Laburnum Avenue & Hermitage Road: Intersection Alternatives Study

July 30, 2024

Prepared for:
City of Richmond

Prepared by:
Kimley-Horn and Associates, Inc.

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Executive Summary

The City of Richmond has initiated an analysis to determine potential improvements for the intersection of Hermitage Road and Laburnum Avenue. The Fall Line Trail, which is planned to run parallel to Hermitage Road and pass through the study intersection, was considered during the concept design development process. This report summarizes results of a safety analysis, existing traffic conditions, alternative concept developments, build condition analysis, and public engagement feedback and conclusions.

Using turning movement count (TMC) data collected in January 2023 and *Synchro Professional, Version 11*, weekday AM, Midday, and PM peak hour traffic conditions were analyzed for existing conditions. The result of this analysis indicates that the study intersection operates at an overall level of service (LOS) C in the AM peak hour, LOS B during the Midday peak, and LOS E in the PM peak hour.

There was an average of 28 crashes/year and 8 injury crashes/year in the five years before the removal of the A.P. Hill statue in late 2022. In the one full year of data after removal, there were 8 total crashes and 4 injury crashes, a 71% reduction in crashes that can be attributed to the removal of the statue. Additionally, in an effort to further increase safety, the City initiated this study to develop intersection alternatives and seek public feedback on the alternatives.

Six alternative intersection designs were considered and analyzed for the intersection:

1. Alternative 1A, a traditional signalized intersection
2. Alternative 1B, a traditional signalized intersection with median U-turns
3. Alternative 2A, a protected intersection with protected left turns
4. Alternative 2B, a protected intersection with median U-turns
5. Alternative 3A, a roundabout with slip lanes, and
6. Alternative 3B, a roundabout with two eastbound/westbound travel lanes and one northbound/southbound travel lanes.

Traffic operations and level of service for alternative 1A, 1B, 2A, and 2B improve in the PM peak hour. Alternative 3A shows improved delays for the AM and PM peak hours, however LOS remains the same. Lastly, Alternative 3B does not experience traffic operation improvements and shows increased delays and worse LOS.

Alternatives 1B and 2B, with the median U-turns in place of left-turns, were not received favorably by the public. While the optional loons shown on the concepts were clearly not supported, even the idea of displaced turns was viewed unfavorably.

The public consistently favored the protected intersection (alternative 2A) slightly over the conventional signalized intersection (alternative 1A). This was even more stark among school parents, bicyclists, and pedestrians. Public feedback consistently showed the desire for safety of vulnerable road users.

Both roundabout alternatives were viewed favorably, even among school parents, bicyclists, and pedestrians. Alternative 3A, the roundabout with northbound and southbound slip lanes, was the most preferred alternative of the public.

Throughout the public involvement process, three main desires emerged from the public in survey responses and discussions at the public meeting: speed control, the ability to make left turns, and safety of vulnerable road users (bicycles, pedestrians, school children). Therefore Kimley-Horn's recommendation is to select Alternative 3A as the preferred alternative, as it best meets these three public desires without compromising traffic operations. The roundabout will better control speeds through the intersection than the other alternatives, while still allowing turning movements to all intersecting roadways. Additionally, Kimley-Horn recommends the inclusion of RRFBs at each pedestrian crossing to enhance the safety of vulnerable road users, particularly with the future Fall Line Trail planned to use this intersection.

There are also several short-term improvements Kimley-Horn recommends the City could make to help improve safety and user protection at the intersection in its given condition. Those include:

- Installing a westbound No U-Turn sign in the median opening at Hill Monument Pkwy on Laburnum Ave
- Installing pedestrian countdown signals for all approaches
- Erecting flexible delineators to gore out the wide intersection radii to tighten the intersection and provide better protected and shorter crossing distances for pedestrians

Introduction

STUDY PURPOSE

In late 2022, the City of Richmond's Department of Public Works removed A.P. Hill statue and landscaped median island in the center of the intersection. As a result of the removal, sight distance and the frequency of crashes have improved. The City of Richmond is now exploring potential intersection improvements to address accessibility, congestion, and safety for motor vehicles, pedestrians, and bicyclists while planning for the future integration of the Fall Line Trail. This report outlines the analysis of existing traffic conditions, proposed design alternatives with corresponding traffic analysis, short-term improvements, and public involvement.

STUDY LOCATION

The intersection of Hermitage Road and Laburnum Avenue sits in between the three northside Richmond neighborhoods, Bellevue, Rosedale, and Laburnum Park, as seen in **Figure 1**. The intersection is located in close proximity to I-64, I-95, and US 360, and Laburnum Avenue is a major East-West Connector between I-65 and I-95. **Figure 2** depicts an aerial view of the study intersection and the proximity to Linwood Holton Elementary School, which is located at the northeast corner of the intersection. The construction of the Fall Line Trail is currently planned to parallel Hermitage Road and run through the study intersection, which was also taken into consideration while developing potential intersection designs. The proposed Fall Line Trail is shown in **Figure 3.**

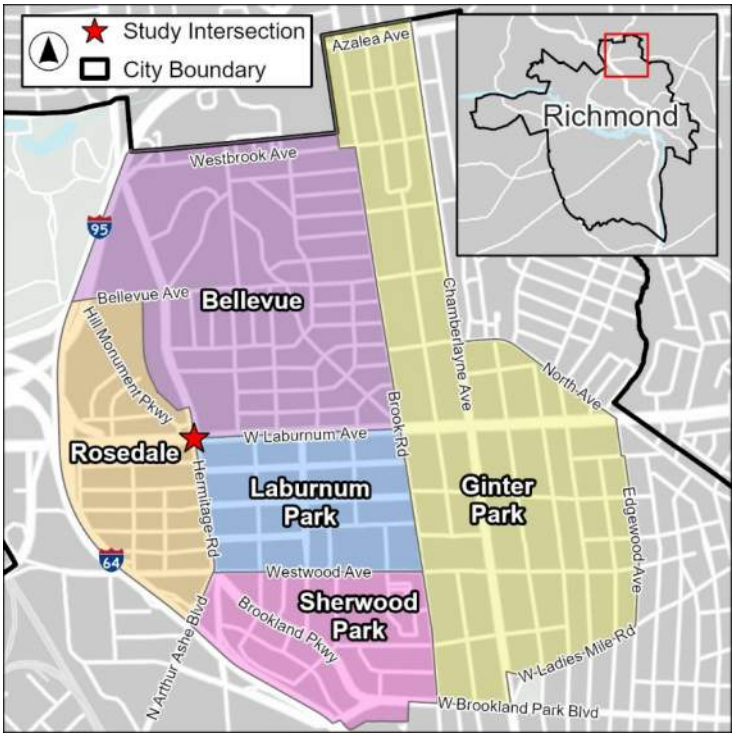

Figure 1: City of Richmond Map

Figure 2: Study Intersection

Figure 3: Proposed Fall Line Trail

Existing Conditions

Existing conditions were examined to assist the study team in better understanding areas of concern and identifying potential countermeasures. Below is a summary of the data collected, field observations, and traffic and safety analysis of the existing intersection.

INTERSECTION CHARACTERISTICS

Hermitage Road and Laburnum Avenue is a four-legged signalized intersection. Hermitage Road a four-lane road with a center landscape median and is oriented in the north-south direction. Laburnum Avenue is also a four-lane road with a center landscape median and is oriented in the east-west direction. Both roads are classified as a Principal Arterial according to the current VDOT functional classification data, and the posted speed limit is 35 MPH on all approaches. Two GRTC bus routes, The 91 and the 14, travel through the study intersection daily. Route 91, the Laburnum Connector, travels through the intersection along Laburnum Avenue and operates during peak hours to connect commuters to the Pulse line. Route 14 travels through the intersection along Hermitage Road and operates daily to connect to the Pulse line. There are four transit stops at the intersection, Hermitage Road has one nearside stop and one farside stop, and Laburnum Avenue has two farside stops. Designated bike lanes are striped along the shoulders of Hermitage Road.

The study team conducted a traffic analysis and an alternatives analysis to identify the preferred alternative to improve the intersection. The traffic analysis documented existing conditions and evaluated potential alternative intersection configurations.

DATA COLLECTION

Kimley-Horn used existing turning movement count (TMC) data collected as part of the Citywide Signal Optimization Program in January 2023. TMC data was collected from 7:00 AM to 9:00 AM and from 4:00 PM to 6:00 PM. Based on TMC data at the study area intersection, the AM and PM peak hours were determined to be 7:30 AM to 8:30 AM and 4:45 PM to 5:45 PM, respectively. Peak hour turning movement count data is summarized in **Figure 4** below.

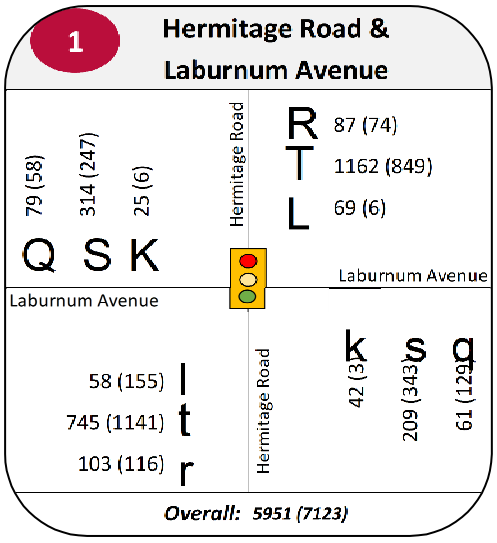

Figure 4: Existing Traffic Counts

FIELD OBSERVATIONS

On Tuesday October 10th, 2023, at approximately 7:30 AM, field observations were completed to evaluate the current traffic conditions and document existing roadway geometry. A comprehensive list of observations can be found in **Appendix G**. A summary of the most impactful observations to safety and mobility include:

The intersection currently has large curb radii, which has provided drivers with the opportunity to make a right turn at an unsafe speed. Along with the large radii, a lack of pedestrian signals and refuge areas creates several safety concerns for pedestrians and cyclists. The existing geometry of the intersection can be referenced in **Figure 5**. The intersection currently prohibits left turns in all directions except for the eastbound approach during peak hours. Drivers have been commonly observed to make illegal left turns during restricted periods, as seen in **Figure 6.**

Figure 5: Existing Intersection Geometry

Figure 6: Vehicles Making Illegal Left Turns

During the field visit, there were a few instances where vehicles avoided a left turn at the intersection and made a u-turn at a median opening further down the road.

TRAFFIC ANALYSIS

Intersection capacity analyses for the study area intersection was conducted for the AM and PM peak hours under 2023 existing conditions using *Synchro Professional, Version 11*. The signalized intersection was analyzed using methodologies from the Highway Capacity Manual (HCM 2000). Delay, measured in seconds per vehicle, and the associated level of service (LOS) were reported by Synchro. LOS illustrates the relative difference in delay and ranges from A to F. LOS A indicates a condition of little or no congestion, and LOS F indicates a condition of severe congestion and unstable traffic flow. **Table 1** summarizes the delay associated with each LOS and the longest 95th percentile queue from AM, Midday, and PM peak hour analyses. Tabular delay and LOS results from the Synchro analysis and the supporting Synchro reports are included in **Appendix A**.

Table 1: Existing Delay, LOS, and 95th Percentile Queue

	Level of Service (LOS)	**Delay**	**Worst 95th % Queue**
AM	C	24.4s	492’ WBT
MID	B	18.1s	126’ EBT
PM	E	60.4s	896’ EBT

Existing pedestrian and bicycle LOS was also evaluated using methodologies contained in the Charlotte Department of Transportation's (CDOT) Pedestrian & Bicycle Level of Service Methodology for Crossing at Signalized Intersections, dated February 2007. The CDOT methodology focuses on identifying and evaluating key intersection design features according to their influence on the comfort and safety of pedestrians and bicyclists. The methodology only analyzes and rates intersection features that have direct impacts to pedestrians and bicyclists such as crosswalk length, presence of corner islands, and left-turn signal features. The existing pedestrian LOS was reported as LOS F, and the existing bicyclists LOS was reported as LOS D. The pedestrian and bike LOS results are included in **Appendix E**.

SAFETY ANALYSIS

Crash data between January 2018 and December 2023 was obtained from VDOT. Between 2018 and 2023, there were a total of 149 crashes in or near the study intersection. 62% of crashes were caused by angle crashes, which was the most frequent collision type. Rear end crashes were 18% of the total crashes. Of all crashes, 69% were property damage only and 26% had suspected minor injuries. Additionally, 76% of crashes occurred in daylight conditions and 82% occurred with no adverse weather conditions. **Figure 7** shows the location of crashes that occurred during the 6-year period. The A.P. Hill statue that was removed in late 2022 improved intersection sight distance and based on the crash data review, appears to have contributed to a reduction in crash frequency at the intersection. Traffic crashes averaged 28 crashes per year while the statue was present. Since removal of the statue, annual crashes have decreased by 71% with 8 crashes reported in 2023. The review of crash data was limited to the completeness and accuracy of available crash data.

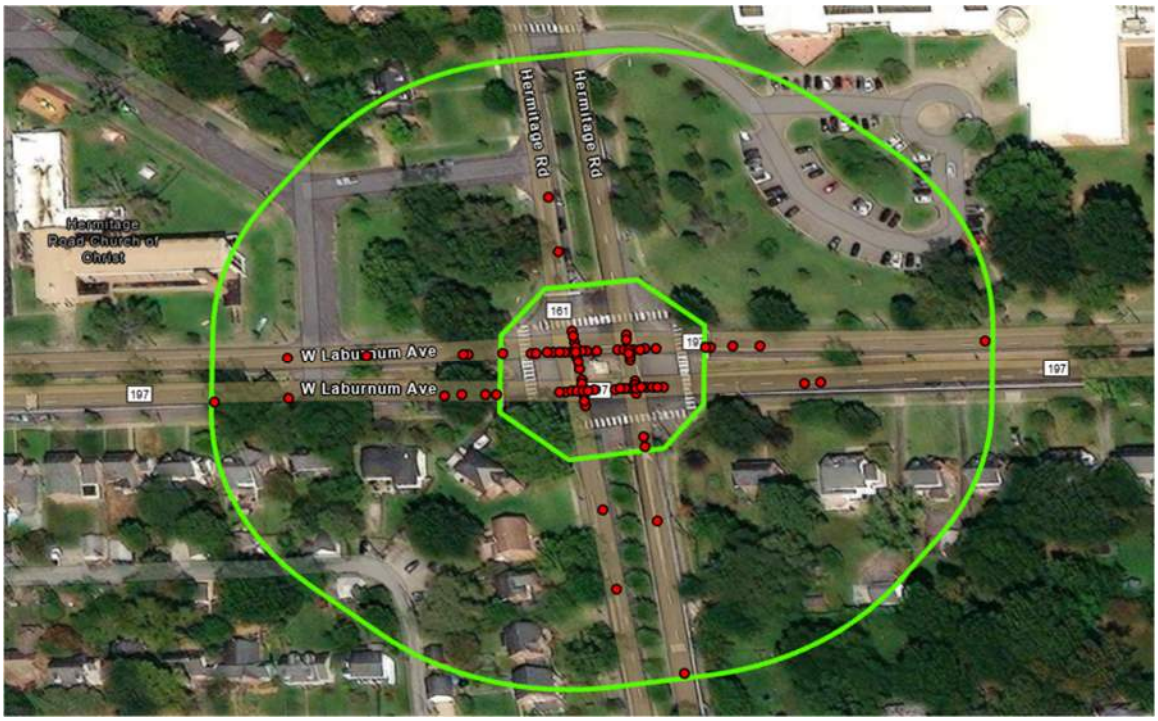

Figure 7: 2018-2023 Crashes - Hermitage Road and Laburnum Avenue

The crash data was analyzed to understand predominant collision types, collision severity, lighting conditions, and weather conditions at the intersection, summarized in Table 3, Table 4, Table 5, and Table 6 respectively. Crashes are classified using the KABCO scale: K = fatal injury, A = suspected serious injury, B = suspected minor injury, C = possible injury, O = property damage only (no apparent injury). Crashes are based on the most severe injury to any person involved in the crash.

Table 2: 2018-2023 Crashes – Collision Severity

Year	Collision Severity					
	K	A	B	C	O	TOTAL
2018	0	0	8	0	21	29
2019	0	0	8	0	25	33
2020	0	1	8	4	14	27
2021	0	0	4	0	21	25
2022*	0	0	7	2	18	27
2023	0	0	3	1	4	8
Total	**0**	**1**	**38**	**7**	**103**	**149**

*A.P. Hill statue removed in 2022

Table 3: 2018-2023 Crashes - Collision Type

Crash Type	Collision Severity					
	K	A	B	C	O	TOTAL
Rear End	0	0	5	2	20	27
Angle	0	1	27	3	61	92
Head On	0	0	1	1	3	5
Sideswipe – Same Direction	0	0	1	1	12	14
Other	0	0	2	0	5	7
Fixed Object in Road	0	0	0	0	1	1
Fixed Object off Road	0	0	2	0	0	2
Backed Into	0	0	0	0	1	1
Total	**0**	**1**	**38**	**7**	**103**	**149**

Table 4: 2018-2023 Crashes - Lighting Condition

Lighting	Collision Severity					
	K	A	B	C	O	TOTAL
Daylight	0	0	24	4	85	113
Dawn	0	0	0	0	2	2
Darkness – Road Lighted	0	1	13	3	15	32
Darkness – Road Not Lighted	0	0	1	0	0	1
Dusk	0	0	0	0	1	1
Total	**0**	**1**	**38**	**7**	**103**	**149**

Table 5: 2018-2023 Crashes - Weather Condition

Weather	Collision Severity					
	K	A	B	C	O	TOTAL
No Adverse Condition (Clear/Cloudy)	0	1	30	5	86	122
Rain	0	0	5	2	16	23
Snow	0	0	2	0	0	2
Mist	0	0	1	0	1	2
Total	**0**	**1**	**38**	**7**	**103**	**149**

The study team applied Highway Safety Manual methodologies to determine predicted, observed, and expected annual crash frequency under existing conditions. A potential for safety improvement (PSI) was also determined. A site is identified as having a PSI if the expected number of crashes is higher than the predicted number of crashes. A zero or negative PSI would indicate that the location is performing similar to or better than other comparable sites in terms of safety. However, there can still be an opportunity to enhance safety.

Table 6 below summarizes the safety performance for existing conditions based on the collision severity.

Table 6: Existing HSM Safety Analysis

	Fatal and Injury Crashes	Property Damage Only Crashes	Total Crashes
Predicted Average Annual Crash Frequency	2.19	4.09	6.29
Observed Average Annual Crash Frequency	9.40	20.40	29.80

Expected Average Annual Crash Frequency	1.78	3.96	5.12
Potential for Safety Improvement (PSI)	-0.41	-0.14	-1.17

Concept Development

Kimley-Horn considered and developed various concept plans to implement at this intersection to help improve safety and functionality.

Each of the six concepts have been developed to accommodate the future Fall Line Trail alignment that is expected to run north and south along Hermitage Road. The concepts show one-way bike facilities on the east and west side of Hermitage Road, however any of the concepts could be modified to accommodate a variety of bicycle and pedestrian facility alternatives such as a two-way shared use path, cycle track, or bike lanes. The concepts do not preclude any future bicycle or pedestrian facilities.

All the concepts also propose closing the median opening at the intersection of Hill Monument Parkway and Laburnum Avenue. Hill Monument Parkway can be accessed via Hermitage Road as well as several other connections in the neighborhood. Closing the median opening eliminates a conflict point near the intersection that violates access management standards due to proximity to the intersection of Hermitage Road and Laburnum Avenue.

Each concept accommodates existing transit stops near the intersection of Hermitage Road and Laburnum Avenue, however the exact location may shift depending on the alternative.

ALTERNATIVE 1A – TRADITIONAL SIGNALIZED INTERSECTION

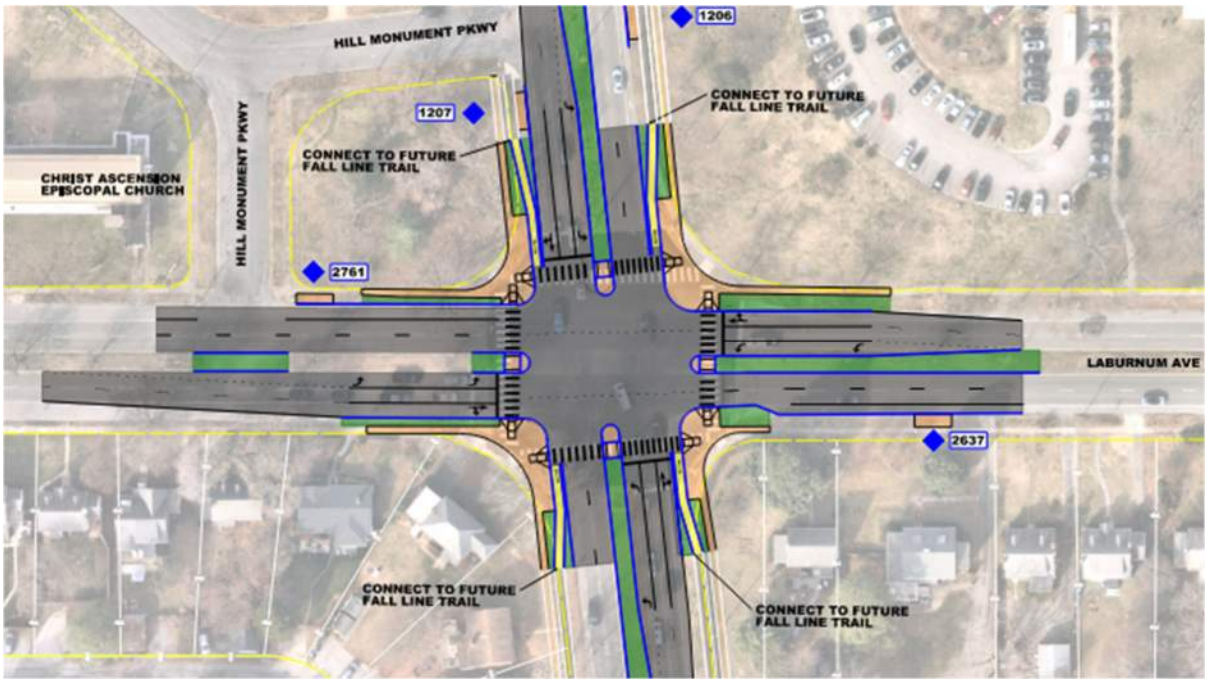

Figure 8: Image of Alternative 1A

Alternative 1A, seen in **Figure 8**, is a proposed traditional signalized intersection. This concept was developed with the goal of maintaining a similar intersection configuration as existing while introducing dedicated left turn lanes. The proposed left turn lanes depicted maximize the use of the existing pavement by reducing existing lane widths, eliminating parking lanes at the intersection and utilizing lane shifts. In locations where the existing pavement widths do not allow for three travel lanes, widening is proposed into the existing medians. Medians have also been extended to intersect with proposed crosswalks and provide pedestrian refuges when crossing Hermitage Road and Laburnum Avenue.

Proposed curb returns in Alternative 1A have a tighter turning radius to provide shorter crosswalks closer to the intersection. The curb return proposed is the minimum radius that still accommodates truck turning movements using a WB-50 design vehicle.

As the trail approaches the intersection, a ramp is proposed to transition cyclists from the trail to the roadway to increase cyclist visibility for drivers and avoid conflicts between pedestrians and cyclists.

ALTERNATIVE 1B – TRADITIONAL SIGNALIZED INTERSECTION WITH MEDIAN U-TURN

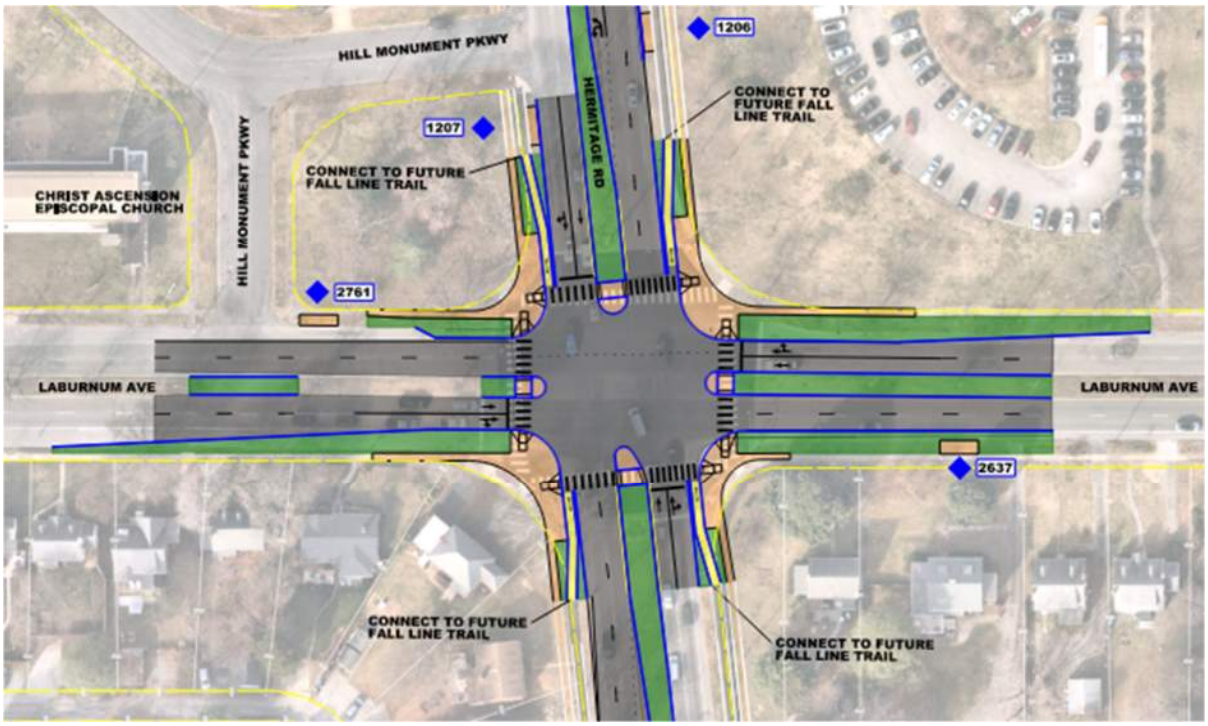

Figure 9: Image of Alternative 1B

Alternative 1B, seen in **Figure 9**, is a proposed traditional signalized intersection with restricted left turns on all four approaches. This concept was developed with the goal of maintaining a similar configuration to the existing intersection and improving travel times through the intersection by prohibiting left turn movements. In Alternative 1B, left turning vehicles are required to continue through the intersection and make a median U-turn, followed by a right turn at the intersection. The proposed westbound U-turn lane makes use of existing pavement utilizing lane shifts. The northbound, southbound, and eastbound proposed U-turn lanes require lane shifts and widening into the existing median to accommodate the width of the proposed turn lane. The existing roadway widths of Laburnum Avenue and Hermitage Road do not allow for trucks to make the U-turn movement. To accommodate the U-turn movement of a WB-50 design vehicle, loons are proposed on each leg of the intersection. Proposed loons for the northbound and southbound U-turns impact multiple residential properties and the westbound loon impacts an existing home.

Proposed curb returns in Alternative 1B have a tighter turning radius to provide shorter crosswalks closer to the intersection to improve pedestrian visibility for drivers. The curb return proposed is the minimum radius that still accommodates truck turning movements using a WB-50 design vehicle.

As the trail approaches the intersection, a ramp is proposed to transition cyclists from the trail to the roadway to increase cyclist visibility for drivers and avoid conflicts between pedestrians and cyclists.

ALTERNATIVE 2A – PROTECTED INTERSECTION WITH LEFT TURNS

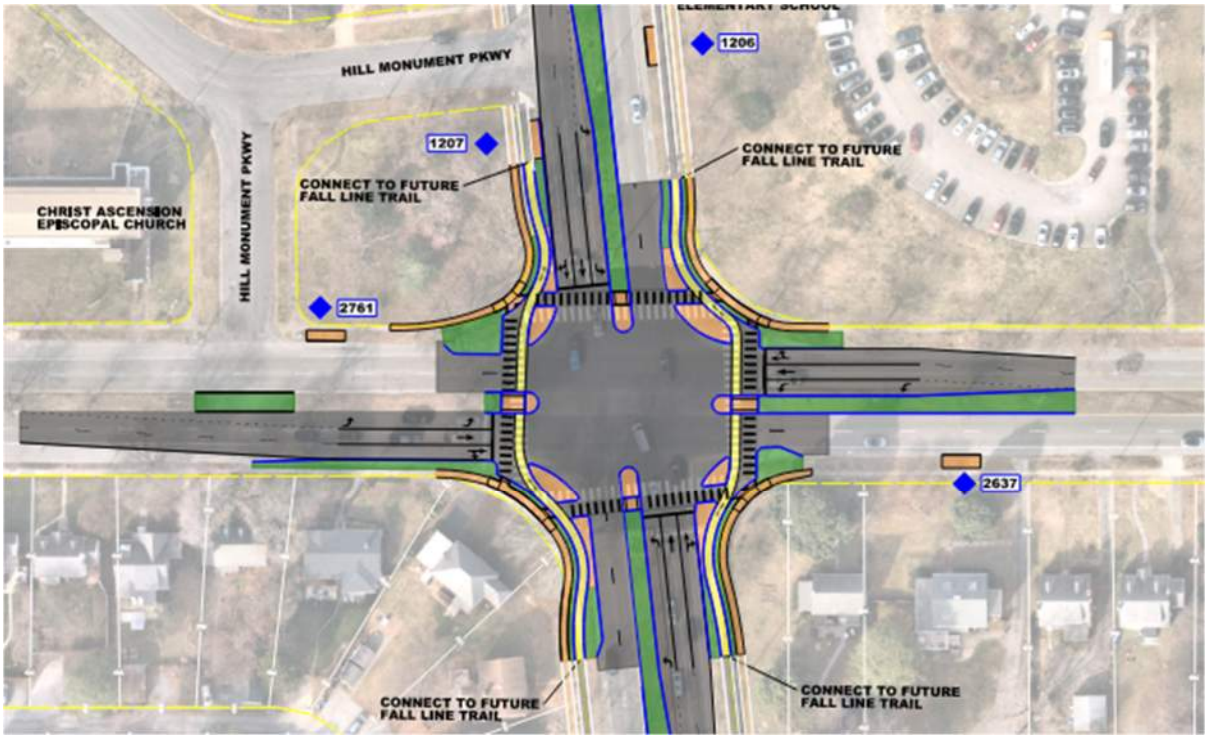

Figure 10: Image of Alternative 2A

Alternative 2A, seen in **Figure 10**, proposes a protected intersection with the introduction of corner islands to protect pedestrians and cyclists near the intersection. Bike facilities are set back from the roadway so cyclists cross in conjunction with pedestrians, using pedestrian signals and allows better visibility of cyclists for turning drivers.

The proposed corner islands depicted allow for additional protection for pedestrians and cyclists and have the minimum turning radius that still accommodates the turning movements of a WB-50.

Alternative 2A also proposes left turn lanes for all approaches. The proposed left turn lanes depicted maximize the use of the existing pavement by reducing existing lane widths, eliminating parking lanes at the intersection and utilizing lane shifts. In locations where the existing pavement widths do not allow for three travel lanes, widening is proposed into the existing medians. Medians have also been extended to intersect with proposed crosswalks and provide pedestrian refuges when crossing Hermitage Road and Laburnum Avenue.

ALTERNATIVE 2B - PROTECTED INTERSECTION WITH MEDIAN U-TURN

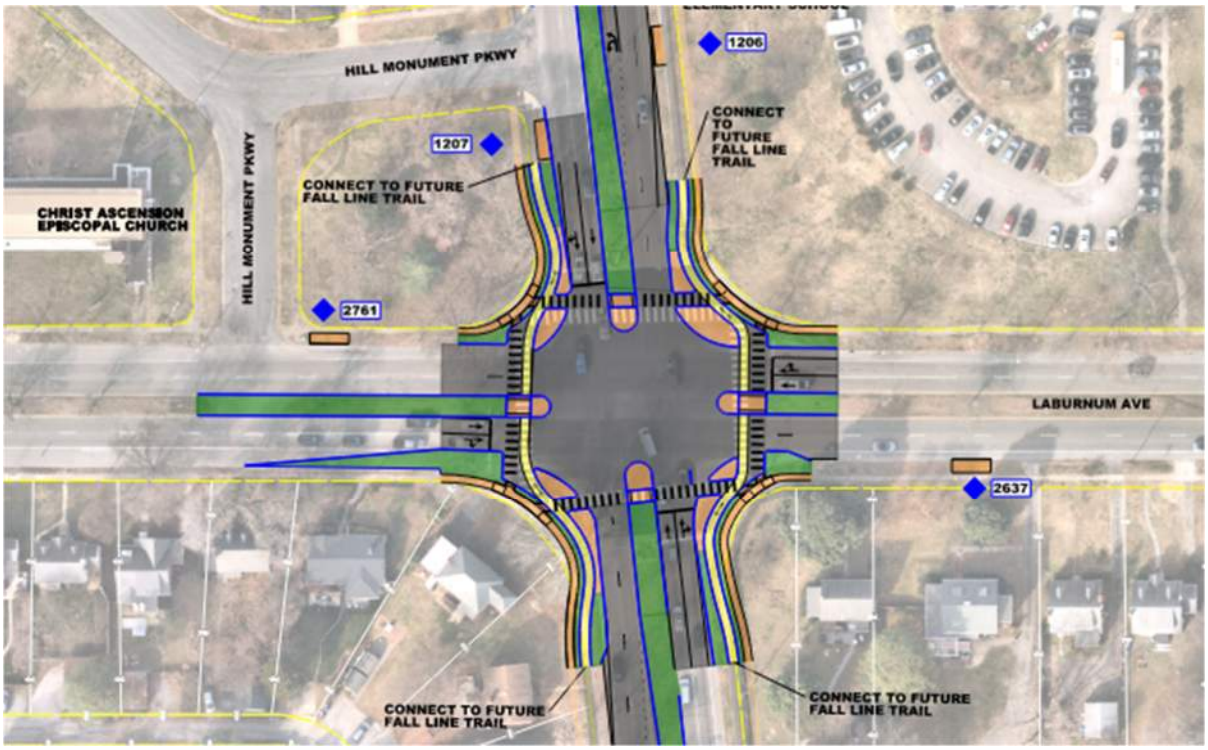

Figure 11: Image of Alternative 2B

Alternative 2B, seen in **Figure 11**, proposes a protected intersection with the introduction of corner islands to protect pedestrians and cyclists near the intersection. Bike facilities are set back from the roadway so cyclists cross in conjunction with pedestrians, which allows for better visibility of cyclists for turning drivers and allows for cyclists to use pedestrian signals when crossing.

The proposed corner islands depicted allow for additional protection for pedestrians and cyclists and have the minimum turning radius that still accommodates the turning movements of a WB-50.

Alternative 2B also restricts left turns on all four approaches to improve travel times. In this concept, left turning vehicles are required to continue through the intersection and make a median U-turn, followed by a right turn at the intersection. The proposed westbound U-turn lane utilizes the existing pavement and lane shifts. The northbound, southbound, and eastbound proposed U-turn lanes require lane shifts and widening into the existing median to accommodate the width of the proposed turn lane. The existing roadway widths of Laburnum Avenue and Hermitage Road do not allow for trucks to make the U-turn movement. To accommodate the U-turn movement of a WB-50 design vehicle, loons are proposed on each leg of the intersection. Proposed loons for the northbound and southbound U-turns impact multiple residential properties and the westbound loon impacts an existing home.

ALTERNATIVE 3A – ROUNDABOUT WITH SLIP LANES

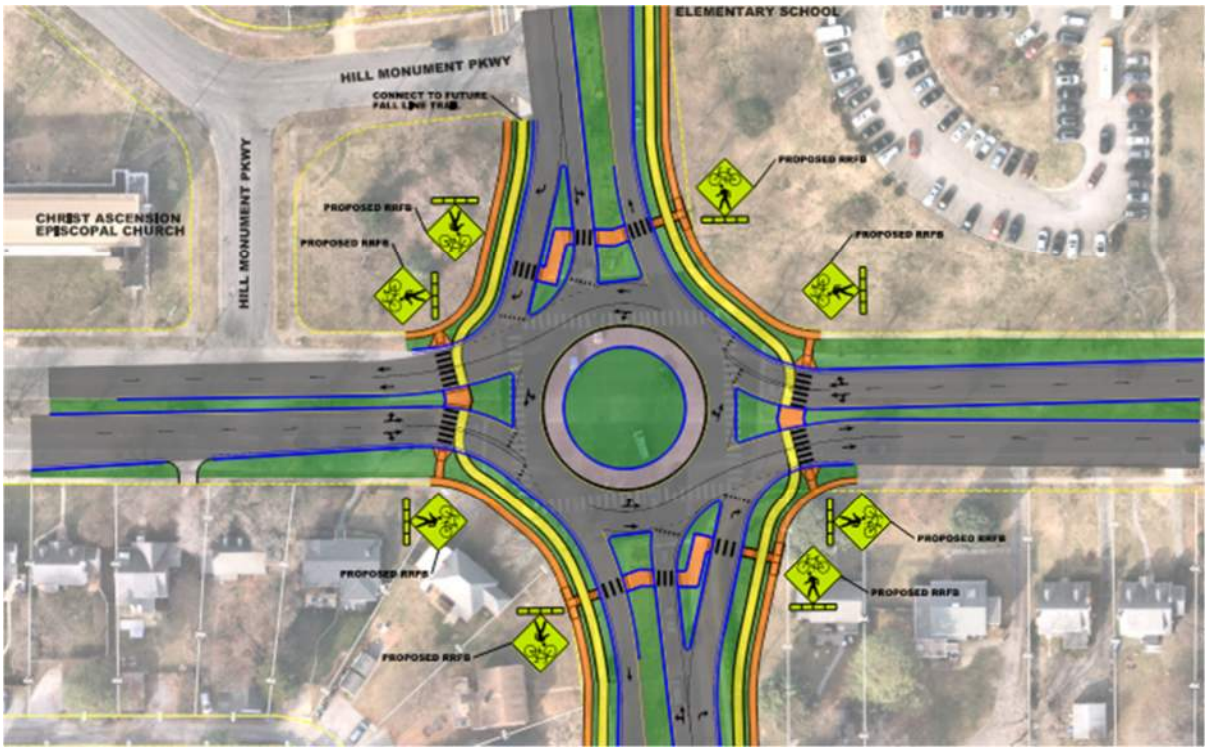

Figure 12: Image of Alternative 3A

Alternative 3A, seen in **Figure 12**, proposes a hybrid roundabout with two lanes through the roundabout to serve Hermitage Road and four lanes through the roundabout to serve Laburnum Avenue. The roundabout was designed to accommodate a WB-50 design vehicle and utilizes the existing intersection footprint except where slip lanes are proposed. To reduce delay for vehicles traveling through the intersection, slip lanes are proposed for the northbound and southbound right turn movements. The slip lanes result in greater right-of-way impacts on the northwest and southeast corners of the roundabout.

The Fall Line Trail is proposed to run parallel to the proposed sidewalk along Hermitage Road and crosses Laburnum Avenue in conjunction with the pedestrian route. The concept also proposes rectangular rapid flashing beacons to provide additional warning to drivers and improve visibility of pedestrians and cyclists.

ALTERNATIVE 3B – ROUNDABOUT

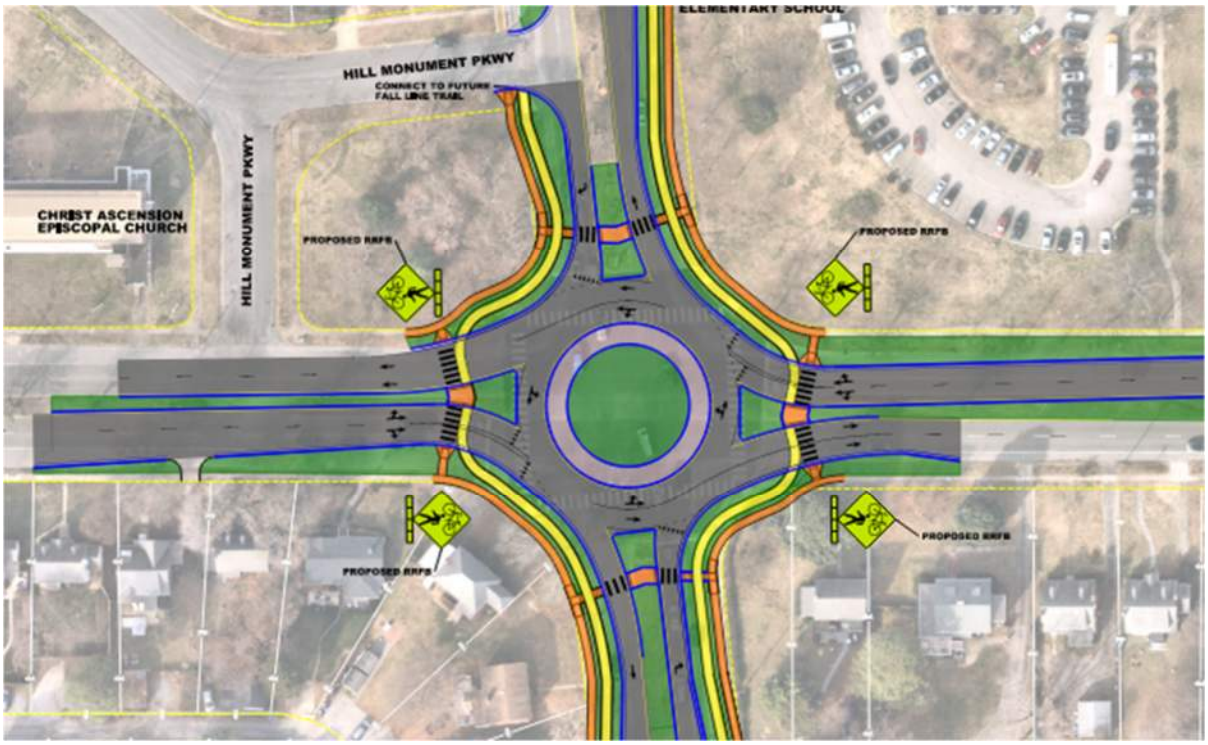

Figure 13: Image of Alternative 3B

Alternative 3B, seen in **Figure 13**, proposes a hybrid roundabout with two lanes to serve Hermitage Road and four lanes in the roundabout to serve Laburnum Avenue. The roundabout was designed to accommodate a WB-50 design vehicle and makes use of the existing intersection footprint. This concept excludes the proposed northbound and southbound slip lanes shown in Alternative 3A, which reduces the right-of-way impacts of the roundabout in the northwest and southeast corners of the intersection. Because this concept excludes slip lanes, Hermitage Road is proposed to merge down to one lane approaching the roundabout in the northbound and southbound directions.

The Fall Line Trail is proposed to run parallel to the proposed sidewalk along Hermitage Road and crosses Laburnum Avenue in conjunction with the pedestrian route. The concept also proposes rectangular rapid flashing beacons at each crossing to provide additional warning to drivers and improve visibility of pedestrians and cyclists.

Build Conditions Analysis

Kimley-Horn conducted intersection capacity analysis for six alternatives for the AM and PM peak hours. These build conditions were analyzed using existing volumes, and no growth factor was used for future projections as requested by the City of Richmond. The analysis was completed to determine the operating characteristics of the study area intersections for alternatives 1A, 1B, 2A, and 2B using Synchro, Version 11. The signalized intersection was analyzed using methodologies from

Highway Capacity Manual (HCM) 2000. Sidra Software was used to determine the operating characteristics for alternatives 3A and 3B, where a roundabout is considered.

The study team projected left turn volumes for the proposed alternatives since the intersection currently restricts all left turn movements during the AM and PM peak periods with exception to the eastbound approach. AM and PM peak left turn volumes were projected by using the midday peak period traffic count data for the northbound, southbound, and westbound approaches. The percent of left turns during each 15-minute interval of the midday peak was used to estimate the number of left turns during the AM and PM peak periods per approach. The percent of left turns per approach was then applied to the total volume of vehicles per 15-minute interval during the AM and PM peak periods to calculate the projected number of left turning vehicles per 15-minute interval per approach. The results of the project left turn analysis can be found in **Appendix F**.

HSM methodologies were also used to determine predicted, observed, and expected annual crash frequency under the alternative build conditions. The results for the alternative build conditions are discussed in the following sections. **Table 7** summarizes the crash type per year. The most notable change is seen in the reduction of angle crashes after 2022. This can be attributed to the removal of the A.P. Hill statue that occurred in 2022. Crashes reduce from 15 angle crashes in 2021 and 2022 to 3 crashes in 2023.

Table 7: Crash Type per Year

YEAR	Crash Type								
	1. Rear End	2. Angle	3. Head On	4. Sideswipe - Same Direction	16. Other	6. Fixed Object in Road	9. Fixed Object - Off Road	15. Backed Into	**Total**
2018	5	20	2	1	1	0	0	0	**29**
2019	5	20	0	5	2	1	0	0	**33**
2020	5	19	0	2	0	0	1	0	**27**
2021	4	15	0	4	2	0	0	0	**25**
2022	4	15	3	1	2	0	1	1	**27**
2023	4	3	0	1	0	0	0	0	**8**
Total	**27**	**92**	**5**	**14**	**7**	**1**	**2**	**1**	**149**

ALTERNATIVE 1A – TRADITIONAL SIGNALIZED INTERSECTION

Alternative 1A features dedicated left turn lanes for each leg of the intersection with no time of day left turn restrictions. Curb radii are reduced to create shorter, safer crosswalks for pedestrians, and leading pedestrian intervals are proposed for all crosswalks. The traditional signalized intersection will also reduce right-turning vehicle speeds with the updated curb radii. **Figure 8** shows the conceptual design for this alternative.

Traffic operations were analyzed using Synchro, Version 11 and HCM 2000 methodologies. A summary of the alternative 1A and existing delay, intersection LOS, and worst 95th percentile queue are shown in **Table 8**. Pedestrian and bicycle LOS was determined using the Charlotte DOT

methodology and was determined to be LOS C and LOS D, respectively. Tabular delay and LOS results from the Synchro analysis and the supporting Synchro reports are included in **Appendix B**.

Table 8: Existing vs. Alternative 1A Delay, LOS, and Worst 95th Percentile Queue

Existing						Alternative 1A					
AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
Delay (s)	LOS	95th Queue	Delay (s)	LOS	95th Queue	Delay (s)	LOS	95th Queue	Delay (s)	LOS	95th Queue
24.4s	C	492' WBT	60.4s	E	896' EBT	26.3s	C	595' WBT	35.7s	D	632' EBT

The study team used an HSM Safety Analysis Tool to determine the safety implications of each alternative. VDOT provides a list of crash modification factors (CMF), which is a tool that can estimate changes in safety performance when a countermeasure is implemented. The two CMF countermeasures applied to determine the total crash frequency were: add median pedestrian island and add leading pedestrian interval. **Table 9** below summarizes the safety performance for existing and alternative 1A conditions. Alternative 1A has been determined to have a 51% crash reduction.

Table 9: Alternative 1A HSM Safety Analysis

Total Crashes		
	Existing Conditions	Alternative 1A
Predicted Average Annual Crash Frequency	6.45	3.19
Expected Average Annual Crash Frequency	5.12	2.53
Change from Existing Conditions	-	2.59
Fatal and Injury Crashes		
Predicted Average Annual Crash Frequency	2.20	0.00
Expected Average Annual Crash Frequency	1.78	0.00
Change from Existing Conditions	-	1.78
Property Damage Only Crashes		
Predicted Average Annual Crash Frequency	4.25	3.19
Expected Average Annual Crash Frequency	3.34	2.50
Change from Existing Conditions	-	0.83

ALTERNATIVE 1B – TRADITIONAL SIGNALIZED INTERSECTION WITH MEDIAN U-TURN

Alternative 1B provides a traditional signalized intersection, except left-turning vehicles will make U-turns at dedicated median openings to complete the desired movement. Curb radii are reduced to create shorter, safer crosswalks, and leading pedestrian intervals are proposed for all crosswalks. Optional “loons” are shown to accommodate the U-turns of larger vehicles and trucks. **Figure 9** shows the conceptual design for alternative 1B.

Traffic operations were analyzed using Synchro, Version 11 and HCM 2000 methodologies. Traffic queues were analyzed using SimTraffic. A summary of the alternative 1B and existing delay,

intersection LOS, and worst 95th percentile queue are summarized in **Table 10**. Pedestrian and bicycle LOS was determined using the Charlotte DOT methodology and was determined to be LOS C and LOS D, respectively. Tabular delay and LOS results from the Synchro analysis and the supporting Synchro reports are included in **Appendix C**.

Table 10: Existing vs. Alternative 1B Delay, LOS, and Worst 95th Percentile Queue

Existing						Alternative 1B					
AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
Delay (s)	LOS	95th Queue	Delay (s)	LOS	95th Queue	Delay (s)	LOS	95th Queue	Delay (s)	LOS	95th Queue
24.4s	C	492' WBT	60.4s	E	896' EBT	17.1	B	254' WBT	23.5s	C	352' EBT

The safety implications of Alternative 1B were determined with the HSM Safety Analysis Tool. The three CMF countermeasures applied to determine the total crash frequency were: add median pedestrian island, add leading pedestrian interval, and convert MUT. **Table 11** below summarizes the safety performance for existing and alternative 1B conditions. Alternative 1B has been determined to have a 59% crash reduction.

Table 11: Alternative 1B HSM Safety Analysis

Total Crashes		
	Existing Conditions	Alternative 1B
Predicted Average Annual Crash Frequency	6.45	2.65
Expected Average Annual Crash Frequency	5.12	2.53
Change from Existing Conditions	-	2.59
Fatal and Injury Crashes		
Predicted Average Annual Crash Frequency	2.20	0.00
Expected Average Annual Crash Frequency	1.78	0.00
Change from Existing Conditions	-	1.78
Property Damage Only Crashes		
Predicted Average Annual Crash Frequency	4.25	2.65
Expected Average Annual Crash Frequency	3.34	2.50
Change from Existing Conditions	-	0.83

ALTERNATIVE 2A – PROTECTED INTERSECTION WITH LEFT TURNS

Alternative 2A provides raised islands in each of the intersection quadrants to provide additional protection for pedestrians and bicyclists. Bicyclists will travel along a bike lane and use a bike crosswalk, separate from the parallel motor vehicle traffic along Hermitage Road. The concept plan for alternative 2A can be seen in **Figure 10.** Leading pedestrian intervals are also proposed for all crosswalks.

Traffic operations were analyzed using Synchro, Version 11 and HCM 2000 methodologies. A summary of the alternative 2A and existing delay and intersection LOS are shown in **Table 12**. Pedestrian and bicycle LOS was determined using the Charlotte DOT methodology and was

determined to be LOS B and LOS D, respectively. Tabular delay and LOS results from the Synchro analysis and the supporting Synchro reports are included in **Appendix B**.

Table 12: Existing vs. Alternative 2A Delay, LOS, and Worst 95th Percentile Queue

Existing						Alternative 2A					
AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
Delay (s)	LOS	95th Queue	Delay (s)	LOS	95th Queue	Delay (s)	LOS	95th Queue	Delay (s)	LOS	95th Queue
24.4s	C	492' WBT	60.4s	E	896' EBT	26.3s	C	595' WBT	35.7s	D	632' EBT

The safety implications of Alternative 2A were determined with the HSM Safety Analysis Tool. The three CMF countermeasures applied to determine the total crash frequency were: add median pedestrian island, add leading pedestrian interval, and add raised pedestrian crossing for protected intersection. **Table 13** below summarizes the safety performance for existing and alternative 2A conditions. Alternative 2A has been determined to have a 54% crash reduction.

Table 13: Alternative 2A HSM Safety Analysis

Total Crashes		
	Existing Conditions	Alternative 2A
Predicted Average Annual Crash Frequency	6.45	2.98
Expected Average Annual Crash Frequency	5.12	2.36
Change from Existing Conditions	-	2.76
Fatal and Injury Crashes		
Predicted Average Annual Crash Frequency	2.20	0.00
Expected Average Annual Crash Frequency	1.78	0.00
Change from Existing Conditions	-	1.78
Property Damage Only Crashes		
Predicted Average Annual Crash Frequency	4.25	2.98
Expected Average Annual Crash Frequency	3.34	2.34
Change from Existing Conditions	-	1.00

ALTERNATIVE 2B- PROTECTED INTERSECTION WITH MEDIAN U-TURN

Alternative 2B is a combination of alternatives 1B and 2A and will incorporate similar protection for pedestrians and bicyclists as well as relocate left turning movements from the signalized intersection to a dedicated median opening. Optional loons are again shown to accommodate the u-turns of larger vehicles and trucks. The design for alternative 2B is shown in **Figure 11**.

Traffic operations were analyzed using Synchro, Version 11 and HCM 2000 methodologies. Traffic queues were analyzed using SimTraffic. A summary of the alternative 2B delay, intersection LOS, and 95th percentile queue are shown in **Table** 14. Pedestrian and bicycle LOS was determined using the Charlotte DOT methodology and was determined to be LOS A and LOS D, respectively. Tabular

delay and LOS results from the Synchro analysis and the supporting Synchro reports are included in **Appendix C**.

Table 14: Existing vs. Alternative 2B Delay, LOS, and Worst 95th Percentile Queue

Existing						Alternative 2B					
AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
Delay (s)	LOS	95th Queue	Delay (s)	LOS	95th Queue	Delay (s)	LOS	95th Queue	Delay (s)	LOS	95th Queue
24.4s	C	492' WBT	60.4s	E	896' EBT	17.1	B	254' WBT	23.5s	C	352' EBT

The safety implications of Alternative 2B were determined with the HSM Safety Analysis Tool. The three CMF countermeasures applied to determine the total crash frequency were: add median pedestrian island, add leading pedestrian interval, and add raised pedestrian crossing for protected intersection. **Table 15** below summarizes the safety performance for existing and alternative 2B conditions. Alternative 2B has been determined to have a 61% crash reduction.

Table 15: Alternative 2B HSM Safety Analysis

Total Crashes		
	Existing Conditions	Alternative 2B
Predicted Average Annual Crash Frequency	6.45	2.54
Expected Average Annual Crash Frequency	5.12	2.36
Change from Existing Conditions	-	2.76
Fatal and Injury Crashes		
Predicted Average Annual Crash Frequency	2.20	0.00
Expected Average Annual Crash Frequency	1.78	0.00
Change from Existing Conditions	-	1.78
Property Damage Only Crashes		
Predicted Average Annual Crash Frequency	4.25	2.54
Expected Average Annual Crash Frequency	3.34	2.34
Change from Existing Conditions	-	1.00

ALTERNATIVE 3A – ROUNDABOUT WITH SLIP LLANES

Alternative 3A replaces the existing signalized intersection with a roundabout with a northbound and southbound slip lane. Traffic will move in a counterclockwise direction around a circular, unsignalized intersection with two eastbound/westbound lanes entering and exiting on Laburnum Avenue, and a shared left-through lane and one right bypass lane northbound/southbound on Hermitage Road. Rectangular rapid flashing beacons are proposed at all crosswalks to facilitate pedestrian and bicycle movements.

Traffic operations were analyzed using SIDRA Intersection 9.0 reporting methodologies. A summary of the alternative 3A delay, intersection LOS, and 95th percentile queue are shown in

Table 16. Pedestrian and bicycle LOS was determined using the Charlotte DOT methodology and was determined to be LOS A and LOS D, respectively. Tabular delay and LOS results from the SIDRA analysis and the supporting SIDRA reports are included in Appendix D.

Table 16: Existing vs. Alternative 3A Delay, LOS, and Worst 95th Percentile Queue

Existing						Alternative 3A					
AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
Delay (s)	LOS	95th Queue	Delay (s)	LOS	95th Queue	Delay (s)	LOS	95th Queue	Delay (s)	LOS	95th Queue
24.4s	C	492' WBT	60.4s	E	896' EBT	28.4s	D	553' WB	35.6s	E	718' NB

The safety implications of Alternative 3A were determined with the HSM Safety Analysis Tool. The two CMF countermeasures applied to determine the total crash frequency were: VDOT signal to roundabout convert and VDOT RRFB install. **Table 17** below summarizes the safety performance for existing and alternative 3A conditions. Alternative 3A has been determined to have a 50% crash reduction.

Table 17: Alternative 3A HSM Safety Analysis

Total Crashes		
	Existing Conditions	Alternative 3A
Predicted Average Annual Crash Frequency	6.45	3.21
Expected Average Annual Crash Frequency	5.12	2.55
Change from Existing Conditions	-	2.57
Fatal and Injury Crashes		
Predicted Average Annual Crash Frequency	2.20	1.04
Expected Average Annual Crash Frequency	1.78	0.84
Change from Existing Conditions	-	0.94
Property Damage Only Crashes		
Predicted Average Annual Crash Frequency	4.25	2.17
Expected Average Annual Crash Frequency	3.34	1.70
Change from Existing Conditions	-	1.64

ALTERNATIVE 3B - ROUNDABOUT

Finally, alternative 3B proposes to replace the existing signalized intersection with a roundabout. The roundabout proposes two eastbound/westbound lanes entering and exiting the roundabout on Laburnum Avenue, and one northbound/southbound lane entering and exiting on Hermitage Road. As with alternative 3A, alternative 3B provides rectangular rapid flashing beacons at crosswalks across Laburnum Avenue to facilitate pedestrian and bicycle movements.

Traffic operations were analyzed using Sidra Intersection 9.0 reporting methodologies. A summary of the alternative 3B delay, intersection LOS, and 95th percentile queue are shown in **Table** 18. Pedestrian and bicycle LOS was determined using the Charlotte DOT methodology and was

determined to be LOS B and LOS D, respectively. Tabular delay and LOS results from the SIDRA analysis and the supporting SIDRA reports are included in Appendix D.

Table 18: Existing vs. Alternative 3B Delay, LOS, and Worst 95th Percentile Queue

Existing						Alternative 3B					
AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
Delay (s)	LOS	95th Queue	Delay (s)	LOS	95th Queue	Delay (s)	LOS	95th Queue	Delay (s)	LOS	95th Queue
24.4s	C	492' WBT	60.4s	E	896' EBT	42.8s	E	892' SB	98.4s	F	2568' NB

The safety implications of Alternative 3B were determined with the HSM Safety Analysis Tool. The two CMF countermeasures applied to determine the total crash frequency were: VDOT signal to roundabout convert and VDOT RRFB install. **Table 19** below summarizes the safety performance for existing and alternative 3B conditions. Alternative 3B has been determined to have a 49% crash reduction.

Table 19: Alternative 3B HSM Safety Analysis

Total Crashes		
	Existing Conditions	Alternative 3B
Predicted Average Annual Crash Frequency	6.45	3.29
Expected Average Annual Crash Frequency	5.12	2.55
Change from Existing Conditions		2.57
Fatal and Injury Crashes		
Predicted Average Annual Crash Frequency	2.20	1.12
Expected Average Annual Crash Frequency	1.78	0.84
Change from Existing Conditions	-	0.94
Property Damage Only Crashes		
Predicted Average Annual Crash Frequency	4.25	2.17
Expected Average Annual Crash Frequency	3.34	1.70
Change from Existing Conditions	-	1.64

Build Alternatives Comparison Matrix

A matrix was composed to compare the six alternatives and how they compare under various metrics, as seen in **Figure 14**. Pedestrian and bike safety, Fall Line Trail integration, vehicular access, speed management, and truck turning movements were evaluated and displayed using a green, yellow, and red rating system. The automobile, pedestrian, and bicycle level of service were evaluated using the grading system outlined previously in the report. The anticipated crash reduction was determined using the crash modification factor and the predicted average annual crash frequency for each alternative. Lastly, the total cost, provided in 2024 dollars, was estimated.

Metric	Existing Intersection	1 – Traditional Signal		2 – Protected Intersection		3 – Roundabout	
		1A – with Left Turns	1B – Median U-turns	2A – with Left Turns	2B – Median U-turns	3A – with NB/SB Slip Lanes	3B – without Slip Lanes
Pedestrian/Bike Safety	🔴	🟢	🟢	🟢	🟢	🟡	🟡
Fall Line Trail Integration	🔴	🟡	🟢	🟢	🟢	🟢	🟢
Vehicular Access (Left Turns)	🟡	🟢	🟡	🟢	🟡	🟢	🟢
Speed Management	🔴	🟡	🟡	🟡	🟡	🟢	🟢
Truck Turning Movements	🔴	🟡	🔴	🟡	🔴	🟡	🟡
Automobile Level of Service	E	D	C	D	C	E	F
Pedestrian Level of Service	F	C	C	B	A	A	B
Bicycle Level of Service	D	D	D	D	D	D	D
Anticipated Crash Reduction	N/A	51%	59%	54%	61%	50%	49%
Total Cost (2024 Dollars)	N/A	$5.8 Million	$7.6 Million	$5.8 Million	$7.5 Million	$6.6 Million	$7.0 Million

🟢 Good – Anticipate above average performance 🟡 Fair – Anticipate acceptable performance 🔴 Poor – Anticipate less than desirable performance

Figure 14: Long-Term Solution Comparison Matrix

Public Engagement

PUBLIC SURVEY CONTENT

Kimley-Horn developed a survey for public participation to gauge the public's input on the intersection and the proposed alternatives. The City reviewed and published the survey using an online ArcGIS platform to public and collect the data. The survey was published to a public website on December 18, 2023 and remained open until February 1, 2024. A total of 794 surveys were taken by the public. The full text of the survey is included in **Appendix H.**

General Questions

In addition to survey questions specific to the alternatives, the following questions were included to gather feedback on general feedback regarding the intersection, with available answers that included: strongly disagree, disagree, neutral, agree, strongly agree:

- I am satisfied with the existing intersection with the statue removed.
- This intersection is safe.
- Biking & Walking/Rolling is safe at the intersection.
- I regularly avoid traveling through this intersection by choosing a different route.
- This intersection only experiences peak period congestion, but the other hours during the weekdays, it is fine.

The following questions were included to gather feedback on general feedback regarding the intersection, with available answers that included: strongly oppose, oppose, neutral, support, strongly support:

- To what extent do you support or oppose removing all left turns at all times of day?
- To what extent do you support or oppose removing all left turns during the peak hours (morning and afternoon)?
- To what extent do you support or oppose allowing all turning movements?

The following question was included to determine the public's order of preference for the potential left turn movements at the intersection:

- If left-turn lanes were provided and allowed at only select movements at the intersection, please select which movements you would prefer be allowed in order of preference (most preferred to least).

Additionally, the following open-ended questions were included where participants could write custom responses to share feedback:

- What other Short-Term Solutions (i.e. not major construction project) improvements would you like to see be made at this intersection as soon as reasonably possible?
- Is there anything else you would like to add about traffic congestion at this intersection? (optional)

Alternative Comparison

Each of the three alternatives (and their respective variations, i.e. 1A and 1B) were shown to the participants, one pair at a time. Then respondent were asked how much they support or oppose each variation (from strongly oppose to strongly support), and then given an open feedback section with

which respondents could write custom responses. This was done for each of the three pairs of alternatives (1A and 1B; 2A and 2b; 3A and 3B).

After participants were asked to share their preference or opposition of each of the six variations and provide open feedback, participants were then asked to rank the six alternatives from most preferred to least. This question also included a seventh option for “no build”, designed to gauge participants’ preferences for the proposed alternatives relative to the existing condition of the intersection.

Demographic Information

The survey included several questions to gather basic demographic information from participates to understand the varying levels of participation from various neighborhood residents, races/ethnic groups, and ages.

Additionally, the survey was designed to understand the opinions of a specific vulnerable user group: Linwood Holton Elementary School students. While the survey was not intended for child participation, one question asked whether respondents were parents/guardians of students at the school to better understand the feedback of this vulnerable user group.

The survey also asked responded how they heard about the survey to understand which methods of engagement were most effective to better inform future efforts by the City to engage the public regarding this or other projects.

Intersection Use

The survey asked several questions about the mode and frequency with which respondents travel the intersection. Questions included:

- How often do you travel through the intersection of Hermitage Rd and Laburnum Ave?
- What is your primary mode of transportation when you travel through this intersection?

Fall Line Trail

The proposed alignment of the Fall Line Trail, a regional trail that once all sections are complete will connect from Ashland to Petersburg, is planned to follow Hermitage Road through the study intersection. The public has shown considerable interest in the proposed trail across various municipalities in the region.

In 2022 the neighborhoods surrounding this intersection (Bellevue, Rosedale, Laburnum Park, and others) participated in a privately administered survey to gather feedback regarding the priorities for the Fall Line Trail along Hermitage Road. Because this previous survey gathered much of the public’s preferences, the survey for this intersection study was not designed to gauge the public’s feedback on the Fall Line Trail or its composition. One question was included expecting the public to want to weigh in, but the results should not be given much consideration in considering the different proposed alternatives, as each is compatible if the various potential configurations of the proposed Fall Line Trail.

RESULTS

**Several respondents wrote in answers that demonstrated issues with the software functionality on the questions that asked respondents to rank answer choices. Common feedback was that the first answer could be ranked but that no other options could be moved. It does not appear this issue affected the majority of participants, who were able to rank choices based on the answers given. Due to this issue, however, throughout the discussion of survey results any questions where respondents were asked to rank answers will only consider the first choice responses and ignore the remaining options as the data may be unreliable.*

Demographics and Intersection Use

Of the 794 respondents, 31% responded they live in Bellevue, 16% in other City neighborhoods, 13% in Ginter Park, 13% in Rosedale, 10% other neighborhoods outside of the City, 8% Laburnum Park, 5% Sherwood Park, and 4% did not respond. See **Figure 15** for a pie chart of these responses.

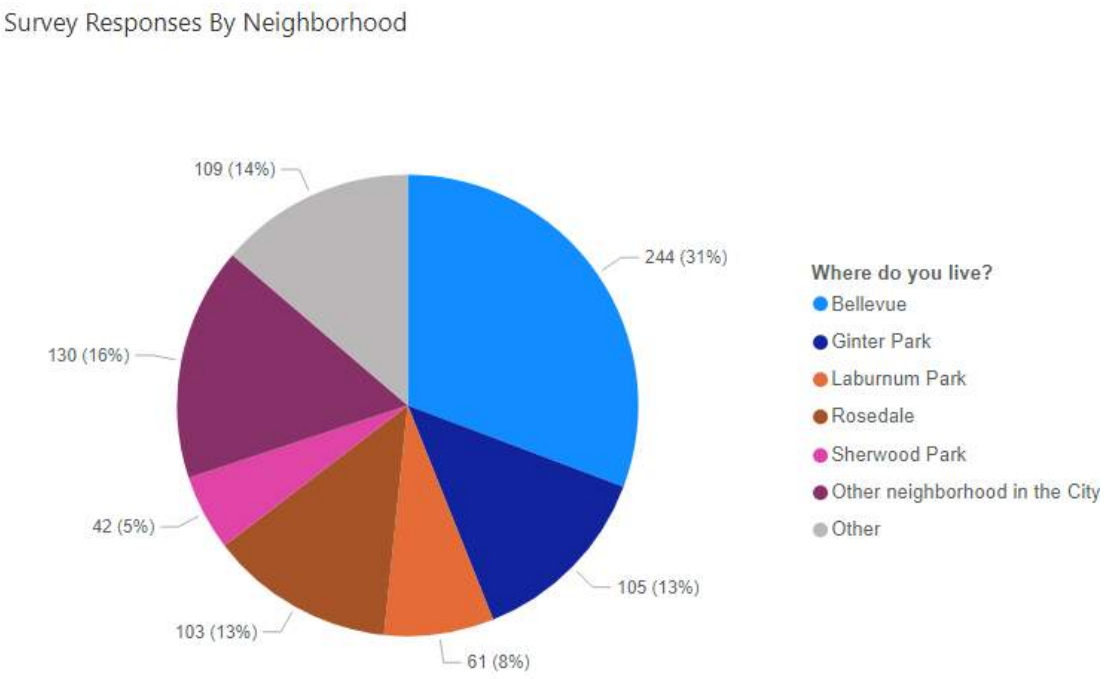

Figure 15: Respondents' neighborhood of residence

Of the 794 respondents, <1% responded they are between 15 and 20 years old, 7% between 21 and 30 years old, 29% between 31 and 40 years old, 21% between 41 and 50 years old, 14% between 51 and 60 years old, and 22% responded they are 60 or older. No response was given by 8% of the respondents. See **Figure 16** for a pie chart of these responses.

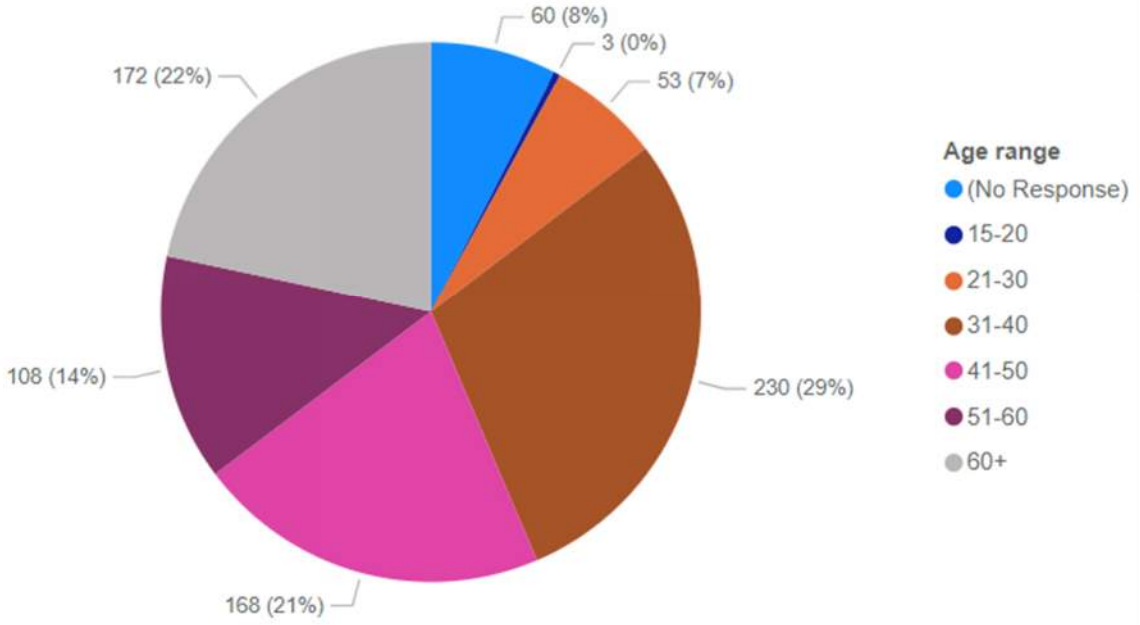

Figure 16: Age of respondents

Of the 794 respondents, 87% responded their primary mode of transport through the study intersection is a personal vehicle, 7% responded by bicycle, 3% by walking/rolling, and 2% did not respond. See **Figure 17** for a pie chart of these responses.

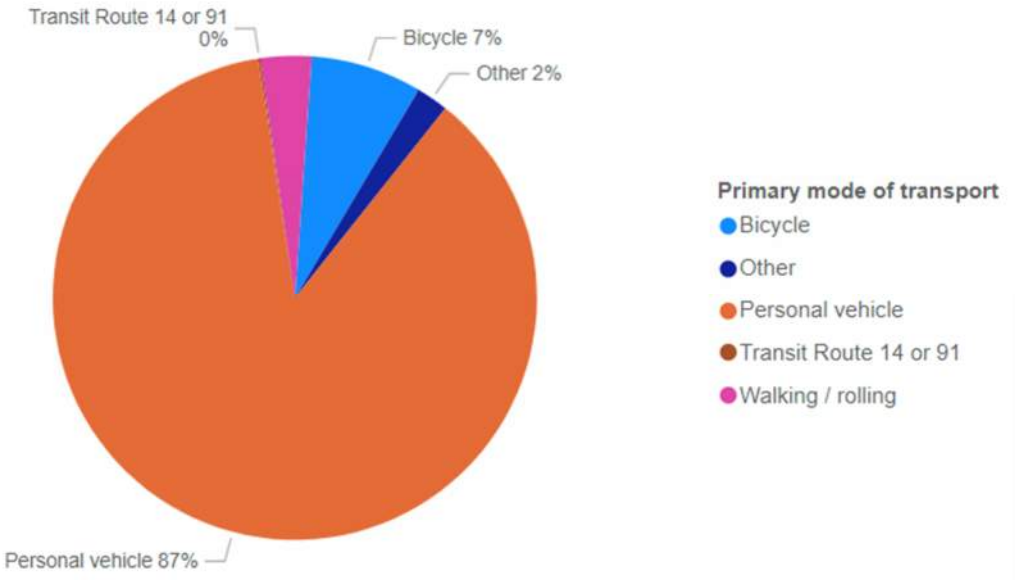

Figure 17: Respondents' primary mode of travel through intersection

General Intersection Feedback

In general respondents do not view the current intersection favorably. Only 19% of respondents said they “agree” or “strongly agree” to being satisfied with the intersection in its current configuration, versus 70% who responded they “disagree” or “strongly disagree.” Additionally, only 12% of respondents said they “agree” or “strongly agree” that the intersection is safe, whereas 74% responded they “disagree” or “strongly disagree.” A similar pattern is observed when asked if biking and walking is safe, which resulted in a 8% to 78% split between “agree”/”strongly agree” and “disagree”/”strongly disagree” respectively. See **Figure 18** for a graph of these responses.

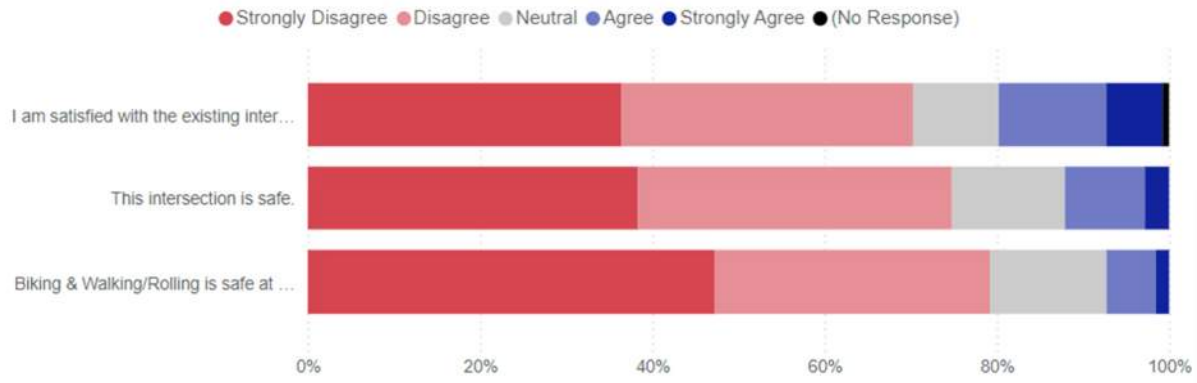

Figure 18: Respondents' feedback on existing intersection

Respondents were asked two questions regarding left-turn restrictions. The first asked how much respondents support restricting left-turns at times of day; the second asked how much respondents support restricting left-turns only during the morning and afternoon peak hours. Only 20% of respondents “support”/”strongly support” left-turn restrictions all day, whereas 47% “support”/”strongly support” restricting left-turns during the peak hours (which is how the intersection operates today). On the reverse of that 65% of respondents “oppose”/”strongly oppose” permanent left-turn restrictions but just 33% “oppose”/”strongly oppose” restricting left-turns only during the morning and afternoon peak hours. See **Figure 19** for a graph of these responses.

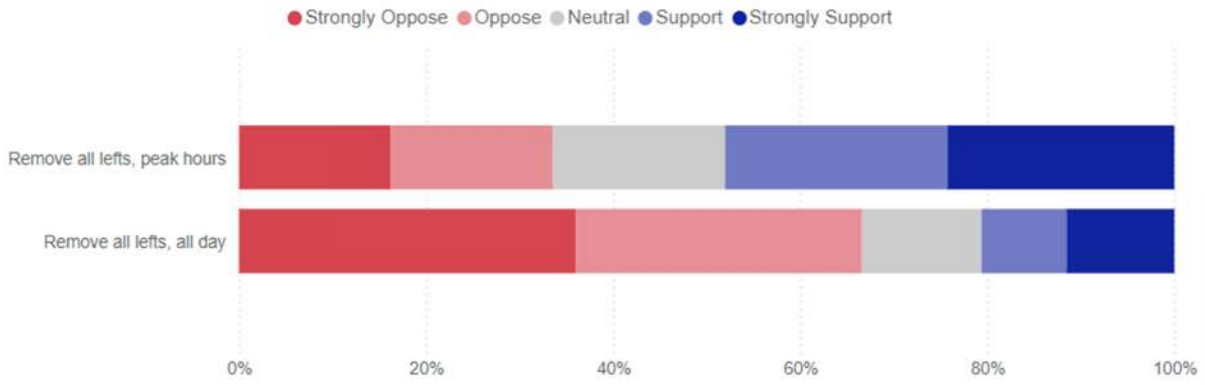

Figure 19: Respondents' preferences for left-turn restrictions

When asked for which left-turn movements were most desirable if allowed, responses showed the following preferences in order of most to least: eastbound (33% of respondents rated this first choice), northbound (30%), westbound (24%), and southbound (13%). See **Figure 20** for a pie chart of these responses.

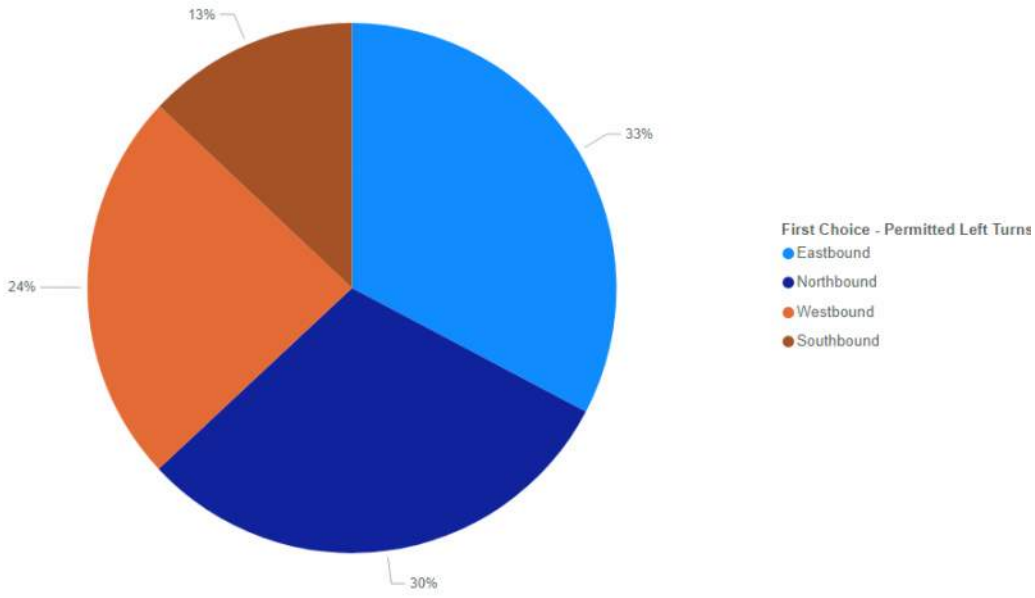

Figure 20: Respondents' first-choice for most desired left-turn movement

There was a noticeable different in the preference of the residents of different neighborhoods, presumably as access to these different neighborhoods requires different turns at the study intersection. Bellevue residents, the largest neighborhood population group represented in the results, selected eastbound (46%) and westbound (24%) as their most desired left-turn movements. Laburnum Park and Sherwood Park residents overwhelmingly favor northbound left turn movements (62% and 61% respectively) as these neighborhoods are both located to the south of the intersection and the northbound left-turn provides the best access from these areas to I-64 and I-195 to the west along Laburnum Ave. Ginter Park residents has a fairly even split among the preferred direction (24% northbound, 17% southbound, 26% eastbound, and 32% westbound). Rosedale favored northbound and eastbound (38% and 35%). Also noteworthy is that the preferred movement for non-City residents is northbound at 41%. See **Figure 21** for a graph of these responses.

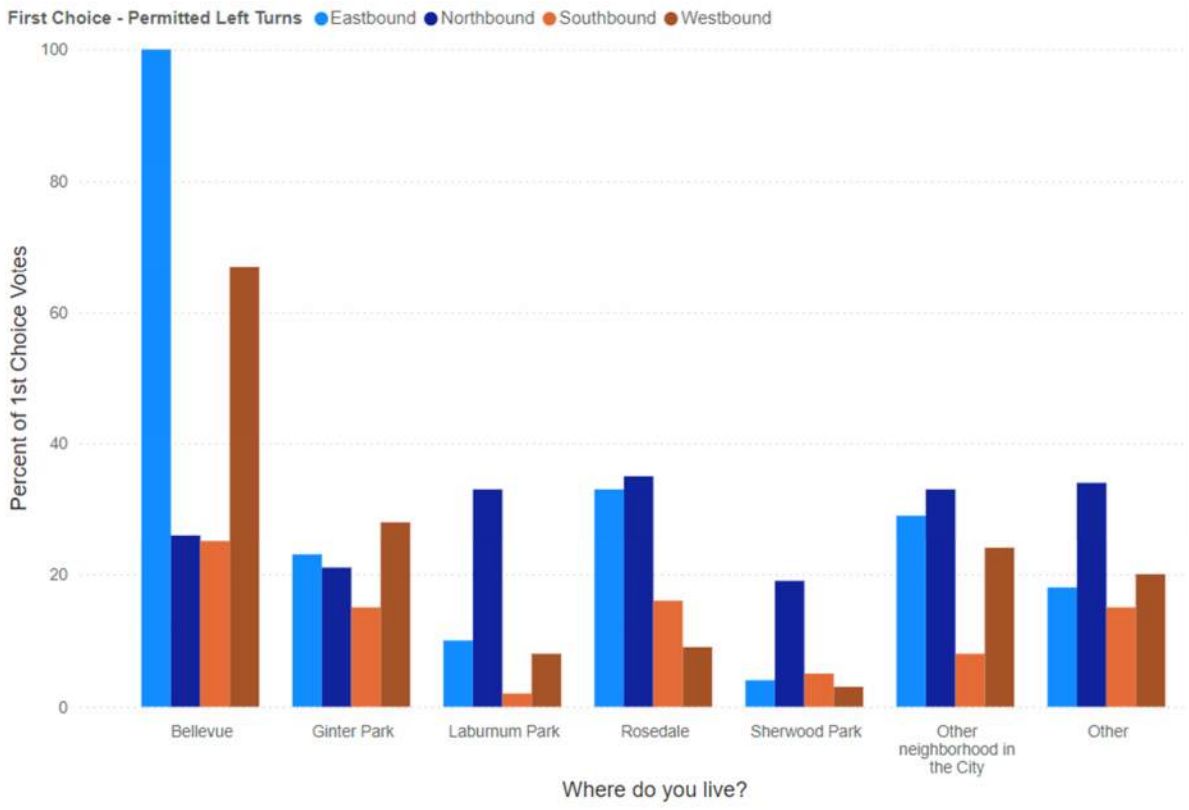

Figure 21: Left-turn preference by respondents' neighborhood of residence

Alternative Comparison

Respondents showed similar support for alternatives 1A, 2A, 3A, and 3B, each receiving between 150 and 275 votes each of “strongly support” and “support”. Whereas alternatives 1B and 2B stood out as not supported, which each receiving between 225 and 350 votes each of “opposed” and “strongly oppose.” Comparing alternative groups among the three primary alternatives (1 = conventional intersection, 2 = protected intersection, and 3 = roundabout), roundabout alternatives (3A and 3B) received 751 votes for “strongly support” or “support”, whereas the conventional intersction (1A and 1B) received 479 votes of “strongly support” or “support” and the protected intersection (2A and 2B) received 590 votes of “strongly support” or “support.” See **Figure 22** for a graph of these responses.

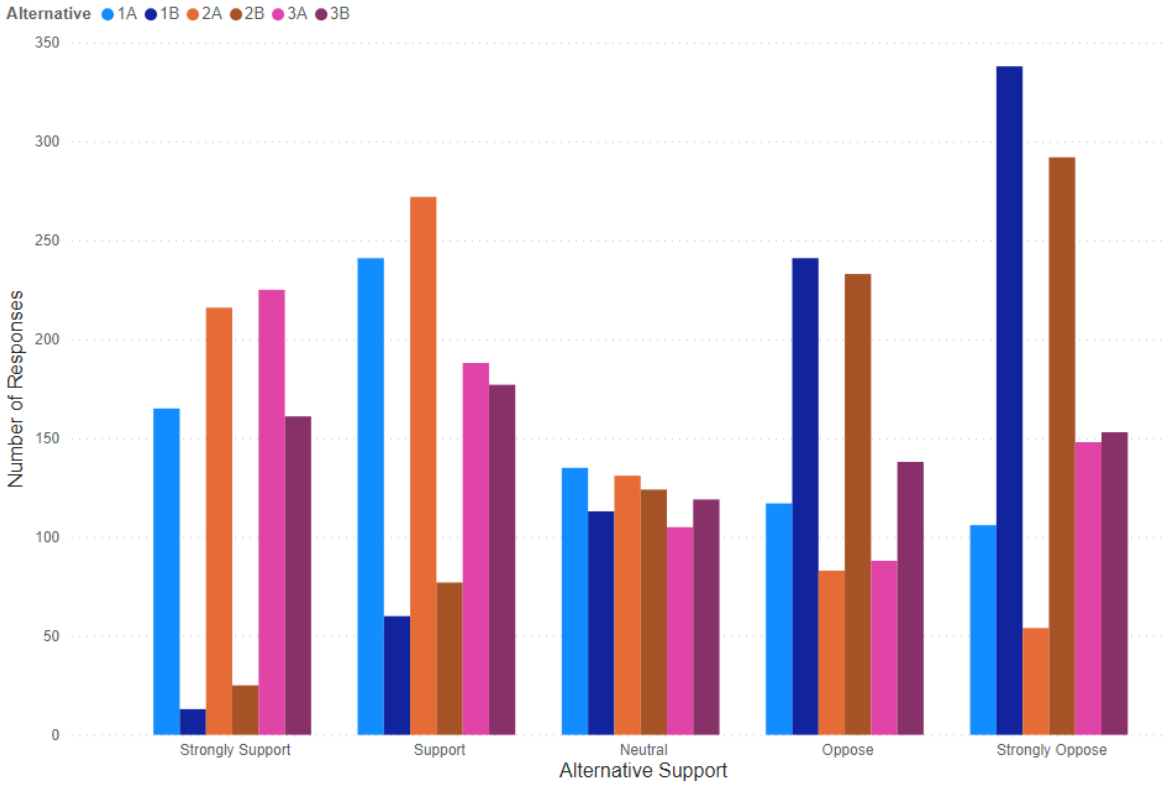

Figure 22: Respondents' support for each alternative

While 1B and 2B stood as as most opposed, there is also a notable amount of opposition for the roundabout alternatives (3A and 3B), though not nearly as opposed as the median u-turn alternatives. With only minor differences, these trends are consistent when reviewed for the responses for each neighborhood. The following graphs (**Figure 23**, **Figure 24**, **Figure 25**, **Figure 26**, and **Figure 27**) display the results for the five nearby northside neighborhoods.

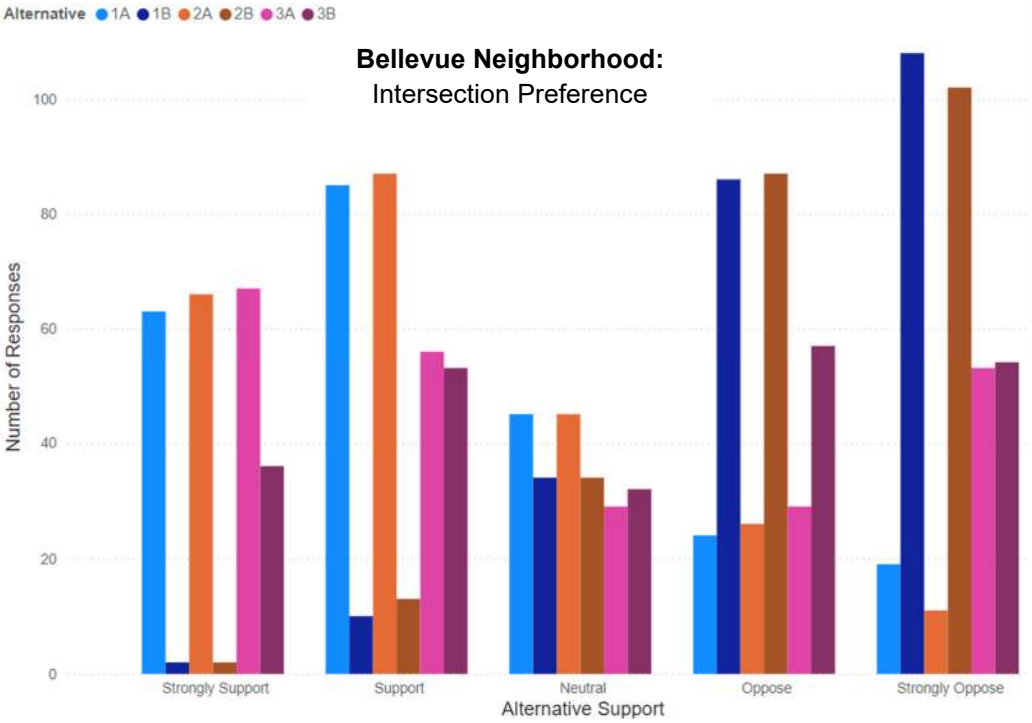

Figure 23: Bellevue residents' support of intersection alternatives

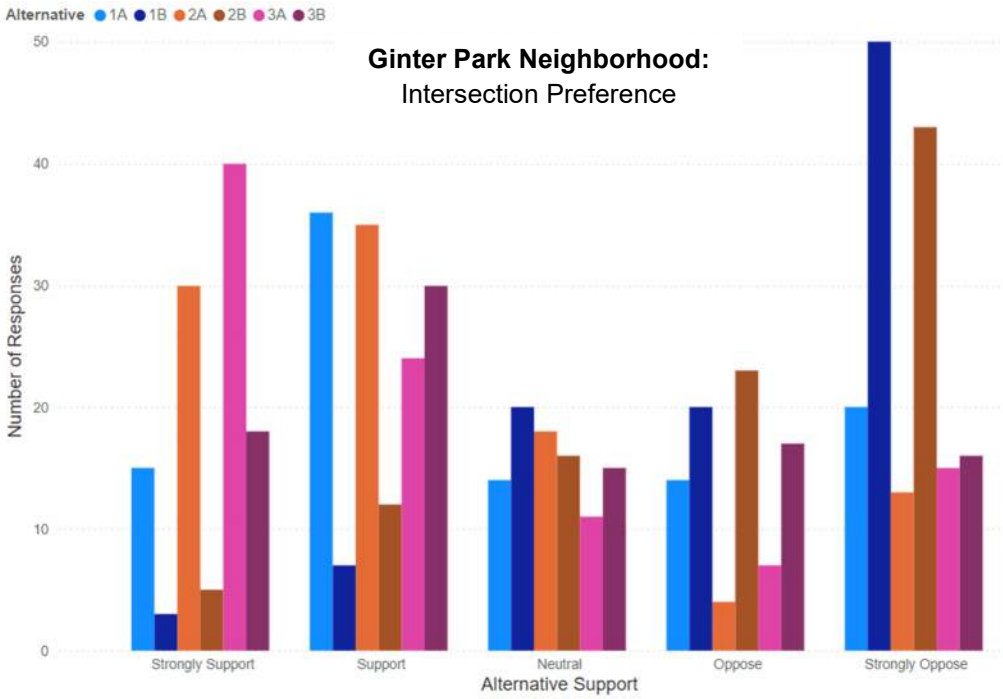

Figure 24:Ginter Park residents' support of intersection alternatives

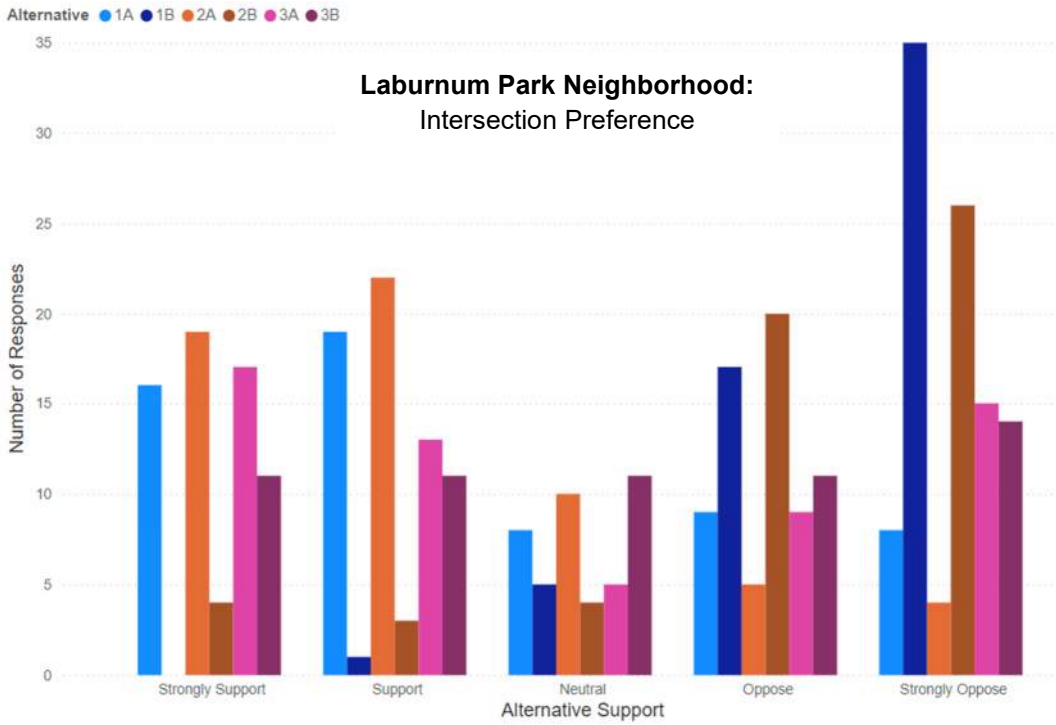

Figure 25: Laburnum Park residents' support of intersection alternatives

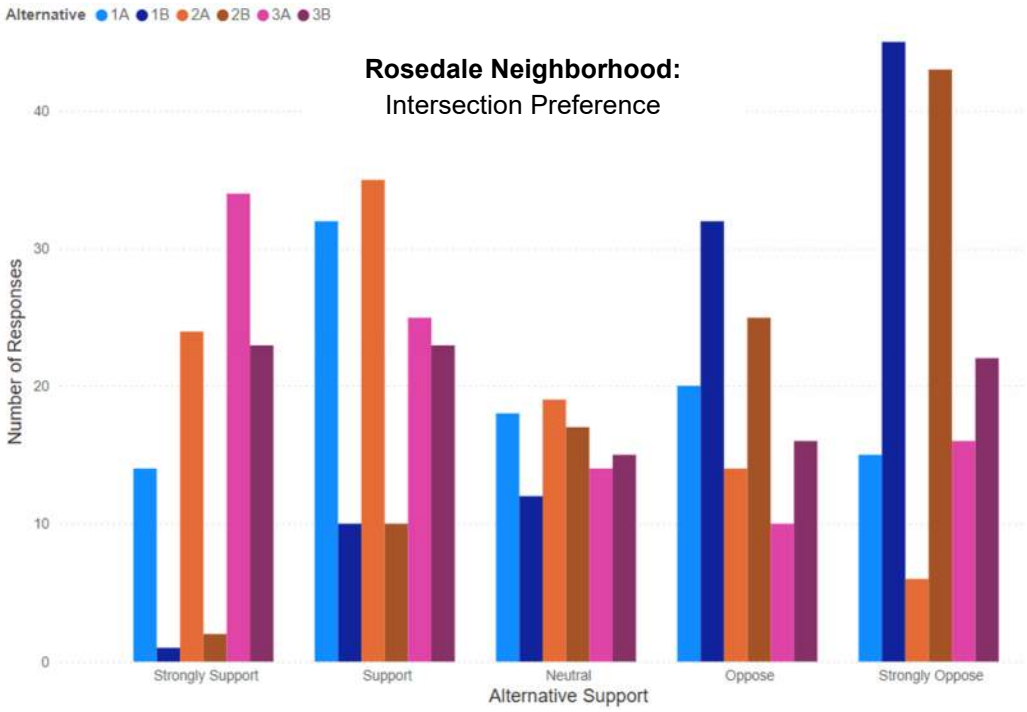

Figure 26: Rosedale residents' support of intersection alternatives

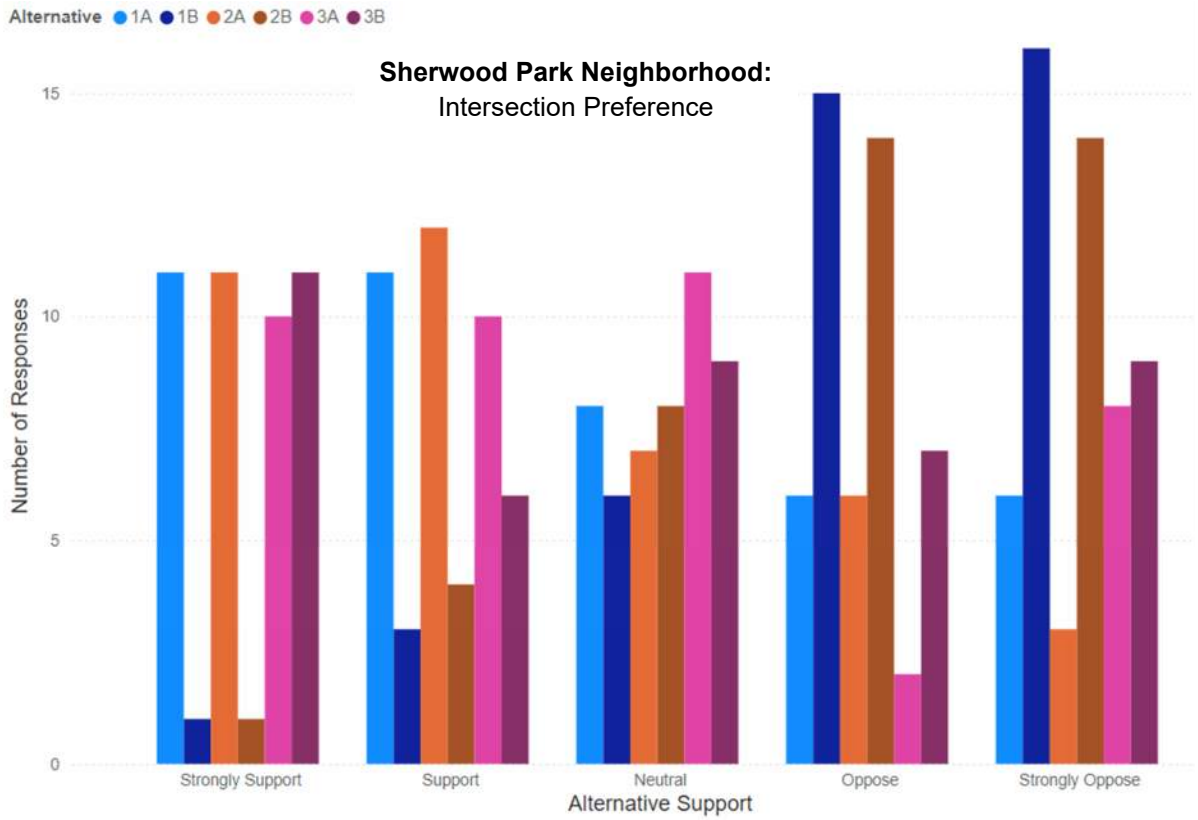

Figure 27: Sherwood Park residents' support of intersection alternatives

When reviewing the first-choice alternative, 1A was most preferred by Bellevue residents, while 3A was most preferred by Ginter Park, Laburnum Park, Rosedale, Sherwood Park, and non-City residents. Alternative 3B was most preferred by residents of other city neighborhoods. See **Figure 28** for a graph of these responses.

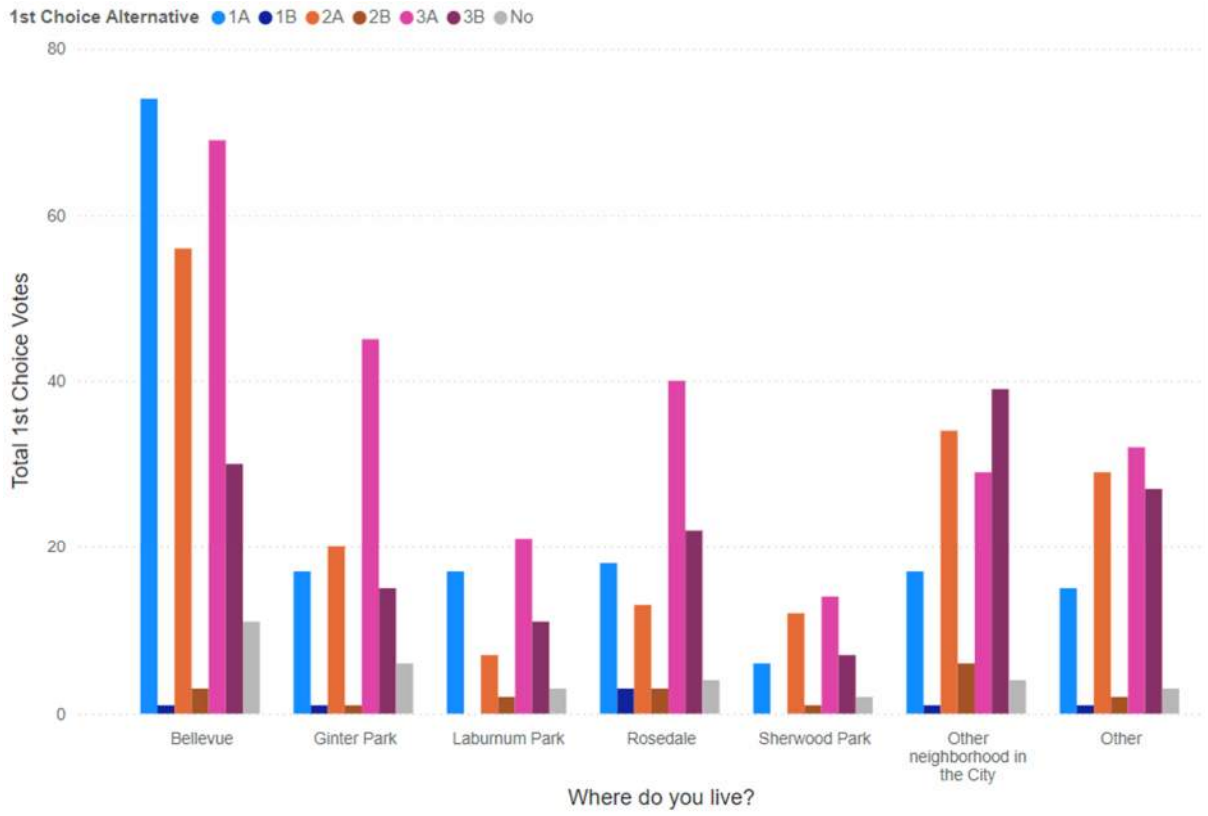

Figure 28: Alternative preference by neighborhood of residence

Specific Population Groups

When intersection preference is reviewed for just those who selected “Bicycle” or “Walking/rolling” as their primary mode of travel, alternatives 3B and 3A stood out as most preferred over the signalized intersection alternatives. See **Figure 29** and **Figure 30** for graphs of these responses.

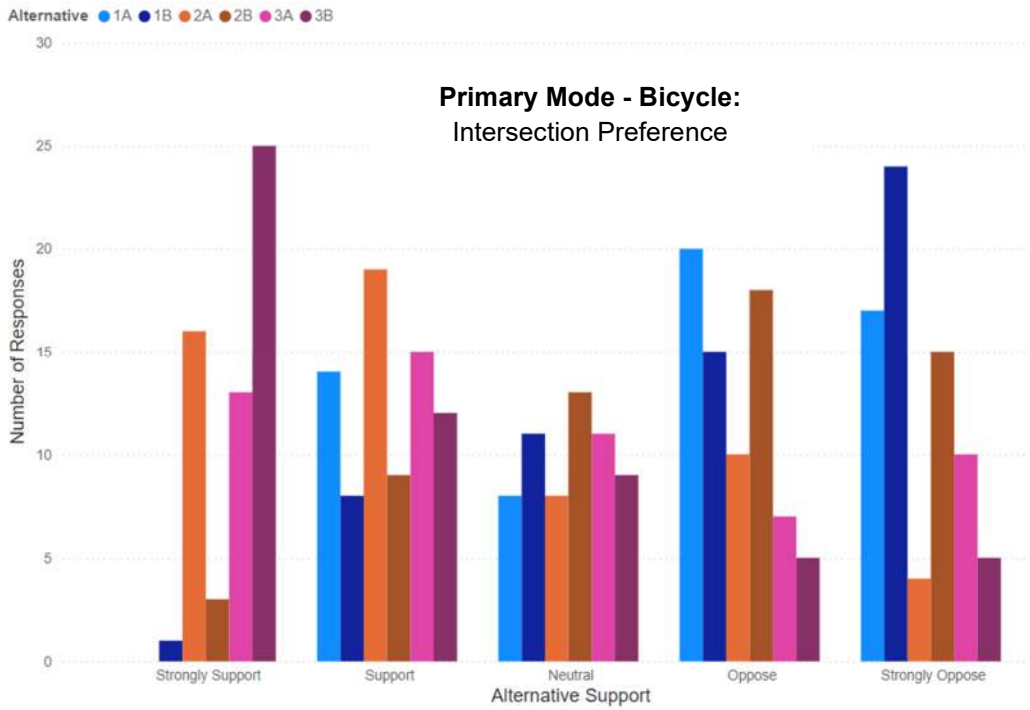

Figure 29: Alternative support of bicyclists

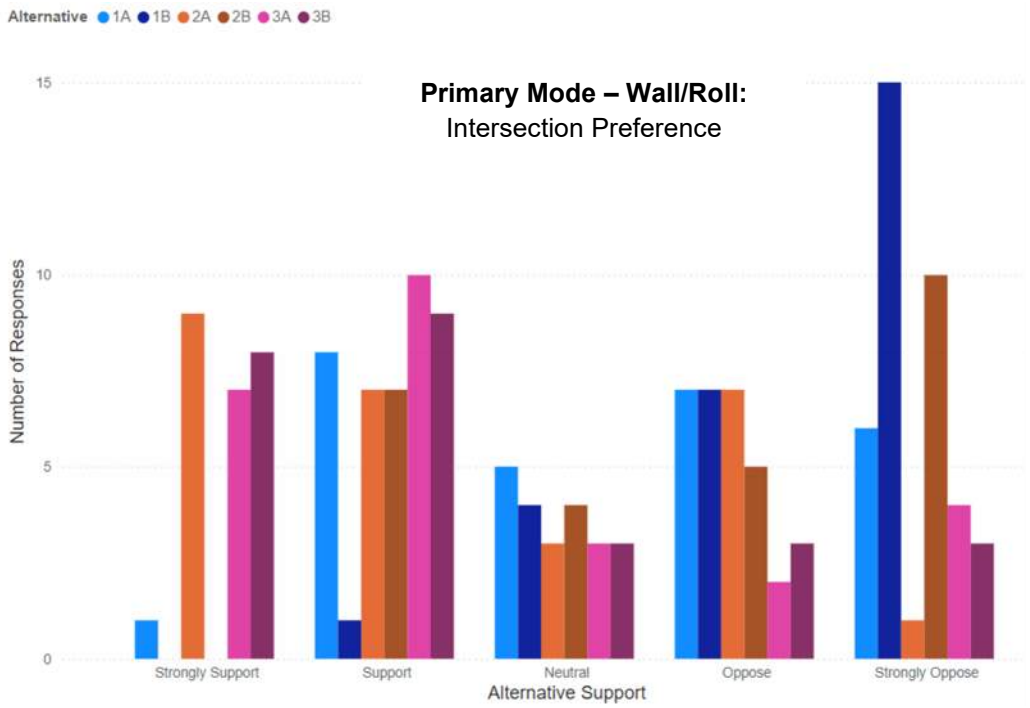

Figure 30: Alternative support of walking/rolling

When intersection preference is viewed just for parents of Linwood Holton Elementary School parents, alternatives 1A, 2A, 3A, and 3B stand out as most-preferred, whereas 1B, 2B, and “no-build” each receive minimal responses of “strongly support” or “support.” See **Figure 31** for a graph of these responses.

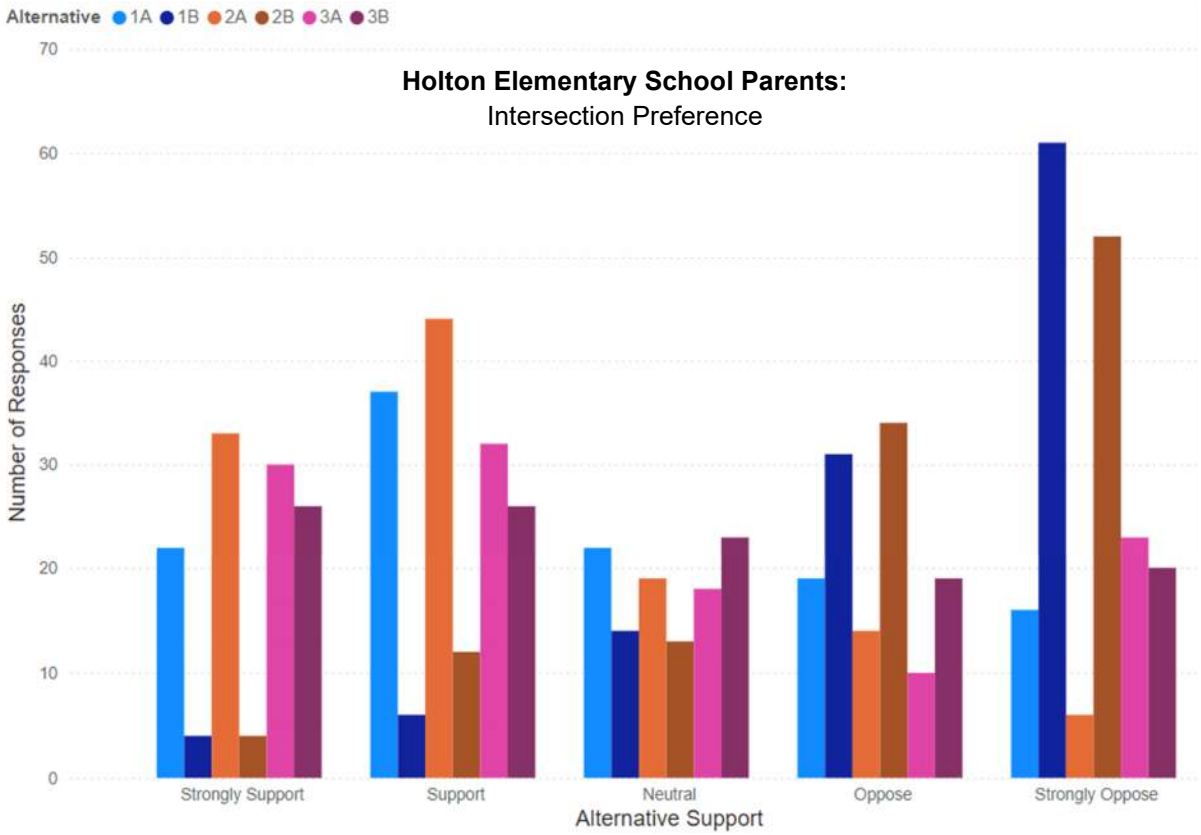

Figure 31: Alternative support among Linwood Holton Elementary School parents

Open Feedback: Short Term Improvements

Respondents were given an opportunity to provide written feedback on the short-term improvements. There were 459 unique responses. The primary themes that arose through these responses can be summarized as follows:

- Left Turn Issues: Many respondents mentioned problems related to left turns, advocating for left turn lanes, dedicated left turn signals, and addressing the challenges faced by left-turning vehicles.
- Speed Control: Concerns about speeding are prevalent, with suggestions for speed enforcement, reduced speed limits, and measures such as speed tables or bumps.

- Pedestrian and Bicycle Safety: Numerous comments emphasize the importance of pedestrian and bicycle safety. Recommendations include raised crosswalks, dedicated bike lanes, protected intersections, and features like pedestrian signals.
- Temporary Measures: Short-term interventions are suggested, including temporary barriers, cones, and barrels to protect pedestrian crosswalks and waiting areas.
- Improved Signage and Markings: Suggestions for clearer lane markings, signage, and painted lines to guide both vehicles and pedestrians through the intersection.
- Signal Timing: Requests for optimized signal timing, especially for pedestrians and bikes, and consideration of left arrow turn signals.
- Signage: Some raised issues about the visibility of signs, particularly "no left turn" signs, and the need for improved signage.

Open Feedback: Alternatives

Respondents were given an opportunity to provide written feedback on the presented intersection alternatives. There were 270 unique responses on alternatives 1A/1B. The primary themes that arose through these responses can be summarized as follows:

- Concerns about U-Turns: Public expressed reservations about the U-turn concept in both alternatives, including fear of congestion, compliance, the potential for crashes, and driver confusion, especially during peak hours. There was general opposition to U-turns near schools due to safety concerns for pedestrians, particularly children.
- Left-turn Lanes: Respondents shared their desire for dedicated left turn lanes.
- Impact on Neighborhoods: There was consistent opposition to Alternative 1B due to the potential for diverting traffic into adjacent neighborhoods.
- Right-of-way Acquisition: There was general disapproval of property acquisition for U-turn lanes, with a preference for less intrusive solutions.
- Bicycle and Pedestrian Safety: There was a strong emphasis on the desire for separated bike lanes and dedicated pedestrian crossings and for enhance protection of the potential Fall Line Trail crossing of the intersection.

There were 201 unique responses on alternatives 2A/2B. The main theme that arose through these responses that differed from the 1A/1B feedback can be summarized as follows:

- Design: Some recommended a simpler, more “conventional” design like alternative 1, while others shared that these alternatives did a better job of prioritizing pedestrian an cyclist safety.

There were 267 unique responses to alternatives 3A/3B. The primary themes that arose through these responses can be summarized as follows:

- Preference for Roundabouts: Many individuals expressed a preference for roundabouts, citing safety benefits and traffic calming effects.
- Safety Concerns: Many expressed concerns about safety for pedestrians and cyclists, especially regarding slip lanes and multi-lane configurations.

- Driver Expectations and Education: Some express worries about drivers' understanding of roundabouts and their ability to navigate them safely and recommended a focus on public education on how to use roundabouts effectively.
- Slip Lanes: Some view the slip lanes as dangerous for non-motorists and fear they may lead to crashes. Others expressed their desire for clear signage and markings of how to navigate the roundabout and slip lanes.
- Traffic Flow and Congestion: Some express concerns about traffic volume at peak hours and potential bottlenecks, particularly with option 3B.
- Right-of-Way Concerns: Many shared concerns about property impacts.
- 3A versus 3B: Some express support for lane reductions to accommodate pedestrians and cyclists, while others prioritized traffic flow.

There were also two additional questions which allowed feedback on the alternatives as a whole and traffic operations at the intersection. Overall, the feedback reflected a diverse range of opinions, but with a focus on safety and continued communication with the public.

PUBLIC MEETING FEEDBACK

A public meeting was held at Linwood Holton Elementary School on Thursday, January 18, 2024 from 5:00pm to 7:00pm. The meeting was attended by numerous City of Richmond officials, GRTC staff, and Kimley-Horn staff. A sign-in sheet was placed at the entrance to the meeting. While not every attendee signed in, 90 persons did sign in. The sign in sheet is included in **Appendix H.**

Information presented at the meeting is included in **Appendix H**, which includes displays on the project background, potential short-term improvements, the 6 design alternatives, and a summary of the alternatives. A brochure was also available for the public to take home, which is also included in **Appendix H**.

The Short Term Improvements display was an interactive exhibit where four potential short-term improvements were displayed, and members of the public were give three stickers to vote for their first, second, and third-most preferred of the presented options. The final displays with stickers are included in **Appendix H**. In general the most-preferred short term improvements is installing striping and flexible delineators to reduce the intersection footprint. Pedestrian countdown signals were the second-most preferred improvement. No Left Turn blank-out signs and No Turn on Red signs were the 2nd and 3rd choice of many respondents. See **Figure 32** for a summary of responses.

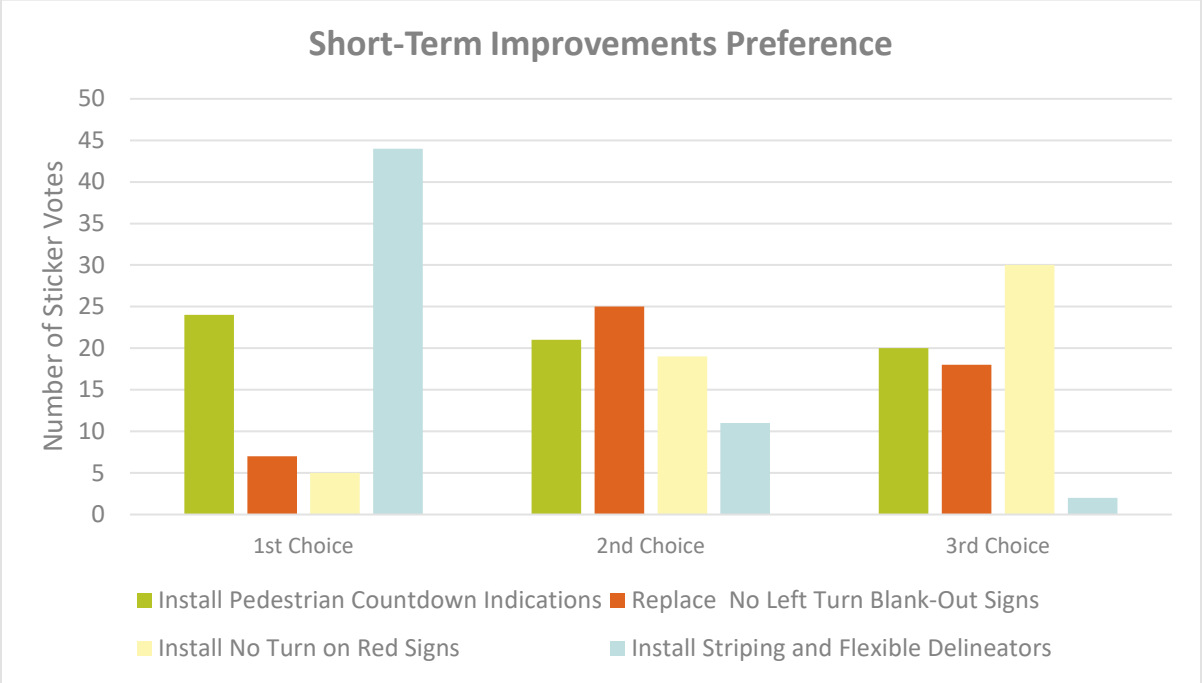

Figure 32: Preference for short-term improvements presented at the public meeting

A comment form was also distributed at the public meeting to allow the public another opportunity to provide feedback. Comment forms were completed by 34 individuals. A summary matrix of these responses is also included in **Appendix H.**

PUBLIC INVOLVEMENT CONCLUSIONS

Throughout the public involvement process, three main desires emerged from the public in survey responses and discussions at the public meeting. Those are desires for speed control, the ability to make left turns, and safety of vulnerable road users (bicycles, pedestrians, school children).

Alternatives 1B an 2B, with the median U-turns in place of left-turns, were not received favorably by the public. While the optional loons shown on the concepts were clearly not supported, even the idea of displaced turns was viewed unfavorably.

When comparing Alternatives 1A and 2A, the public consistently favored the protected intersection (alternative 2A) slightly over the conventional signalized intersection (alternative 1A). This was even more stark among school parents, bicyclists, and pedestrians. The is consistent with the written feedback regarding the desire for safety of vulnerable road users. Other feedback reveals that those that preferred 1A over 2A were less likely to understand the difference or have concerns about user understanding of the intersection. Those concerns, however, could be eased through more detailed design and continued public engagement.

When comparing the roundabout alternatives (3A with slip lanes and 3B with single-lane north/south approaches), the majority of respondents favored the option with slip lanes over the single-lane

northbound and southbound approaches. However, when groups of vulnerable road users are considered (bicycles, pedestrians, school parents), they favored the single-lane alternative slightly over the slip lane alternatives, presumably because the single-lane alternative provides less lanes for bicycles and pedestrian to cross on Hermitage Road. However, this preference is only subtle.

Finally, when considering the comparison between all generally favored alternatives (1A, 2A, 3A, and 3B), alternative 3A received the most votes as the first choice. Additionally, the roundabout options 3A and 3B received more total first-choice votes (401 votes) over the total of the signalized intersections (360 votes). See **Figure 33** for a graph of these responses.

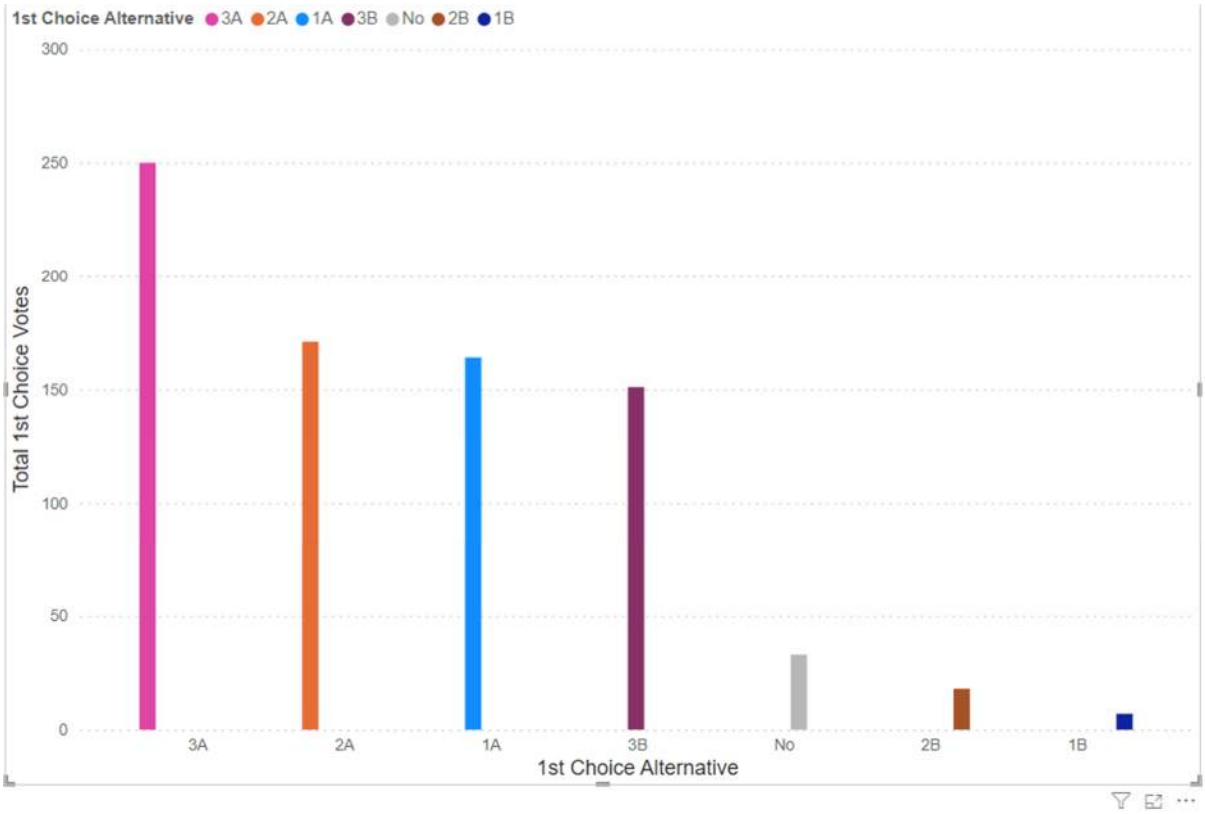

Figure 33: Ranked order of alternatives selected as first choice

Regarding potential short-term improvements, many of the options presented were viewed favorably as the public desires improvements at this intersection occur soon. Pedestrian-centric changes were the most preferred of the options presented. Additionally, open feedback consistently showed that more markings and signage for how to turn lane is desired and increased enforcement of left-turn restrictions is desired. Finally, several people reported how many westbound vehicles on Laburnum Ave attempt to make a U-turn at Hill Monument Parkway, creating a dangerous situation. It is recommended this median opening be marked with “No U-Turn” signs to improve safety and reinforce the turn restrictions at the intersection.

APPENDIX A

Existing Conditions Capacity Analysis

APPENDIX B

Alternative 1A and 2A Capacity Analysis

APPENDIX C

Alternative 1B and 2B Capacity Analysis

APPENDIX D

Alternative 3A and 3B Capacity Analysis

APPENDIX E

Pedestrian and Bicycle LOS Analysis

APPENDIX F

Traffic Volumes and Projected Left Turns

APPENDIX G

Field Observations

APPENDIX H

Public Involvement Materials and Responses