ROAD SAFETY AUDIT

Pearl Street at Torrey Street

City of Brockton, Massachusetts

September 14, 2021

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

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Table of Contents

Contents

Background **1**

Project Data **1**

Project Location and Description **2**

Audit Observations and Potential Safety Enhancements **3**

Summary of Road Safety Audit **6**

List of Appendices

Appendix A. RSA Meeting Agenda
Appendix B. RSA Audit Team Contact List
Appendix C. Detailed Crash Data
Appendix D. Additional Information

List of Tables

Table 1: Participating Audit Team Members 2
Table 2: Estimated Time Frame and Costs Breakdown 6
Table 3: Potential Safety Enhancement Summary 7
Table 3: Potential Safety Enhancement Summary, Continued 8

Background

This Road Safety Audit for Pearl Street at Torrey Street in Brockton 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. The objective of the Road Safety Audits at Multiple Locations project 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 September 14, 2021. Out of an abundance of caution and respect to health and safety of Audit particpants, 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 chicle traffic) along with surrounding land use were discussed during the Audit. Supplemental crash data provided by MassDOT was analyzed by Old Colony Planning Council following the Audit and is included in this report.

During the audit, crash analysis, land use, and traffic data was discussed. 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, law enforcement and emergency response, and advocacy. A list of RSA attendees is shown in Table 1.

Table 1: Participating Audit Team Members

Audit Team Member	Agency/Affiliation
Bill McNulty	Old Colony Planning Council
Charles Kilmer, AICP	Old Colony Planning Council
Raymond Guarino	Old Colony Planning Council
Guoqiang Li	Old Colony Planning Council
Kyle Mowatt	Old Colony Planning Council
Shawn Bailey	Old Colony Planning Council
Rob May, CEcD	City of Brockton, Director of Planning and Economic Development
Brady Winsten	Office of Mayor Robert Sullivan
Michelle Deng	MassDOT Traffic Safety Division
Kevin Fitzgerald	MassDOT Traffic Safety Division
Ale Kuncaitis	MassDOT District Five - Projects
Bianca Marshall	MassDOT District Five - Traffic
Jason Walters	MassDOT District Five - Projects
Joseph Wong	MassDOT Traffic Safety Division
Ryan Cook	Unidentified

Project Location and Description

The intersection of Pearl Street at Torrey Street is a four-legged, traffic signal-controlled intersection in Brockton, Massachusetts on the western side of the city, one half-mile east of the Easton Town Line. All approaches to the intersection are single lane approaches and are controlled by a two-phase traffic signal system with a call-button activated exclusive pedestrian crossing phase.

The intersection is in a primarily residentially zoned area of the city, with some commercial on the corners of the intersection. Residential development is moderately dense and considered thickly settled.

- **Pearl Street**: Pearl Street is a two-lane roadway under local jurisdiction of the City of Brockton, functionally classified as an Urban Collector. It runs from south to north through primarily residential areas, connecting Route 138 in Easton to the south to Route 27 to the north. It is a primary route to the Good Samaritan Medical Center to the north in Brockton. There is a sidewalk on the western edge (southbound direction) of the roadway. None of the approaches include bicycle accommodations. The posted speed limit on Route 104 is 40 MPH.

- **Torrey Street**: Torrey Street is a two-lane roadway under local jurisdiction of the City of Brockton, functionally classified as an Urban Minor Arterial. It is an east-west roadway that connects Belmont Street (Route 123) and Downtown Brockton to Rote 138 and points west in Easton, including serving as a connection to Stonehill College. Torrey Street has a sidewalk along the southern edge (eastbound direction) of the roadway east

of the intersection, however, does not have any sidewalks west of the intersection. Neither Torrey Street approach has bicycle accommodations. Development along Torrey Street is primarily residential and recreational, however becomes more commercial about a mile east of the intersection. The posted speed limit along Torrey Street is 30 MPH.

Figure 1: Locus Map

Audit Observations and Potential Safety Enhancements

Mix of Post Mounted and Overhead Traffic Signals: The existing traffic signal system at this location is an older system and features a mix of post mounted traffic signals on the corners, and an overhead mast arm that extends over the westbound lane of Torrey Street. The post mounted traffic signals have a tendency to blend into the background, particularly during warmer months with full foliage and tree canopies in the background.

Potential Safety Enhancements: Replace traffic signal system, replacing post mounted signals with overhead (mast arm or guidewire mounted) traffic signals. Adjustment to or relocation of overhead elective lines may be necessary to accommodate new overhead traffic signals. Investigate feasibility of reconstruction intersection with a roundabout and removing traffic signals. In short term, assess feasibility of heightening visibility of post mounted traffic signals using combination of LED signals and backplates on signal heads.

Overhead Signals Not Aligned with Approaches: The mast arm mounted overhead traffic signal for are not aligned with the northbound and eastbound approaches, but rather aligned with the departing lanes.

Image 1: Overhead signal does dot align with approach lane.

Potential Safety Enhancements: Replace mast arms with properly aligned mast arms or guidewire mounted signals, properly aligning appropriate signa heads with each approach. Adjustment to or relocation of overhead elective lines may be necessary to accommodate new overhead traffic signals

Red Light Running: Crash narratives indicate red light running occurring at this location, and field observation and audit participants confirmed this. Most angled collisions involved a westbound vehicle. Small signal heads may be a factor in this.

Potential Safety Enhancements: Enhance visibility of existing signals with high intensity LED signals. Replace existing 9" signal faces with larger diameter, higher visibility 12" signal faces. Evaluate all-red and yellow clearance times. Install retroreflective backplates on traffic signals to enhance visibility. There were several crashes involving a left turning vehicle colliding with a thru-moving vehicle. Adding left turn protection may improve safety for these movements. Long term, replace traffic signals with overhead signals for each approach or evaluate reconstructing intersection and replacing traffic signals with a roundabout. Increase patrols with regular and strict traffic enforcement.

Lane Departures: During site visits and field observation, evidence of roadway departure (rutting and compression in earth next to roadway) of vehicles was noted, likely to maneuver around queued traffic. It was also noted a makeshift barrier had been placed on the northeast corner to prevent vehicles from leaving roadway and traveling into parking lot.

Potential Safety Enhancements: Install curbs and sidewalks.

Poor Drainage: Evidence of significant ponding at intersection. Lack of curbing, and no drainage facilities on southwest corner of intersection.

Potential Safety Enhancements: Install curbing. Construct drainage on southwest corner. Enhance crown of roadways.

Bases of Traffic Signals Not Flush with Sidewalk: The bases of the traffic signal posts are not flush with the sidewalk surfaces. This is a tripping hazard for pedestrians.

Potential Safety Enhancements: Make bases flush with sidewalk surface.

Image 2: Curbs block ADA access to crosswalks. One crosswalk leads nowhere

Poor Pedestrian Connectivity and ADA Access: Crosswalks are blocked by curbs in many cases, making access for those in mobility assistance devices impossible. There are no ramps for the crosswalks. There are no detectable tactile surfaces. The exclusive pedestrian crossing phase appears to be short (7 seconds). One of the crosswalks leads to nowhere into open roadway pavement, The crosswalk on the eastern leg of Torrey Street is wider than the other crosswalks. Overall, sidewalk connectivity in area is poor. Signal posts and signal control box obstruct sidewalks. A Brockton Area Transit route (Route 9) travels though this intersection. The bus route generates pedestrian trips through this intersection for commuters using this route.

Potential Safety Enhancements: Construct new sidewalks on all approaches. Enhance crossings with proper crosswalks with accessible ramps instead of existing apex ramps. Modify alignment of crosswalks with new curbing and ramp improvements. Upgrade push buttons and pedestrian housings to include countdown heads for pedestrian crossing phase. Ensure pedestrian crossing times are adequate for length of crosswalks. Consider using high visibility crosswalk treatments. Work with the Brockton Area Transit Authority to ensure safe access for pedestrians accessing transit at this node, including the consideration on bus pull out areas and passenger shelters.

Poor Bicycle Mobility and Access: There are no bike lanes or sharrows on any of the approaches. Signal does not contain bicycle accommodation. Travel speeds on the approaches are uncomfortably high for beginner and intermediate riders.

Potential Safety Enhancements: Consider adding bike lanes to Pearl Street and Torrey Street. Include bicycle accommodations in any traffic signal upgrade.

High Speed Limit on Pearl Street: The posted speed limit is 40 miles per hour. The speed limit is high for thickly settled areas. Traffic speed may be a factor in many of the rear-end collisions at the intersection, particularly on the northbound approach.

Potential Safety Enhancements: Opt into Chapter 90 Section 17 of Massachusetts General Laws to create a city-wide 25 MPH Speed Limit for Thickly Settled and Business District areas on roadways under city jurisdiction and not otherwise governed by a special speed regulation. Work with MassDOT to adjust existing special speed regulations if necessary. Increase patrols with regular and strict traffic enforcement.

Poor access management: The abutting Harden Center has very wide curb cuts to the street with little access control. Property on the southeast corner is using a combination of boulders and a large downed pule to precent over-terrain access from Pearl Street.

Potential Safety Enhancements: Work with abutters to improve access management.

Wide Travel Lanes on Approach and turning Radii: Approaches are rather wide in most cases and turning radii on corners is large. The wide approaches are sometimes used as two lanes, despite being marked and designed as one.

Potential Safety Enhancements: Evaluate if turning radii are necessary. Use bump-outs if radii are not necessary. Install curbing, sidewalks, and bike lanes to provide more uniform approaches and

calm traffic while enhancing pedestrian and bicycle safety. Consider using width to add turning lanes. If left turn lanes are added, modify traffic signals to provide left turn protection.

Outdated Signage: There were "SLOW Children". And "Truck Quiet Zone" signs observed on the approaches. A speed limit sign on Pearl Street southbound is undersized and not mounted properly. "Thickly Settled" signage not consistent with speed limit. There is a lack of advance warning signage to the intersection.

Potential Safety Enhancements: Consider removing non MUTCD supported (such as "Slow Children") signage. Install MUTCD compliant speed limit signs and advance warning signage on all approaches. Install "Signal Ahead" advance warning signs on the Torrey Street approaches. Ensure signal ahead signage on Pearl Street is unobstructed by vegetation.

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	
Short-Term	<1 Year
Mid-Term	1-3 Years
Long-Term	>3 Years

Costs	
Low	<$10,000
Medium	$10,001-$50,000
High	>$50,000

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Table 3: Potential Safety Enhancement Summary

Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Jurisdiction
Mix of post mounted and overhead mast arm	Replace signal system with overhead signals. Assess feasibility of reconstructing intersection with a roundabout.	High	Long Term	High	City of Brockton
Overhead signals not aligned with approaches	Replace traffic signals and align properly	High	Long Term	High	City of Brockton
Red light running	Install backplates, use LED signals, and evaluate all-red clearance times. Upgrade existing 8” signal faces with 12” faces. Consider replacing traffic signals or installing roundabout.	High	Short Term / Long Term	Low / High	City of Brockton
Lane departures.	Install curbing and sidewalks.	Medium	Mid Term	High	City of Brockton
Poor drainage.	Install curbing and sidewalks and new drainage.	High	Long Term	High	City of Brockton
Bases of signals not flush with sidewalk surface.	Make bases flush with surface.	Medium	Short Term / Mid Term	Medium	City of Brockton
Poor pedestrian and ADA accessibility.	Construct new accessible sidewalks and crossings. Use ADA compliant ramps instead of apex ramps. Align crosswalks with any new curbing and sidewalk improvements. Ensure pedestrian crossing timing is adequate for crosswalk length. Work with Brockton Area Transit to ensure safety for pedestrians accessing transit at this node.	High	Long Term	High	City of Brockton

Table 3: Potential Safety Enhancement Summary, Continued

Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Jurisdiction
Poor bicycle connectivity	Install bike lanes.	High	Long Term	Medium	City of Brockton
High Speed Limit	Opt into Chapter 90 Section 17 for roadways city-wide. Work with MassDOT to adjust existing peed regulations. Increase traffic enforcement.	High	Short Term	Low	City of Brockton
Poor access management	Work with abutters to improve access management	Low	Mid Term	Low	City of Brockton
Wide cross sections	Evaluate if curb radii are necessary. Install sidewalks, curbing, and bike lane. Consider using pavement width to add turning lanes and storage. If left turn lanes are added, modify signals with left turn protection.	High	Long Term	High	City of Brockton
Outdated Signage / Lack of Signage	Update signage with MUTCD supported signage plan. Install Signal Ahead advance warning signs on Torrey Street approaches. Ensure advance warning signs on Pearl Street are unobstructed by vegetation.	High	Short Term	Low	City of Brockton

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Appendix A. RSA Meeting Agenda

Agenda	Virtual Road Safety Audit for Pearl Street and Torrey Street Brockton, MA Tuesday, September 14, 2021 10:00 AM – 11:30 AM
Contact:	Bill McNulty, Old Colony Planning Council (508) 583-1833 ext. 207 wmcnulty@ocpcrpa.org (or Ray Guarino, rguarino@ocpcrpa.org)
Attendees:	Invited Participants Include a Multidisciplinary Team including Brockton Officials (Chief Elected Officials, DPW, Police, Fire, Administration, Planning), MassDOT, FHWA, Legislative Delegation
Please Bring:	Thoughts and Suggestions
Meeting Location:	Virtual Meeting (Zoom): **Registration Link** https://us02web.zoom.us/webinar/register/WN_ihbEBmQLTwmvH0RqTVW8tQ Webinar ID - 817 0283 1446 **Password - 974284**
10:00 AM	Welcome and Introductions
10:10 AM	Study Background and Review of Study Area
10:35 AM	Virtual Road Safety Audit of Pearl Street and Torrey Street • Review of Crash Data • Existing Conditions and Known Challenges • Identification of Potential Safety Improvements
11:00 AM	Wrap-Up Site Audit; Discussion of Next Steps

Instructions For Participants:

- 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
- 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
- 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

Appendix B. RSA Audit Team Contact List

Participating Audit Team Members

Date: September 14, 2021 Location: Pearl Street at Torrey Street, Brockton

Audit Team Members	Agency/Affiliation
Bill McNulty	Old Colony Planning Council
Charles Kilmer, AICP	Old Colony Planning Council
Raymond Guarino	Old Colony Planning Council
Guoqiang Li	Old Colony Planning Council
Kyle Mowatt	Old Colony Planning Council
Shawn Bailey	Old Colony Planning Council
Rob May, CEcD	City of Brockton, Director of Planning and Economic Development
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Michelle Deng	MassDOT Traffic Safety Division
Kevin Fitzgerald	MassDOT Traffic Safety Division
Ale Kuncaitis	MassDOT District Five - Projects
Bianca Marshall	MassDOT District Five - Traffic
Jason Walters	MassDOT District Five - Projects
Joseph Wong	MassDOT Traffic Safety Division
Ryan Cook	Unidentified

Appendix C. Detailed Crash Data

Crash Data Summary Table

Pearl Street at Torrey Street, Brockton, MA

2017 to 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*	*DOB*	*DOB*	*D1*	*D2*	
1	2/12/17	Sunday	3:27 PM	Rear-end	Daylight	Snow	Wet	Inattention	10/2/1969	1/12/2000	47	17	17-275-AC
2	4/29/17	Saturday	10:31 AM	Angle	Daylight	Clear	Dry	Failed to yield right of way					17-783-AC
3	7/10/17	Monday	11:19 AM	Angle	Daylight	Clear	Dry	Failure to keep in proper lane or running off road					17-1243-AC
4	11/11/17	Saturday	9:40 PM	Angle	Dark - lighted roadway	Clear	Dry	Inattention					17-2058-AC
5	11/13/17	Monday	5:13 PM	Angle	Dark - lighted roadway	Cloudy	Wet	Failed to yield right of way					17-2077-AC
6	12/14/17	Thursday	5:30 PM	Rear-end	Dark - roadway not lighted	Blowing Sand, Snow	Other	Inattention	1/23/1984	8/21/1973	33	44	17-2321-AC
7	12/21/17	Thursday	8:55 AM	Rear-end	Daylight	Clear	Dry	Unknown					17-2358-AC
8	1/19/18	Friday	3:22 PM	Angle	Daylight	Cloudy	Dry	Failure to keep in proper lane or running off road					18-169-AC
9	2/16/18	Friday	8:08 AM	Rear-end	Daylight	Cloudy	Dry	Followed too closely	10/15/1982	4/7/1995	35	22	18-369-AC
10	2/20/18	Tuesday	7:38 AM	Angle	Daylight	Clear	Dry	Failed to yield right of way					18-393-AC
11	5/21/18	Monday	6:58 AM	Angle	Daylight	Clear	Dry	Followed too closely					18-985-AC
12	6/16/18	Saturday	11:25 AM	Angle	Daylight	Clear	Dry	Failed to yield right of way					18-1152-AC
13	8/1/18	Wednesday	11:02 AM	Single Vehicle Crash	Daylight	Cloudy	Dry	No Improper Driving					18-1445-AC
14	8/5/18	Sunday	9:09 PM	Rear-end	Dark - lighted roadway	Clear	Dry	Unknown					18-1470-AC
15	8/19/18	Sunday	4:15 PM	Angle	Daylight	Clear	Dry	Unknown	6/13/1967	6/23/1989	51	29	18-1550-AC
16	1/5/19	Saturday	7:13 PM	Angle	Dark - lighted roadway	Rain	Wet	Unknown					19-24-AC
17	1/14/19	Monday	6:01 PM	Angle	Dark - lighted roadway	Clear	Dry	Unknown					19-75-AC
18	4/18/19	Thursday	1:37 PM	Angle	Daylight	Cloudy	Dry	Failed to yield right of way					19-677-AC
19	4/22/19	Monday	6:14 PM	Angle	Dusk	Rain	Wet	Inattention	1/10/1982	5/27/1972	37	46	19-710-AC
20	6/25/19	Tuesday	11:38 AM	Rear-end	Daylight	Clear	Wet	Inattention					19-1127-AC
21	8/1/19	Thursday	3:04 PM	Rear-end	Daylight	Clear	Dry	Followed too closely	5/31/1949	6/13/1983	70	36	19-1371-AC
22	11/10/19	Sunday	12:22 AM	Angle	Dark - lighted roadway	Clear	Dry	Unknown					19-2083-AC
23	12/8/19	Sunday	4:25 PM	Angle	Dark - lighted roadway	Clear	Dry	Made an improper turn					19-2307-AC
24	1/27/20	Monday	10:24 AM	Rear-end	Daylight	Clear	Dry	Followed too closely					20-174-AC
25	5/9/20	Saturday	4:12 PM	Rear-end	Daylight	Clear	Dry	Inattention	7/26/1962	9/24/1982	57	37	20-628-AC
26	6/4/20	Thursday	10:43 AM	Angle	Daylight	Clear	Dry	Unknown					20-731-AC
27	6/12/20	Friday	8:35 PM	Rear-end	Daylight	Cloudy	Wet	Followed too closely					20-768-AC
28	7/31/20	Friday	10:48 AM	Angle	Daylight	Clear	Dry	Failed to yield right of way	3/8/1962	4/16/1999	58	21	20-1035-AC
29	8/10/20	Monday	12:17 PM	Angle	Daylight	Clear	Dry	Unknown	4/18/1979	6/24/1966	41	54	20-1107-AC
30	9/9/20	Wednesday	8:34 PM	Angle	Dark - lighted roadway	Clear	Dry	Other improper action					20-1295-AC
31	9/17/20	Thursday	10:09 PM	Rear-end	Dark - lighted roadway	Clear	Dry	Other improper action					20-1341-AC
32	10/9/20	Friday	8:54 AM	Rear-end	Daylight	Clear	Dry	No Improper Driving					20-1461-AC
33	11/20/20	Friday	6:15 PM	Single Vehicle Crash	Dark - lighted roadway	Clear	Dry	Fatigued/asleep					20-1732-AC

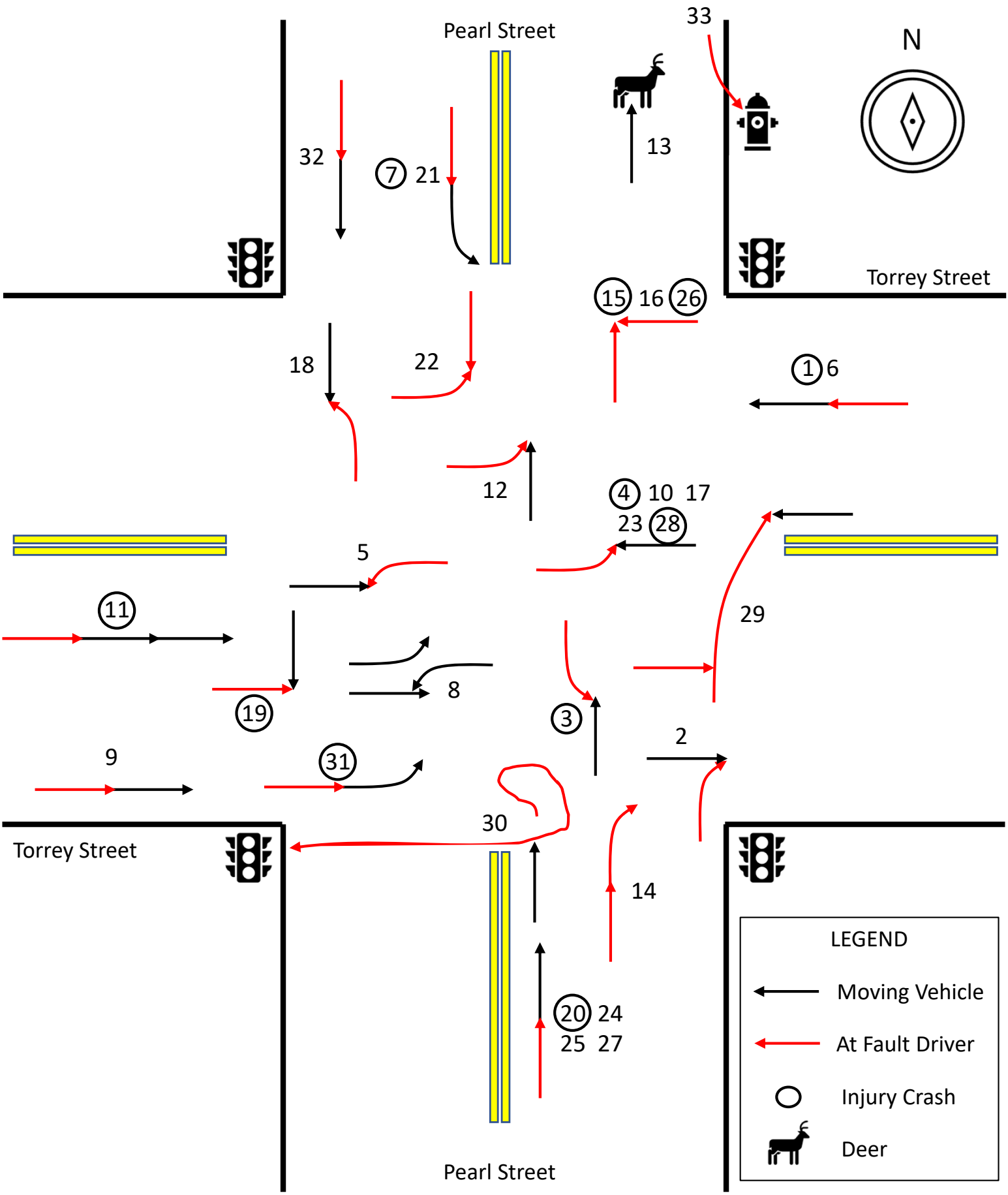
*Courtesy Crash - A term used to describe a crash that occurs subsequent to a non-involved mainline driver who gives the right of way, contrary to the rules of the road, to another driver.

COLLISION DIAGRAM

Pearl Street at Torrey Street

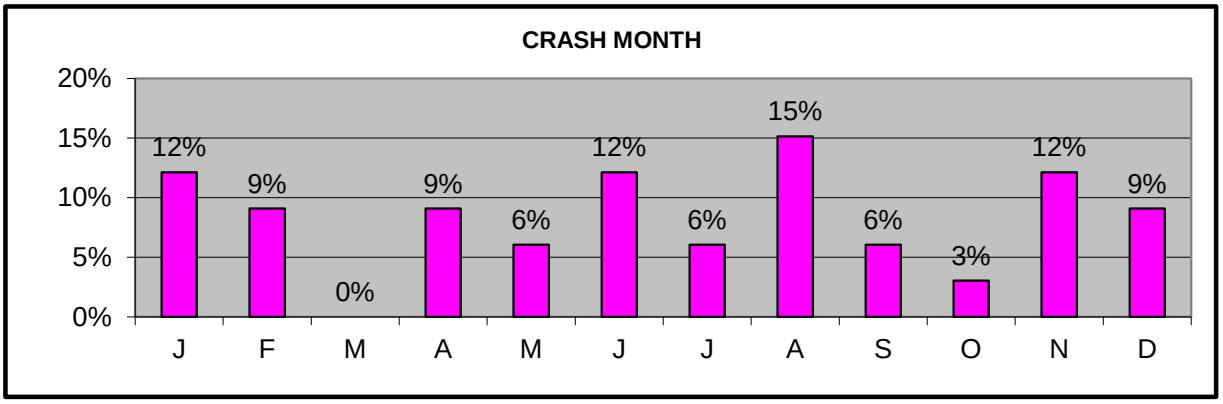
Collision Diagram for Crashes (2017-2020)

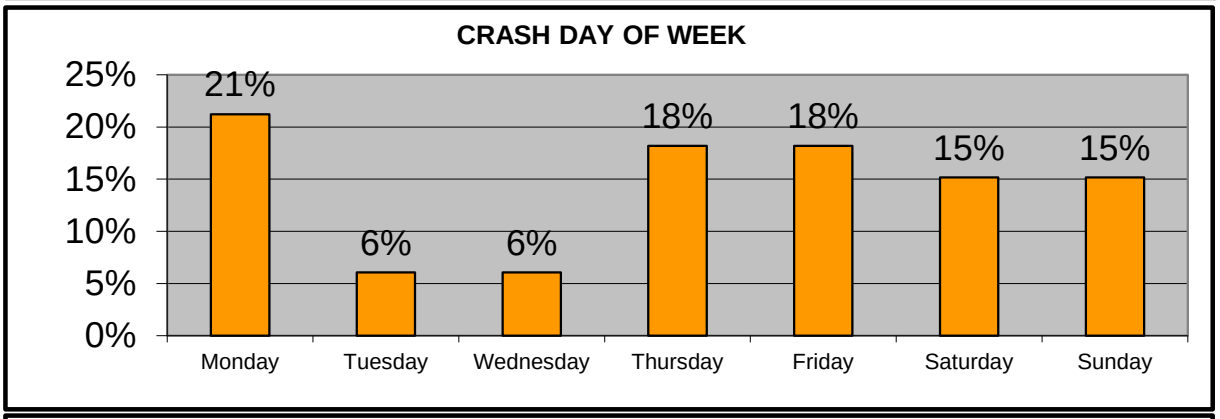
Prepared by OCPC (SB 09/2021) (Source: Brockton Police Dept.)

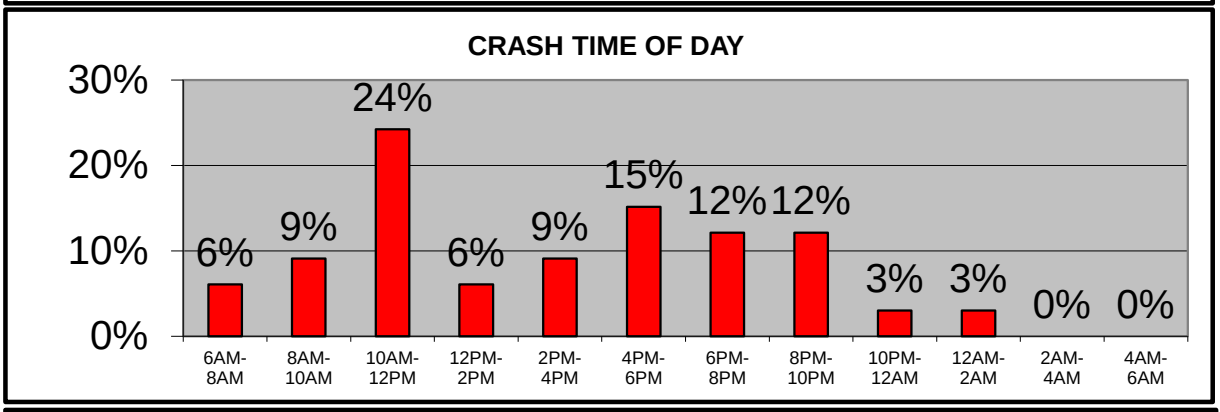


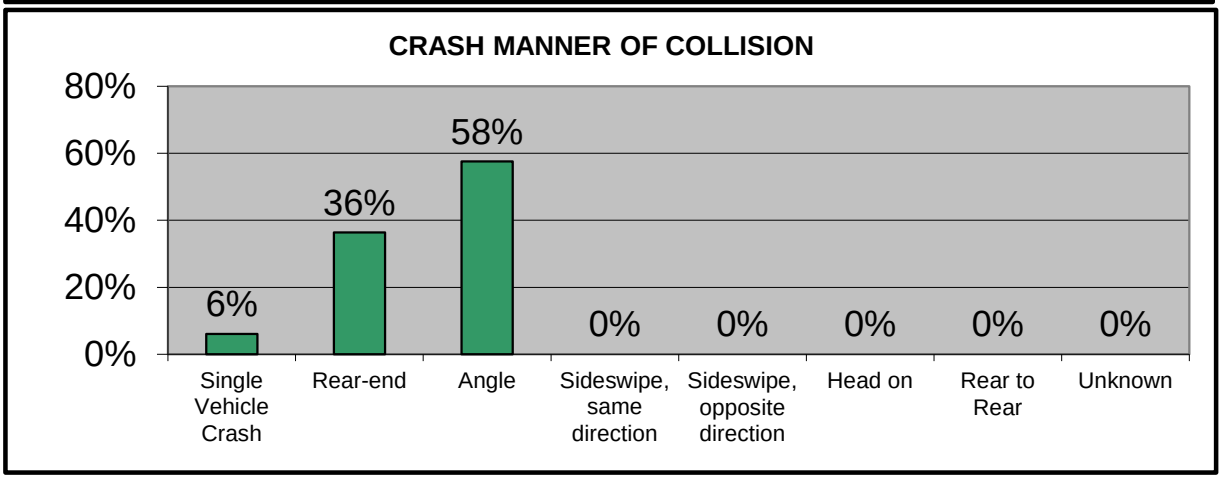
Crash Data Summary Tables and Charts

Pearl Street at Torrey Street, Brockton, MA



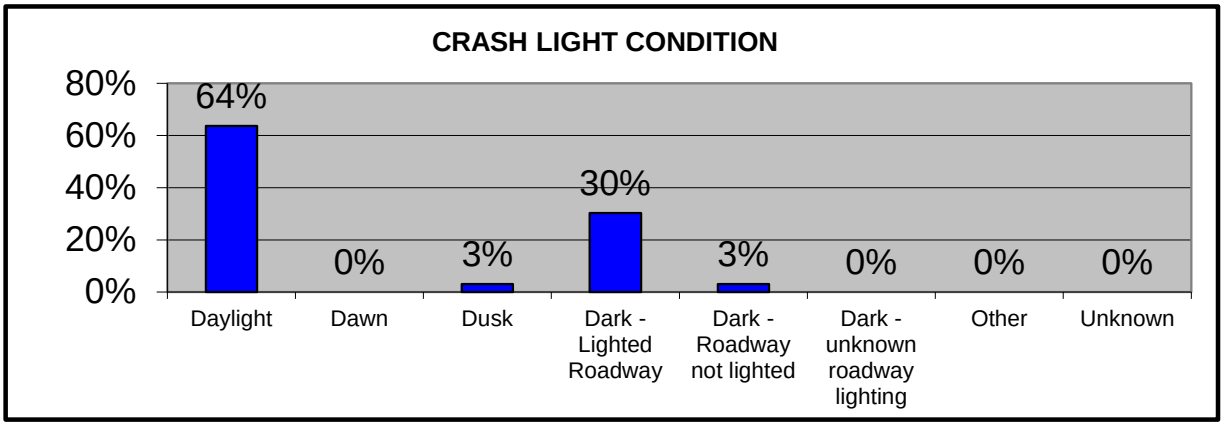


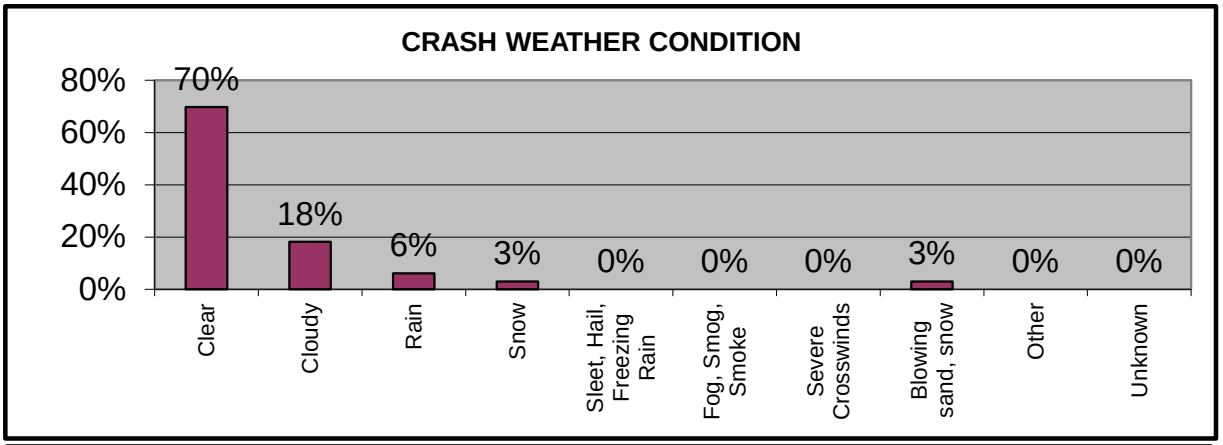


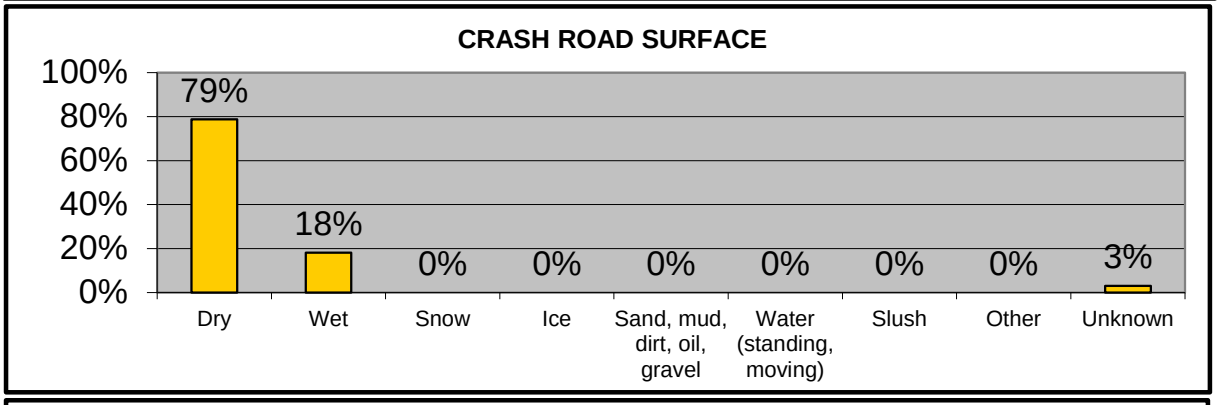


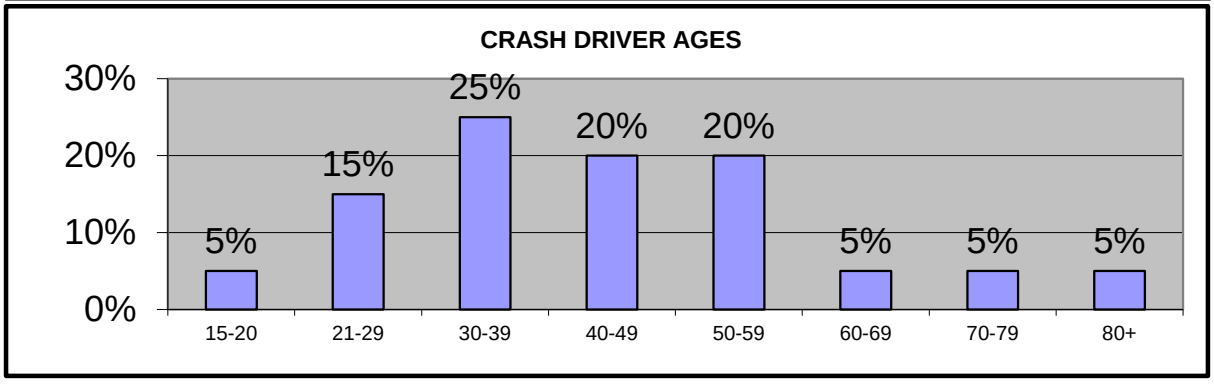
Crash Data Summary Tables and Charts

Pearl Street at Torrey Street, Brockton, MA









Appendix D. Road Safety Audit References

Road Safety Audit References

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