WESTFIELD STREET (ROUTE 20) SAFETY STUDY

(SIBLEY AVENUE TO KINGS HIGHWAY)

WEST SPRINGFIELD, MA

July 2022

PREPARED UNDER THE DIRECTION OF THE PIONEER VALLEY MPO BY:
THE PIONEER VALLEY PLANNING COMMISSION

Prepared in cooperation with the Town of West Springfield, the Massachusetts Department of Transportation and the U.S. Department of Transportation. The views and opinions of the Pioneer Valley Planning Commission expressed herein do not necessarily state or reflect those of the Massachusetts Department of Transportation or the U.S. Department of Transportation.

If information is needed in another language, please contact the PVPC Title VI Specialist by phone at (413) 781-6045.

Caso esta informação seja necessária em outro idioma, favor contar o Especialista em Título VI do PVPC pelo fone 413-781-6045."

Si necesita información en otro lenguaje, favor contactar al especialista de MassDOT del Título VI al 413-781-6045.

如果需要使用其它语言了解信息，请联系马萨诸塞州交通部（PVPC）《民权法》第六章专职人员，电话 413-781-6045

如果需要使用其它語言了解信息，請聯系馬薩諸塞州交通部（PVPC）《民權法》第六章專職人員，電話 413-781-6045

Contents

Study Area

This report presents the results of a transportation safety study performed along a section of Westfield Street (Route 20) between the intersections of Sibley Avenue and Kings Highway in the Town of West Springfield (*Figure 1*). This segment of the roadway is about 1.5 miles in length with residential side streets and limited commercial development. Route 20 is a part of the National Highway System and is classified as an urban principal arterial. It is aligned along an east-west direction in the study area.

Existing Infrastructure

A total of 15 side streets intersect Route 20 from the north and 14 side streets intersect from the south within the study area. All of the side streets have dense residential development. The posted speed limit for this section of the road is 40 mph for both eastbound and westbound traffic. There are 2 signalized intersections: Rogers Avenue and Lancaster Avenue / Fife Lane. Sidewalks are present along the corridor throughout the study area along both sides of the road. There are 2 crosswalks for pedestrians to cross Route 20 within the study area. A midblock crosswalk with push button activated pedestrian signals is located between the intersections of Wolcott Avenue and Sherwood Avenue and the second cross walk is located across Route 20 at its intersection with Fife Lane. This segment of Route 20 is also serviced by Pioneer Valley Transit Authority's R10 bus route which connects the Union Station in Springfield to West Springfield Center, Westfield Center, and Westfield State University. Two sheltered bus stops (along with several pole mounted bus stop signs) are located in the study area in the vicinity of Sherwood Avenue and Harwich Road.

Existing Conditions

Traffic Volumes

The Pioneer Valley Planning Commission (PVPC) collected traffic volume and speed data along Route 20 and select side streets. Appendix 1 presents the detailed volumes and counts at each of these locations. These volumes are depicted in *Figure 2*. To determine whether there was any impact from the Covid19 Pandemic on the traffic and travel patterns along this roadway, these numbers were compared to available historic data. PVPC reviewed historic count data from 2005 counts at several locations in the study area as well as data provided by MassDOT from 2010 and 2011. These counts are summarized in *Table 1.*

Figure 1: Westfield Street (Route 20) and Connecting Streets in the Study Area

Figure 2: 2021 Traffic Volumes (Annual Daily Traffic – ADT) and Speed in miles per hour (mph)

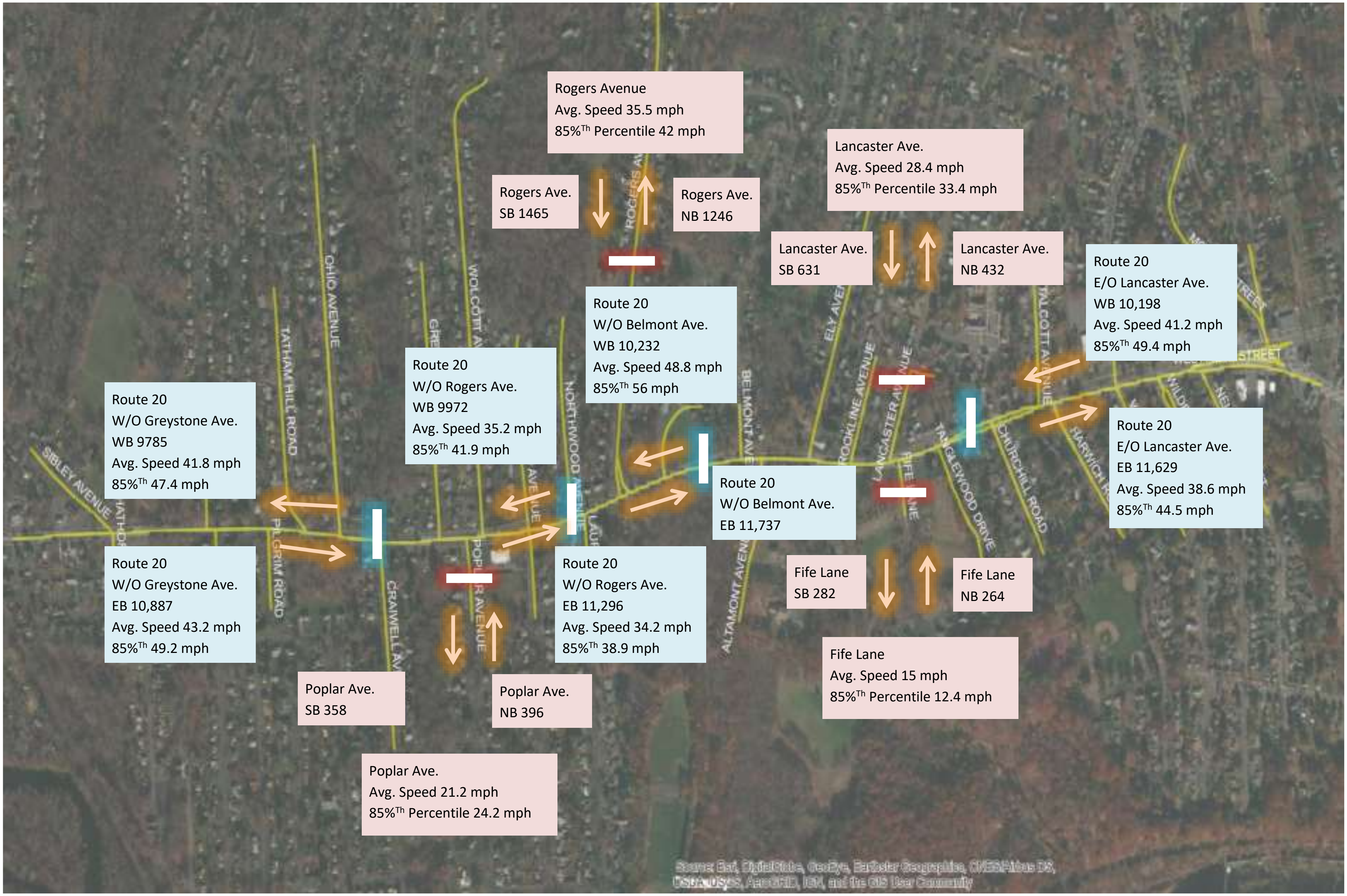


Table 1: Comparison of Current and Historic Traffic Volumes

Source	Year	Location	Direction		ADT	2021 Counts (Located in Vicinity)		
			EB/NB	WB/SB		EB/NB	WB/SB	ADT
PVPC Counts	2005	Route 20 W/O Ohio Avenue	10,511	9,775	20,286	10,887	9,785	20,672
		Route 20 E/O Craiwell Avenue	11,238	10,272	21,510			
		Poplar Avenue	381	386	767	396	358	754
		Rogers Avenue	1,471	1,590	3,061	1,246	1,465	2,711
MassDOT Counts	2010	Rogers Avenue	-	-	3,086			
MassDOT Report	2011	Route 20 Bridge over CSX Railroa	-	-	20,800	Avg. ADT for segment		21,434

The data for the year 2021 was collected late in the month of May when a vast majority of pandemic restrictions were lifted. From the data comparison in Table 1, it appears that the 2021 data is consistent with historic data from 2010 and 2011. Traffic was observed to be slightly lower on Rogers Avenue but was considered acceptable for use in this study.

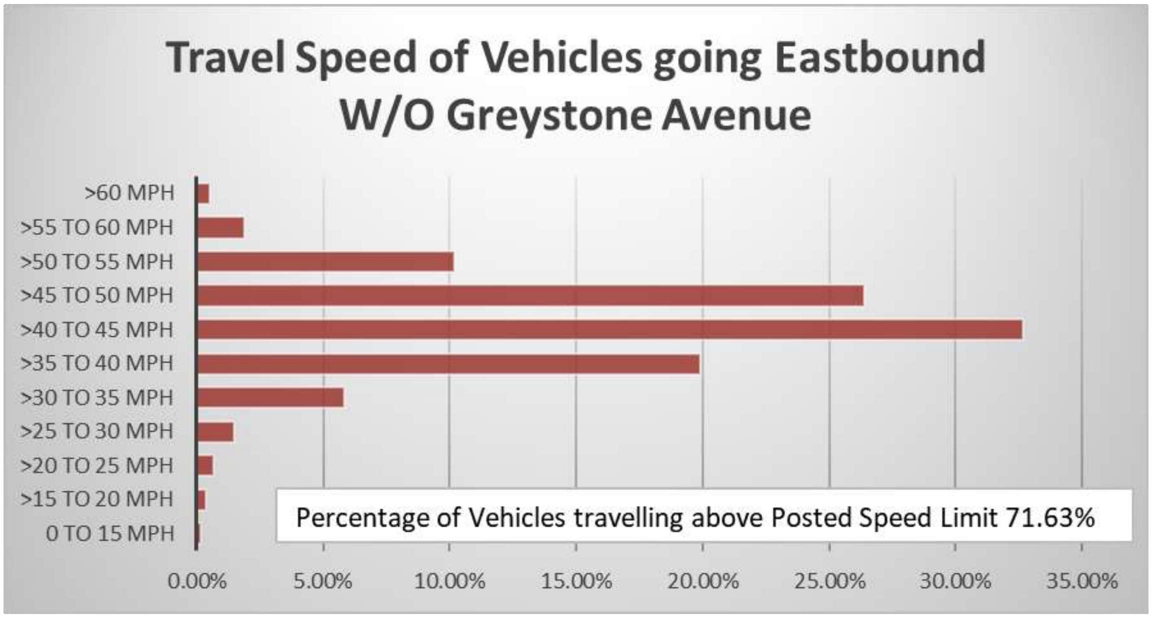
Travel Speed

Figure 2 depicts the average speeds and the 85th percentile speeds of vehicles travelling eastbound and westbound along Route 20 at 4 different locations. The PVPC could only collect speed data in the westbound direction in the vicinity of Belmont Avenue because of an equipment malfunction.

The 85th percentile speed denotes the speed at which 85% of all the vehicles travel at or below on that road. The 85th percentile speed along Route 20 is consistently higher than the posted speed limit in both directions. The travel speed data collected on Route 20 in the vicinity of Rogers Avenue is lower than other areas due to the impact of the traffic signal at this intersection. Appendix 2 presents detailed speed data at each of the surveyed locations in the study area.

To further analyze the extent of speeding along the road, the PVPC distributed the travel speed data into 5 mph increments or "bins" at the three locations. The location in the vicinity of Rogers Avenue was influenced by the proximity of the traffic signal, therefore it was not included in the speed bin analysis. *Figures 3, 4 and 5* depict the percentages of vehicles travelling at different speeds and the total percentage of vehicles travelling above the posted speed limit. It is noteworthy that a higher number of westbound vehicles are travelling above speed limit than eastbound vehicles. Over 25% of vehicles travel more than 5 mph over the posted speed limit in the vicinity of Greystone Avenue. Westbound traffic in the vicinity of Belmont Avenue travels almost 10 mph more than the posted speed limit. Figure 5 further depicts that nearly 40% of the vehicles at this location travel at speeds greater than 50 mph.

Figure 3: Travel Speed of Vehicles W/O Greystone Avenue



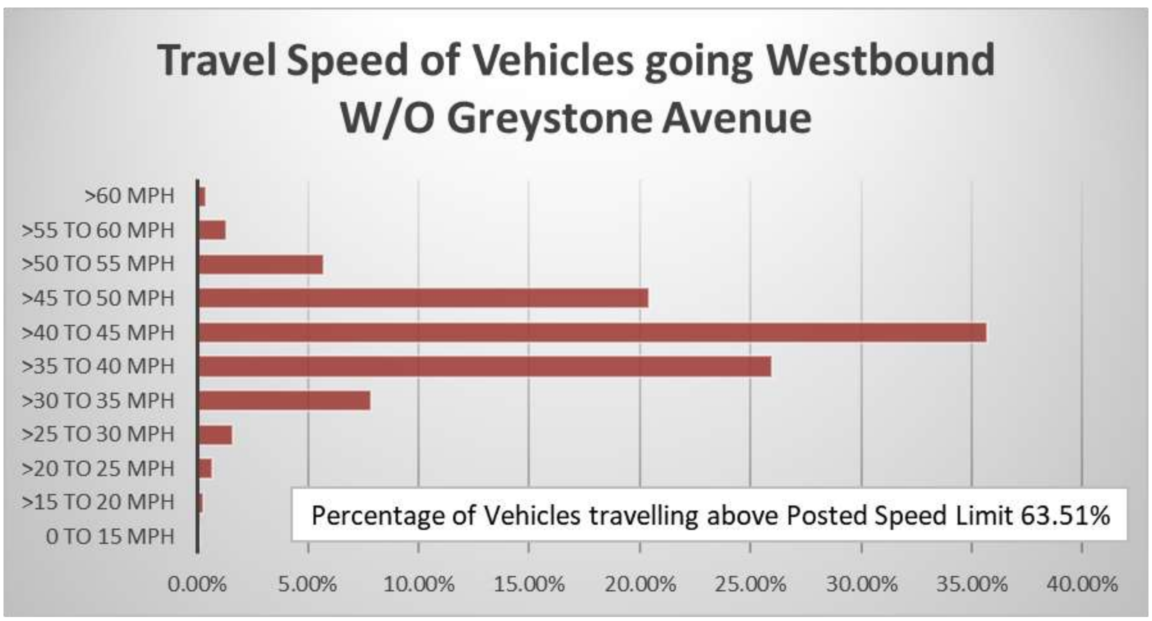
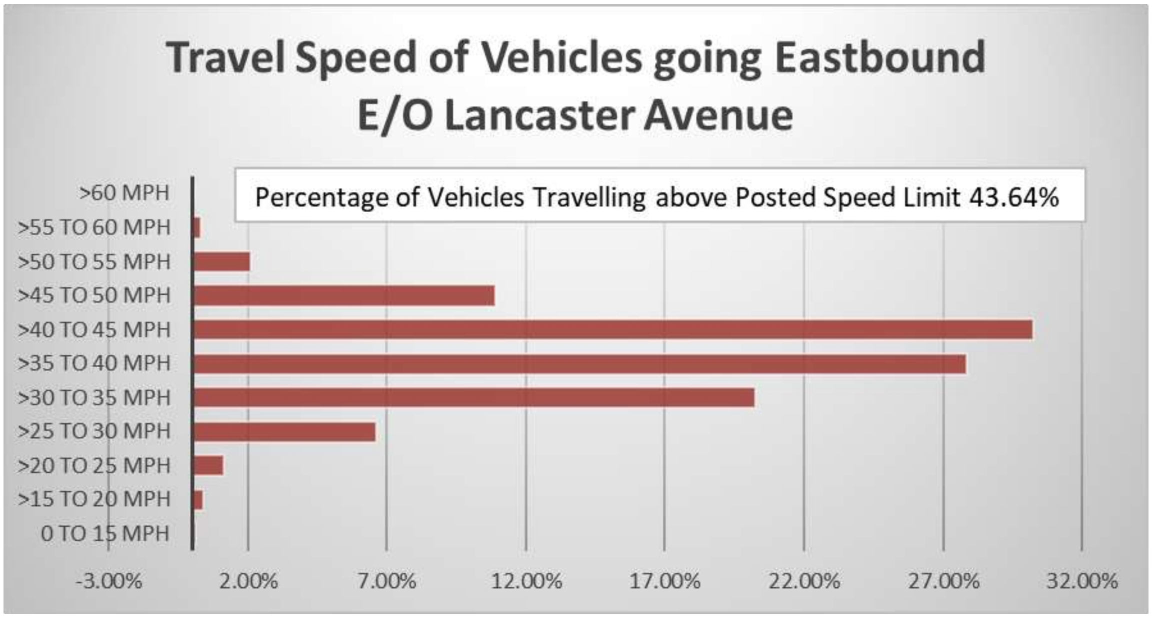


Figure 4: Travel Speed of Vehicles E/O Lancaster Avenue



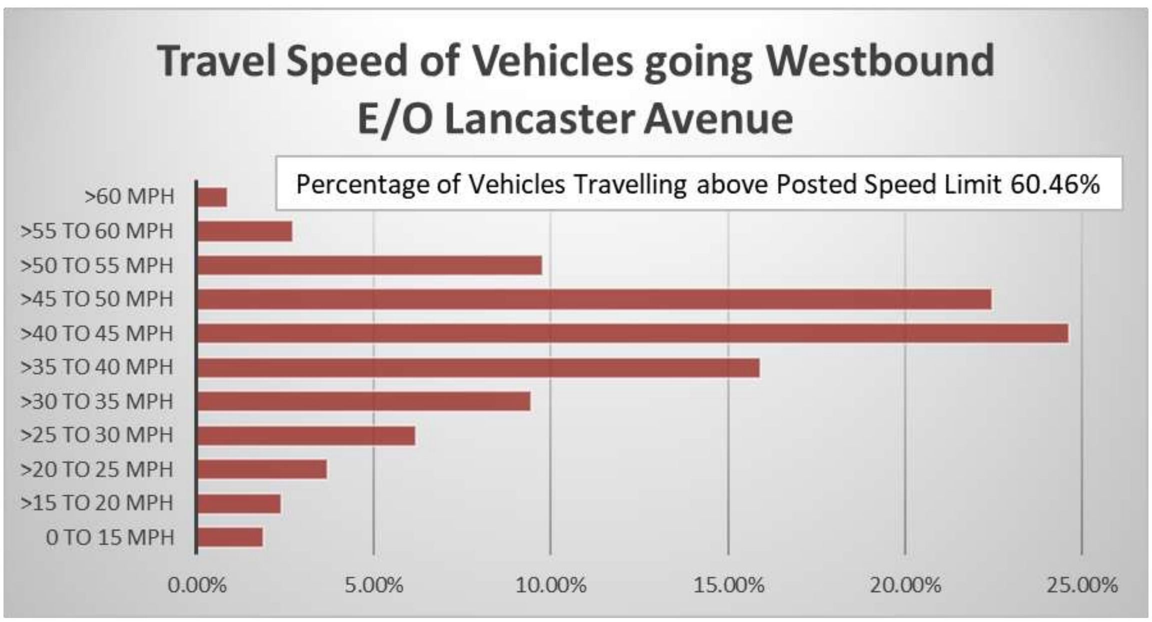
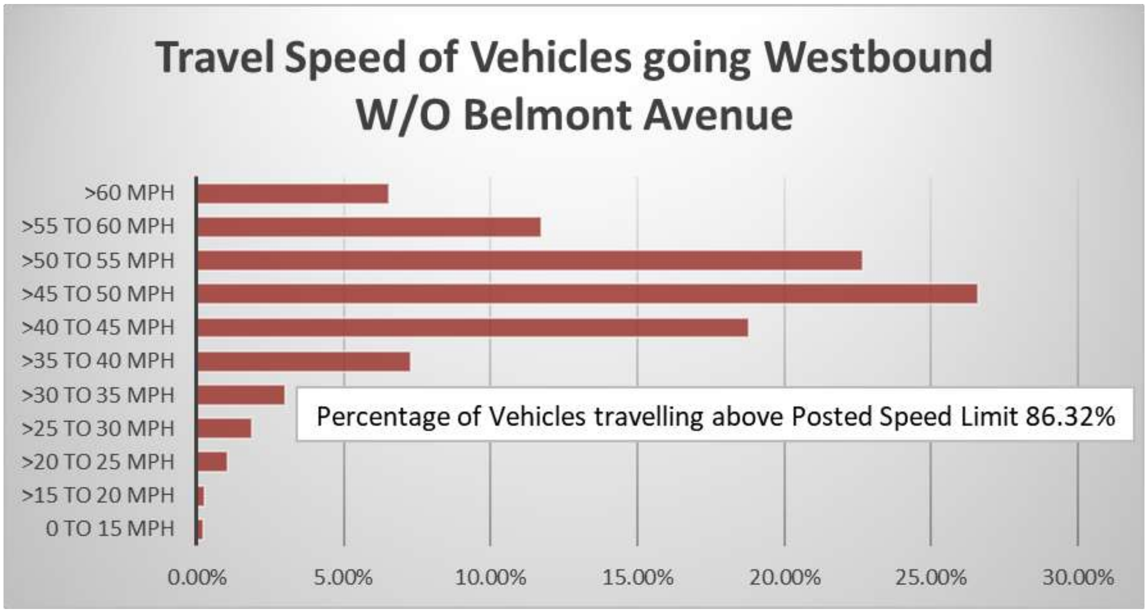


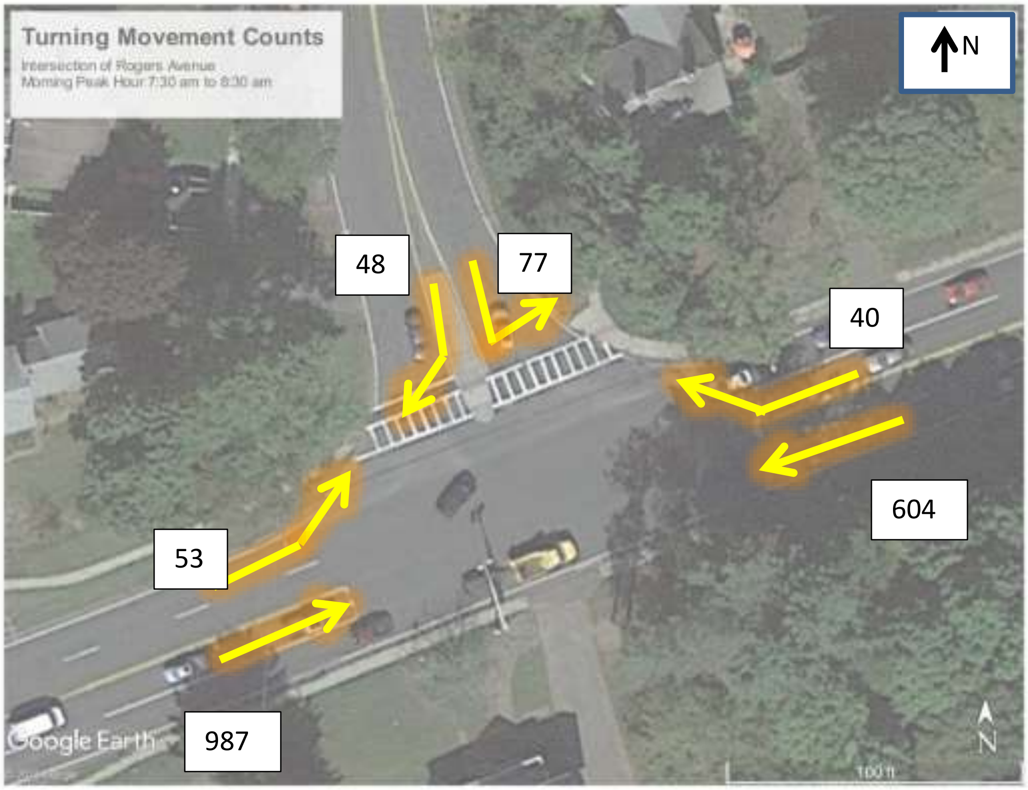
Figure 5: Travel Speed of Vehicles W/O Belmont Avenue



Turning Movement Counts

PVPC collected turning movement counts at the two signalized intersections in the study area to calculate the level of service at these locations. Appendix 3 contains these counts for the morning and afternoon periods. The peak hour morning and afternoon counts are also summarized in *Figures 6 and 7*. The counts show the commuting patterns of traffic along Route 20 as slightly more vehicles travel in the eastbound direction during the morning peak hour and more vehicles travel westbound during the afternoon peak hour.

Figure 6: Turning Movement Counts at the Intersection of Rogers Avenue



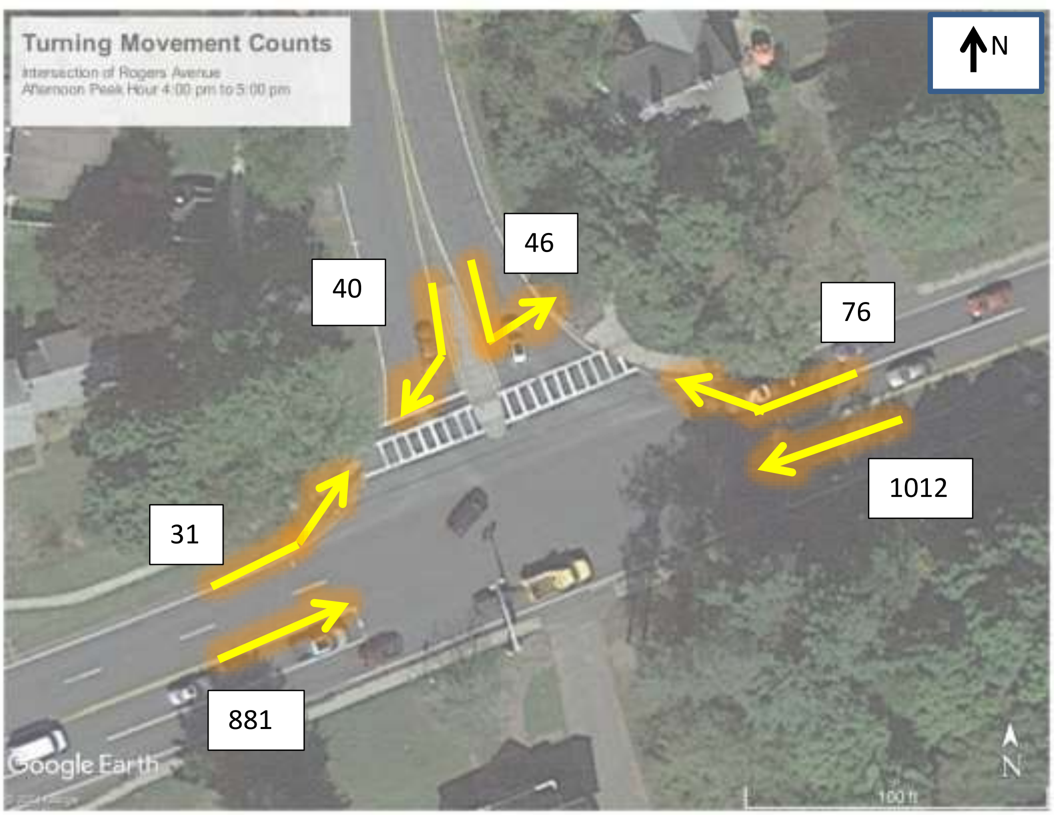
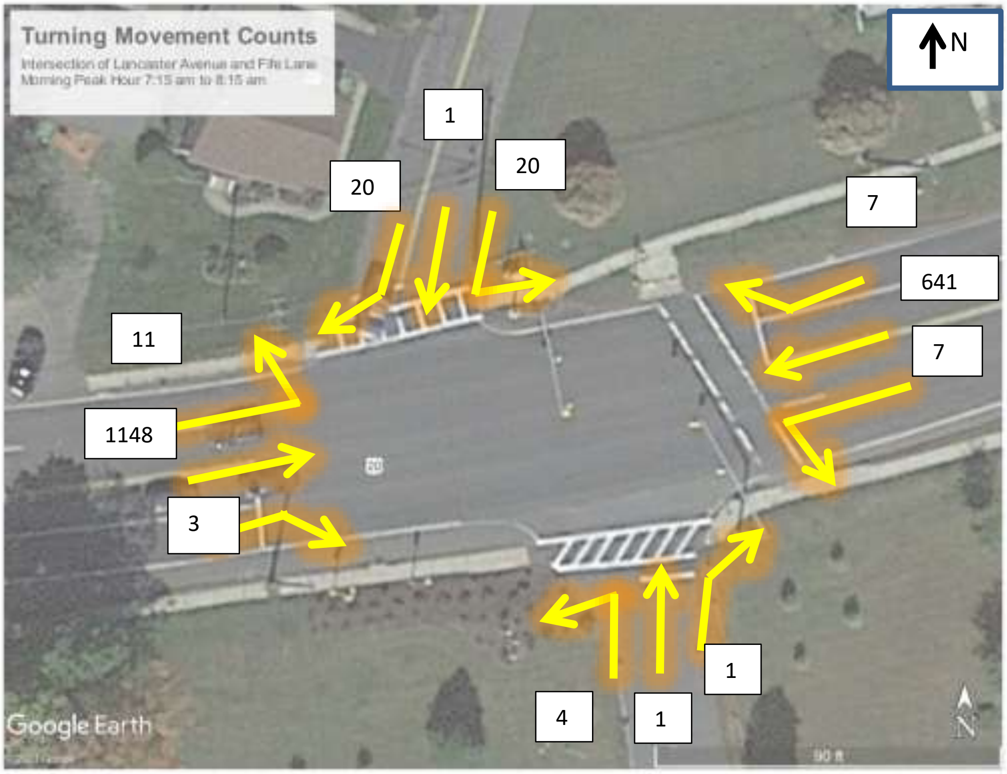
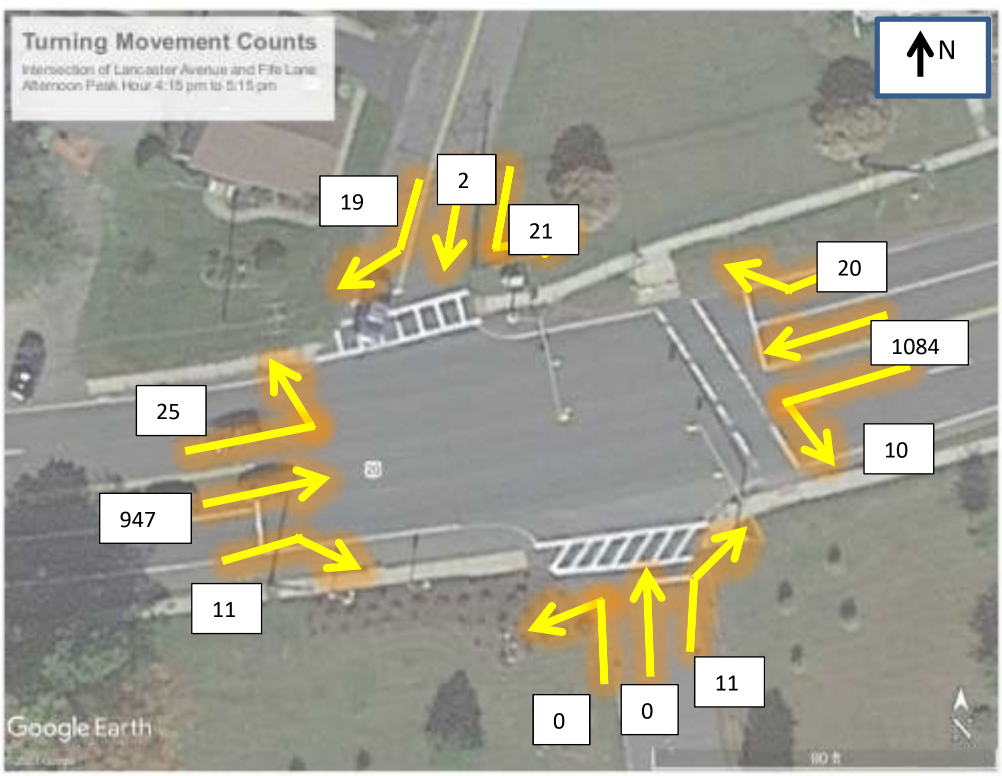


Figure 7: Turning Movement Counts at the Intersection of Lancaster Avenue / Fife Lane





Level of Service Analyses

Both the signalized intersections were examined with regards to capacity and delay characteristics to determine the existing Level of Service (LOS). LOS is an indicator of the operating conditions which occur on a roadway under different volumes of traffic and is defined in the 2010 Highway Capacity Manual by six levels, 'A' through 'F'. A number of operational factors can influence the LOS including geometry, travel speeds, delay, and the number of pedestrians. Table 2 presents the LOS designations for a signalized intersection.

Table 2: Level of Service Designations for Signalized Intersections

Category	Description	Delay in seconds
LOS A	Describes a condition of free flow, with low volumes and relatively high speeds. There is little or no reduction in maneuverability due to the presence of other vehicles and drivers can maintain their desired speeds. Little or no delays result for side street motorists.	< 10.0
LOS B	Describes a condition of stable flow, with desired operating speeds relatively unaffected, but with a slight deterioration of maneuverability within the traffic stream. Side street motorists experience short delays.	>10.0 to 20.0
LOS C	Describes a condition still representing stable flow, but speeds and maneuverability begin to be restricted. Motorists entering from side streets experience average delays.	>20.0 to 35.0
LOS D	Describes a high-density traffic condition approaching unstable flow. Speeds and maneuverability become more restricted. Side street motorists may experience longer delays.	>35.0 to 55.0
LOS E	Represents conditions at or near the capacity of the facility. Flow is usually unstable, and freedom to maneuver within the traffic stream becomes extremely difficult. Very long delays may result for side street motorists.	>55.0 to 80.0
LOS F	Describes forced flow or breakdown conditions with significant queuing along critical approaches. Operating conditions are highly unstable as characterized by erratic vehicle movements along each approach.	> 80.0

Depending on the time of day and year, a roadway may operate at varying levels. Level of Service 'A' represents the best operating conditions and is an indicator of ideal travel conditions with vehicles operating at or above posted speed limits with little or no delays. Conversely, LOS 'F', or failure, generally indicates forced flow conditions illustrated by long delays and vehicle queues. Level of Service 'C' indicates a condition of stable flow and is generally considered satisfactory in rural areas. Under LOS 'D' conditions, delays are considerably longer than under LOS 'C', but are considered acceptable in urban areas. At LOS 'E' the roadway begins to operate at unstable flow conditions as the facility is operating at or near its capacity. The results of the analyses are depicted in *Table 3*. Both signalized intersections along Route 20 in the study area operate at an optimal level with minimal delays to side streets and left turning traffic from Route 20.

Table 3: Level of Service along Route 20's Signalized Intersections

Intersection	Intersection LOS		Approach	AM Peak		PM Peak	
	AM	PM		Delay	LOS*	Delay	LOS*
Rogers Avenue	Delay 6.9 Seconds Cycle Length 69 Sec LOS A	Delay 5.9 Seconds Cycle Length 59 Sec LOS A		7:30 am - 8:30 am		4:00 pm - 5:00 pm	
			Eastbound (Route 20)	7.3	A	5.3	A
			Westbound (Route20)	5.2	A	5.3	A
			SouthBound (Rogers Avenue)	23.6	C	18.4	B
Lancaster Avenue and Fife Lane	Delay 6.9 Seconds Cycle Length 73 Sec LOS A	Delay 7.3 Seconds Cycle Length 72 Sec LOS A		7:15 am - 8:15 am		4:15 pm - 5:15 pm	
			Eastbound (Route 20)	7.2	A	6.9	A
			Westbound (Route 20)	5.5	A	7.2	A
			Southbound (Lancaster Avenue)	18.5	B	18.4	B
			Northbound (Fife Lane)	23.2	C	0.4	A

Signal Warrant Analysis

With the help of West Springfield Department of Public Works and MassDOT District 2, PVPC identified two side streets for signal warrant analyses (SWA): Ohio Avenue and Poplar Avenue. The traffic volumes along Poplar Street were collected by installing Automatic Traffic Recorders (ATR). The data indicated that volumes along Poplar Street were too low to meet the minimum volume requirements for an approaching side street to install a signal.

Turning movement counts at the intersection of Ohio Avenue were collected utilizing a pole mounted video camera and results were obtained from a private video processing service. These counts were utilized to conduct the signal warrant analysis and are included in Appendix 4. Table 4 depicts the results of the SWA.

Table 4: Signal Warrant Analysis at the Intersection of Ohio Avenue

Warrant	Description	Result
1	Eight Hour Vehicular Volume	Not Satisfied
2	Four Hour Vehicular Volume	Not Satisfied
3	Peak Hour Volume	Not Satisfied
4	Pedestrian Volume	Not Applicable
5	School Crossings	Not Applicable
6	Coordinated Signal System	Not Applicable
7	Crash Experience	Not Satisfied
8	Roadway Network	Not Applicable

The traffic signal warrant analysis only considered the existing traffic on Ohio Avenue and Poplar Street. It did not estimate the potential traffic that currently exits onto Route 20 from a different connecting side street that could be expected to shift to the new signalized intersection. Further data collection and detailed traffic pattern study is necessary along additional side streets to identify if a signal is potentially warranted by existing volume at other intersections. It should also be noted that installation of additional traffic signals could results in increases in both traffic and travel speeds on the side street as a result of the new signal.

Transportation Safety Analysis

The safety analyses for the current project was conducted utilizing historic crash data, crash rates and network screening tools provided by MassDOT. Additional local crash data was obtained from West Springfield Police Department to identify specific crash patterns to be able to derive helpful information for recommendations.

Historic Crash Data

Crash history for the past decade (2011-2020) along Route 20 was obtained utilizing MassDOT's Impact Crash portal. This data was utilized to study types and patterns of crashes to identify contributing factors and measures to alleviate the issues.

Figure 8 depicts the locations of all crashes. The circles represent clusters of crashes at that location. Many locations have densely clustered crash points. As can be observed from Table 5, the crashes have been consistently high throughout the study area; however, there was a minor decrease in the number of crashes in 2020 after the pandemic. A spike in crashes in that occurred in 2015 did not continue in later years and 2018 had the lowest number of crashes over the 10 year period.

Table 5: Severity of Crashes Annually

Crash Year	Fatal injury	Non-fatal injury	Property damage only	Not Reported	Grand Total
2011	1	16	29		**46**
2012	1	12	21		**34**
2013	1	10	23	1	**35**
2014		16	18	1	**35**
2015		12	40		**52**
2016		16	16		**32**
2017		10	22	2	**34**
2018		12	14		**26**
2019		12	26		**38**
2020		11	19		**30**

Table 6 depicts the manner of collisions. The predominant manner of crash was rear-end collisions. This phenomenon is indicative of the significant side street turning movements and high travel speeds in the study area. These crashes are distributed throughout the length of the study area.

Figure 8: Location of Crashes over Past 10 Years

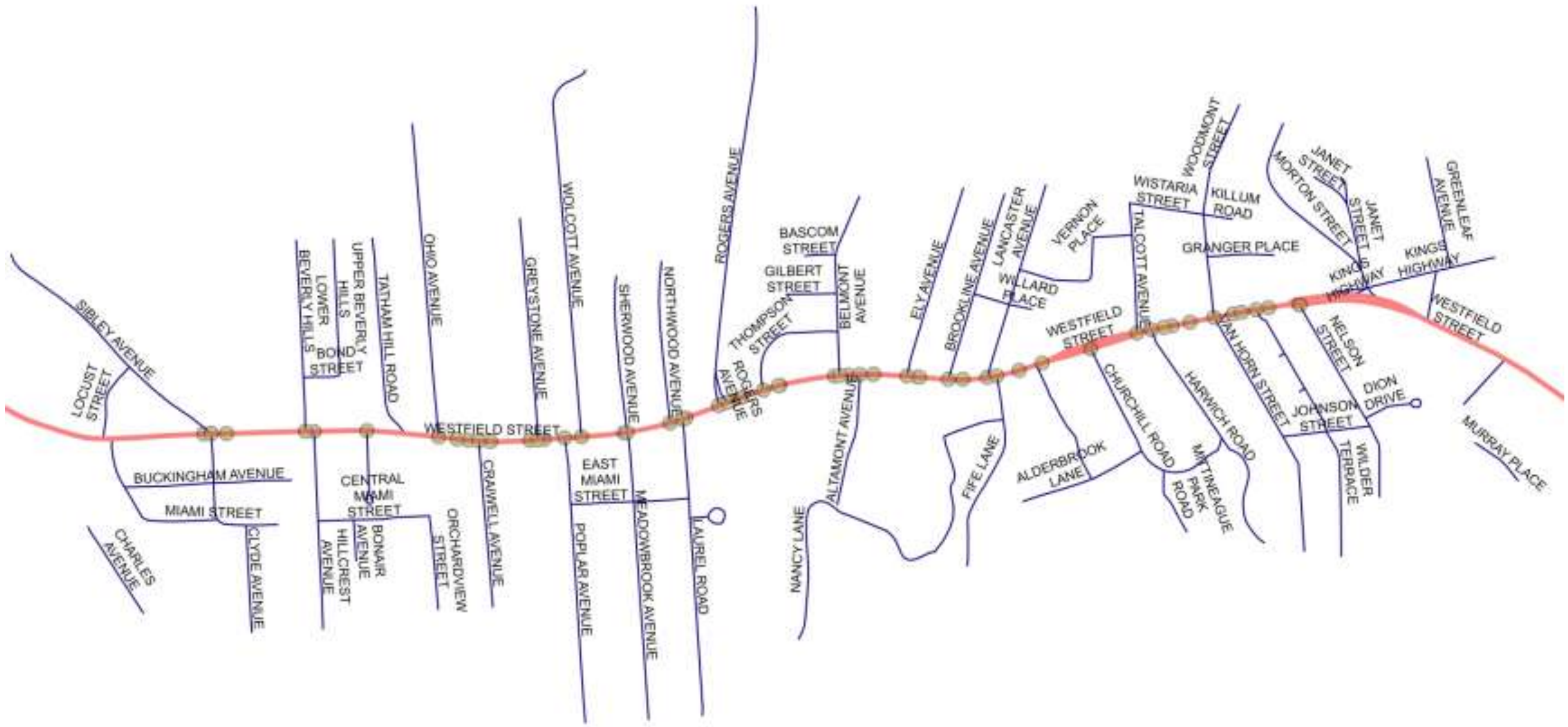


Table 6: Manner of Collision

Year	Manner of Collision	No.	Year	Manner of Collision	No.
2011	Angle	10	2016	Angle	6
	Head-on	2		Head-on	2
	Rear-end	20		Rear-end	17
	Rear-to-rear	2		Sideswipe, same direction	4
	Sideswipe, opposite direction	1		Single vehicle crash	3
	Sideswipe, same direction	4			
	Single vehicle crash	7			
2011 Total		46	2016 Total		32
2012	Angle	11	2017	Angle	10
	Head-on	1		Head-on	1
	Rear-end	15		Rear-end	17
	Sideswipe, opposite direction	1		Rear-to-rear	1
	Sideswipe, same direction	4		Sideswipe, same direction	2
	Single vehicle crash	2		Single vehicle crash	3
2012 Total		34	2017 Total		34
2013	Angle	11	2018	Angle	4
	Head-on	4		Rear-end	17
	Rear-end	12		Sideswipe, same direction	1
	Sideswipe, opposite direction	2		Single vehicle crash	4
	Sideswipe, same direction	4		Unknown	0
	Single vehicle crash	2			
2013 Total		35	2018 Total		26
2014	Angle	9	2019	Angle	12
	Head-on	1		Rear-end	22
	Rear-end	16		Sideswipe, same direction	1
	Sideswipe, opposite direction	1		Single vehicle crash	3
	Sideswipe, same direction	4			
	Single vehicle crash	2			
	Unknown	2			
2014 Total		35	2019 Total		38
2015	Angle	12	2020	Angle	6
	Not reported	1		Head-on	1
	Rear-end	26		Rear-end	15
	Rear-to-rear	1		Sideswipe, opposite direction	1
	Sideswipe, opposite direction	1		Sideswipe, same direction	5
	Sideswipe, same direction	4		Single vehicle crash	2
	Single vehicle crash	6			
	Unknown	1			
2015 Total		52	2020 Total		30

Crash Rate and MassDOT's Impact Safety Analysis Tool for Network Screening

The crash rate is a statistic derived to quantify the number of crashes at a particular location as a function of vehicle exposure or in other words probability of crashes or conflicts based on the current volume of traffic. MassDOT express crash rates as: crashes per Million Vehicle Miles Traveled (MVMT) for roadway segments.

The statewide average crash rates by roadway functional classification are based upon the total number of located crashes and the vehicle miles traveled for each roadway functional classification (*Table 5*). The ten-year crash data derived from the MassDOT Impact portal using the mapping tool depicted a total of 384 crashes within the study area segment of Route 20. A distance of approximately 1.5 miles.

Table 7: Statewide Average Crash Rates along Roadway Segments by Classification

Roadway Federal Functional Classification	Rural	Urban
Statewide	0.88	2.26
Interstate	0.40	0.61
Principal Arterial – other freeways and expressways	0.67	0.80
Principal Arterial – other	0.57	3.58
Minor Arterial	0.92	3.49
Major Collector	0.96	3.33*
Minor Collector	2.35	-
Local	1.20	2.36

Notes on Functional Classification Data:

- * This rate is for all Urban Collector roads, including both Urban Major Collector and Urban Minor Collector roadways.
- If a crash occurred at an intersection or along two different functional classifications, the crash was assigned to the higher order roadway.

Table 8: Crash Rate

YEAR	ADT	Total Crashes	Time Period	Crash Rate	Statewide Avg.
2021	21,434	384	10 Years	3.23	3.58

The crash rate along the roadway is lower than the average crash rate along urban principal arterials in the Commonwealth. However, a majority of crashes occurred along a smaller section of the study area between Craiwell Avenue and Woodmont Street. This smaller section is expected to have a much higher crash rate than the statewide average.

The PVPC utilized MassDOT's Impact Safety Analysis Tool for Crash Based Network Screening. This tool provides a ranking of the top crash segments in the region for all crashes and for just Injury and Fatal Crashes. There were a total of 18 unique segments along Route 20 in the study area. Two of these segments were ranked among the top 15% in the Pioneer Valley for expected over predicted Injury and Fatal Crashes. One of these segments is in the vicinity of the Rogers Avenue intersection and the other segment is located east Lancaster Avenue. The results obtained from this analysis are presented in Appendix 5

Local Crash Data

PVPC obtained local crash data from the West Springfield Police Department. The latest complete annual information for 2018, 2019, and 2020 was collected. This information was studied in detail and collision diagrams were prepared to present a visual depiction of the safety issues in the study area.

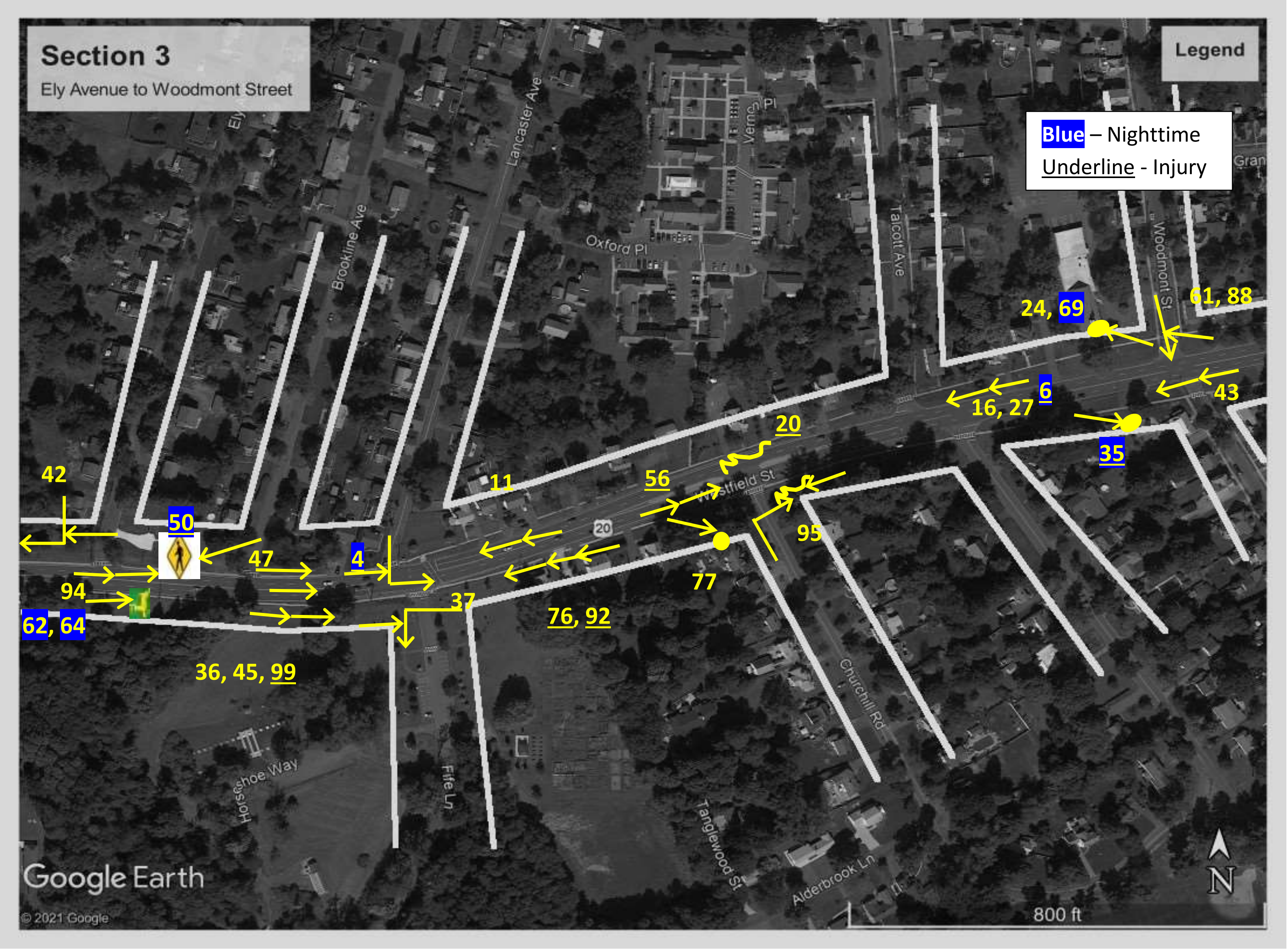
A total of 94 crashes occurred within these three years. To study these crashes in detail, the roadway was divided into 4 sections going eastbound: Section 1: Sibley Avenue to Craiwell Avenue, Section 2 Greystone Avenue to Altamont Avenue, Section 3: Ely Avenue to Woodmont Street, and Section 4: Wilder Terrace to King's Highway (the King's Highway Intersection is not included as a part of study area). These crashes are depicted in the four figures below and detailed information about each crash is provided in Appendix 5. This information corresponds to the crash number in the diagrams. Sections 2 (42 crashes) and 3 (26 crashes) are longer in length and have a higher number of crashes when compared to sections 1 (19 crashes) and 4 (7 crashes).

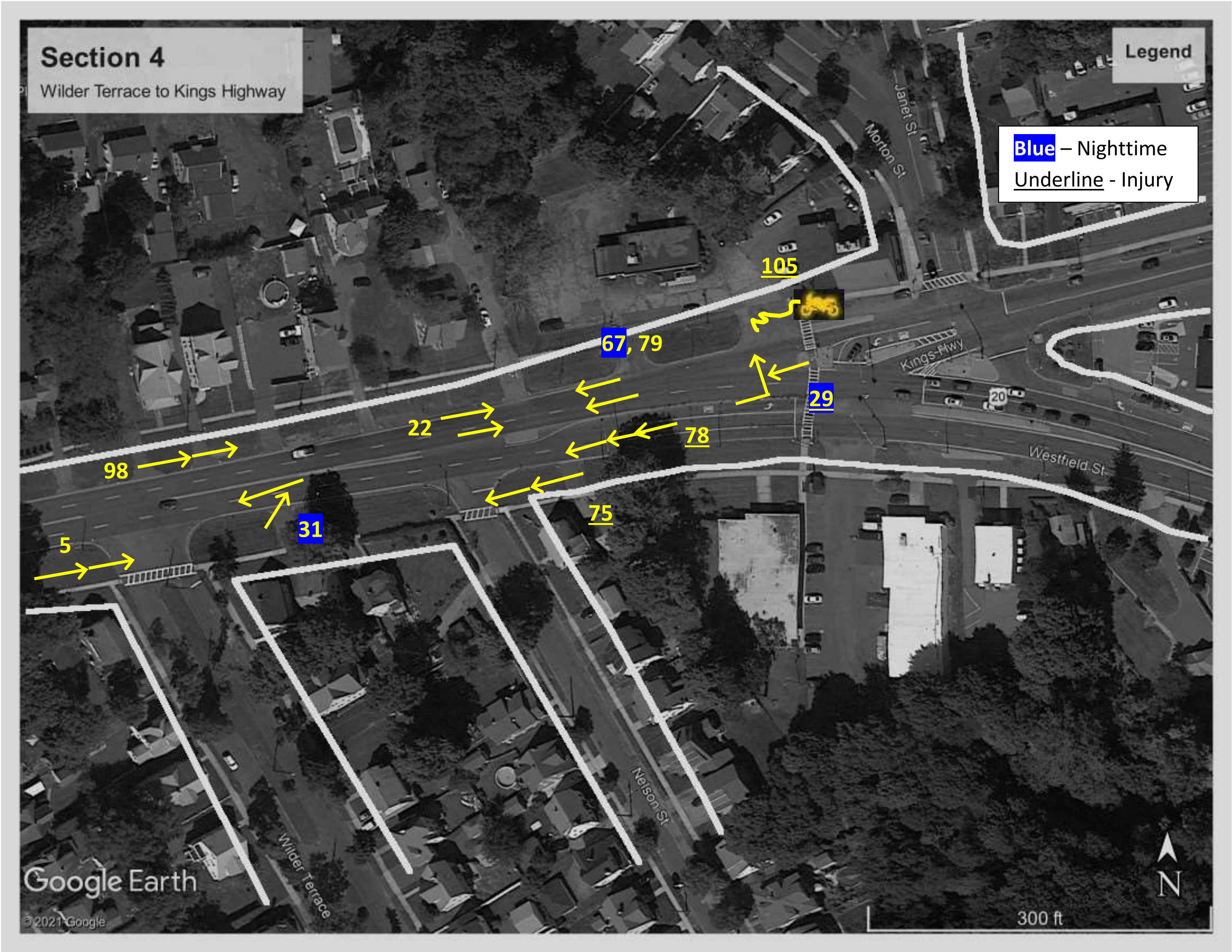
To understand and visualize the traffic conditions and safety issues in the study area from a motorist point of view, PVPC staff created a webstory of the roadway segments travelling eastbound from Sibley Avenue. The major areas of concern were photographed and documented in the story which can be found at:

https://express.adobe.com/page/ZflbO3uzhhlRM/


Section 1
Sibley Avenue to Craiwell Avenue
Legend
Blue – Nighttime
Underline - Injury
Sibley Ave
Upper Beverly Hills
Bond St
Lower Beverly Hills
Tatham Hill Rd
Hathorne Ave
Hillcrest Ave
Pilgrim Rd
Bonair Ave
Orchardview St
Craiwell Ave
Buckingham Ave
Central Miami St
Miami St
Dale St
20
8
38, 101
23, 103
14, 39, 41
30, 40, 73
100
49, 66
65
52, 80
68, 86
89
102
53
12
N
800 ft
Google Earth
© 2021 Google


Section 2
Greystone Avenue to Altamont Avenue
Legend
Blue – Nighttime
Underline - Injury
Gilbert St
Thompson St
Belmont Ave
Rogers Ave
Greystone Ave
Sherwood Ave
Poplar Ave
Meadowbrook Ave
Altamont Ave
Westfie
93
32, 33, 34,57, 82, 87
17
25
7
63
74
9, 81, 83, 90
59, 96
13
55
26, 54
18, 48
91
3, 60
2,10, 19, 58, 70, 104
28, 46, 85
21
44, 51, 72, 84
71,
1
97
15
20
Google Earth
© 2021 Google
800 ft
N


Section 3
Ely Avenue to Woodmont Street
Legend
Blue – Nighttime
Underline - Injury
Lancaster Ave
Brookline Ave
Oxford Pl
Vernon Pl
Talcott Ave
Woodmont St
Westfield St
Churchill Rd
Tanglewood St
Alderbrook Ln
Fife Ln
Horseshoe Way
42
50
47
4
94
62, 64
36, 45, 99
37
11
76, 92
56
20
77
95
24, 69
61, 88
16, 27
6
43
35
20
800 ft
N
Google Earth
© 2021 Google



Section 4
Wilder Terrace to Kings Highway
Legend
Blue – Nighttime
Underline - Injury
105
67, 79
29
22
78
98
31
75
5
Janet St
Morton St
Kings Hwy
Westfield St
Nelson St
Wilder Terrace
20
Google Earth
©2021 Google
300 ft
N

Observations

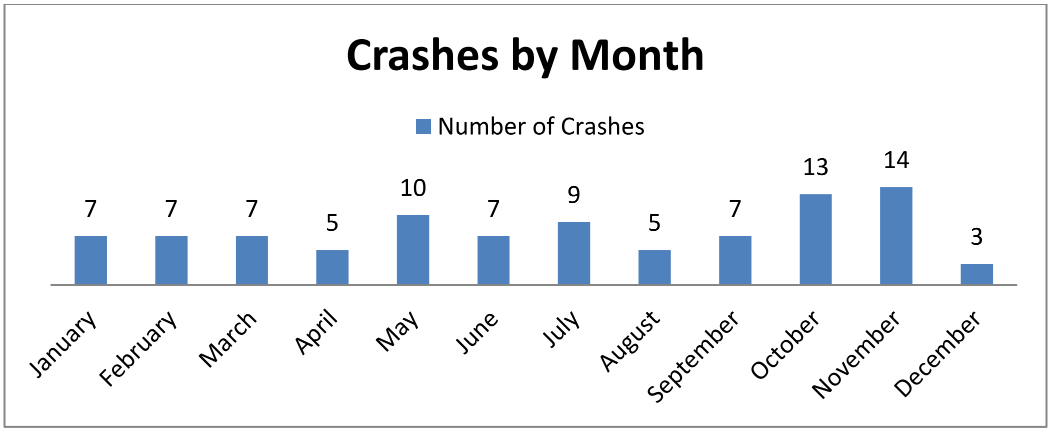
1. Rear- End Collisions – Almost 60% of the total crashes are rear-end collisions, 12 of which involved more than two vehicles. These collisions occurred between vehicles travelling in both directions. There are multiple side streets along this roadway and the vehicles travel at higher speeds. The potential for conflict increases whenever a vehicle slows down or stops to make a turn into one of the side streets, the vehicle travelling at high speed behind the first vehicle does not have enough time to stop which results in a rear end collision.

2. Horizontal Curve along Segment 2 - As mentioned earlier, the number of crashes are higher in segments 2 and 3. There is a horizontal curve along/between these segments. This curve significantly reduces the sight distance for vehicles travelling in both directions. Besides having multiple side streets, and higher speeds, this section of roadway also experiences significant solar glare during the peak commuter traffic hours. Route 20 has a higher eastbound traffic during the morning and higher westbound traffic during afternoon. During the spring and fall when the sun is lower in the horizon the resulting solar glare significantly reduces visibility for drivers.

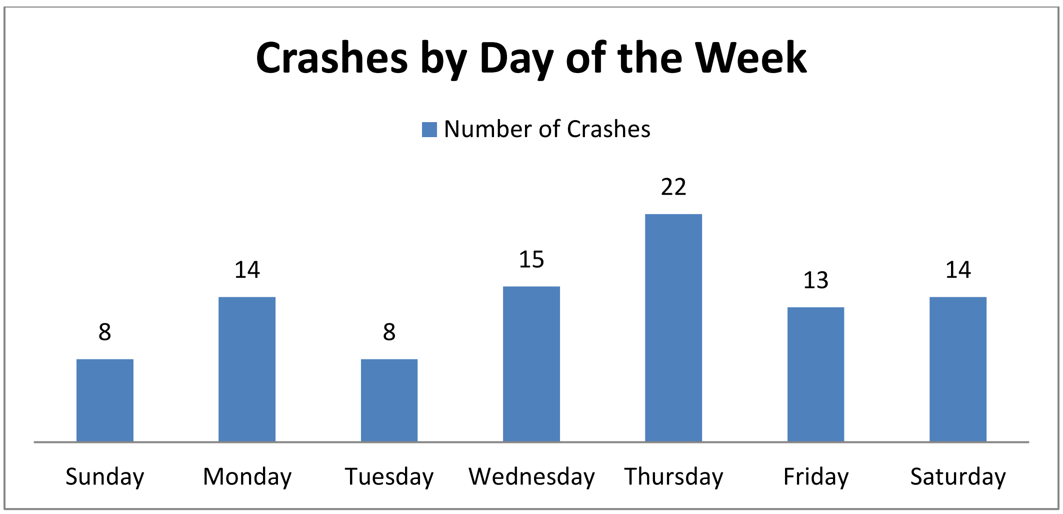
3. Deer Crashes – Four crashes occurred when motor vehicles collided with deer crossing across Route 20 at 3 different locations. All four of these crashes occurred during hours of darkness.

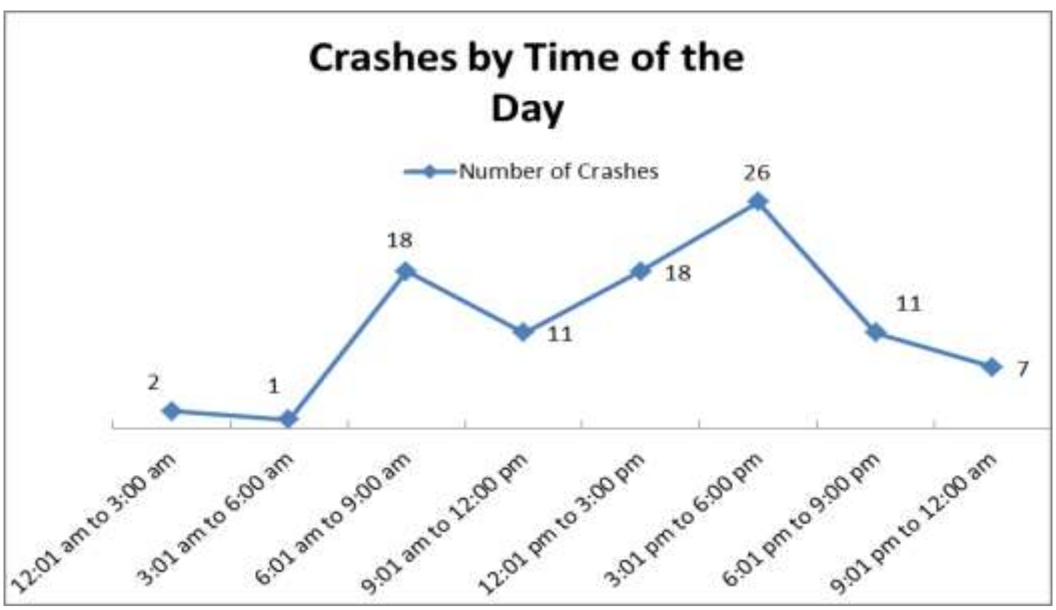
4. Merging Traffic from Side Streets – Descriptions of angle type collisions between vehicles entering Route 20 from side streets and through moving traffic along Route 20 indicate that a significant number of crashes occurred when a motor vehicle in one lane of travel yielded to the side street traffic while the vehicle in the further lane did not or could not stop in time to let the left turning vehicle enter the road. These types of crashes are defined as 'Courtesy Crashes'.

5. Side-swipe crashes – The travel lanes along both directions of travel on Route 20 are narrow for trucks and other heavy commercial vehicles. This could increase the potential for side-swipe crashes. Vehicles travelling along Route 20 rapidly change lanes at the last minute without turn signals to pass vehicles in front of them that are stopped or slowing down to turn into side streets, this also increases the potential for side-swipe crashes.

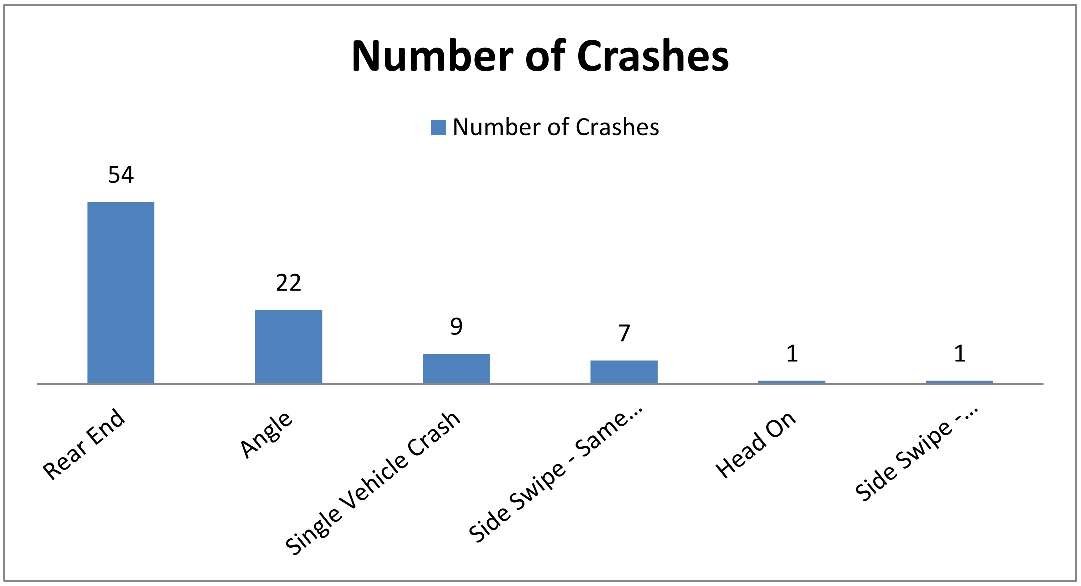


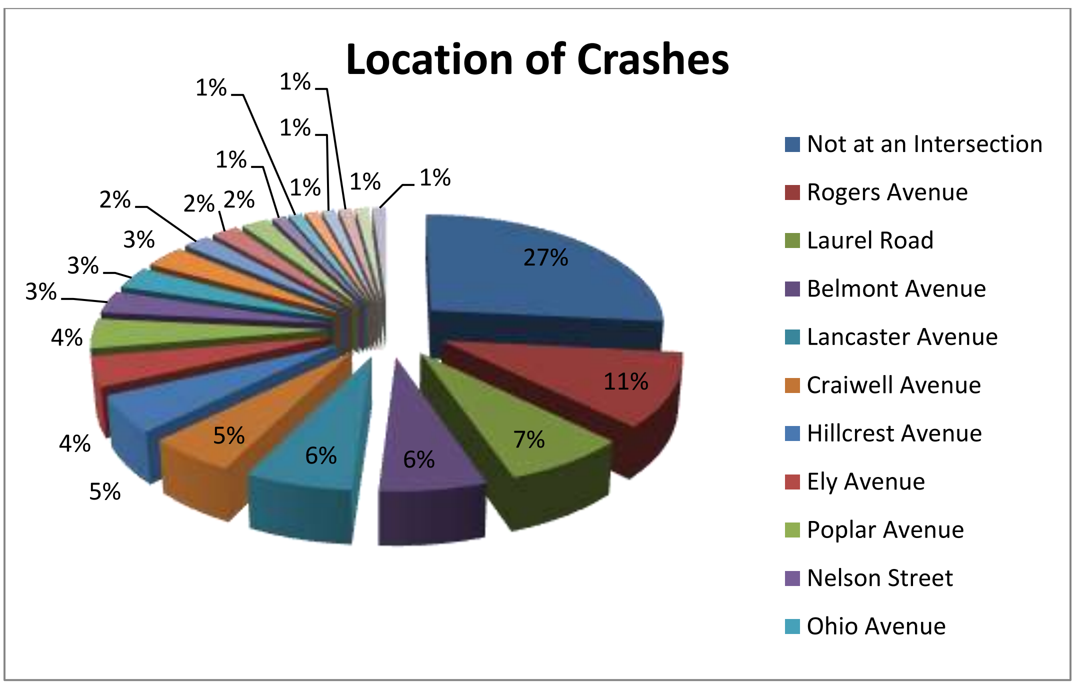
6. Higher crashes in May (Late Spring) and October/November (Fall) support the hypothesis of solar glare as a contributing factor for some of the rear end collisions.





7. Higher traffic during the afternoon creates more potential for crashes. A higher volume of traffic is observed travelling westbound along Route 20 during the afternoon peak hour. A significant number of rear end crashes were observed in this direction in the afternoon.





8. In addition to the 2 signalized intersections, Laurel Road and Belmont Avenue both had higher crashes than all of the other side streets. Both of these roads are in segment 2 of the study area and are located in the vicinity of the horizontal curve. A utility pole located along the southwest corner of Laurel Road was damaged during a night time crash with a motor vehicle.

Recommendations

1. Pavement Condition and Markings
   The pavement along Route 20 was observed to have multiple potholes and longitudinal and transverse cracks along with insufficient drainage caused by raveling. There was noticeable rutting along certain sections of the road. The pavement markings were faded at several locations and the retro reflectivity of the pavement markings was insufficient. It is recommended that MassDOT consider repairing the pavement and restriping the pavement markings with high visibility retroreflective paint or high durability recessed polyurea markings. It is also recommended that the catch basins for the storm drains are properly maintained and unclogged to ensure proper drainage and for eliminating puddles.

   It is also recommended that supplemental treatments be considered for the white lane lanes along the westbound approach of Route 20 in the vicinity of Belmont Avenue. Potential treatments include the use of wider pavement markings to increase visibility and the consideration of solid white lane line to prohibit lane changes through the curve. Another option could be to consider the sinusoidal pavement markings similar to what was recently installed by MassDOT on the western section of Route 20 approaching the Westfield City Line as shown in *Figure 9*.

Figure 9: Sinusoidal Rumble Strips along Center of Route 20 in Westfield

2. Advance Warning Signs and Additional Regulatory Signs
   It is recommended that MassDOT consider installing high visibility warning signs approaching the horizontal curve along the road in the vicinity of Belmont Avenue to warn drivers about the potential for Solar Glare in this area. These signs should be installed in advance of this curve in both directions.

Additional solar powered flashing LED Speed Limit signs along with Speed Feed Back Meter (Solar Radar Speed Signs) are recommended for this section of the road in both directions. Currently one such sign is posted for westbound traffic in the vicinity of Ohio Avenue, it is recommended that an additional sign be considered in advance of Belmont Avenue before the downhill section of Route 20. It is also recommended that a sign be considered for eastbound traffic in the vicinity of Craiwell Avenue.

Local officials and stake holders expressed concern about the lack of advance warning signs for the existing midblock pedestrian signal located between the intersections of Wolcott Avenue and Sherwood Avenue. This signal remains green until activated. As a result, it is not unusual for vehicles traveling on Route 20 to drive through this red light after the pedestrian signal is activated. It is recommended that advance warning signs be installed for this signal along both directions of travel along Route 20.

Currently there is a warning sign alerting drivers of potential deer crossing along Route 20 in the vicinity of Lancaster Avenue for westbound traffic. It is recommended that MassDOT consider installing another warning sign for eastbound traffic in the vicinity of Craiwell Avenue.

3. Increased Patrolling and Speed Limit Enforcement
   The average speed of vehicles travelling in both directions along Route 20 was higher than the posted speed limit of 40 mph. It is recommended that The Town of West Springfield Police Department consider additional measures to enforce the speed limit along Route 20. Increased patrolling and innovative educational and awareness measures within the community will help slow the traffic in long term and decrease speed related traffic issues.

4. Social Media and Lawn Sign Campaigns
   The Town of West Springfield should consider developing a social media campaign to encourage drivers to reduce speeds along Route 20. This campaign could include information on the current safety problem and the impact of higher travel speeds on serious injury and fatal crashes. Information on sample speed campaigns is available through the National Highway Traffic Safety Administration (NHTSA). https://www.trafficsafetymarketing.gov/get-materials/speed-prevention

   Similarly, some communities have used lawn signs on private property to encourage drivers to obey the posted speed limits. These signs are a reminder that residents live along and immediately off of the road and that excessive travel speeds have a negative impact on their quality of life.

5. Road Diet Study
   MassDOT could undertake a larger corridor wide Road Diet study to examine the possibility of reducing the number of lanes along Route 20 in select areas and the installation of center two-way left turn lanes or exclusive left turn lanes at select intersections. This will require additional

data collection and analysis of current traffic patterns to identify the long-term potential impacts and costs associated with such a change.

6. Optical Traffic Calming Measures
   Besides customary regulatory signs and pavement markings as discussed, additional pavement markings and well maintained highly visible lane markings play a significant role in reducing traffic speeds along roadways. These measures can help focus drivers' attention to their speed and make them aware to comply by regulations. One example is painting the speed limit on the pavement at select high crash /speeding locations. These speed limit pavement markings are effective regulatory measure in abating speeds.

   During discussion with local officials, it was mentioned that sinusoidal rumble strips were preferred by drivers along this road in the western section of Route 20, it is recommended that MassDOT consider examining the possibility of utilizing these markings and treatments at select locations in the study area to provide traffic calming alternative.

7. Transit
   It is recommended that the Town of West Springfield and MassDOT work with the Pioneer Valley Transit Authority to examine the probability and utility of bus pull out zones for existing bus stops. These zones help remove the bus from the travel lane and allow vehicles to pass the bus when passengers are boarding and alighting.

8. Bicycle and Pedestrian Accommodations
   Many locations in the study area do not appear to meet current Americans with Disabilities Act (ADA) requirements. The ADA guarantees that people with disabilities have the same opportunities as everyone else to participate in all activities. This includes accessibility to public infrastructure such as sidewalks via ramps that allow wheelchairs safe and efficient access to sidewalks and crosswalks. Wheel chair ramps must be wide enough to accommodate wheelchairs with a gentle slope that can be safely navigated by a manually powered wheelchair. Inverted tactile domes are also required at the bottom of all ramps to clearly identify the edge of the roadway for people with visual impairment. Similarly, pedestrian signals should have ADA compliant signs and amenities as well as count down timers to clearly identify how much time is remaining before vehicle travel resumes.

   The sidewalks along Route 20 have overgrown vegetation at certain locations. It is recommended that these sidewalks are properly maintained and cleaned. Only two crosswalks exist along this 1.5-mile segment of road. The Town of West Springfield could work with MassDOT to examine if additional crosswalks are needed in the study area. There are currently no bicycle accommodations along Route 20 in the study area. It is recommended that MassDOT conduct a feasibility study to determine if a shared use path could be constructed along one side of Route 20 from King's Highway to Fife Lane. There are large sections of green space between the existing sidewalks and roadway that could potentially accommodate a shared pedestrian and bicycle facility. Residents would benefit from enhanced access to the Mittineague Park recreational facilities off of Fife Lane.

9. Utility Work

   Based on information from the Town of West Springfield, there is the possibility of a future project to relocate existing utility poles along the Route 20 corridor. It is recommended that the Town of West Springfield and MassDOT coordinate with the utility company to improve intersection turn radii after poles have been relocated. This could improve access to many side streets and reduce the opportunity for crashes with fixed objects such as utility poles in the vicinity of the intersection.