

ROAD SAFETY AUDIT

Commerce Way at Christa McAuliffe Boulevard and
Colony Place

Plymouth, MA

June 10, 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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Background

This Road Safety Audit for Commerce Way at Colony Place and Christa McAuliffe Boulevard 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.

This location had a calculated Equivalent to Property Damage Only (EPDO) index value of 77 based on crashes that occurred in a three-year period from January 1, 2018, through December 31, 2020., ranking #15 locally in the Town of Plymouth. The EPDO Index is a 21-Point weighting system that assigns a single point to crashes that result in property damage only and 21 points to crashes that result in an injury or fatality. This location was selected for an RSA to be performed in conjunction with an RSA for the adjacent intersection of Commerce Way at Industrial Park Road, which ranks #3 in the Town of Plymouth.

Colony Place is a large-scale commercial development featuring retail businesses, restaurants, and hotel space. The Plymouth Industrial Park is a large industrial park and is home to primarily office buildings with some light industrial and the Plymouth location of the Massachusetts Registry of Motor Vehicles (RMV).

A large 224-unit planned 55+ community (Sawyer's Reach) Is currently under construction adjacent to Colony Place, which will bring a large influx of residents to the immediate area and will likely generate a substantial number of pedestrian and bicycle trips on the area roadways.

Project Data

This Road Safety Audit was conducted on June 10, 2021, in conjunction with a Road Safety Audit for the intersection of Commerce Way at Industrial Park Road. Due to the State of Emergency, which was in effect through June 15, 2021 in the Commonwealth of Massachusetts in response to the COVID-19 pandemic, 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.

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

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. Table 1 lists the participants present during the Road Safety Audit.

Table 1: Participating Audit Team Members

Audit Team Member	Agency/Affiliation
Bill McNulty	Old Colony Planning Council
Ray Guarino	Old Colony Planning Council
Charles Kilmer, AICP	Old Colony Planning Council
Guoqiang Li	Old Colony Planning Council
Shawn Bailey	Old Colony Planning Council
Kyle Mowatt	Old Colony Planning Council
Melissa Arrighi	Town Manager – Town of Plymouth
Deputy Chief Greg Kane	Plymouth Fire Department
Jonathan Beder	Director, Town of Plymouth Department of Public Works
Sheila Sgarzi, PE	Town Engineer - Town of Plymouth Department of Engineering
Kevin Manuel	Plymouth Police Department
James Downey	Town of Plymouth Department of Engineering
Jonathan Brown	MassDOT Traffic and Safety Section
Kevin Fitzgerald	MassDOT Traffic and Safety Division
Rob Fitzgerald	MassDOT
Bianca Marshall	MassDOT District Five Traffic Operations
David Soares, PE	MassDOT District Five Traffic Operations
Lauren McNaughton	MassDOT District Five
Jane Richardson	MassDOT District Five

Project Location and Description

The intersection of Commerce Way at Colony Place and Christa McAuliffe Boulevard is in northern Plymouth, off Route 44. It is a four-legged intersection, with Commerce Way running north to south, connecting Cherry Street at its northern end to Route 80 on

the southern end. The roadway has an interchange with Route 44 just to the north of this intersection. Colony Place is a major commercial and retail center, while Christa McAuliffe Boulevard provides access to the Plymouth Industrial Park. The intersection features through lanes and turn lanes from each approach. It is controlled by an actuated traffic signal system, which provides protected left turns from left turn lanes in each approach.

Figure 1 displays an aerial photograph of the location and study area.

- **Commerce Way** Commerce Way is a four-lane Urban Minor Arterial divided roadway, with a raised median. It is under the jurisdiction of the Town of Plymouth. The roadway is a “Complete Street”, with sidewalks and bicycle lanes. There is a “Continental Style” crosswalk with ADA compliant ramps across Commerce Way on the northern side of the intersection. Pavement is in good condition. Commerce Way does not have a speed limit but is rather governed by Massachusetts General Laws prima facie speed limit of 50 MPH for a divided highway in a non-thickly settled area. The southbound approach features an exclusive right turn lane which leads into a flared, channelized, YIELD controlled right turn movement into Colony Place; two through lanes; and an exclusive left turn lane for left turns into Christa McAuliffe Boulevard. The northbound approach features three lanes: a through movement lane, an exclusive left turn lane, and a shared through movement and right turn lane.
- **Christa McAuliffe Boulevard:** Christa McAuliffe Boulevard is a two-lane, undivided non-functionally classified local roadway under the jurisdiction of the Town of Plymouth. Land use features a mix of commercial uses. The approach to the intersection features three lanes: a through lane into Colony Place; an exclusive left turn lane; and a flared channelized right turn with STOP sign control for right turns onto Commerce Way. There is a sidewalk on the northern side (westbound direction) of the roadway. There is a “Continental Style” crosswalk with ADA compliant ramps across Christa McAuliffe Boulevard at the intersection, including on the channelized right turn. There is no special speed regulation for this roadway. There are no bike lanes, sharrows, and useable shoulders.
- **Colony Place:** The drive to Colony Place is a private roadway. It is a four-lane roadway divided by a raised, vegetated median. The Colony Place approach to the intersection features three lanes: dual exclusive left run lanes, and a shared through movement and right turn lane. There is a sidewalk on the northern

inbound) side of the roadway. There is no special speed regulation for this roadway. There are no bike lanes, sharrows, and useable shoulders.

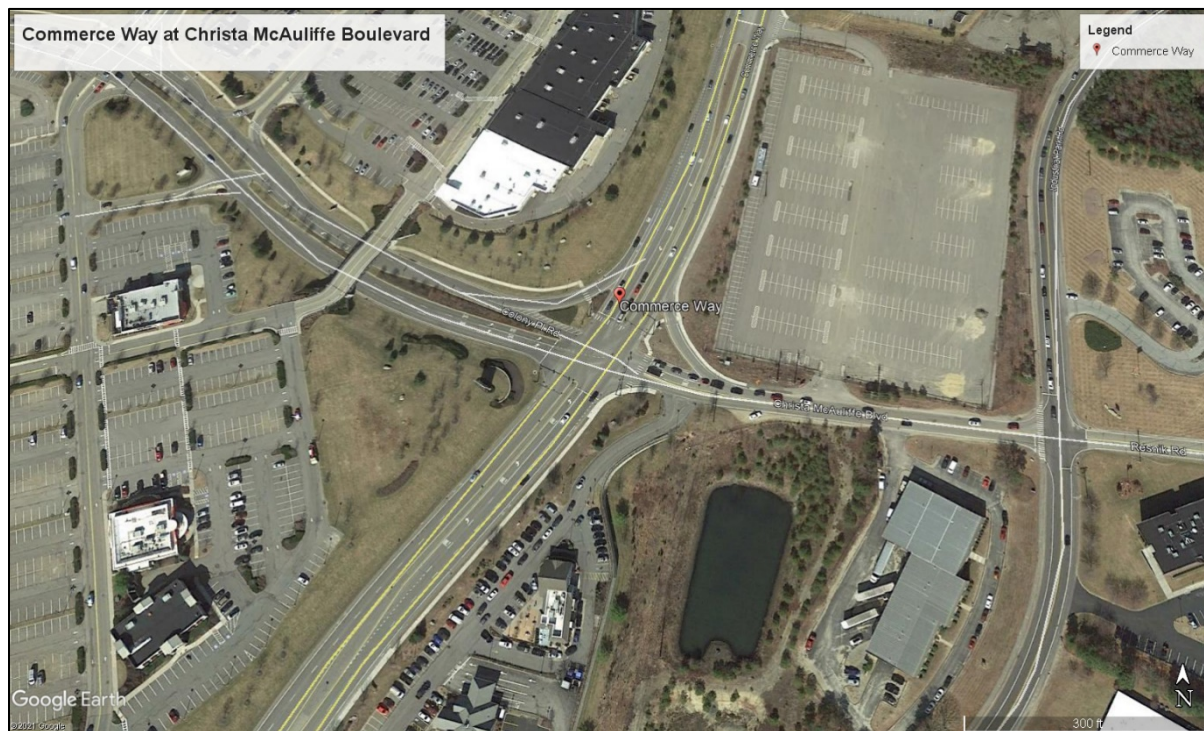


Figure 1: Locus Map

Audit Observations and Potential Safety Enhancements

Frequency of rear-end collisions: Analysis of crash reports provided by the Plymouth Police Department indicated a high percentage (45%) of crashes occurring at this location are rear-end collisions. Archived traffic data from the Old Colony Planning Council indicates that the prevailing 85th percentile speed of traffic on Commerce Way is around 50 MPH. Furthermore, the frictionless transition from Route 44 eastbound to Commerce Way southbound and lack of traffic signals and warning signage encourages drivers to maintain a high rate of speed departing Route 44 into Commerce Way. Considering these conditions, speed may be a factor in some of these collisions, with drivers unable to stop in time with stopped or slowing vehicles ahead of them. Common factors for frequent rear-end collisions drivers being unaware of intersection, sudden stops, and vehicles skidding particularly in wet conditions. Further analysis of the crash data shows over one-third of crashes occur on wet surfaces.

Potential Safety Enhancements: Use advance signage to better enhance awareness by drivers of intersection and reduce driver confusion. Ensure optimized signal coordination of signalized intersections on Commerce Way to better provide efficient platooning of vehicles. Apply high friction surface treatments to pavement on Commerce Way approaches to reduce skidding in wet conditions. Evaluate signal clearance times against prevailing speeds to ensure drives have adequate time to make decisions.

Prevailing speeds high for shared use with bicycles: Prevailing speeds on this roadway make it unattractive for bicyclists, even with the striped bike lane. Lowering the speed limit to one preferred by bicyclists for comfort and safety (<35 MPH) does not appear feasible at this location based on existing design.

Potential Safety Enhancements: Separate bicycle lane from travel lane with physical barrier or replace with a shared use separated path.

Lack of bicycle conflict markings: There are no bicycle conflict markings painted in the intersection.

Potential Safety Enhancement: Stipe bicycle conflict markings in intersection.

High volumes of turning movements: Trip generation from both the Colony Place development on the west side of the intersection and the industrial park on the east side of the intersection results in high volumes of turning movements. These volumes of turning movements not only require large queuing spaces but may also be a factor in several of the collisions occurring here.

Potential Safety Enhancements: Long term, consider reconstructing the intersection with a multi-lane roundabout. A roundabout would reduce conflicts between through moving and turning vehicles while also reducing severity of crashes that occur.

Lack of advance warning signs: Neither direction of Commerce Way has advance signage to warn drivers of a signalized intersection coming up. Lack of advance warning of the intersection could be a factor in same direction sideswipe collisions at this location (sudden unsafe lane change when driver realizes cross-street is coming up) as well as some of the rear-end collisions (sudden, unsafe stops).

Potential Safety Enhancements: Install MUTCD compliant advance warning signage on each approach.

Vulnerability of pedestrians: The channelized right turns from Commerce Way southbound into Colony Place, and from Christa McAuliffe Boulevard northbound to Commerce way have crosswalks crossing them. The combination of drivers making

these turns at relatively high rates of speed and reduced visibility due to the curve increases vulnerability and hazard level for pedestrians. Furthermore, prevailing speeds on Commerce Way create a high stress environment for pedestrians with little separation between the travel lane and sidewalk provided for pedestrians.



Image 1: Pedestrian crossing on high-speed free right turn lane increases hazard for pedestrians.

Potential Safety Enhancements: Enhance pedestrian safety at these crossings with a combination of signage and/or pedestrian activated beacons. Use flashing illuminated border on STOP sign on Christa McAuliffe Boulevard right turn to emphasize stop for motorists in advance of crosswalk. Enhance pedestrian comfort and safety by creating vegetated buffer and higher profile curbing between roadway and sidewalk, or shared-use path.

Incomplete pedestrian network: Only one side of Commerce Way has a sidewalk. The side of Commerce Way where a large scale planned residential community (Sawyers Reach) is currently under construction does not have sidewalks. Pedestrian connections do not currently extend into the industrial park.

Potential Safety Enhancements: Construct new sidewalks and crosswalks to complete pedestrian network.

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
Frequency of rear-end Collisions	Ensure optimized signal coordination. Provide high friction surface treatments. <i>Evaluate signal clearance times against prevailing speeds to ensure drives have adequate time to make decisions.</i>	High	Mid-Term	Medium	Town of Plymouth
Prevailing speeds high for shared use with bicyclists	Separate bike lane from travel lane with barrier or replace with separated, shared use path	High	Long Term	High	Town of Plymouth
No bicycle conflict markings	Add bicycle conduct markings through intersection.	Medium	Short Term	Low	Town of Plymouth
Large volumes of turning movements.	Replace traffic signal with multi-lane roundabout.	High	Long Term	High	Town of Plymouth
Lack of advance warning Signs	Install MUTCD compliant intersection ahead and lane usage signage	Medium	Short Term	Low	Town of Plymouth
Vulnerability of pedestrians	Enhance driver awareness of pedestrians on sweeping right turns (Signage / Flashing Beacon). Enhance separation between Commerce Way and pedestrians with vegetated buffer, higher profile physical barriers, or separated shared-use path. Tighten curb radius on southeast corner.	Medium	Short Term / Long Term	Low / High	Town of Plymouth
Incomplete pedestrian network	Complete sidewalk and crosswalk network into industrial park.	High	Long Term	High	Town of Plymouth

Appendix A. RSA Meeting Agenda

Agenda	<p style="text-align: center;">Virtual Road Safety Audit for Commerce Way (Plymouth) Intersections Commerce Way at Christa McAuliffe Boulevard and Colony Place Commerce Way at Industrial Park Road Plymouth, MA Thursday, June 10, 2021 10:00 AM – 11:30 AM</p>
Contact:	<p>Bill McNulty, Old Colony Planning Council (508) 583-1833 ext. 207 wmcnulty@ocpcrpa.org</p>
Attendees:	<p>Invited Participants Include a Multidisciplinary Team including Plymouth Officials (Chief Elected Officials, DPW, Police, Fire, Administration, Planning), MassDOT, FHWA, Legislative Delegation</p>
Please Bring:	<p>Thoughts and Suggestions</p>
Meeting Location:	<p>Virtual Meeting (Zoom): https://us02web.zoom.us/j/85316852872?pwd=MDFaZkpUNIF6V1VNTHTFRUKRnbXRhUT09 Webinar ID: 853 1685 2872 Password: 747072</p>
10:00 AM	<p>Welcome and Introductions</p>
10:05 AM	<p>Study Background and Review of Study Area</p>
10:10 AM	<p>Virtual Road Safety Audit of Commerce Way at Christa McAuliffe Boulevard / Colony Place</p> <ul style="list-style-type: none"> • Review of Crash Data • Existing Conditions and Known Challenges • Identification of Potential Safety Improvements
10:40 AM	<p>Virtual Road Safety Audit of Commerce Way at Industrial Park Road / Plaza Way</p> <ul style="list-style-type: none"> • Review of Crash Data • Existing Conditions and Known Challenges • Identification of Potential Safety Improvements
11:10 AM	<p>Wrap-Up Site Audit; Discussion of Next Steps</p>
<p>Instructions For Participants:</p> <ul style="list-style-type: none"> • 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:	June 10, 2021	Location:	Commerce Way at Christa McAuliffe Boulevard, Plymouth
Audit Team Members		Agency/Affiliation	
Bill McNulty		Old Colony Planning Council	
Ray Guarino		Old Colony Planning Council	
Charles Kilmer, AICP		Old Colony Planning Council	
Guoqiang Li		Old Colony Planning Council	
Shawn Bailey		Old Colony Planning Council	
Kyle Mowatt		Old Colony Planning Council	
Melissa Arrighi		Town Manager – Town of Plymouth	
Deputy Chief Greg Kane		Plymouth Fire Department	
Jonathan Beder		Director, Town of Plymouth Department of Public Works	
Sheila Sgarzi, PE		Town Engineer - Town of Plymouth Department of Engineering	
Kevin Manuel		Plymouth Police Department	
James Downey		Town of Plymouth Department of Engineering	
Jonathan Brown		MassDOT Traffic and Safety Section	
Kevin Fitzgerald		MassDOT Traffic and Safety Section	
Rob Fitzgerald		MassDOT	
Bianca Marshall		MassDOT District Five Traffic Operations	
David Soares, PE		MassDOT District Five Traffic Operations	
Lauren McNaughton		MassDOT District Five	
Jane Richardson		MassDOT District Five	

Appendix C. Detailed Crash Data

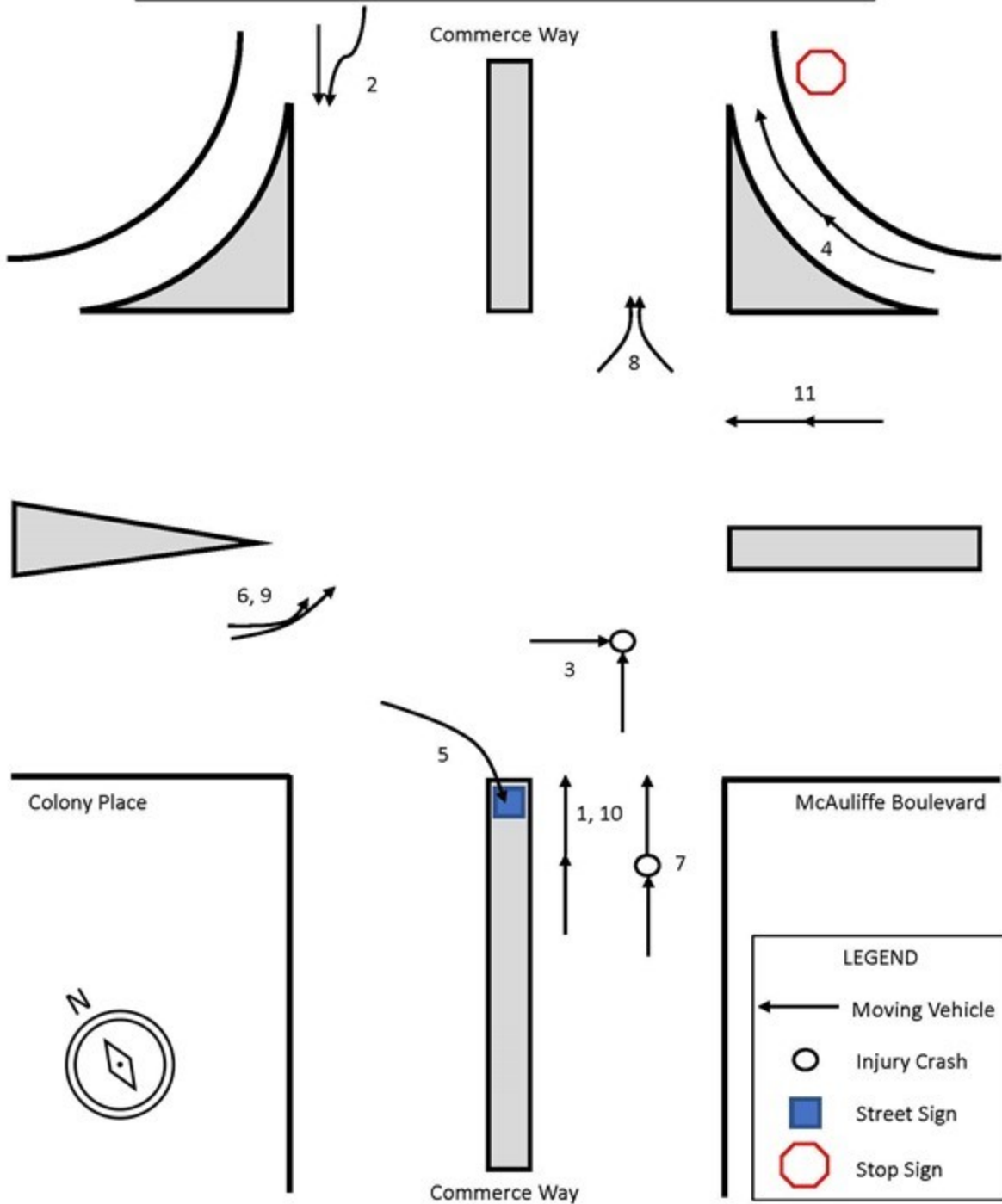
Crash Data Summary Table

Commerce Way at Colony Place & McAuliffe Boulevard - Plymouth, MA
2017-2020

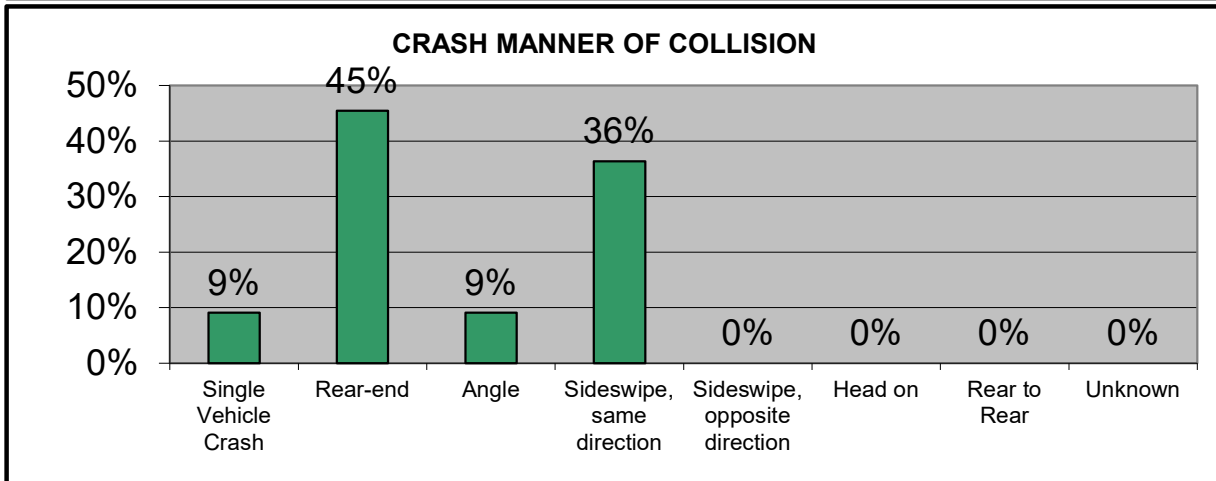
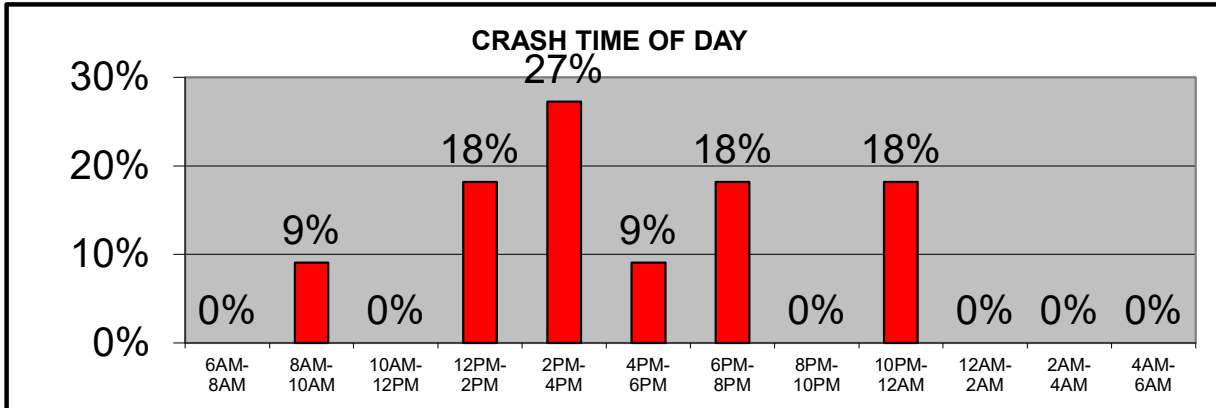
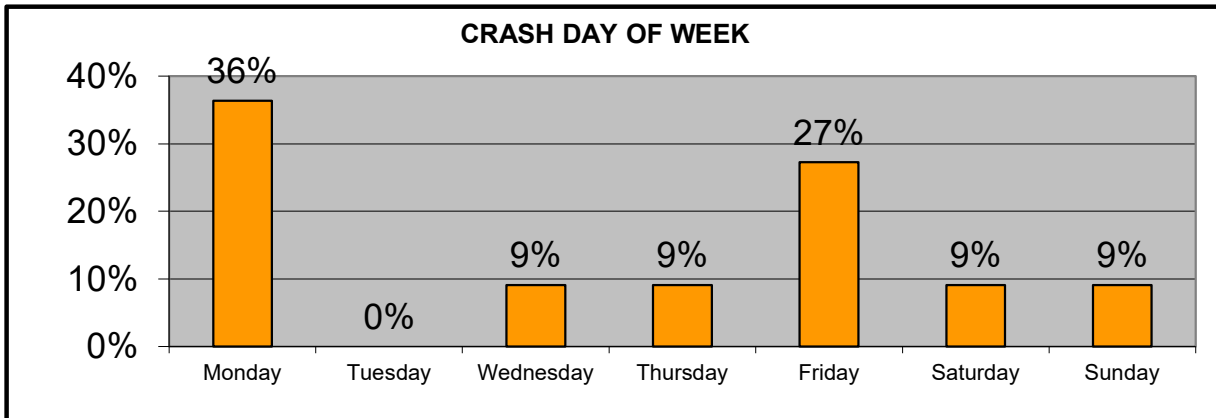
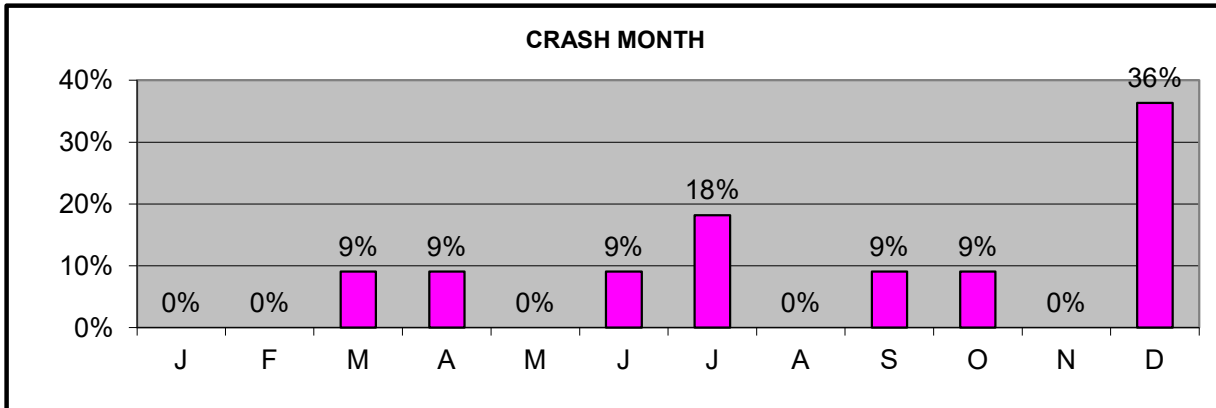
Crash Diagram Ref #	Crash Date <i>m/d/y</i>	Crash Day	Time of Day	Manner of Collision <i>Type</i>	Light Condition <i>Type</i>	Weather Condition <i>Type</i>	Road Surface <i>Type</i>	Driver Contributing Code <i>Type</i>	Ages		Comments
									<i>D1</i>	<i>D2</i>	
1	7/24/17	Monday	8:58 AM	Rear-end	Daylight	Rain	Wet	No Improper Driving	74	34	17PLY-16967-AC
2	7/23/18	Monday	12:58 PM	Sideswipe, same direction	Daylight	Clear	Dry	No Improper Driving	37	72	18PLY-16845-AC
3	9/10/18	Monday	11:48 PM	Angle	Dark - lighted roadway	Rain	Wet	Disregarded traffic signs, signals, road markings	35	25	18PLY-20952-AC
4	3/27/19	Wednesday	6:00 PM	Rear-end	Dusk	Clear	Dry	Followed too closely	35	45	19PLY-6475-AC
5	12/12/19	Thursday	11:33 PM	Single Vehicle Crash	Dark - lighted roadway	Clear	Wet	Over-correcting/over-steering	30	119	19PLY-30412-AC
6	12/16/19	Monday	6:19 PM	Sideswipe, same direction	Dark - lighted roadway	Cloudy	Dry	Made an improper turn	18	45	19PLY-30744-AC
7	10/30/20	Friday	5:20 PM	Rear-end	Dusk	Snow	Wet	Unknown	29		20PLY-34225-AC
8	12/11/20	Friday	2:23 PM	Sideswipe, same direction	Daylight	Cloudy	Dry	Failure to keep in proper lane or running off road	55	23	20PLY-39186-AC
9	4/22/18	Sunday	12:29 PM	Sideswipe, same direction	Daylight	Clear	Dry	No Improper Driving			18PLY-8900-AC
10	6/30/18	Saturday	2:53 PM	Rear-end	Daylight	Clear	Dry	Operating defective equipment			18PLY-14676-AC
11	12/7/18	Friday	3:37 PM	Rear-end	Daylight	Clear	Dry	Unknown			18PLY-27948-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.

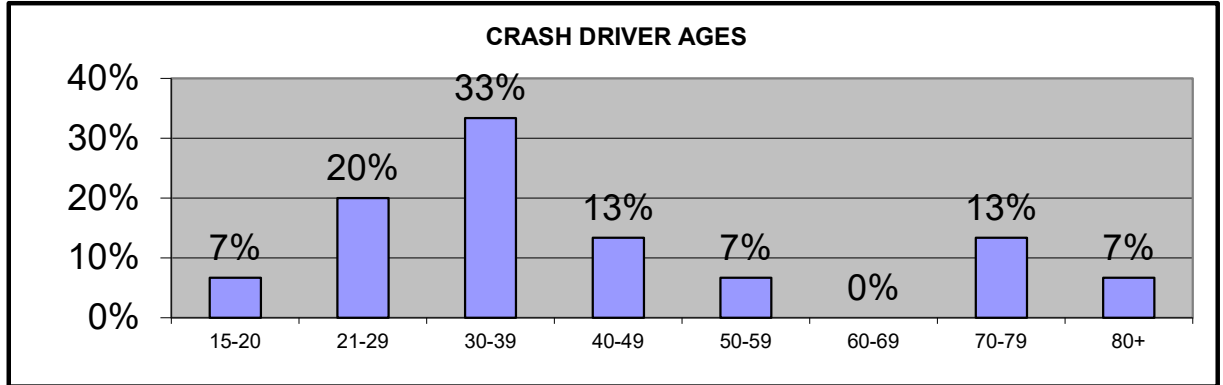
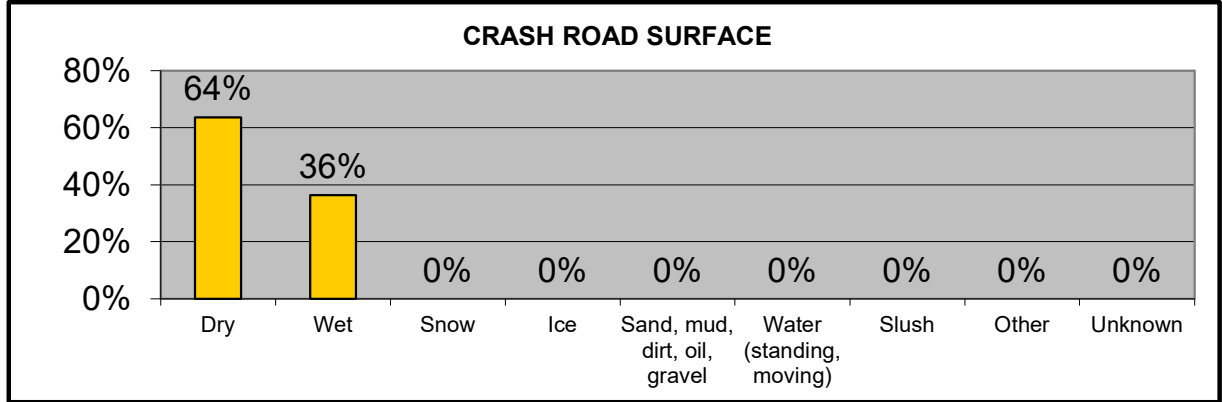
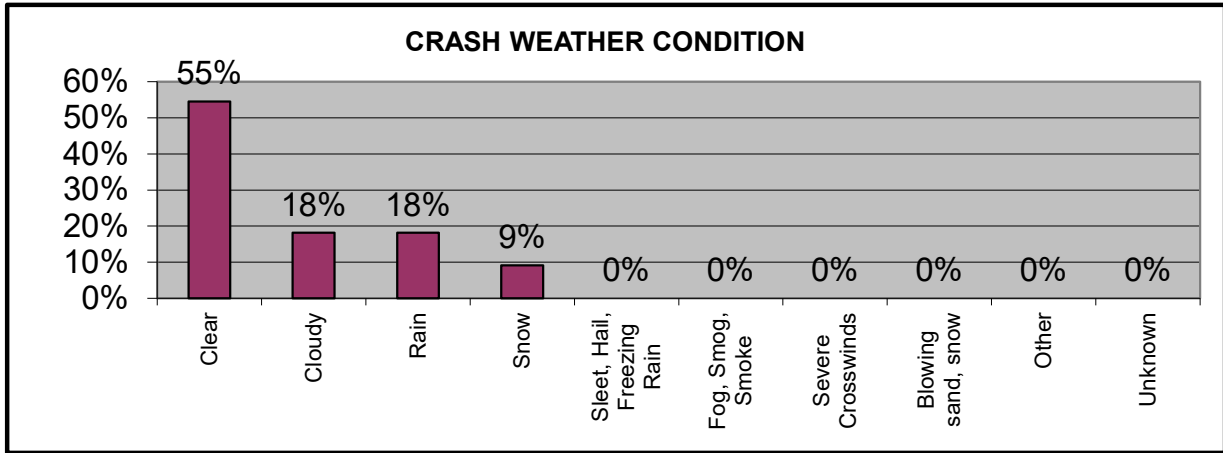
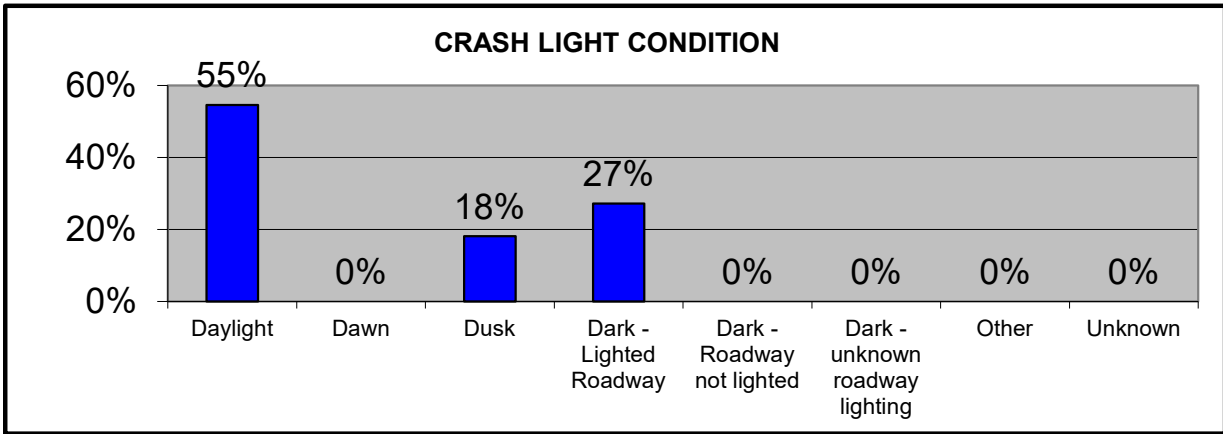
COLLISION DIAGRAM
 Commerce Way at Colony Place & McAuliffe Boulevard
 Collision Diagram for Crashes (2017-2020)
 Prepared by OCPC (SB 04/2021) (Source: Plymouth Police Dept.)



Crash Data Summary Tables and Charts
 Commerce Way at Colony Place & McAuliffe Boulevard - Plymouth, MA



Crash Data Summary Tables and Charts
 Commerce Way at Colony Place & McAuliffe Boulevard - Plymouth, MA



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/>.

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