mayor Robert Sullivan – City of Brockton	
Dr. James Cobbs		Brockton Public Schools	
Michael Munchbach		Office of Senator Michael brady	
Ben Mueller		MassDOT Office of Transportation Planning	
Bianca Marshall		MassDOT District Five Traffic	
Jason Walters		MassDOT District Five Projects	
Dakota DelSignore		MassDOT Traffic and Safety Section	
Jonathan Brown		MassDOT Traffic and Safety Section	
Iten Beshay		MassDOT Traffic and Safety Section	
Vivian Ortiz		Massachusetts Safe Routes to School	
David Soares		MassDOT District Five Traffic Operations	
Nathan Shea		CDM Smith	
Lisa Sherman		CDM Smith	
Kim Tran		CDM Smith	
Gloria Anderson Armstrong		Resident	

## Appendix C. Detailed Crash Data

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# Crash Data Summary Table

Main Street at Forest Avenue, Brockton, MA

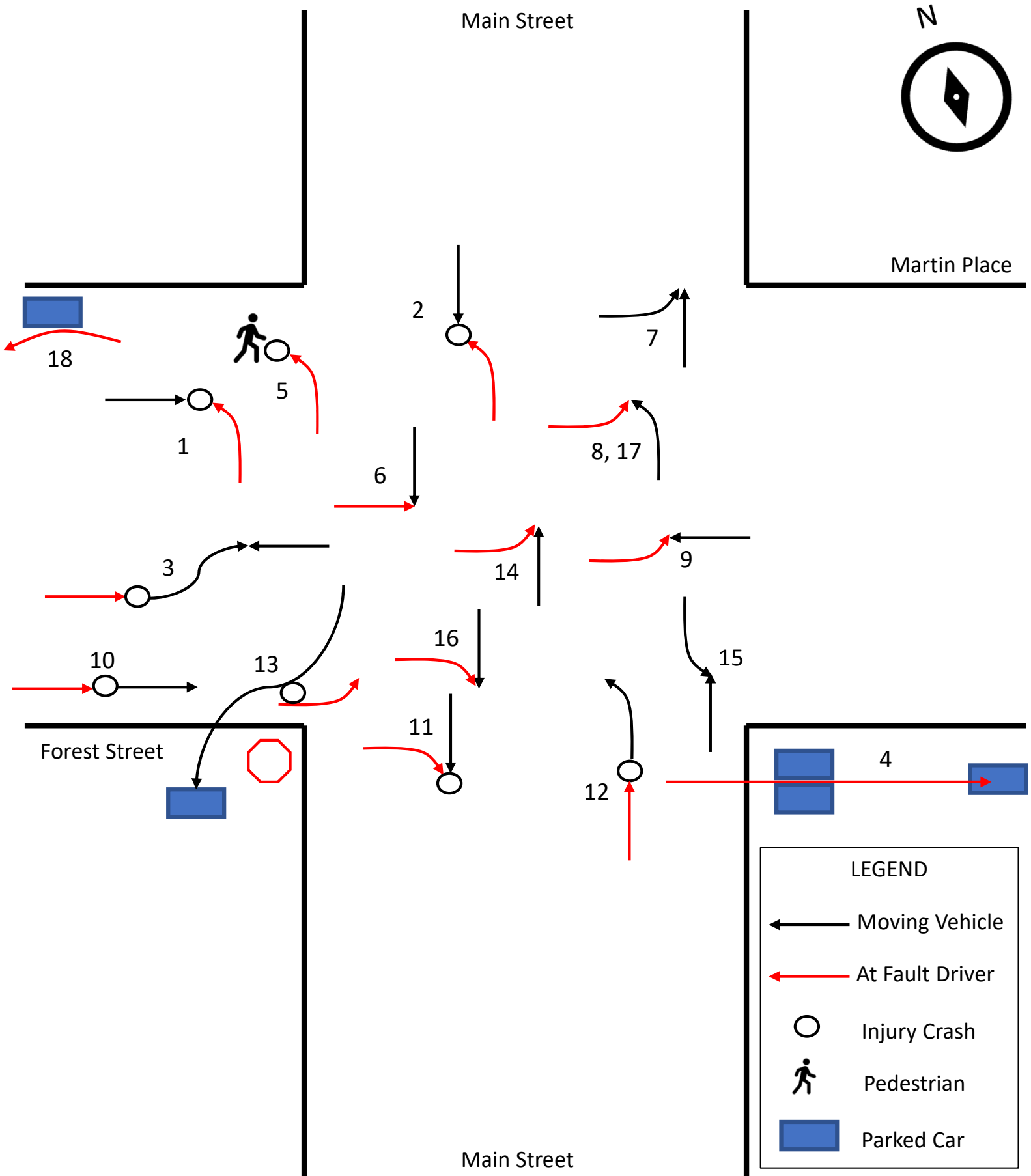
2017-2020

Crash Diagram Ref #	Crash Date	Crash Day	Time of Day	Manner of Collision	Light Condition	Weather Condition	Road Surface	Driver Contributing Code	Ages			Comments
	m/d/y			Type	Type	Type	Type	Type	D1	D2	D3	
1	1/20/17	Friday	6:04 PM	Head on	Dark - lighted roadway	Clear	Dry	Unknown	39	48		17-126-AC
2	2/2/17	Thursday	1:34 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	79	39		17-216-AC
3	8/4/17	Friday	3:56 PM	Rear-end	Daylight	Clear	Dry	Illness	74	33	56	17-1410-AC
4	8/28/17	Monday	1:34 AM	Head on	Dark - lighted roadway	Clear	Dry	Operating Vehicle in erratic, reckless, careless, negligent, or aggressive manner	35			17-1545-AC
5	12/11/17	Monday	4:41 PM	Single Vehicle Crash	Dark - lighted roadway	Clear	Dry	Unknown	51	34		17-2299-AC
6	12/12/17	Tuesday	4:17 PM	Angle	Dusk	Rain	Wet	Failed to yield right of way	32	57		17-2305-AC
7	12/12/17	Tuesday	5:59 PM	Angle	Dark - lighted roadway	Clear	Wet	Unknown	42	34		17-2307-AC
8	2/12/18	Monday	12:38 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	24	33		18-353-AC
9	3/23/18	Friday	9:21 AM	Angle	Daylight	Clear	Dry	Unknown	45	21		18-582-AC
10	9/26/19	Thursday	8:07 PM	Rear-end	Dark - lighted roadway	Cloudy	Wet	Followed too closely	35	20		19-1753-AC
11	10/29/19	Tuesday	11:00 AM	Angle	Daylight	Cloudy	Wet	Failed to yield right of way	36	38		19-1986-AC
12	12/9/19	Monday	9:24 PM	Rear-end	Dark - lighted roadway	Rain	Wet	Followed too closely	18	55		19-2320-AC
13	4/19/20	Sunday	4:58 PM	Angle	Daylight	Clear	Dry	Unknown	21	20		20-562-AC
14	6/25/20	Thursday	5:49 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	61	28		20-841-AC
15	10/11/20	Sunday	1:27 PM	Angle	Daylight	Clear	Dry	Unknown		69		20-1478-AC
16	11/6/20	Friday	5:10 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	37	40		20-1657-AC
17	11/20/20	Friday	4:51 PM	Angle	Dawn	Clear	Dry	Failed to yield right of way	20	61		20-1729-AC
18	12/8/20	Tuesday	6:11 PM	Sideswipe, same direction	Dark - lighted roadway	Clear	Dry	Unknown		21		20-1854-AC

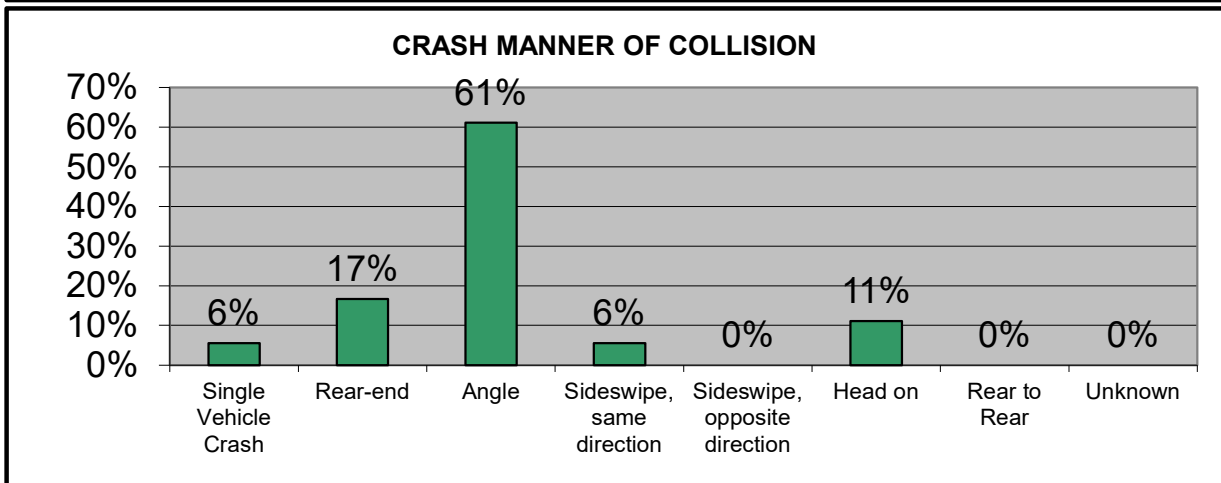
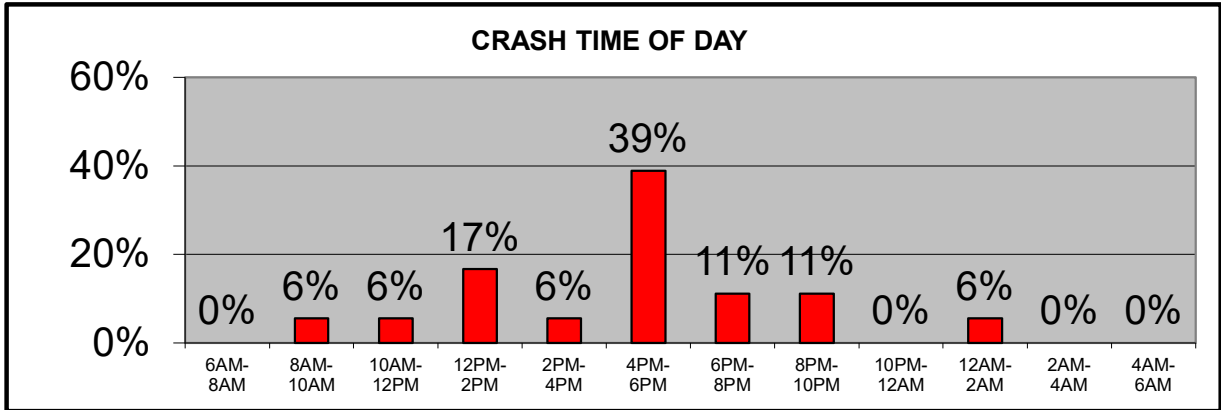
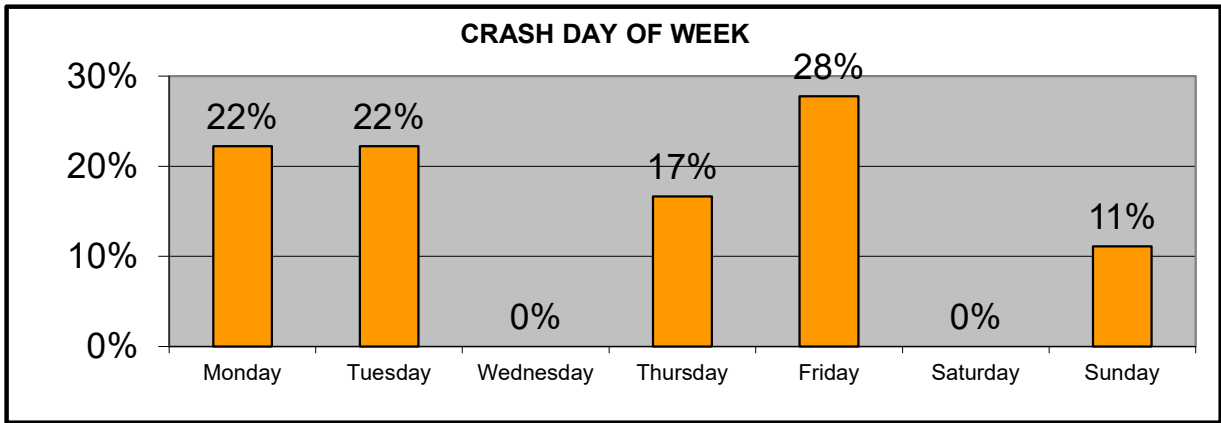
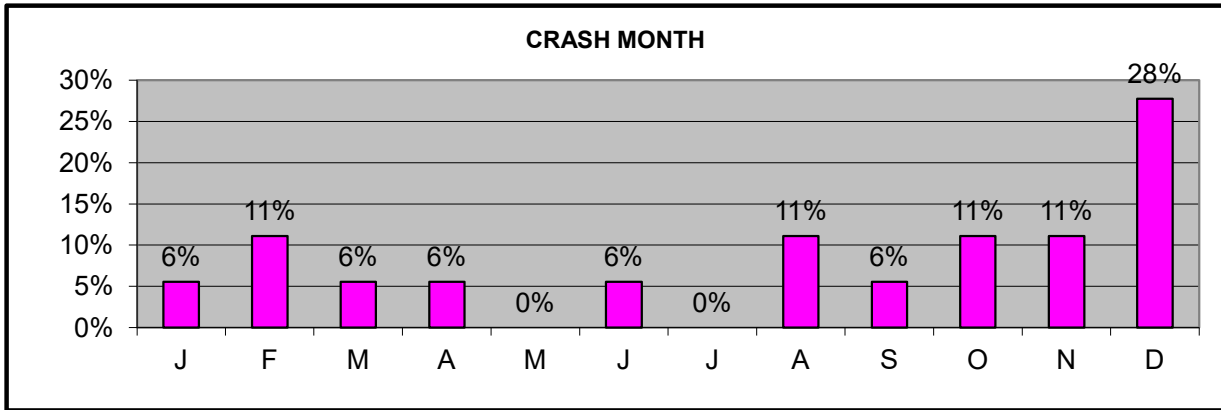
\*Courtesy Crash - A term used to describe a crash that occurs subsequent to a non-involved mainline driver who gives the right of way, contrary to the rules of the road, to another driver.



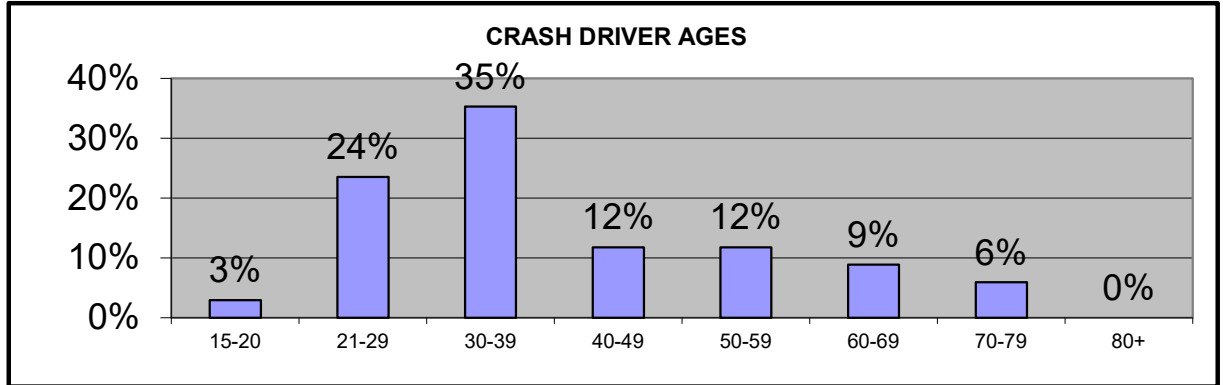
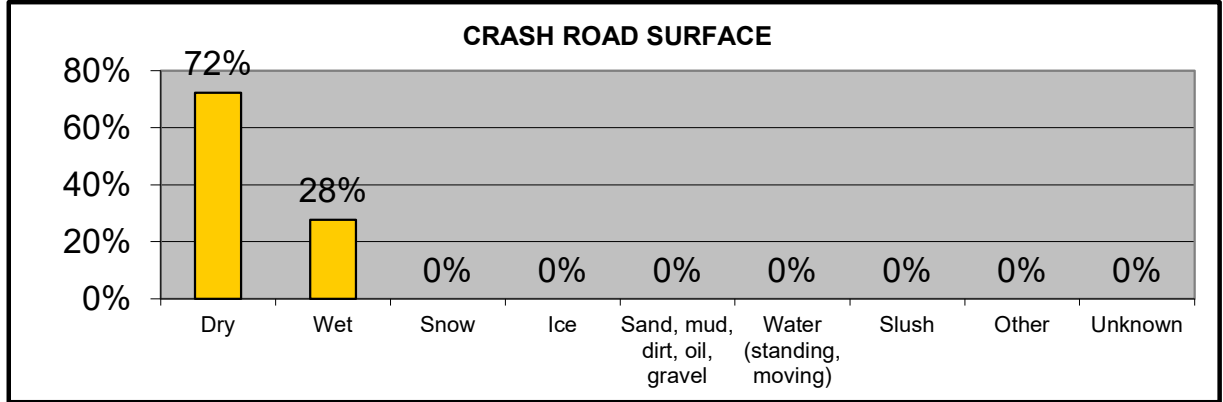
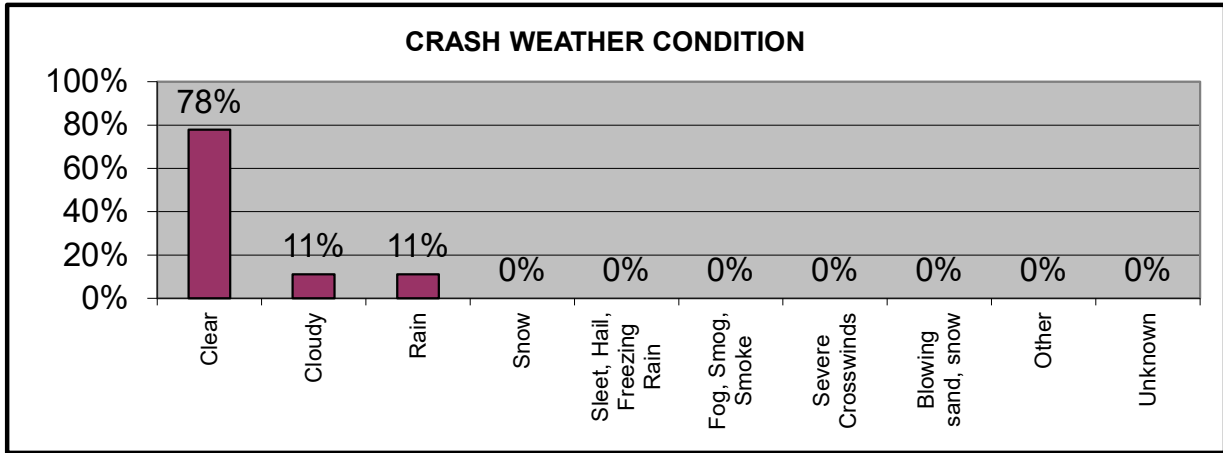
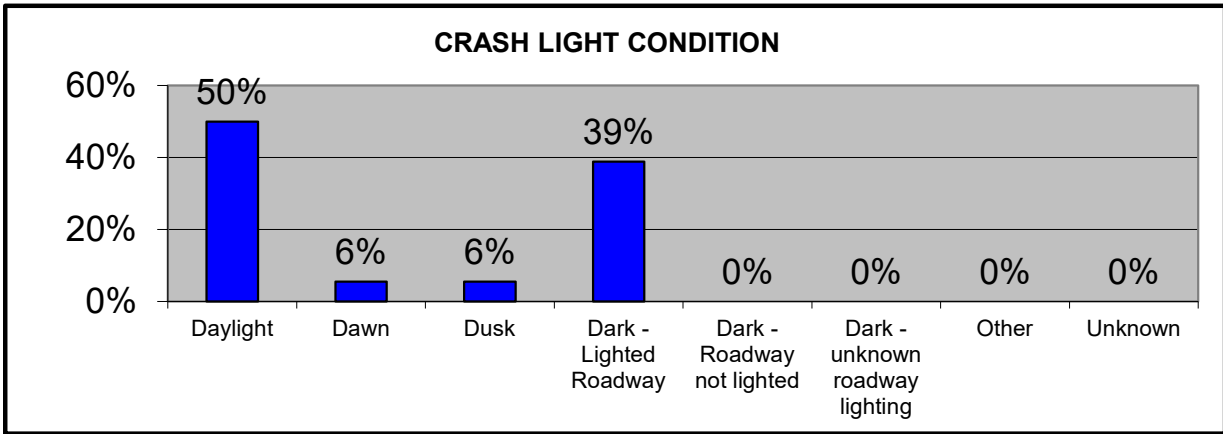
**COLLISION DIAGRAM**  
 Main Street at Forest Street  
 Collision Diagram for Crashes (2017-2020)  
 Prepared by OCPC (SB 07/2021) (Source: Brockton Police Dept.)



**Crash Data Summary Tables and Charts**  
Main Street at Forest Avenue, Brockton, MA



**Crash Data Summary Tables and Charts**  
Main Street at Forest Avenue, Brockton, MA



## Appendix D. Additional Information

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## Appendix E. Road Safety Audit References

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## Road Safety Audit References

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