Traffic and Transportation Study

at the Intersection of

Page Boulevard (Route 20) and Bircham Street

in the City of Springfield, MA

June 2022

PREPARED UNDER THE DIRECTION OF THE PIONEER VALLEY MPO BY:

THE PIONEER VALLEY PLANNING COMMISSION

In Cooperation with The City of Springfield

Prepared in cooperation with 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.

Cover Pictures: May 19th, 2022
Top: Guardrail along northwest corner of the intersection, to the west of Bircham Street
Middle: Bircham Street approach from Page Boulevard westbound
Bottom: Chevrons and Curve Ahead signs along Page Boulevard eastbound approach

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Contents

Safety Study and Signal Warrant Analysis at the Intersection of Page Boulevard (Route 20) and Bircham Street in the City of Springfield, MA

The City of Springfield requested the Pioneer Valley Planning Commission (PVPC) to conduct an assessment of existing safety and operational characteristics at the intersection of Page Boulevard and Bircham Street as a part of the Unified Planning Work Program 2022. This analysis also includes a review of existing traffic volumes to determine if the minimum required thresholds for the installation of a traffic signal are met. The following sections provide an overview of the study area, an assessment of existing conditions and a series of recommendation to improve traffic flow and safety.

Study Area

The intersection of Page Boulevard and Bircham Street is a three-legged unsignalized intersection located in the northern part of Springfield, east of Interstate 291 along one of the important east-west transportation corridors, Route 20. The Bircham Street approach to this intersection is controlled by a 'Stop' sign. Land uses in the vicinity of the intersection are predominantly residential, however Page Boulevard serves a mix of residential and commercial development.

Figure 1: Aerial View of the Intersection from Google Maps

Bircham Street intersects Page Boulevard along a horizontal curve. Multiple post mounted, double sided chevron signs are installed along the curve on Page Boulevard. A post mounted solar powered speed feedback sign is located along the Page Boulevard eastbound approach to the intersection. Streetlights

are installed along both sides of Page Boulevard in the vicinity of the intersection. Sidewalks are provided on both sides of Page Boulevard and granite curbing is provided in the vicinity of the intersection. A double line crosswalk is located across the Bircham Street approach to the intersection. A guard rail is provided along the northwest corner of the intersection which extends down the west side of Bircham Street. A white wooden fence behind this guard rail was damaged at the time of the field inventory.

Figure 2: Guard Rail and Damaged Fence along Northwest corner of the Intersection

Page Boulevard (Route 20) is a four-lane undivided highway classified as urban principal arterial which is aligned in the northeast-southwest directions in the vicinity of the study area. The speed limit along a major section of Page Boulevard is 40 mph for traffic moving in both directions which is reduced to 35 mph in the immediate vicinity of the intersection. No shoulders are provided on either side of the road and many areas were noted to have drainage issues, pavement deterioration and overgrown vegetation.

Figure 3: Chevron Signs along Northern Side of Page Boulevard

Bircham Street is a local residential street approximately 30 feet wide with one travel lane in each direction and no marked shoulders. It connects Page Boulevard to Worcester Street (Route 141) and Cadwell Drive to the north. The layout of Bircham Street makes it an ideal cut-through route for traffic to avoid Berkshire Avenue and Caldwell Drive.

Existing Conditions

This section provides a technical evaluation of the transportation components for the intersection. It includes a presentation of the data collected, analysis of traffic operations, and a series of observations and conclusions derived from the analysis.

Transportation Infrastructure

Pavement

Overall, the pavement at the intersection is in Fair to poor condition with scattered cracks, pot holes, and rutting along Page Boulevard. Bircham Street is in fair condition. No remarkable drainage issues were observed during the data collection however the lack of shoulders could result in ponding in the travel lanes during heavy rain events. Pavement markings have moderately faded along Page Boulevard and crosswalk markings along Bircham Street are faded at several locations. The stop line at Bircham Street is in fair to good condition. The retro reflectivity of the pavement markings at night is good.

Curbing, Sidewalks, and Guardrail

The granite curbing along the intersection was mostly intact and sidewalks are raised and separated from the pavement by a grass strip along Page Boulevard. The sidewalks have overgrown vegetation and dirt accumulation at several locations. The guard rail along the northwest corner is in good condition but the fence for the private residence immediately behind the guardrail is broken, which indicates it could have been hit by a vehicle or vehicles in past.

Regulatory and Warning Signs

Post mounted Chevron signs along northern side of the curve on Page Boulevard are not visible to the vehicles travelling in the far-right lane along eastbound approach if there are larger vehicles in the adjacent inside/left lane travelling in the same direction. It was also noted that the chevrons are beginning to fade and may not have a high level of reflectivity at night. The speed limit sign for the eastbound approach is in good condition. No advance warning signs about the approaching intersection were observed along either side of Page Boulevard.

Average Daily Traffic

The Pioneer Valley Planning Commission (PVPC) collected daily traffic counts and speed data along all three approaches of the intersection midweek in October 2021. The volumes obtained from the counts have not been adjusted with seasonal adjustment factors for the purpose of analyses in this report. It is possible that some of the results in the warrant analysis or level of service analysis might change if these factors were applied. Appendix 1 summarizes the traffic counts along each approach separated by direction of travel. The Average Daily Traffic (ADT) on Bircham Street is 3,110 vehicles. The ADT for Page Boulevard is 18,740 vehicles in the westbound direction and 16,979 vehicles in the eastbound direction.

Speed

Appendix 2 depicts the travel speed of vehicles in the vicinity of the intersection separated by direction of travel. The speed limit along a major section of Page Boulevard is 40 mph for traffic moving in both directions which is reduced to 35 mph in the immediate vicinity of the intersection. There is a regulatory speed limit sign informing drivers to reduce their speeds to 35 mph in the vicinity of the intersection for the eastbound approach. It is verified from the Special Speed Regulation (The City of Springfield, No. 680-E, October 23rd, 1985) data obtained from MassDOT (Appendix 3) that the speed limit for westbound traffic is also reduced to 35 mph in the vicinity of the intersection; however, no speed limit regulatory sign is currently provided for this direction. Bircham Street is a local residential street and there is not speed limit sign posted in either direction of travel.

The average speed of vehicles travelling along Bircham Street is 28 mph with an 85th percentile speed of 31.9 mph for both directions of travel. Similarly, the average speed along Page Boulevard (both approaches combined) is 38.7 mph with an 85th percentile speed of 44.5 mph. The 85th percentile speed is the speed at which 85% of all traffic is travelling at or below.

Speeds for the study area were further classified into 5 mph ranges to identify the percentage of traffic in each range. This information is presented in Figures 4 and 5. It is observed that more than 80% of vehicles along the eastbound approach are travelling above the posted speed limit. This percentage is reduced slightly to almost 70% in the westbound direction. Nearly 20% of vehicles are travelling over 45 mph in the eastbound direction as they approach the intersection.

Figure 4: Travel Speed in Percentage of Vehicles Along Westbound Approach of Page Boulevard

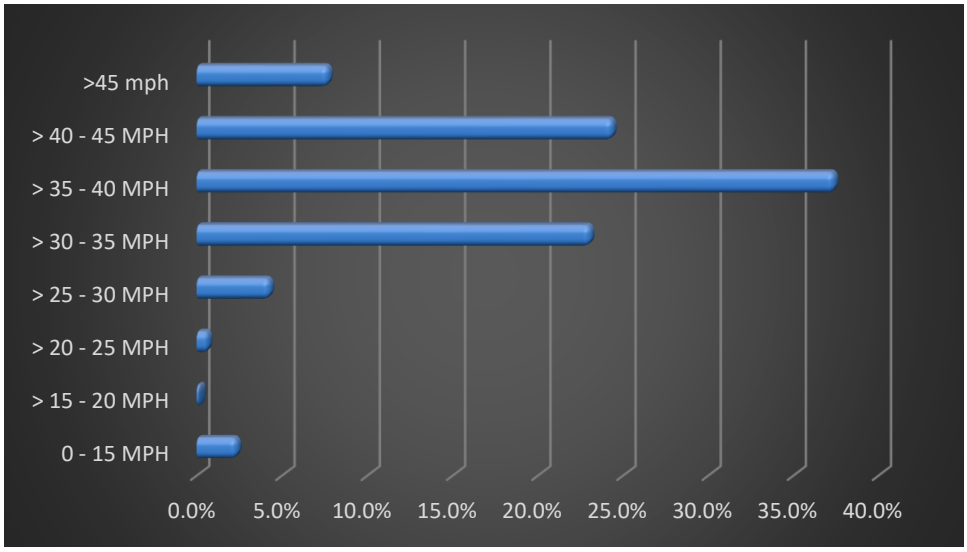
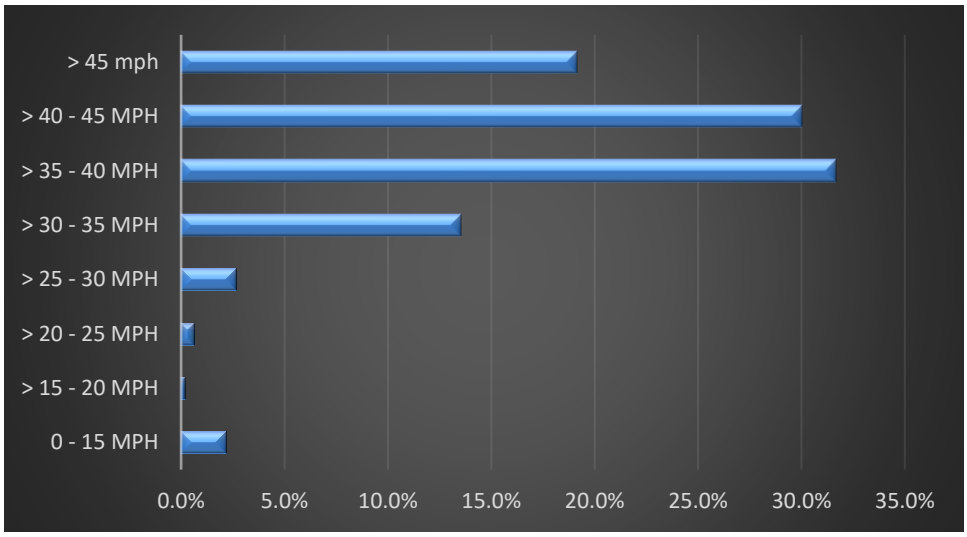


Figure 5: Travel Speed in Percentage of Vehicles along Eastbound Approach of Page Boulevard



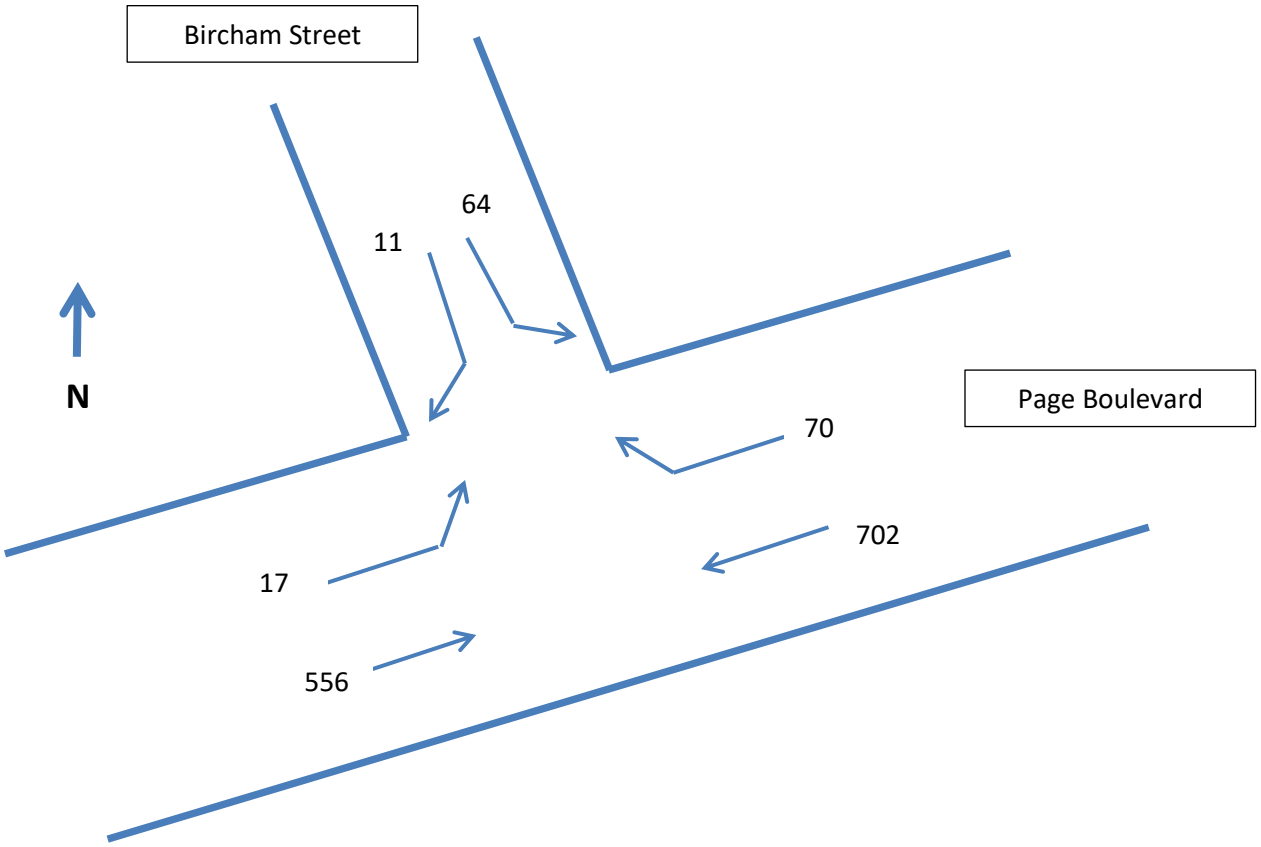
Peak Hour Volume and Turning Movement Counts

Turning Movement Counts (TMCs) were conducted for the intersection during the peak commuter periods. The weekday peak commuter period occurs during the morning hours of 7:00 AM to 9:00 AM and the afternoon hours of 2:00 PM to 6:00 PM. The TMC's were conducted to identify the peak four consecutive 15-minute periods of traffic through the intersection. These consecutive peaks 15-minute periods constitute a location's Peak Hour Volume. The peak hour of traffic volume represents the most critical period for operations and will be the focus for some of the analysis conducted in this study.

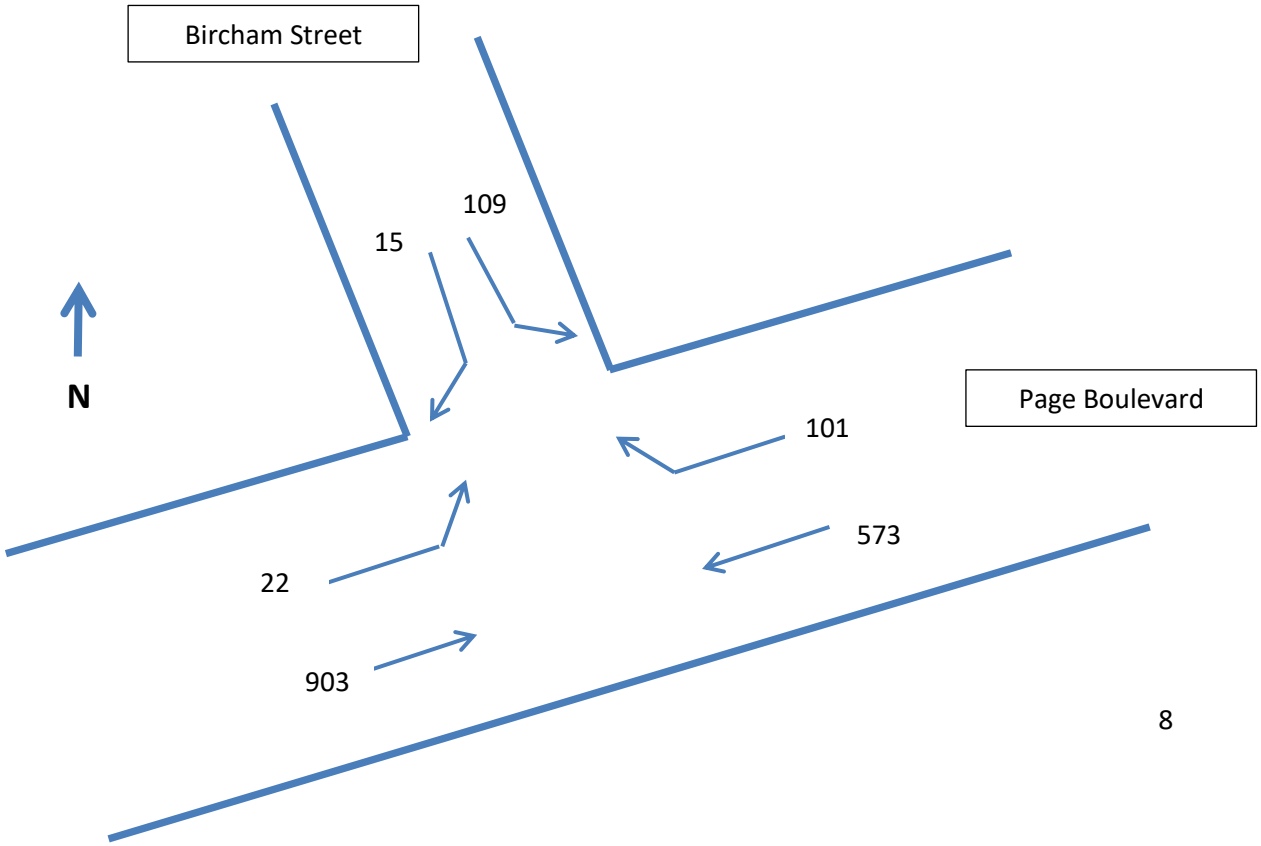
The TMC data also identifies the number of heavy vehicles on the roadway. Heavy vehicles include trucks, recreational vehicles and buses. Appendix 4 represents the data and volume by movement along each approach broken by these 15-minute intervals. Figure 6 depicts the peak hour interval and volumes at the intersection. The percentage of heavy vehicles in the traffic flow is an important component in calculating the serviceability of a corridor or intersection. Trucks impact traffic flow because they occupy more roadway space than passenger cars and have poorer operating capabilities with respect to acceleration, deceleration and maneuverability. The impact of these factors is utilized as an input to obtain the level of service along the intersection. The TMC data was obtained during weekday peak periods.

Figure 6: Peak Hour Turning Movement Counts

Morning Peak Hour Turning Movement Counts (7:15 am to 8:15 am)



Afternoon Peak Hour Turning Movement Counts (4:00 pm to 5:00 pm)



A vast majority of vehicles exiting Bircham Street turn left onto Page Boulevard during both the morning and afternoon peak hours. It was observed during data collection and multiple field visits that at certain intervals there were queues of more than six vehicles waiting to exit Bircham Street Bircham Street is likely utilized as a cut through route to travel between Worcester Street and Page Boulevard.

The volume of vehicles currently turning left from Page Boulevard onto Bircham Street is low during both the morning and afternoon peak hours. This is a movement of concern because of the higher potential for conflict with the high volume of through traffic in the opposite direction. Left turning traffic from Page Boulevard onto Bircham Street was not observed to create queues during data collection.

Congestion and Level of Service

The intersection was examined regarding 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 Highway Capacity Manual by six levels, 'A' through 'F'. Several operational factors can influence the LOS including geometry, travel speeds, delay, and the number of pedestrians. 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. Table 1 depicts the delay and LOS designations along unsignalized intersections as per Highway Capacity Manual. Table 2 depicts the results of PVPC's LOS Analysis.

Based on the results of the capacity analysis, Page Boulevard left turning vehicles experienced minimal delay. As noted above, the low volume of vehicles making this turn results in minimal congestion along this approach and a lower potential for conflict. Vehicles travelling along Bircham Street were calculated to operate at Level of Service 'D' in the morning peak hour which is acceptable along urban roadways. (Table 3) The level of service however deteriorated to 'F' in the afternoon. The longer delays in the afternoon correspond with the conditions required to consider traffic signal warrants, which is discussed later in the report. The higher volume of left turning vehicles from Bircham Street contribute to the longer delays and congestion issues at this intersection.

Table 1: LOS Designations

Level of Service	Expected Delay to Minor Street	Average Control Delay (s/veh)
A	Little or no delay	0.0 to 10.0
B	Short Traffic Delays	>10.0 to 15.0
C	Average Traffic Delays	>15.0 to 25.0
D	Long Traffic Delays	>25.0 to 35.0
E	Very Long Delays	>35.0 to 50.0
F	Extreme Delays	>50.0

Table 2: Existing LOS at the Intersection of Page Boulevard and Bircham Street

			AM Peak Hour		PM Peak Hour	
Street	**Approach**	**Movement**	**Delay in seconds**	**LOS**	**Delay in seconds**	**LOS**
Page Boulevard	Eastbound	Left	0.02	A	0.3	A
		Through	0.24	A	0.3	A
	Westbound	Through	0.3	A	0.24	A
		Right	0.19	A	0.19	A
Bircham Street	Southbound	Left/Right	33.9	D	**66.2**	**F**

Crash Data Analysis

Crash data was obtained from MassDOT's IMPACT crash portal utilizing the spatial query for the five-year period between calendar years 2017 to 2021. A total of 38 crashes were reported in the study area at the intersection within this time period. Table 3 represents the classification of these crashes and circumstances and conditions under which these crashes were reported to have occurred. A vast majority of crashes occurred during daylight hours, under clear weather and dry road conditions. Figure 7 depicts the manner of collisions or crash type. A majority of crashes were angle type collisions, followed by single vehicle crashes.

Table 4 depicts the crash severity reported for these crashes. Almost half of the crashes were non-injury crashes resulting in property damage only. There were no fatalities or incapacitating injuries reported during the analysis period of 5 years. Table 5 depicts the driver contribution codes for each crash. The driver contribution code provides a detailed outlook of the different factors that lead to the crash. There can be more than one contributing code for each crash. The most cited or observed cause of crashes was 'Failure to Yield Right of Way'. This could be a result of the heavy left turning traffic volume from Bircham Street that conflicts with four lanes of through traffic along Page Boulevard. Speeding was recorded as a contributing factor for 6 crashes at the intersection.

Table 3: Crash Data Classification

Year	Total	Manner of Collision		Severity		Weather Condition		Road Condition		Light Condition	
2017	9	Angle	4	No injury	2	Blowing sand, snow/Cloudy	1	Dry	6	Dark - lighted roadway	2
		Rear-end	1	Non-fatal injury - Non-incapacitating	2	Clear	6	Snow	1	Dark - roadway not lighted	1
		Sideswipe, same direction	1	Non-fatal injury - Possible	4	Rain	2	Wet	2	Dawn	1
		Single vehicle crash	2	Unknown	1			Dry	9	Daylight	5
		Unknown	1					Ice	1		
2018	11	Angle	7	No injury	8	Clear	10	Dry	9	Dark - lighted roadway	2
		Rear-end	1	Non-fatal injury - Non-incapacitating	1	Cloudy/Rain	1	Ice	1	Daylight	9
		Sideswipe, same direction	1	Non-fatal injury - Possible	2			Wet	1		
		Single vehicle crash	2								
2019	8	Angle	4	No injury	4	Clear	5	Dry	6	Dark - lighted roadway	3
		Single vehicle crash	4	Non-fatal injury - Non-incapacitating	1	Clear/Unknown	1	Snow	1	Daylight	5
				Non-fatal injury - Possible	3	Rain	1	Wet	1		
						Snow	1				
2020	4	Angle	1	No Apparent Injury (O)	2	Clear	2	Dry	1	Dark - lighted roadway	1
		Sideswipe, same direction	1	No injury	1	Rain	1	Slush	1	Daylight	3
		Single vehicle crash	2	Non-fatal injury - Possible	1	Snow/Rain	1	Wet	2		
2021	6	Angle	4	No Apparent Injury (O)	3	Clear	4	Dry	5	Dark - lighted roadway	2
		Single vehicle crash	2	Suspected Minor Injury (B)	2	Cloudy	1	Snow	1	Daylight	4
				Suspected Serious Injury (A)	1	Snow	1				

Figure 7: Crash Type

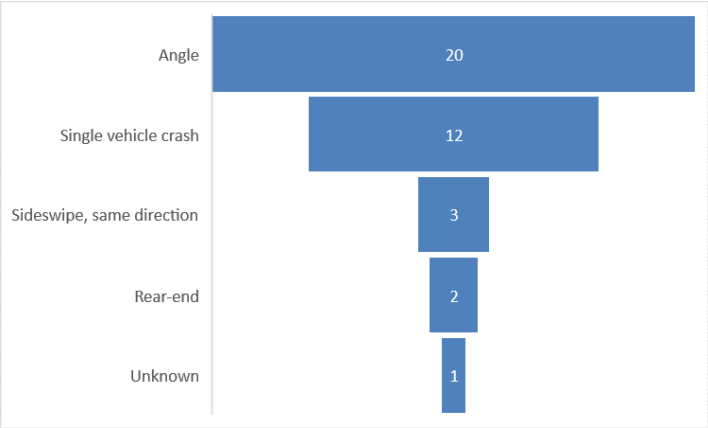


Table 4: Crash Severity

No injury	15
Non-fatal injury - Possible	10
No Apparent Injury (O)	5
Non-fatal injury - Non-incapacitating	4
Suspected Minor Injury (B)	2
Suspected Serious Injury (A)	1
Unknown	1

Table 5: Summary of Driver Contribution Codes

Failed to yield right of way	11
No improper driving	10
Inattention	7
Failure to keep in proper lane or running off road	6
Speeding	6
Disregarded traffic signs, signals, road markings	3
Swerving or avoiding vehicle, object, non-motorist in roadway, etc.	3
Unknown	3
Other improper action	2
Over-correcting	1

A total of 9 collisions were reported to have occurred when a motor vehicle crashed into a guardrail (Table 6). Seven of these nine crashes occurred with vehicle travelling in the westbound direction on Page Boulevard. Five occurred during wet conditions and five during hours of darkness. This category follows the 'Collision with motor vehicle in traffic' as the second most occurring event which resulted in a crash. As mentioned in the Study Area section, the fence behind guardrail along the northwest corner of the intersection is damaged and it can be concluded that it has been hit by vehicles possibly more than once. The high speed of vehicles along Page Boulevard and the curve along the roadway could be the contributing factor behind these crashes. It was also observed during the field inventory that the guardrail can be difficult to see due to overgrown vegetation that may interfere with reflectors on the guardrail. The westbound approach Page Boulevard may also benefit from enhanced pavement markings to guide vehicles through the curve in the vicinity of the intersection.

Table 6: First Harmful Event Summary

Collision with motor vehicle in traffic	24
Collision with guardrail	9
Collision with curb	2
Collision with other light pole or other post/support	1
Collision with tree	1
Other non-collision	1

Signal Warrants

The Manual on Uniform Traffic Control Devices (MUTCD) identifies eight different warrants to evaluate if an intersection meets the minimum requirements for signalization. One or more warrants must be satisfied to justify the installation of a traffic signal; however, engineering judgment ultimately dictates if an intersection warrants the installation of a signal. The installation of a traffic signal must also improve

the safety and operation of the location under study. Table 7 presents the results of the signal warrant analysis (SWA). Of the eight total warrants for the installation of a traffic signal, Warrant1 – Eight Hour Vehicular Volume is generally considered the most important as it requires minimum volumes to be met on both the major and minor streets for at least eight hours. Warrant 2 – Four Hour Vehicular Volume and Warrant 3 – Peak Hour Volume also require minimum volumes to be met but over shorter timeframes. Warrant 7 – Crash Experience requires 80% of the volume requirements of Warrant 1 to be satisfied and at least 5 crashes of a type correctable through traffic signalization to have occurred over the last year. This warrant also requires that less restrictive remedies such as improved signage and pavement markings be tried and have failed to reduce crashes before a signal can be installed.

Crash Data Analysis and Crash Warrant

Crash data obtained from MassDOT's IMPACT portal depicted a total of 20 angle type collisions within the five-year period between 2017 – 2021. This number is less than the required average of five annual crashes which can potentially be prevented by the installation of a signal. Angle collisions are considered the one type which qualifies as potentially preventable through the installation of a traffic signal. Based on MassDOT data, the Crash Warrant is not satisfied under current conditions. Crash Data obtained from IMPACT is attached in Appendix 5.

Results and Interpretation

Table 7 represents the results of the SWA conducted utilizing Highway Capacity Software (HCS) 2022.The intersection meets volume requirements for the first three warrants as specified by the MUTCD. The detailed analyses sheets from HCS are presented in Appendix 6.

Table 7: Signal Warrant Analysis Results

	Description	**Result**
Warrant 1	Eight – Hour Vehicular Volume	Satisfied
Warrant 2	Four- Hour Volume	Satisfied
Warrant 3	Peak Hour Volume	Satisfied
Warrant 4	Pedestrian Volume	Not Satisfied
Warrant 5	School Crossing	N/A
Warrant 6	Coordinated Signal System	N/A
Warrant 7	Crash Experience	Not Satisfied
Warrant 8	Road Network	N/A
Warrant 9	Intersection Near a Grade Crossing	N/A

Warrant 1 is satisfied under condition B which accounts for the *Interruption of Continuous Traffic* along the major street. Condition B is intended for application at locations where traffic volume on a major street is so heavy that traffic on a minor intersecting street suffers excessive delay or conflict in entering or crossing the major street. Bircham Street does experience longer delays during the afternoon peak hour however, based on field observations and data collected by the PVPC the delays are not as

significant during other periods of the day. Warrants 2 and 3 are also satisfied by the volume of traffic and delay along Bircham Street.

The MUTCD guidelines specify that in addition to meeting a Signal Warrant, engineering judgement and justification of proper measures to improve existing traffic conditions should be considered in making decisions regarding new signal installation. Alternate measures to mitigate traffic problems along the intersection should be considered simultaneously while examining the potential effectiveness of the signal in alleviating those issues. Under the current circumstances, it is recommended that the City of Springfield consider other alternative measures to improve conditions at this location before considering a traffic signal. The installation of a signal might potentially decrease delay and queueing along the Bircham Street approach; however, the traffic on Page Boulevard would experience higher congestion and delays. Further, a traffic signal could encourage more traffic to turn left from Page Boulevard onto Bircham Street resulting in higher traffic volumes and travel speeds on Bircham Street. The installation of a signal could assist in reducing the current number of angle collisions at the intersection but there is a possibility that rear end collisions could increase in number due to longer queues of vehicles and the existing curvature of Page Boulevard.

It is also worthy to note that this analysis is based upon actual, unadjusted traffic volumes collected at the intersection. Traffic volumes tend to fluctuate by day of the week and time of the year. Information on seasonal traffic volume fluctuation from MassDOT shows that traffic volumes in the month of October are typically 6% higher than average conditions. PVPC chose not to adjust the traffic data collected for this study as the regional travel patterns and traffic volumes were heavily impacted by the Covid-19 Pandemic. Traffic Volumes and conditions have still not returned to the pre-pandemic levels and additional data is necessary to understand the true long-term impact of the pandemic on regional traffic. Therefore, it is recommended that this location get revisited in the next 3-5 years to observe if the recommendations outlined in this report have had a positive impact on traffic congestion and safety in the vicinity of the intersection. Should the intersection show a lack of improvement, it is recommended that another traffic signal warrant analysis be considered for this intersection.

Recommendations to Improve Transportation Conditions

The following recommendations are presented for the City of Springfield to consider to improve traffic safety and travel conditions in the vicinity of the intersection of Page Boulevard with Bircham Street. These recommendations are considered short term recommendations that could be implemented over the next 3 years.

1. It is recommended that the City consider improving the pavement condition and repainting pavement markings with high retro reflective paint to ensure proper visibility and compliance. The City could also consider painting speed limit markings within the travel lanes along Page Boulevard to improve compliance with the posted speed limits. Wider edge lines in the vicinity of the intersection would enhance the visibility of the edge of the pavement and granite curb particularly through the existing curve. Guidance from the Federal Highway Administration indicates that edge lines can be up to 6 inches wide.

2. The current Speed Feedback sign along eastbound approach of Page Boulevard is located right at the intersection. The City of Springfield could consider moving this sign farther to the west of the intersection to encourage vehicles to slow down in advance of approaching this intersection. The use of flashing yellow warning beacons could improve the visibility of this speed limit sign.
3. Overgrown vegetation along the westbound approach of Page Boulevard makes visibility of warning signs and regulatory signs difficult. It is suggested that the City consider trimming and maintaining the vegetation along this section of roadway on regular basis.
4. Currently there are curve warning signs along the roadway however there are no advance warning signs to alert drivers about the potential for entering traffic as they approach the intersection. It is recommended that the City of Springfield consider installing appropriate supplemental 'Intersection Ahead' warning signs along both approaches of Page Boulevard.
5. Based on information received from MassDOT, the existing 35 mph Speed Limit sign for the westbound approach of Page Boulevard is missing. This speed regulation information is included in the appendix to this document. It is recommended that the City review this information and coordinate with MassDOT to identify where a new 35 mph speed limit sign should be located. It is also recommended that a Reduced Speed Limit Ahead warning sign be considered for the westbound approach of Page Boulevard to alert drivers of the reduction in the posted speed limit from 40 mph to 35 mph in advance of the intersection and curve.
6. The post mounted chevron signs need to be updated and mounted higher according to the guidelines of the Manual of Uniform Traffic Control Devices. (MUTCD). New signs will improve the visibility and help define the curve along Page Boulevard in the vicinity of the intersection.
7. The guardrail along the northwest corner of the intersection does not have reflective chevrons. It is recommended that reflective high visibility chevrons get installed along the guardrail to improve visibility and reduce possibility of vehicles crashing into it. Removal of the overgrown vegetation in the vicinity of the guardrail will also assist in improving the visibility of this guardrail.

Issues and Alternate Mitigation Measures

In addition to regular infrastructure improvements and maintenance in the vicinity of this location, potential Traffic Calming measures can help to reduce travel speeds which in turn can reduce the potential for crashes as well as reduce the severity of crashes. Appropriate regulatory measures can also help to better guide traffic flow and reduce congestion along Bircham Street.

Issue 1: Congestion and Delay

Page Boulevard

Left Turns from the eastbound approach of Page Boulevard do not experience significant delays under current conditions. As can be seen from the turning movement counts, the volume of left turning vehicles during both peak hours is significantly lower than through traffic.

Bircham Street

Bircham Street experiences longer delays during the afternoon peak hour due to a higher volume of left turning traffic. The installation of a signal is not recommended at this time. Alternative lower cost, short term recommendations may result in improvements to travel speeds and safety. The following alternative mitigation strategies could be considered by the City.

Alternate Mitigation Strategies

Regulatory and traffic flow design measures can be undertaken at this intersection to alleviate congestion. Some major cities in the region like Northampton and Westfield have experimented with temporary infrastructure installation along roadway to implement and try new traffic flow patterns and get public input while observing the new operations and examining their effectiveness. The City of Springfield could consider undertaking the following traffic flow changes at the intersection of Page Boulevard with Bircham Street.

(i) One-Way Designation

Bircham Street could be designated as ONE-WAY enter only (northbound) at this intersection. This will eliminate delays at the intersection as there would no longer be any exiting traffic onto Page Boulevard. Exiting traffic from Bircham Street could be diverted to 2nd Street to the west and Fiberloid Street to the east via Worcester Street (Route 141). This measure could also reduce the volume of cut through traffic using Bircham Street. This improvement will result in an inconvenience for the residents that live on and immediately off Bircham Street. Another potential negative feature of this change is that travel speeds along Bircham Street could increase as vehicles have more freedom to maneuver under one way traffic flow. This change would require advance communication with local residents and emergency responders to ensure they have the opportunity to identify any concerns they may have with this change.

(ii) Restricting Left Turns out of Bircham Street by installing a Regulatory Sign

As can be observed by the Turning Movement Counts, an overwhelming majority of vehicles at Bircham Street make a left turn from Bircham Street onto Page Boulevard. If this movement is restricted by installing regulatory signs there is a possibility that left turning vehicles could be diverted to Cadwell Drive and Route 141. The potential problem with this measure is that in absence of a median barrier it will be difficult to enforce this restriction.

(iii) Median Barrier and Restricting Left Turns (for both Page Boulevard and Bircham Street)

Installing a median barrier between the four lanes of Page Boulevard will restrict the left turns from Bircham Street and left turns from Page Boulevard. Vehicles along Page Boulevard can utilize 2nd Street and Rio Vista Street to access Bircham Street. The City of Springfield could consider temporary barriers to observe the impact of such a change before installing permanent median or guardrail, however the lack of shoulders in this area may create the opportunity for more collisions with the temporary barriers. The large negative impact of this improvement is the need to widen Page Boulevard to safely accommodate a

median. This would have a higher implementation cost and could require the acquisition of private property if there is not sufficient right-of-way on Page Boulevard.

Issue 2: Traffic Safety and Travel Speeds

This location does not satisfy the crash warrant based on the average number of angle type crashes; however, there is a concern that higher percentage of angle crashes could contribute to more severe crashes at this intersection. MUTCD guidelines indicate that other adequate and alternative improvement measures should be considered with satisfactory observance and enforcement before installation of a signal for the sole purpose of reducing crash occurrence.

Intersection sight distance for the intersection could be improved through the maintenance of existing vegetation along Page Boulevard. The existing speed limits on Page Boulevard vary along the roadway. Improved visibility and advance communication of the posted speed limits would help to improve driver compliance.

Mitigation Strategies

(i) Traffic Speed Regulation/Enforcement

The 85th percentile speeds along Page Boulevard in both directions were recorded to exceed the posted speed limits. Based on speed regulation information received from MassDOT, it appears that a 35-mph speed limit sign is missing for westbound traffic on Page Boulevard approaching the intersection. It is recommended that the City review this information and coordinate with MassDOT to identify where a new 35 mph speed limit sign should be located. Enhanced enforcement of the existing speed limit will also help to increase awareness and compliance of the posted speeds.

(ii) Advance Warning and Regulatory Signs

Installation of additional high visibility Speed Limit signs accompanied by appropriate advance warning signs of 'Approaching Intersection' could help in alerting drivers the intersection with Bircham Street. It is also recommended that advance warning signs for the curve be installed at appropriate locations along both approaches of Page Boulevard. The MUTCD provides design guidelines for high visibility regulatory signs (e.g., solar flashing LED signs) to ensure the compliance along four lane higher speed roadways. Finally, a Reduced Speed Limit Ahead warning sign for the westbound approach of Page Boulevard will alert drivers of the reduction in the posted speed limit from 40 mph to 35 mph in the vicinity of the intersection.

(iii) Speed Feed Back Signs

Mobile Speed feedback signs are most effective in regulating speed limits along transportation corridors. Placing these units along both directions could greatly help in reducing the speed of vehicles which decreases the potential for traffic conflicts and crashes. There is already an existing speed transition zone in the vicinity of this intersection

where travel speeds along both directions of Page Boulevard are reduced to 35 mph from 40 mph. To reduce the severity of crashes, the City of Springfield could consider an engineering study to examine the feasibility of reducing the speed limit to 30 mph in the vicinity of the intersection.

(iv) Enhanced pavement markings and signs

Additional pavement markings and well maintained highly visible lane markings play a large role in reducing traffic speeds along roadways. These measures can also help focus drivers' attention on their speed and make them aware to comply by regulations. Similarly, wider roadway lane lines and edge lines can help to keep drivers in the proper travel lane. New regulatory and warning signs have higher visibility and reflectivity and could assist in defining the existing curve in the vicinity of the intersection.

(v) Road Diet

The City of Springfield could undertake a larger corridor wide study to examine the possibility of reducing the number of travel lanes along Page Boulevard. The two most widely used measures are the installation of center two way left turn lanes or transitions to exclusive left turn lanes for select intersections. This would require a study of longer sections of Page Boulevard and that considers the long-term impacts of such a change.