

ROAD SAFETY AUDIT

Washington Street (Route 138) at Purchase Street and
Turnpike Street at Purchase Street

Municipality of Easton

April 2018

Prepared For:

The Town of Easton

Prepared By:

Old Colony Planning Council
70 School Street, Brockton, MA 02301
Under MassDOT Contract 88826



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Background

This Road Safety Audit (RSA) for two intersections in Easton, Washington Street (Route 138) at Purchase Street and Turnpike Street at Purchase Street was conducted by the Old Colony Planning Council, (OCPC) for the Town of Easton. OCPC received a request from the Town of Easton Department of Public Works for a Road Safety Audit for the intersection of Turnpike Street at Purchase Street. According to the Easton DPW, this intersection has drawn the attention of the town's Traffic Safety Committee due to numerous crashes at this location. The Turnpike Street/Purchase Street intersection is included in MassDOT's 2013-2015 HSIP Crash Clusters. In addition, this intersection is included in the Old Colony Region's Top 100 High Crash Intersection List. The intersection of Washington Street (Route 138) at Purchase Street was added to the Road Safety Audit at the suggestion of OCPC, because the intersections are in close proximity.

Both of the intersections were included in the Easton State Number Route Corridor Study, which was prepared by OCPC in 2007. The corridor study was a comprehensive study of the state numbered routes in the Town of Easton for the purpose of identifying specific problems in traffic efficiency, circulation, and safety.

The Easton State Number Route Corridor Study concluded that the traffic flow on the major roads, Washington Street (Route 138) and Turnpike Street, is so heavy during the peak hours that side street traffic on minor streets, which are stop-controlled approaches, has very few sufficient gaps in the major street traffic to make safe, efficient through, left, or right turning movements. The levels-of-service (LOS) on the side street approaches are characterized as forced flow conditions (LOS "F") during the afternoon peak hour.

Project Data

The Road Safety Audit (RSA) took place on Tuesday October 3, 2017 at the Easton Town Hall, located at 136 Elm Street, North Easton MA. The meeting was facilitated by OCPC staff. OCPC provided collision diagrams and the latest crash experience (2013 through 2017), based on crash reports provided by the Easton Police Department. In addition, OCPC compiled background traffic data and analysis including morning and afternoon turning movement counts, intersection peak hour levels-of-service, and signal warrant analysis. This data and analysis is included in the appendix to this report.

The RSA meeting consisted of three components. The first portion of the meeting focused on a discussion of the issues and concerns. The participants left the meeting room and proceeded to the intersection to visit the site for the second portion of the meeting. The discussion of issues was continued during the site visit as OCPC staff took notes. The third portion of the meeting focused on potential short term and long term potential improvements for the intersections. The agenda and the background materials are included in the appendix to this report. Table 1 lists the names and affiliations of the audit participants.

Table 1: Participating Audit Team Members

Audit Team Member	Agency/Affiliation
Thomas Rebello	MassDOT District 5
David Field	Easton DPW
Elsa Chan	MassDOT Traffic Safety
Gary Sullivan	Easton Police Department
Greg Swan	Easton DPW
Connor Keating	MassDOT Traffic Safety
Jason Walters	MassDOT Projects
Kevin Partridge	Easton Fire Department
Bill McNulty	Old Colony Planning Council
Raymond Guarino	Old Colony Planning Council

Project Location and Description

Washington Street (Route 138)

Washington Street (Route 138) runs north-south through the eastern portion of Easton from Stoughton to Raynham. The posted speed limit varies from 40 miles per hour to 45 miles per hour. The speed limit is posted at 45 MPH on Washington Street (Route 138) northbound side north of the Purchase Street intersection. Washington Street (Route 138) provides two lanes of travel, one for each direction of travel through the study area. There is a six to seven foot shoulder on both sides of Washington Street (Route 138) within the study area. There are no sidewalks along Washington Street (Route 138) in the vicinity of the study area.

Washington Street (Route 138) connects to I-495 in Norton to I-93 (Route 128) in Canton and is an important connection for local communities to and from the interstate network. It connects with I-495 in Raynham and runs parallel to Route 24 north through Stoughton to I-93 (Route 128). Washington Street (Route 138) is often used as an alternative to Route 24, especially when incidents and back-ups occur on Route I-495.

The land use along Washington Street (Route 138) varies with multiple driveways and side roads serving residential, commercial, and institutional uses. There are a number of retail plazas along Route 138 and an industrial park is located off of Plymouth Drive to the east of the road. Washington Street (Route 138) is eligible for federal funding under the Surface Transportation Program (STP) within the study area. Washington Street (Route 138) is classified as an “Urban Minor Arterial,” within the study area, based upon MassDOT’s road inventory. According to MassDOT’s road inventory, Washington Street (Route 138) in Easton is under state jurisdiction within the study area.

Turnpike Street

Turnpike Street is a two lane facility (north-south) and classified as an “Urban Minor Arterial” roadway under local town jurisdiction in the study area. The speed limit is posted at 30 MPH on Turnpike Street northbound and southbound approaching the Purchase Street intersection and 40 MPH on Turnpike Street on the northbound side north of the Purchase Street intersection. On the southbound side of Turnpike Street, the speed limit is posted at 30 MPH approaching the Purchase Street intersection. There are no shoulders along Turnpike Street and a sidewalk is located along the west side of Turnpike Street in the study area.

Purchase Street

Purchase Street is a two lane road classified as a “Major Urban Collector” under town jurisdiction. It extends from Depot Street (Route 123) in Easton to the West Bridgewater line, where it becomes West Street and connects to West Center Street (Route 106). The posted speed limit on Purchase Street is 25 MPH eastbound approaching Washington Street (Route 138) and 35 MPH westbound west of the Washington Street (Route 138) intersection.

The Turnpike Street/Purchase Street Intersection

Turnpike Street and Purchase Street form a four-way intersection in Easton located approximately 650 feet north of the Washington Street (Route 138)/Turnpike Street intersection and 340 feet east of the Washington Street (Route 138)/Purchase Street intersection. The intersection is stop sign controlled on the eastbound and westbound Purchase Street approaches. There is a flashing beacon facing the Purchase Street eastbound and westbound approaches (located on the east side of Turnpike Street), and one located on the southwest corner facing northbound and southbound traffic on Turnpike Street. All four approaches to the intersection provide a single lane shared for left, through, and right turning vehicles. There is limited sight distance on the Purchase Street westbound approach due to vegetation at the side of the road.

Washington Street (Route 138) and Turnpike Street form a “Y” type intersection south of Turnpike Street and Purchase Street. Consequently, vehicles headed northbound on Washington Street (Route 138) bearing right through this “Y” intersection have very little deflection and maintain a high rate of speed as they head northbound approaching the Turnpike Street/Purchase Street intersection.

The level-of-service for vehicles on the Purchase Street shared lane eastbound stop-signed approach is LOS “D” during the morning peak hour and LOS “E” during the afternoon peak hour. The level-of-service for vehicles on the Purchase Street shared lane westbound stop-signed approach is LOS “F” during the morning peak hour and LOS “E” during the afternoon peak hour.

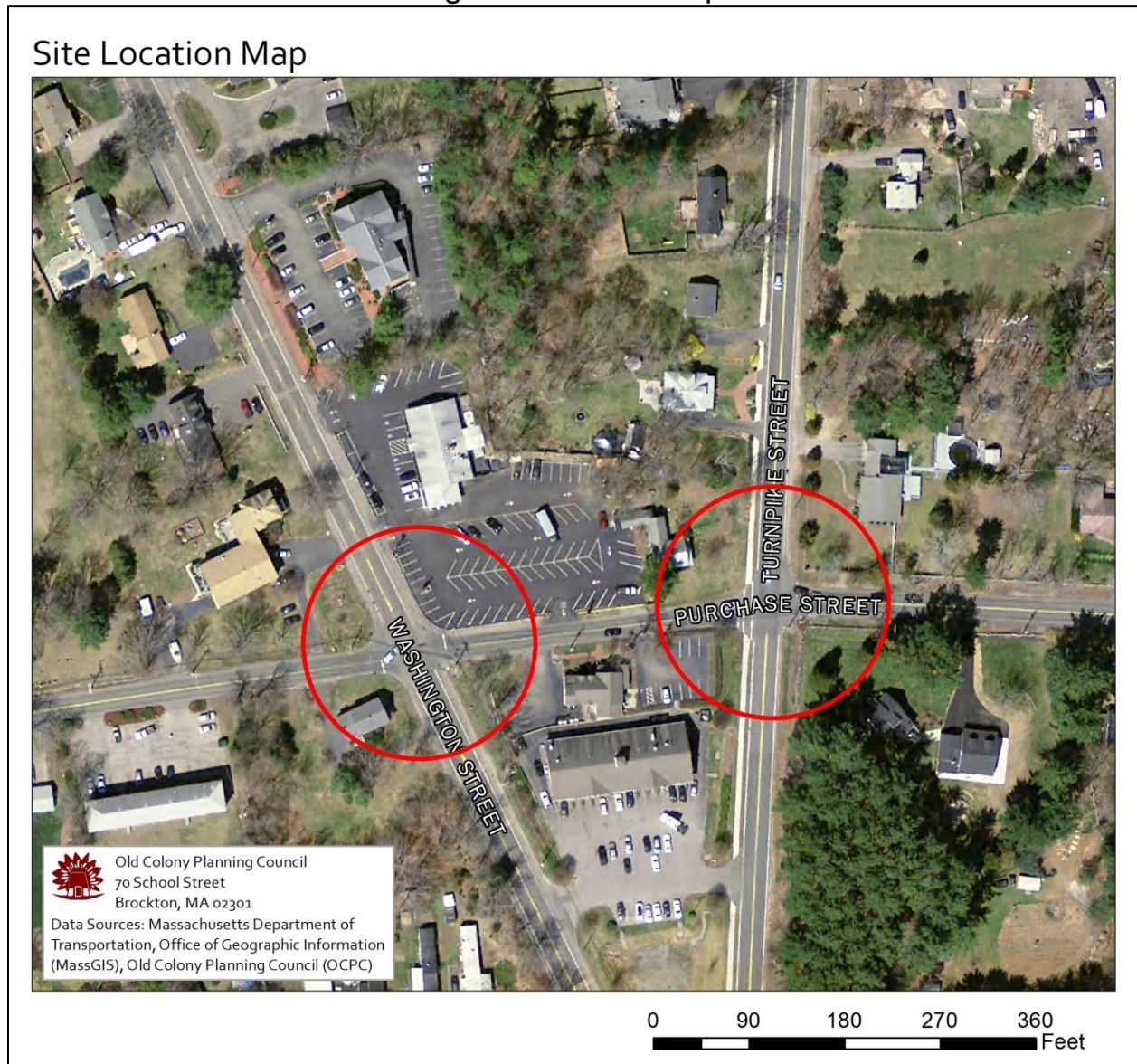
The Washington Street (Route 138)/Purchase Street Intersection

The Washington Street (Route 138)/Purchase Street Intersection is a four-way intersection located approximately 340 feet west of the Turnpike Street/Purchase Street intersection. The intersection is stop-controlled on the eastbound and westbound Purchase Street approaches. All four approaches provide a

single shared left, through, and right turn lane. A restaurant parking lot is located adjacent to Purchase Street on the northern side of the street. The restaurant parking lot has two curb cut entrances and exits off of the east side of Washington Street (Route 138), and one exit off of Purchase Street.

The level-of-service for vehicles on the Purchase Street shared lane eastbound stop-signed approach is LOS “C” during the morning peak hour and LOS “C” during the afternoon peak hour. The level-of-service for vehicles on the Purchase Street shared lane westbound stop-signed approach is LOS “C” during the morning peak hour and LOS “D” during the afternoon peak hour.

Figure 1: Locus Map



Crash Details

Crash data for both intersections, Washington Street (Route 138) at Purchase Street and Turnpike Street at Purchase Street, were obtained from the Easton Police Department for the years 2013 through 2017. The data was analyzed by OCPC in accordance with the standard practices published by the Institute of Transportation Engineers (ITE) in the Manual of Traffic Engineering Studies.

There were a total of 49 crashes at the Turnpike Street/Purchase Street intersection within the study time period. Ninety percent of the crashes were angle type crashes, four percent were rear-end crashes, four percent were head-on crashes, and two percent were vehicle ran off the road type crashes.

Forty-eight percent of the crashes resulted in personal injury, while 52 percent resulted in property damage only. The majority of the crashes were spread out evenly during the day between 6 a.m. and 6 p.m. and occurred under daylight and dry conditions; however there were 14 percent or six crashes that occurred after dark and before 6 a.m. The intersection has a crash rate of 2.75 crashes per million entering vehicles. The MassDOT District 5 average for unsignalized intersections is 0.58 crashes per million entering vehicles. More detailed crash data is included in the Appendix.

Audit Observations and Potential Safety Enhancements

During the RSA meeting prior to the field visit, a brief introduction of the RSA process and a summary of traffic volumes and crash information were presented to the audit participants. Following this brief presentation, the members of the audit team were asked to discuss the existing issues that may affect safety at the two intersections, Washington Street (Route 138) at Purchase Street and Turnpike Street at Purchase Street in Easton. The audit team then visited the site as a group, at which time observations, safety concerns, and deficiencies were identified and documented.

The following provides a list of the safety concerns and the potential enhancements that were identified during the RSA.

Turnpike Street at Purchase Street Intersection:

Safety Issue: Lack of Advanced Warning Signs

On Turnpike Street northbound approaching Purchase Street, there is a lack of warning signs indicating the presence of an intersection ahead. On the southbound approach, there is a “reduce speed ahead” sign before the posted 30 MPH speed limit sign, but no warning of the potential to cross moving traffic. There are “Stop Ahead” warning signs on the Purchase Street westbound and eastbound approaches to the intersection.

Enhancements: Improve visibility at the intersection by installing



Purchase Street westbound approach to the Turnpike Street/Purchase Street intersection.

overhead beacons and adding advanced warning on the northbound and southbound Turnpike Street approaches.

Safety Issue: Lack of Sight Distance on the Purchase Street Approach Due to Vegetation and Parking on Turnpike Street

Sight distance for vehicles approaching the intersection on the stop-sign controlled Purchase Street westbound approach is obscured by the presence of vegetation along the east side of Turnpike Street.



Purchase Street westbound approach looking south toward Turnpike Street

Enhancements: Improve visibility at the intersection by trimming back vegetation on the southwest corner of the intersection, adjust stop bars, and adjust the height of signs. In addition, restrict or prohibit parking on Turnpike Street.

Safety Issue: The Flashing Beacon Visibility is Blocked

The flashing beacon visibility, located on the southeast corner of the intersection, is blocked by a utility pole and weight limit signs.

Enhancements: Improve visibility at the intersection by installing overhead beacons.

Safety Issue: Too Few Gaps in Turnpike Street Traffic

The traffic flow on Turnpike Street, which has the right of way at the intersection, is such that there are very few gaps in the traffic sufficient for vehicles turning from the Purchase Street side streets to enter Turnpike Street safely.

Enhancements: Install Traffic signals. Warrant analyses were performed for the intersection and the intersection satisfies the Manual On Uniform Traffic Control Devices (MUTCD) Warrants for Warrant 1, Eight-Hour Vehicular Volume, Warrant 2, Four-Hour Vehicular Warrant, and Warrant 3, Peak Hour Warrant.

Safety Issue: False Right Turn Directional Signal on Turnpike Street Northbound Vehicles

As vehicles headed northbound on Washington Street (Route 138) bear right at the Washington Street (Route 138)/Turnpike Street intersection, they quickly approach the Turnpike Street/Purchase Street intersection, which is approximately 650 feet just north of the Washington Street (Route 138)/Turnpike Street intersection. They make this movement at a high rate of speed because there is very little deflection for northbound right turns at the Washington Street (Route 138)/Turnpike Street intersection. In addition, the right-turn directional signals on many of these vehicles that make this movement are still on. As these vehicles approach Purchase Street, with their directional turn signal still on, it appears that their directional is for the Turnpike Street/Purchase Street intersection, which falsely indicates to vehicles waiting to turn from Purchase Street to Turnpike Street that these vehicles would be turning right at that

intersection. These vehicles turn onto Turnpike Street in anticipation of a gap in traffic, when in fact the vehicles are actually going through the intersection and not turning right.

Enhancement: Change the turning radius at the Washington Street (Route 138)/Turnpike Street intersection to create a sharper turn thereby adding deflection and slowing down vehicles turning right on Washington Street (Route 138) northbound to Turnpike Street.

Safety Issue: Poor Pavement Conditions

The pavement is in poor condition on the southeast corner of Purchase Street. This condition puts vehicle tires at risk and is detrimental to motorcycles and bicycles.

Enhancement: Repair and resurface the road surface at the intersection.

Washington Street (Route 138) at Purchase Street Intersection:

Safety Issue: Visibility at the intersection is limited and On Street Parking Blocks Sight Lines

On street parking is occurring on Washington (Route 138) on both sides of the road, especially in the vicinity of the restaurant, and vegetation on the southwest corner blocks sight lines.

Enhancement: Enforce no parking on state highways on Washington Street (Route 138) in the vicinity of the Washington Street (Route 138)/Purchase Street intersection. Clear vegetation on the southwest corner of the intersection and add overhead flashing beacons (red on the stop sign approach and yellow on the Washington Street (Route 138) approaches.

Enhancement: Install overhead flashing beacons, flashing red facing Purchase Street stop approaches and yellow facing northbound and southbound Washington Street (Route 138) approaches.

Enhancement: Signalize the intersection. Warrant analyses were performed for the intersection and the intersection satisfies the Manual On Uniform Traffic Control Devices (MUTCD) Warrants for Warrant 1, Eight-Hour Vehicular Volume, Warrant 2, Four-Hour Vehicular Warrant, and Warrant 3, Peak Hour Warrant.

Safety Issue: Lack of Advanced Warning Signs

The Washington Street (Route 138) northbound and southbound approaches to the intersection lack warning signs. The eastbound Purchase Street approach has a stop ahead warning sign; however, this sign is partially blocked by vegetation.

Enhancement: Add warning signs to the northbound and southbound Washington Street (Route 138) approaches to the intersection. Clear vegetation blocking signs.

Safety Issue: Speeding on Washington Street (Route 138)

Vehicles on the Washington Street (Route 138) northbound and southbound approaches to the intersection, which have the right of way through the intersection, pass through often at high speeds.

Enhancements: Enhance speed enforcement.

Summary of Road Safety Audit

Based on the review of data, on-site field observations and group discussion, the RSA team identified possible enhancements that could improve safety at the two intersections, Turnpike Street at Purchase Street and Washington Street (Route 138) at Purchase Street, in Easton. Further study and design work will need to be conducted to determine the feasibility of making some of the improvements.

Table 2 summarizes the estimated time frame and costs breakdown and Tables 3 and 4 summarize the safety issues, possible enhancements, estimated safety payoff, time frame, cost, and 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 for Turnpike Street/Purchase Street

Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Responsible Agency
Lack of Advanced Warning Signs	Install overhead beacons and add advanced warning on the northbound and southbound Turnpike Street approaches.	Medium	<1 Year	Medium	Town of Easton
Lack of Sight Distance on the Purchase Street Approach Due to Vegetation and parking	Trim back vegetation on the southwest corner of the intersection, adjust stop bars, and adjust the height of signs. In addition, restrict or prohibit parking on Turnpike Street.	Medium	<1 Year	Low	Town of Easton
The Flashing Beacon Visibility is Blocked	Install overhead beacons.	Medium	1-3 Years	Medium	Town of Easton
Too Few Gaps in Turnpike Street Traffic	Install Traffic signals.	High	>3 Years	High	Town of Easton
False Right Turn Directional Signal on Turnpike Street Northbound Vehicles	Change the turning radius at the Washington Street (Route 138)/Turnpike Street intersection to create a sharper turn thereby adding deflection and slowing down vehicles turning right on Washington Street (Route 138) northbound to Turnpike Street.	Medium	>3 Years	High	Town of Easton
Poor Pavement Conditions	Repair and resurface the road surface at the intersection.	Low	<1 Year	Medium	Town of Easton

Table 4: Potential Safety Enhancement Summary for Washington Street (Route 138)/Purchase Street

Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Responsible Agency
Visibility at the intersection is limited and On Street Parking Blocks sight Lines	Enforce no parking on state highways on Washington Street (Route 138).	Low	<1 Year	Low	MassDOT
	Clear vegetation on the southwest corner of the intersection.	Low	<1 Year	Low	
	Add overhead flashing beacons.	Medium	1-3 Years	Medium	
	Signalize the intersection.	High	>3 Years	High	
Lack of Advanced Warning Signs	Add warning signs to the northbound and southbound Washington Street (Route 138) approaches to the intersection.	Medium	<1 Year	Low	MassDOT
Speeding on Washington Street (Route 138)	Enhance speed enforcement.	Medium	<1 Year	Low	State Police and the Town of Easton

Appendix A. RSA Meeting Agenda

Agenda	Road Safety Audit for Turnpike Street at Purchase Street, and Washington Street (Route 138) at Purchase Street, Easton Tuesday, October 3rd, 2017 1:00 PM – 3:00 PM
Contact:	Bill McNulty, Old Colony Planning Council (508) 583-1833 ext. 207 wmcnulty@ocpcrpa.org
Attendees:	Invited Participants Include a Multidisciplinary Team including Easton Officials (DPW, Police, Fire, Planning, Administration), MassDOT, and OCPC
Please Bring:	Thoughts and Suggestions
Meeting Location:	Easton Town Offices 136 Elm Street Easton, MA. 02356
1:00 PM	Welcome and Introductions at Easton Town Offices
1:10 PM	Review and Discussion of Project and Site Specific Material <ul style="list-style-type: none"> • Review of Traffic Data • Existing Conditions and Known Challenges
1:30 PM	Adjourn from Opening Session and head to site visits at each intersection <ul style="list-style-type: none"> • Identify any deficiencies and/or potential improvements at the study area location • OCPC staff will document all observations and comments
2:15 PM	Wrap-Up Site Visit / Conclude Audit Back at Easton Town Offices
2:45 PM – 3:00 PM	Adjourn For The Day
Instructions For Participants: <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 • Please wear comfortable footwear, and bring safety vest if possible. A limited number of safety vests will be available at the audit. 	


Appendix B. RSA Audit Team Contact List

Participating Audit Team Members

Date: January 1, 2014 Location: Easton, MA

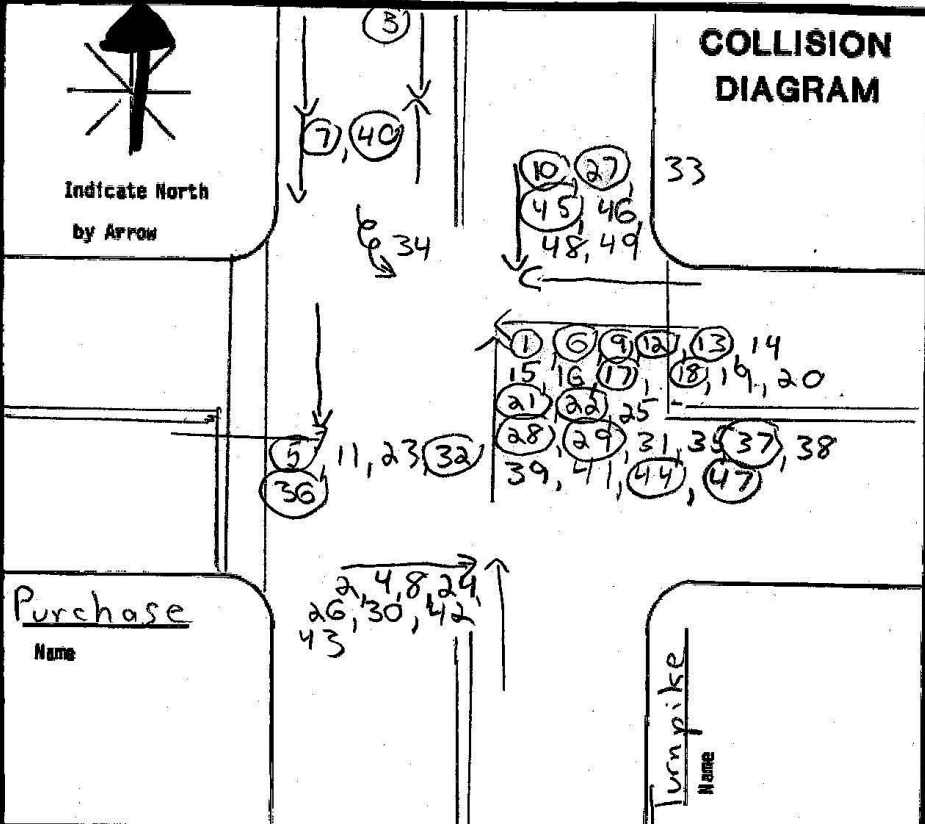
Audit Team Members	Agency/Affiliation		
Thomas Rebello	MassDOT District 5	thomas.rebello@state.ma.us	
David Field	Easton DPW	dfield@easton.ma.us	
Elsa Chan	MassDOT Traffic Safety	elsa.chan@state.ma.us	
Gary Sullivan	Easton Police Department	gsullivan@easton.ma.us	
Greg Swan	Easton DPW	gswan@easton.ma.us	
Connor Keating	MassDOT Traffic Safety	connor.keating@state.ma.us	
Jason Walters	MassDOT Projects	Jason.walters@state.ma.us	
Kevin Partridge	Easton Fire Department	kpartridge@easton.ma.us	
Bill McNulty	Old Colony Planning Council	wmcnulty@ocpcrpa.org	
Raymond Guarino	Old Colony Planning Council	r Guarino@ocpcrpa.org	

Appendix C. Detailed Crash Data

















Indicate North
by Arrow

**COLLISION
DIAGRAM**



Purchase
Name

Turnpike
Name

SYMBOLS	TYPES OF COLLISIONS	SHOW FOR EACH ACCIDENT
<ul style="list-style-type: none">  Moving Vehicle  Backing Vehicle  Non-Involved Vehicle  Pedestrian  Parked Vehicle  Fixed Object  Fatal Accident  Injury Accident 	<ul style="list-style-type: none">  Rear-End  Head On  Side Swipe  Out of Control  Left Turn  Right Angle 	<ol style="list-style-type: none"> 1. Approximate location of accident 2. Type of collision and vehicles involved. 3. Time, Day, Date 4. Any other pertinent factors mentioned on the report (i.e. presence of oil on road, ruts, etc.)

INTERSECTION: Turnpike Street and Purchase Street

PERIOD FROM: 1/1/2013 to 9/20/2017

25-5

Crash Data Summary Table

Turnpike Street at Purchase Street, Easton
1/1/2013 - 9/9/17

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			
									D1	D2	D3	D4
1	2/8/13	Friday	10:40 AM	Angle	Daylight	Snow	Snow	Inattention	26	36		
2	2/15/13	Friday	1:55 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	20	30		
3	3/22/13	Friday	4:17 PM	Head on	Daylight	Clear	Dry	Operating Vehicle in erratic, reckless, careless, negligent, or aggressive manner	31	23		
4	5/14/13	Tuesday	3:17 PM	Angle	Daylight	Cloudy	Dry	Failed to yield right of way	40	23	40	23
5	5/30/13	Thursday	5:18 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	19	25		
6	11/8/13	Friday	5:30 PM	Angle	Dark - lighted roadway	Clear	Dry	Failed to yield right of way	78	25	40	
7	11/12/13	Tuesday	9:01 AM	Rear-end	Daylight	Rain	Wet	Followed too closely	25	47		
8	11/12/13	Tuesday	5:23 PM	Angle	Dark - lighted roadway	Clear	Dry	Failed to yield right of way	50	37		
9	11/15/13	Friday	7:06 AM	Angle	Daylight	Clear	Dry	Failed to yield right of way	53	63		
10	11/22/13	Friday	2:09 PM	Angle	Daylight	Rain	Wet	Failed to yield right of way	65	51		
11	1/3/14	Friday	4:50 PM	Angle	Dark - lighted roadway	Clear	Snow	Failed to yield right of way	48	21		
12	3/25/14	Tuesday	5:12 PM	Angle	Daylight	Cloudy	Dry	Failed to yield right of way	69	38		
13	4/2/14	Wednesday	7:33 AM	Angle	Daylight	Clear	Dry	Disregarded traffic signs, signals, road markings	24	52		
14	4/18/14	Friday	12:24 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	35	17		
15	6/6/14	Friday	4:32 PM	Angle	Daylight	Clear	Dry	Disregarded traffic signs, signals, road markings	69	58		
16	6/13/17	Tuesday	7:37 AM	Angle	Daylight	Rain	Wet	Disregarded traffic signs, signals, road markings	50	20		
17	11/3/14	Monday	6:57 PM	Angle	Daylight	Cloudy	Dry	Other improper action	38	53		
18	12/9/14	Tuesday	6:24 PM	Angle	Daylight	Rain	Wet	Other improper action	66	20		
19	2/3/15	Tuesday	7:22 PM	Angle	Dark - lighted roadway	Clear	Ice	Failed to yield right of way	44	31		
20	2/5/15	Thursday	3:36 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	55	60		
21	2/17/15	Tuesday	11:08 AM	Angle	Daylight	Snow	Snow	Failed to yield right of way	40	53		
22	3/14/15	Saturday	4:26 PM	Angle	Daylight	Rain	Wet	Failed to yield right of way	41	26		
23	3/31/15	Tuesday	10:15 AM	Angle	Dark - lighted roadway	Cloudy	Dry	Failed to yield right of way	35	44		
24	4/8/15	Wednesday	4:00 PM	Angle	Daylight	Rain	Wet	Failed to yield right of way	77	68		
25	6/17/15	Wednesday	4:41 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	18	20		
26	4/24/15	Friday	1:59 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	19	57		
27	7/17/15	Friday	2:00 PM	Head on	Daylight	Clear	Dry	Failure to keep in proper lane or running off road	20	86		
28	11/3/15	Tuesday	8:05 PM	Angle	Dark - lighted roadway	Clear	Dry	Failed to yield right of way	28	23		
29	1/23/16	Saturday	10:47 AM	Angle	Daylight	Clear	Dry	Failed to yield right of way	42	21		
30	4/2/16	Saturday	5:50 PM	Angle	Daylight	Cloudy	Wet	Failed to yield right of way	18	78		
31	4/6/16	Wednesday	4:09 PM	Angle	Daylight	Clear	Dry	Unknown	34	27		
32	5/25/16	Wednesday	5:07 PM	Angle	Daylight	Clear	Dry	Disregarded traffic signs, signals, road markings	59	16		
33	7/21/16	Thursday	4:43 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	17	26		
34	8/20/16	Saturday	8:43 PM	Single Vehicle Crash	Dark - lighted roadway	Clear	Dry	No Improper Driving	49			

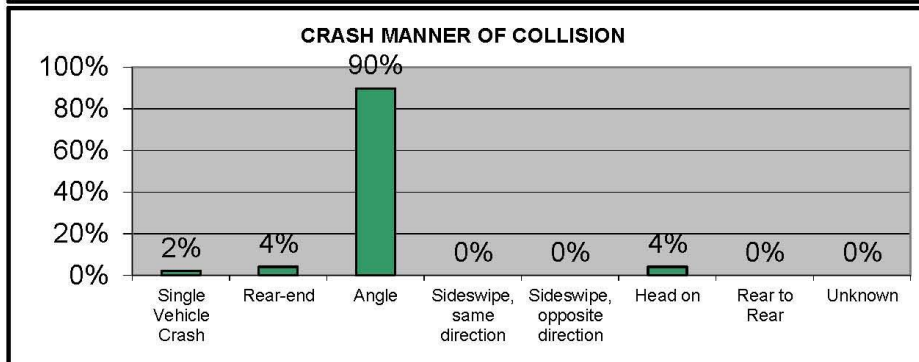
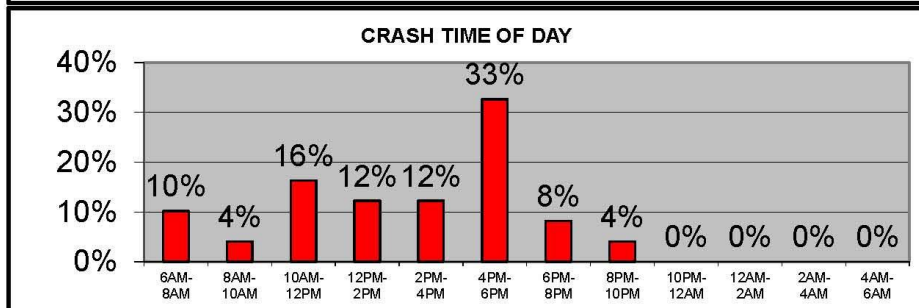
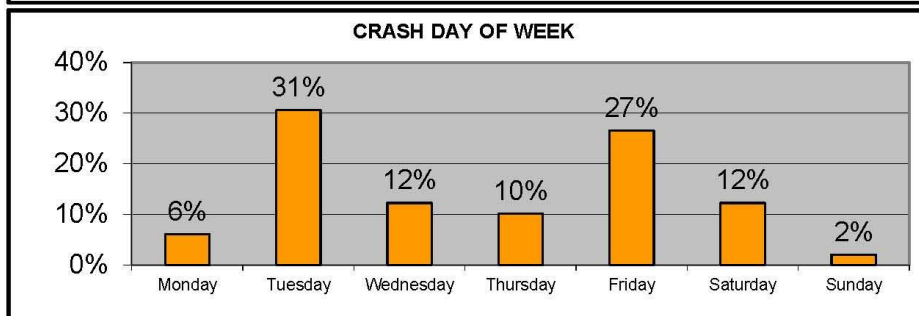
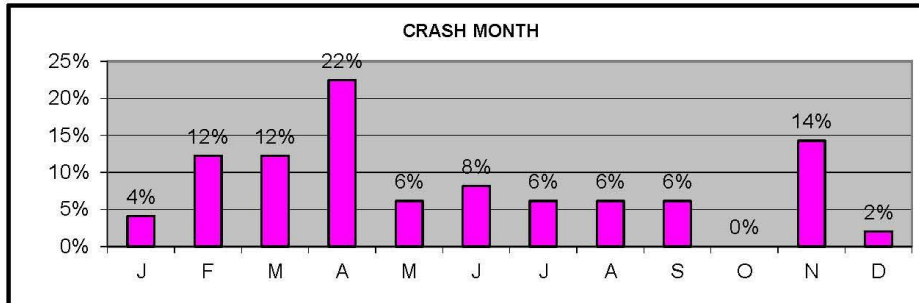
Crash Data Summary Table

Turnpike Street at Purchase Street, Easton
1/1/2013 - 9/9/17

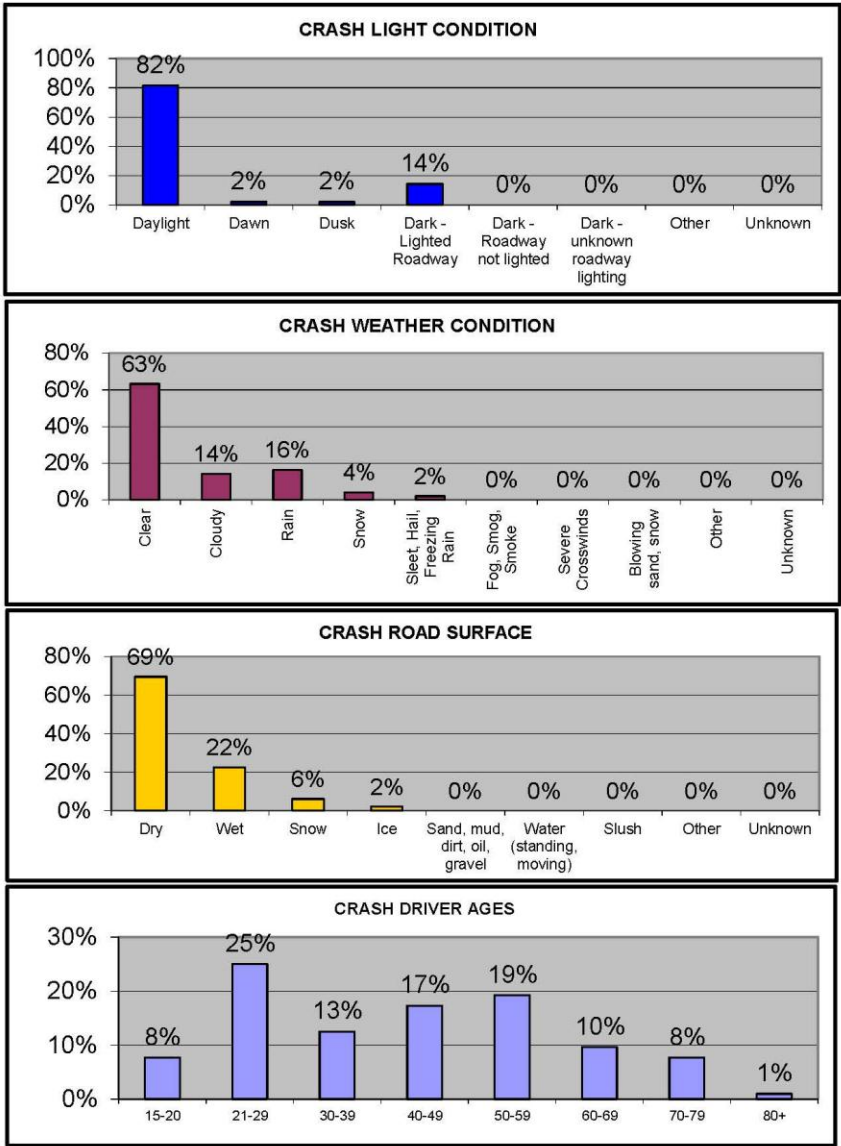
Crash Diagram Ref #	Crash Date <i>mm/dd/yy</i>	Crash Day	Time of Day	Manner of Collision <i>Type</i>	Light Condition <i>Type</i>	Weather Condition <i>Type</i>	Road Surface <i>Type</i>	Driver Contributing Code <i>Type</i>	Ages			
									D1	D2	D3	D4
35	9/19/16	Monday	11:34 AM	Angle	Daylight	Cloudy	Wet	Failed to yield right of way	69	48		
36	2/1/17	Wednesday	2:20 PM	Angle	Daylight	Clear	Dry	Disregarded traffic signs, signals, road markings	68	47		
37	3/2/17	Thursday	6:04 AM	Angle	Dawn	Cloudy	Dry	Failed to yield right of way	52	28		
38	3/28/17	Tuesday	6:17 PM	Angle	Dusk	Rain	Wet	Failed to yield right of way	43	55		
39	4/1/17	Saturday	12:09 PM	Angle	Daylight	Street, Hail, Freezing Rain	Wet	Failed to yield right of way	45	58	31	
40	4/11/17	Tuesday	9:06 AM	Rear-end	Daylight	Clear	Dry	Illness	42	73		
41	4/18/17	Tuesday	12:56 PM	Angle	Daylight	Clear	Dry	Disregarded traffic signs, signals, road markings	58	74		
42	4/25/17	Tuesday	7:32 AM	Angle	Daylight	Rain	Wet	Failed to yield right of way	20	31	52	
43	4/27/17	Thursday	4:40 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	50	21		
44	6/25/17	Sunday	10:33 AM	Angle	Daylight	Clear	Dry	Failed to yield right of way	36	70		
45	7/28/17	Friday	1:40 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	74	28		
46	8/11/17	Friday	11:29 AM	Angle	Daylight	Clear	Dry	Failed to yield right of way	52	75		
47	8/22/17	Tuesday	2:39 PM	Angle	Daylight	Clear	Dry	swerving or avoiding due to wind, slippery surface, vehicle, object, non-motorist in roadway, etc.	49	55	52	
48	9/4/17	Monday	5:47 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	22	44	64	
49	9/9/17	Saturday	11:04 AM	Angle	Daylight	Clear	Dry	Failed to yield right of way	19	28		

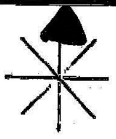
*Courtesy Crash - A term used to describe a crash that occurs subsequent to a non-involved mainline driver who gives the right of way, contrary to the rules of the road, to another

Crash Data Summary Tables and Charts
Turnpike Street at Purchase Street, Easton



Crash Data Summary Tables and Charts
Turnpike Street at Purchase Street, Easton





Indicate North
by Arrow

11, 38

↓

**COLLISION
DIAGRAM**

Doyle's
Pub

14, 29, 32
33, 36, 37

4, 6, 7, 10, 21,
22,
23, 24, 25, 26, 30

31

1, 8, 12, 15, 17
27, 34

2, 5, 9, 13
30, 28, 35

18
16, 19

31

Purchase

Name

Washington

Name R.F. 138

SYMBOLS	TYPES OF COLLISIONS	SHOW FOR EACH ACCIDENT
<ul style="list-style-type: none"> ← Moving Vehicle ← Backing Vehicle --- Non-involved Vehicle ✕ Pedestrian ▣ Parked Vehicle □ Fixed Object ● Fatal Accident ○ Injury Accident 	<ul style="list-style-type: none"> ← Rear-End ← Head On ← Side Swipe ← Out of Control ← Left Turn ← Right Angle 	<ol style="list-style-type: none"> 1. Approximate location of accident 2. Type of collision and vehicles involved. 3. Time, Day, Date 4. Any other pertinent factors mentioned on the report (i.e. presence of oil on road, ruts, etc.)

INTERSECTION Washington 138 and Purchase St.

PERIOD FROM: 1/1/2013 to 9/20/2017

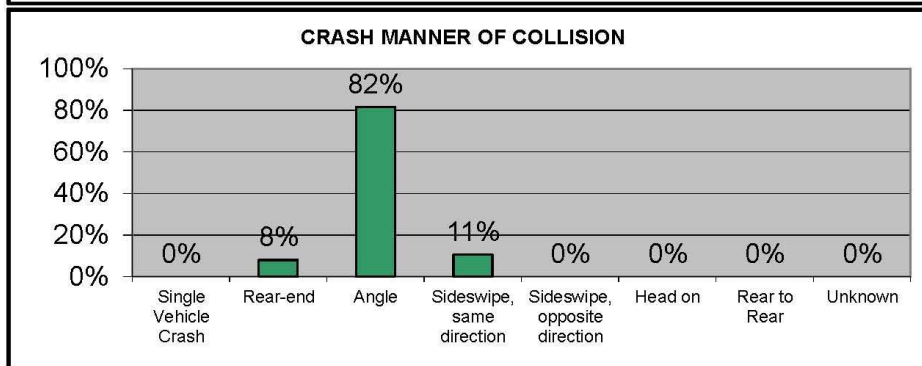
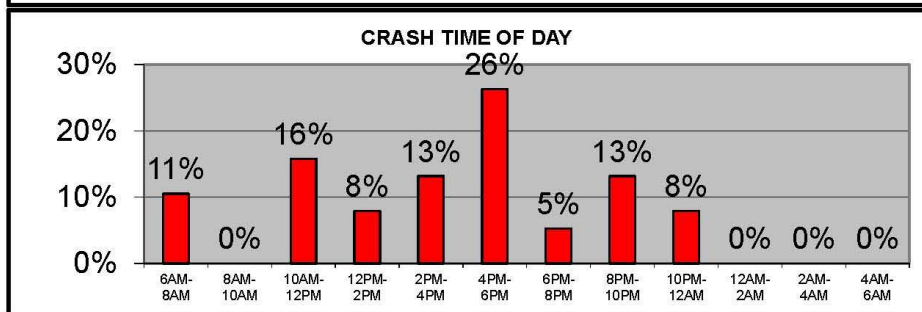
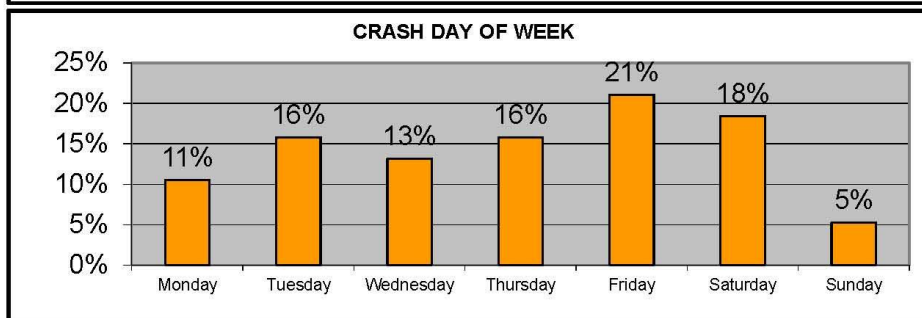
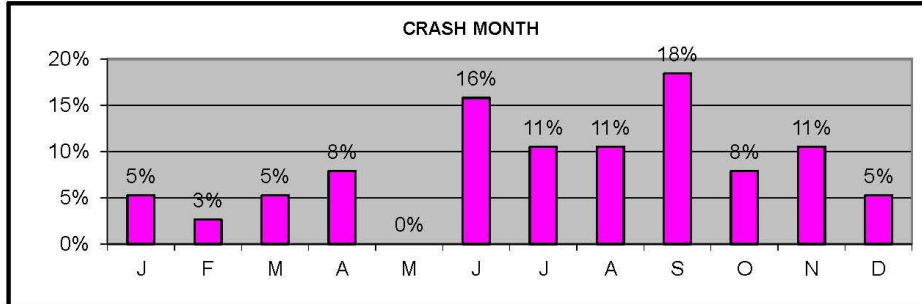
A-5

Crash Data Summary Table
 Washington Street (Route 138) at Purchase Street, Easton
 1/1/2013 - 9/20/17

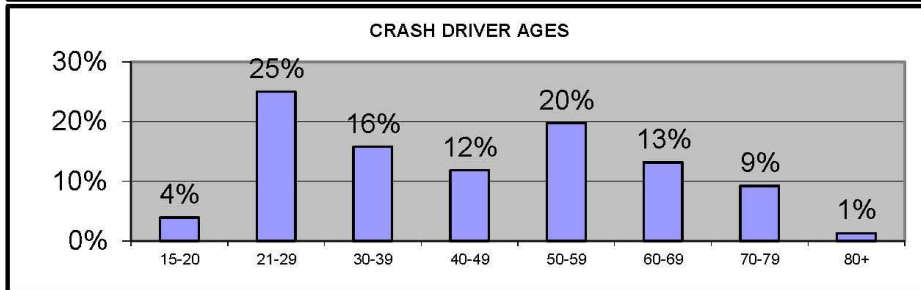
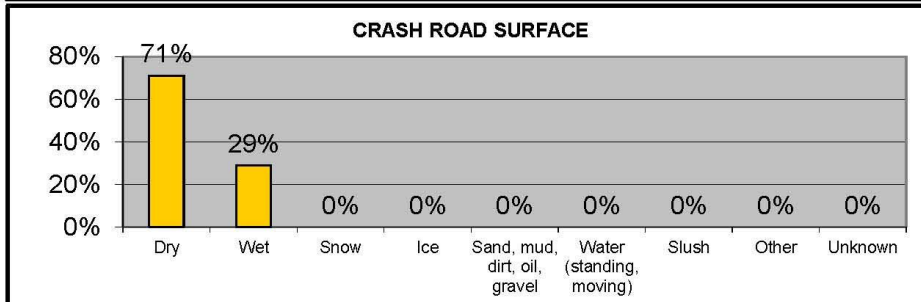
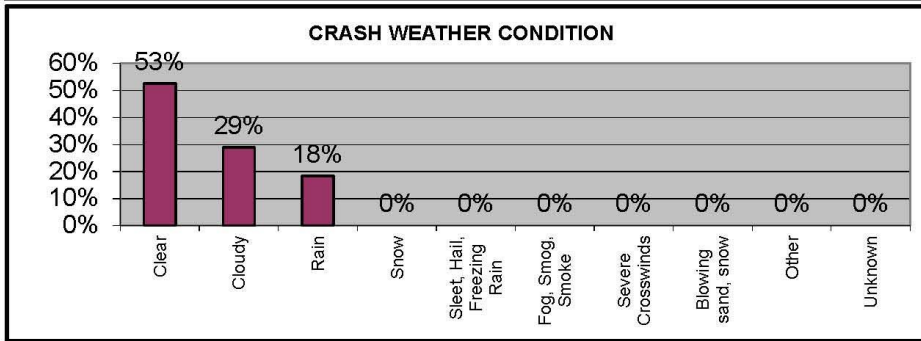
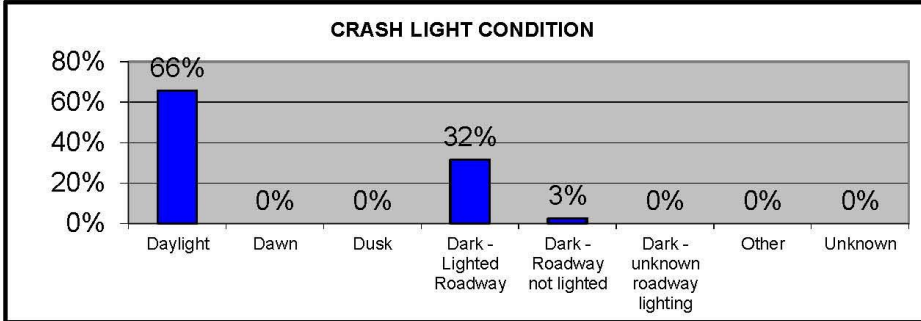
Crash Diagram Ref #	Crash Date	Crash Day	Time of Day	Manner of Collision		Light Condition		Weather Condition		Road Surface	Driver Contributing Code	Ages				Comments
				Type	Type	Type	Type	D1	D2			D3	D4			
1	9/13/13	Wednesday	8:37 PM	Angle	roadway	Clear	Daylight	Clear	Dry	Unknown		65	43			
2	8/8/13	Thursday	9:37 PM	Angle	roadway	Cloudy	Daylight	Clear	Dry	Failed to yield right of way		17	20			
3	9/6/13	Friday	7:22 AM	Sideswipe, same direction	roadway	Clear	Daylight	Clear	Dry	Unknown		55	35			
4	1/22/14	Wednesday	2:29 PM	Angle	roadway	Clear	Daylight	Clear	Dry	Failed to yield right of way		44	59			
5	4/16/14	Friday	4:00 PM	Angle	roadway	Cloudy	Daylight	Clear	Dry	Failed to yield right of way		53	71			
6	4/23/14	Wednesday	4:01 PM	Angle	roadway	Rain	Daylight	Clear	Wet	Failed to yield right of way		70	53			
7	8/3/14	Tuesday	7:15 AM	Angle	roadway	Clear	Daylight	Clear	Dry	Failed to yield right of way		68	65			
8	7/24/14	Thursday	4:53 PM	Angle	roadway	Clear	Daylight	Clear	Dry	Failed to yield right of way		24	44			
9	11/22/14	Saturday	5:02 PM	Angle	roadway	Cloudy	Daylight	Clear	Dry	Failed to yield right of way		52	20			
10	11/28/14	Wednesday	3:50 PM	Angle	roadway	Rain	Daylight	Clear	Wet	Failed to yield right of way		27	31			
11	1/29/14	Tuesday	7:19 PM	Rear-end	roadway	Rain	Daylight	Clear	Wet	Operating defective equipment		35	38			
12	9/30/15	Tuesday	4:35 PM	Angle	roadway	Clear	Daylight	Clear	Dry	Operating defective equipment		63				
13	8/22/15	Saturday	10:57 AM	Angle	roadway	Clear	Daylight	Clear	Dry	Operating defective equipment		80	30			
14	9/13/15	Sunday	12:27 PM	Angle	roadway	Clear	Daylight	Clear	Dry	Operating defective equipment		20	40			
15	10/2/15	Friday	12:03 PM	Angle	roadway	Rain	Daylight	Clear	Wet	No Improper Driving		38	25			
16	11/6/15	Monday	6:45 AM	Sideswipe, same direction	roadway	Clear	Daylight	Clear	Dry	Intention		54	31			
17	1/9/16	Saturday	4:59 PM	Angle	roadway	Dark - lighted	Daylight	Clear	Dry	Disregarded traffic signs, signals, road markings		78	54			
18	2/4/16	Thursday	8:23 PM	Rear-end	roadway	Cloudy	Daylight	Clear	Wet	Unknown		32	32			
19	6/11/16	Saturday	5:19 PM	Sideswipe, same direction	roadway	Cloudy	Daylight	Clear	Wet	Failure to keep in proper lane or running off road		68	29			
20	7/10/16	Sunday	10:16 AM	Angle	roadway	Cloudy	Daylight	Clear	Dry	Disregarded traffic signs, signals, road markings		70	39			
21	8/16/16	Tuesday	4:06 PM	Angle	roadway	Rain	Daylight	Clear	Wet	Failed to yield right of way		40	57			
22	9/3/16	Saturday	10:28 PM	Angle	roadway	Clear	Daylight	Clear	Dry	Failed to yield right of way		52	47			
23	9/8/16	Thursday	5:44 PM	Angle	roadway	Clear	Daylight	Clear	Dry	Failed to yield right of way		54	19			
24	9/13/16	Tuesday	2:59 PM	Angle	roadway	Clear	Daylight	Clear	Dry	Failed to yield right of way		73	55			
25	9/19/16	Monday	6:57 AM	Angle	roadway	Cloudy	Daylight	Clear	Wet	Intention		50	81			
26	10/21/16	Friday	10:00 AM	Angle	roadway	Clear	Daylight	Clear	Dry	Failed to yield right of way		28	23			
27	10/21/16	Friday	9:01 PM	Angle	roadway	Dark - roadway not lighted	Daylight	Rain	Wet	Disregarded traffic signs, signals, road markings		63	58			
28	11/3/16	Thursday	6:14 PM	Angle	roadway	Cloudy	Daylight	Clear	Dry	Failed to yield right of way		27	28			
29	1/28/16	Saturday	12:03 PM	Angle	roadway	Clear	Daylight	Clear	Dry	Failed to yield right of way		24	34			
30	3/9/17	Thursday	10:00 PM	Angle	roadway	Clear	Daylight	Clear	Dry	Failed to yield right of way		19	58			
31	4/3/17	Monday	2:21 PM	Sideswipe, same direction	roadway	Clear	Daylight	Clear	Dry	No Improper Driving		40	25			
32	6/12/17	Monday	11:11 AM	Angle	roadway	Clear	Daylight	Clear	Dry	No Improper Driving		21	60			
33	6/16/17	Friday	11:59 AM	Angle	roadway	Cloudy	Daylight	Clear	Dry	Failed to yield right of way		38	70			
34	8/23/17	Friday	4:58 PM	Angle	roadway	Clear	Daylight	Clear	Dry	Failed to yield right of way		59	60			
35	7/15/17	Saturday	11:45 PM	Angle	roadway	Clear	Daylight	Clear	Dry	No Improper Driving		40	20	25		
36	7/18/17	Tuesday	11:12 AM	Angle	roadway	Clear	Daylight	Clear	Dry	Distraction		68	72			
37	8/18/17	Friday	8:50 PM	Angle	roadway	Dark - lighted	Daylight	Rain	Wet	Disregarded traffic signs, signals, road markings		41	31			
38	9/20/17	Wednesday	3:28 PM	Rear-end	roadway	Clear	Daylight	Cloudy	Wet	Followed too closely		29	20			

*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.

Crash Data Summary Tables and Charts
Washington Street (Route 138) at Purchase Street, Easton



Crash Data Summary Tables and Charts
Washington Street (Route 138) at Purchase Street, Easton



Appendix D. Additional Information

Warrants Summary Report

1: Turnpike at Purchase

Intersection Information

	Major Street	Minor Street
Street Name	Turnpike Street	Purchase Street
Direction	NB/SB	EB/WB
Number of Lanes	1	1
Approach Speed	30	30

Warrant	Met?	Notes
Warrant 1, Eight-Hour Vehicular Volume		
	Yes	
Condition A or B Met	Yes	13 Hours met (8 required)
Condition A and B Met	Yes	9 Hours met (8 required)
Warrant 2, Four-Hour Vehicular Volume		
	Yes	7 Hours met (4 required)
Warrant 3, Peak Hour		
	Yes	
Condition A Met?	No	0 Hours met (1 required)
Condition B Met?	Yes	3 Hours met (1 required)
Warrant 4, Pedestrian Volume		
	No	
Peds > 100 Condition	No	0 Hours met (4 required)
Peds > 190 Condition	No	0 Hours met (1 required)
Warrant 5, School Crossing		
	No	

Warrants Summary Report

2: Washington at Purchase

Intersection Information

	Major Street	Minor Street
Street Name	Route 138	Purchase Street
Direction	NB/SB	EB/WB
Number of Lanes	1	1
Approach Speed	30	30

Warrant	Met?	Notes
Warrant 1, Eight-Hour Vehicular Volume		
	Yes	
Condition A or B Met	Yes	8 Hours met (8 required)
Condition A and B Met	Yes	12 Hours met (8 required)
Warrant 2, Four-Hour Vehicular Volume		
	Yes	7 Hours met (4 required)
Warrant 3, Peak Hour		
	Yes	
Condition A Met?	No	0 Hours met (1 required)
Condition B Met?	Yes	2 Hours met (1 required)
Warrant 4, Pedestrian Volume		
	No	
Peds > 100 Condition	No	0 Hours met (4 required)
Peds > 190 Condition	No	0 Hours met (1 required)
Warrant 5, School Crossing		
	No	

Appendix E. Road Safety Audit References

Road Safety Audit References

Massachusetts Traffic Safety Toolbox, Massachusetts Highway Department,
www.mhd.state.ma.us/safetytoolbox.

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

Road Safety Audits. Institute of Transportation Engineers and U.S. Department of Transportation, Federal Highway Administration, www.roadwaysafetyaudits.org.

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

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