

2023 Road Diet Assessments

FINAL REPORT - John Marr Drive

December 17, 2024

Prepared for:



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Executive Summary

The Virginia Department of Transportation (VDOT) will be repaving the John Marr Drive corridor between Backlick Road and Columbia Pike. As such, the Fairfax County Department of Transportation (FCDOT) initiated an assessment for a road diet to potentially reallocate existing pavement width for the purposes of accommodating bike lanes. The corridor contains three signalized intersections and four unsignalized intersections. This report summarizes the findings of a crash analysis, existing traffic conditions, a road diet assessment, and final recommendations and conclusions.

There were a total of 35 reported crashes along the entire corridor between January 1, 2020 and December 31, 2022, with the highest number of crashes occurring at the intersections with Backlick Drive (16 crashes) and Little River Turnpike (13 crashes). The results of the crash analysis suggest that these crashes were more likely a result of human error rather than existing road geometry or operations. Using turning movement count (TMC) data collected in March 2023 and Synchro software, weekday AM and PM peak hour traffic conditions were analyzed for existing conditions. The result of this analysis indicates that the intersection of John Marr Drive and Backlick Road operates at an acceptable level of service (LOS) B during the AM peak hour and LOS C during the PM peak hour. Similarly, the intersection of John Marr Drive and Columbia Pike operates at LOS C during both the AM and PM peak hours. As for the intersection of John Marr Drive and Little River Turnpike, the overall intersection operates at LOS D during the AM peak hour and LOS E during the PM peak hour. As John Marr Dr is located within the Annandale Community Business Center, the County Board-approved Fairfax County Comprehensive plan allows for LOS E. VDOT and FCDOT have formalized that requirement in a memorandum of understanding which allows for a better balance between bicyclists, pedestrians, transit users and vehicles in these activity centers. A Build traffic analysis was completed using the 2033 No Build traffic volumes and the No Build Synchro model, which was updated to reflect the road diet conditions. AM peak hour operations reduce to LOS C at Backlick Road, while LOS C operations are maintained during the PM peak hour. At Columbia Pike, operations improve to LOS B during the AM peak hour and remain at LOS C operating conditions during the PM peak hour. At Little River Turnpike, operations reduce more significantly during the PM peak hour than the AM peak hour, with the overall intersection delay increasing by approximately 18 seconds. While delay is better balanced around the intersection across the allowable turning movements, there could be potential progression impacts along Little River Turnpike. It is recommended this be further evaluated before implementing any bike lane improvements.

The operational results at Little River Turnpike indicate worsened conditions; however, this would most likely occur during the peak 15 minutes of the AM and PM weekday commuting time periods. While drivers may experience increased delay, the increase is of a magnitude that would likely go unnoticed given the overall intersection delay increases by less than 20 seconds during the AM and PM peak hours.

The proposed bike lanes along John Marr Drive will provide a useful connection between the existing bike lanes west of Backlick Road and a future bike facility proposed (planning stage) along Columbia Pike. While the operational impacts are expected to affect commuters, the delay impact at Little River Turnpike is not substantial, and the logical bike connection outweighs the minor inconvenience to drivers. Outside of peak periods, it is unlikely the average driver will notice much of a delay impact.

Based on the outcome of the road diet assessment, it is recommended that the following be considered as part of the implementation of bike lanes on John Marr Drive between Backlick Road and Columbia Pike:

- John Marr Drive, South of Little River Turnpike
 - Maintain the existing westbound left turn and shared through and right-turn lanes at Backlick Road
 - Reconfigure the eastbound approach at Backlick Road to provide a shared through and left-turn lane and an exclusive right-turn lane, crossing the existing bike lane from the curb to the left side of the right-turn lane
 - Maintain one eastbound and one westbound travel lane with a center turn lane east of Backlick Road
 - Install bike lanes (4' bike lane, 1.5' gutter pan) beginning at Backlick Road up to Little River Turnpike
 - Reconfigure the northbound approach to provide a shared through and left-turn lane and an exclusive right-turn lane
 - Remove one westbound left-turn lane (striping)
 - On the northbound approach to Little River Turnpike, cross the proposed bike lane from the curb to the left side of the right-turn lane
- John Marr Drive, North of Little River Turnpike
 - Reconfigure the southbound approach to provide a shared through and left-turn lane and an exclusive right-turn lane
 - On the southbound approach to Little River Turnpike, cross the proposed bike lane from the curb to the left side of the right-turn lane
 - Maintain one northbound and one southbound travel lane
 - Install a buffered bike lane within the existing rightmost travel lane (6' buffer, 6' bike lane, which includes the 1.5' gutter pan when a right-turn lane is not present) from Little River Turnpike to Columbia Pike.
 - Bike lanes will not be buffered at existing transit stop; instead, skip markings should be installed to indicate the space is not a travel lane for vehicles, but that buses may cross to service the transit stop
- Other considerations
 - Existing signal heads and lane control signs will need to be reconfigured to match proposed geometry at Little River Turnpike, namely:
 - Remove the 3-section arrow signal head on the southbound approach
 - Remove the R3-5 (left) and R3-6 (through and right) signs on the southbound approach mast arm
 - Install an R3-5 (right) on the southbound approach mast arm
 - Remove the R3-5a sign on the northbound approach mast arm
 - Remove the R3-8 advance lane control sign on the southbound approach located at Tom Davis Drive
 - Consider operating the longer 180-second cycle length at Little River Turnpike (and along the corridor) during the AM and PM peak periods for a limited duration to minimize delay and queue spillback, and instead operating a lower cycle length to be more responsive to demand and minimize queue spillback

Introduction

As part of the 2023 Virginia Department of Transportation (VDOT) annual paving program, the Fairfax County Department of Transportation (FCDOT) requested that three separate corridors be evaluated to explore the feasibility of implementing a road diet to reallocate pavement space by removing a travel lane in each direction and to install buffered bicycle lanes where space allows. John Marr Drive is one corridor included in this evaluation. The corridor extents begin at the signalized intersection of John Marr Drive and Backlick Road and ends at the signalized intersection of John Marr Drive and Columbia Pike. The corridor also contains the signalized intersection at Little River Turnpike along with four unsignalized intersections:

- John Marr Drive and Little River Turnpike Access Road,
- John Marr Drive and Pep Boys Driveway (Pep Boys),
- John Marr Drive and Tom Davis Drive, and
- John Marr Drive and United Bank.

John Marr Drive is a four-lane major collector that provides connections to Route 617, Little River Turnpike, and Columbia Pike. It is an undivided roadway south of Little River Turnpike and a divided roadway north of Little River Turnpike, with a posted speed limit of 25 mph along the entire corridor. Little River Turnpike provides direct access to I-495 and I-395, which generally runs north-south. The area surrounding John Marr Drive is primarily commercial along the corridor itself with various types of residential land uses in the broader vicinity. Marked bike lanes exist on John Marr Drive from Ravensworth Road to Backlick Road and along McWhorter Place and Ravensworth Road, with portions of these bike lanes buffered from the adjacent vehicular travel lanes by a painted buffer. **Figure 1** provides an overview of the study area and intersection spacing between the study intersections. Also noted in **Figure 1** is the typical cross-section of John Marr Drive. **Figure 1** is not to scale.

FCDOT has initiated this road diet study to evaluate the potential to improve the corridor regarding accessibility, safety, and improved mobility for all travel modes. According to the most recent Fairfax County Bicycle Network Map, John Marr Drive is a future bike lane facility. This report outlines the analysis of existing traffic conditions, build condition traffic analysis accounting for the proposed bike lanes, potential cross sections, and recommendations.

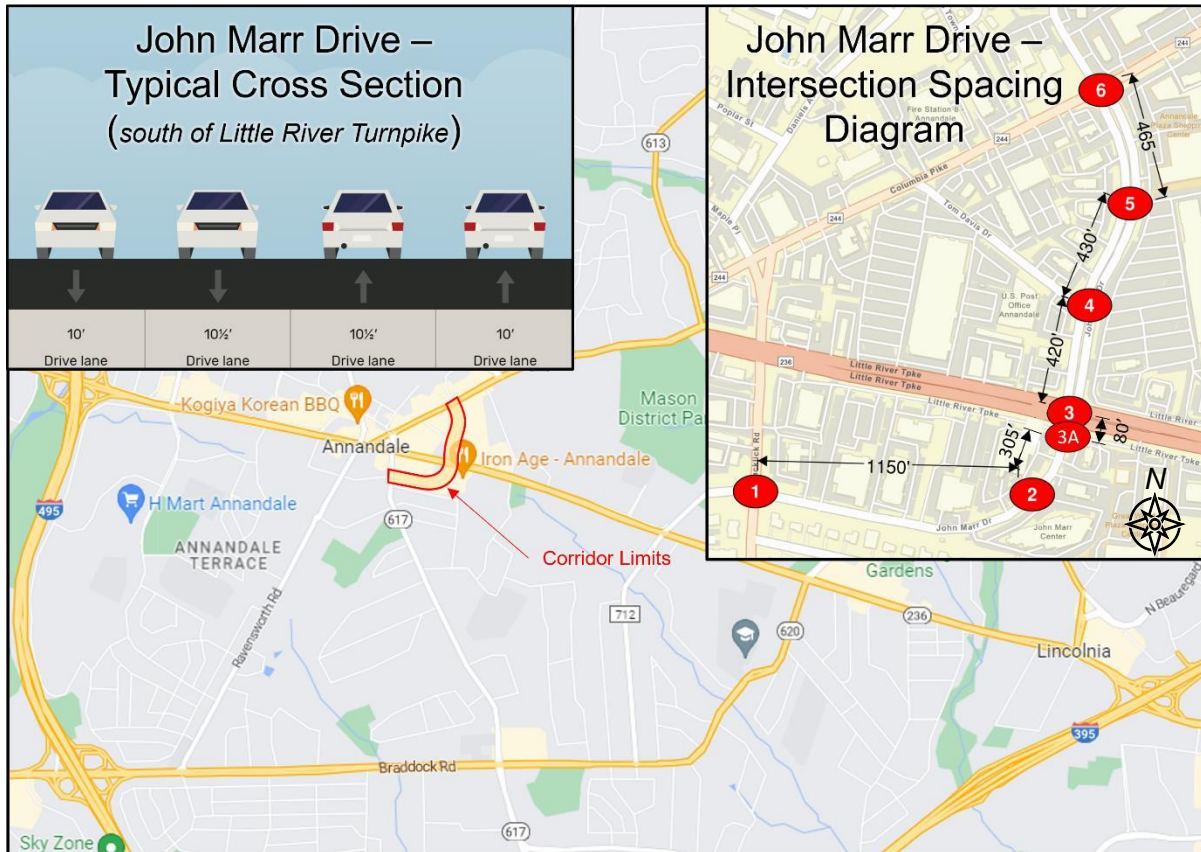


Figure 1: Study Corridor Map and Intersection Spacing Diagram

Data Collection

Turning movement counts (TMC) data were collected on Tuesday, March 14th, 2023, from 6:00 to 9:00 AM and from 4:00 to 7:00 PM for the following intersections:

1. John Marr Drive and Backlick Road
2. John Marr Drive and Pep Boys
3. John Marr Drive and Little River Turnpike
- 3A. John Marr Drive and Little River Turnpike Access Road
4. John Marr Drive and Tom Davis Drive
5. John Marr Drive and United Bank
6. John Marr Drive and Columbia Pike

Based upon a review of the collected TMC data, the network peak hour for the corridor was determined to be 7:45 AM to 8:45 AM and 5:00 PM to 6:00 PM. The network peak hours were used to evaluate the existing traffic conditions and build scenario conditions (with road diet). Peak hour turning movement count data is summarized in **Figure 2**. Based on review of the network peak hour volumes in the Synchro, traffic volumes were fairly balanced along the corridor and no adjustments were made to the source volume.

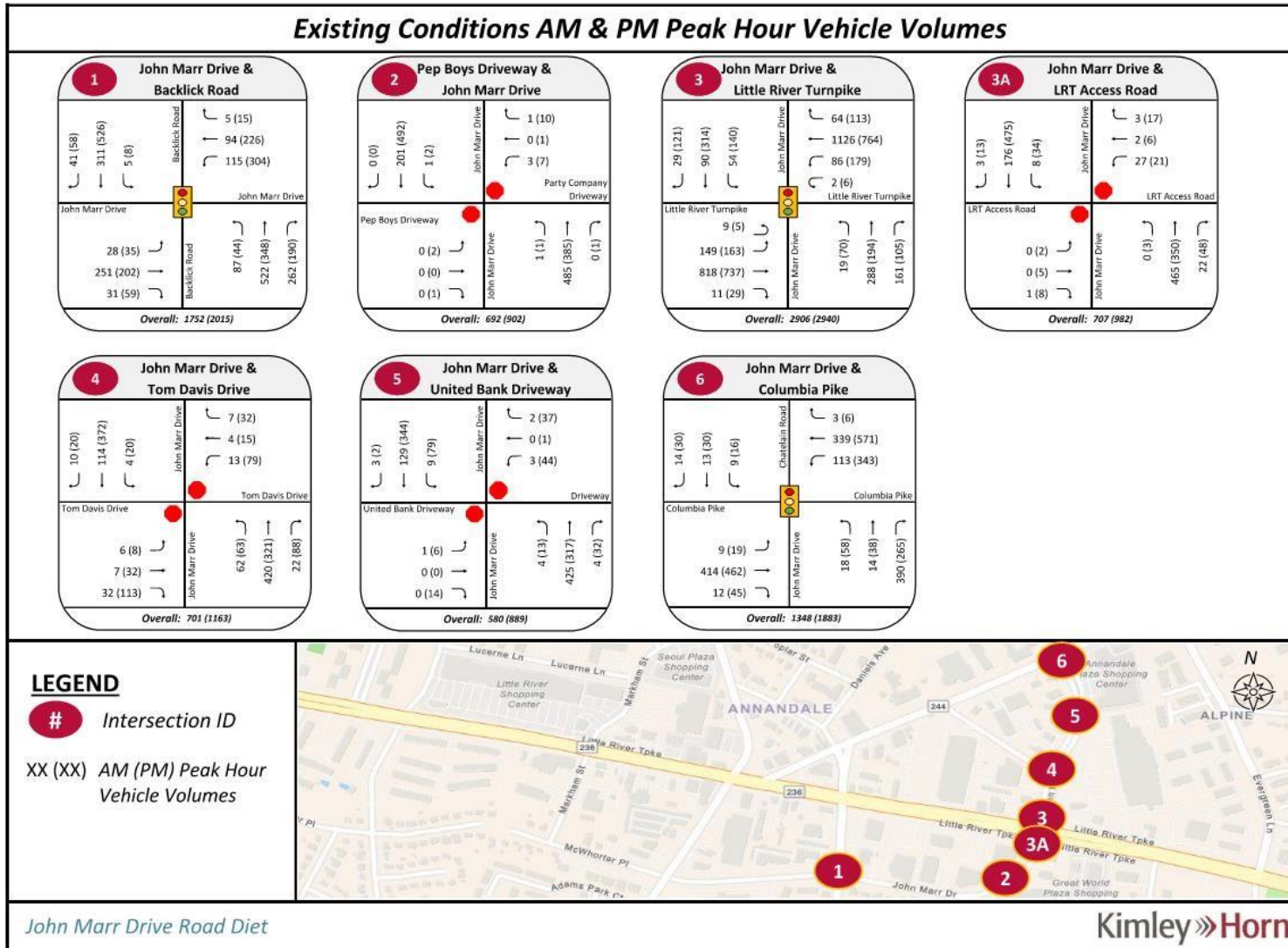


Figure 2: John Marr Drive Existing Peak Hour Traffic Volumes

Historical annual average daily traffic (AADT) volumes along the corridor for the most recent five years of traffic data are provided in **Table 1**. From Backlick Road to Little River Turnpike, the AADT volumes decreased by 1,000 vehicles per day from 2017 to 2019. Between 2017 and 2019, the AADT volumes from Little River Turnpike to Columbia Pike remain the same. The data shows that between

2019 and 2020, the annual average daily traffic along both segments has decreased by approximately 2,400 vehicles per day. In 2021, AADT volumes demonstrate an increase as compared to 2020; however, still not to the same volume in 2019 or earlier. Based upon the 2023 traffic data collected and K factors of 0.098 and 0.097, the hourly peak hour TMC data at the endpoint intersections with Backlick Road and Columbia Pike would suggest an average daily volume between 7,000 and 9,000 vehicles. This indicates that daily traffic volumes are at levels similar to COVID conditions.

Table 1: Historical AADT

Street	From	To	Year	AADT	%T	K	D
John Marr Drive	Backlick Road	Little River Turnpike	2017	11,000	2%	0.098	0.598
			2018	10,000	1%	0.093	0.616
			2019	10,000	1%	0.093	0.616
			2020	7,600	1%	0.093	0.616
			2021	9,500	2%	0.091	0.574
	Little River Turnpike	Columbia Pike	2017	10,000	2%	0.091	0.59
			2018	10,000	1%	0.091	0.564
			2019	10,000	1%	0.091	0.564
			2020	7,700	1%	0.091	0.564
			2021	8,400	2%	0.097	0.508

On March 8th, 2023, at approximately 9:00 AM, field observations were completed to evaluate the current traffic conditions and document existing roadway geometry. These observations were documented in a field data collection checklist and can be referenced in **Appendix A**. Aggressive driving was observed at the intersection of John Marr Drive and Backlick Road, in part due to northbound congestion along Backlick Road. There are six bus stops located along the corridor. A photograph of one of the existing bus stops on the corridor is shown in **Figure 3**. Current bus operations are limited to the Washington Metropolitan Area Transit Authority (WMATA) Metrobus Route 16A, Metrobus Route 26A, and Fairfax Connector Routes 401 and 402.



Figure 3: Bus Stop and Shelter at the intersection of John Marr Drive and Tom Davis Drive

Sight distance at the driveway of Hayadi Salon and the curvature of the roadway make the left-turn movements difficult, as seen in **Figure 4**. While the required intersection sight distance of 280 feet for a left-turning vehicle is available, it is likely that this is hindered at times by the presence of parked vehicles and the growth of vegetation on the roadside.

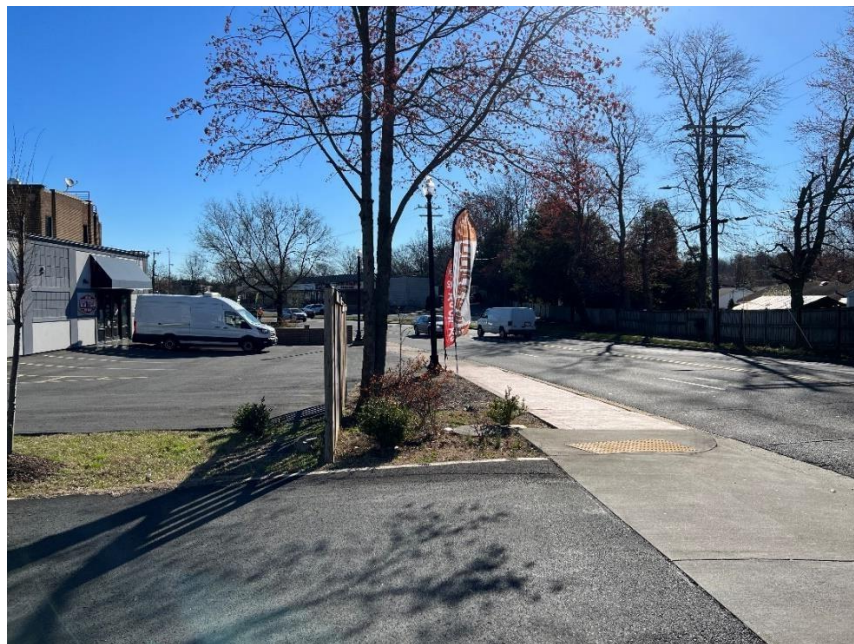


Figure 4: Sight Distance at Hyandi Salon Driveway and John Marr Drive

As noted above, the queue of vehicles heading northbound on Backlick Road toward Little River Turnpike extends to John Marr Drive (approx. 450 feet). This can be referenced below in **Figure 5**.



Figure 5: Vehicle Queue from Little River Turnpike

Crash Analysis

A crash analysis for the John Marr Drive corridor was conducted using the previous three years of crash data to identify crash patterns that may impact recommendations in the road diet assessment. The crash reports for the calendar years 2020 through 2022 were obtained from the Virginia Department of Transportation database. Each study intersection was isolated to a 150-foot radius around the center of the intersection and analyzed individually. The crash data along the corridor segments, which includes roadway outside of each 150-foot intersection radius, was also collected and analyzed.

There were a total of 35 reported crashes along the entire corridor between January 1, 2020 and December 31, 2022, with the highest number of crashes occurring at the intersections with Backlick Drive (16 crashes) and Little River Turnpike (13 crashes). The results of the crash analysis suggest that these crashes were more likely a result of human error rather than existing road geometry or operations. The occurrence of crashes primarily during the off-peak hours suggests that traffic congestion was likely not a contributing factor. Also, the occurrence of angle crashes suggests that left-turning vehicles likely failed to yield right-of-way to opposing through vehicles. In addition, there were two crashes that occurred along the corridor, with one being a fatal pedestrian crash. The crash occurred in the evening, during the off-peak hours, with clear weather and dry roadway conditions. The pedestrian attempted to cross in the middle of the corridor, south of the intersection with Columbia Pike. The findings from the crash analysis are summarized in **Appendix B**.

Existing Conditions Traffic Analysis

Intersection capacity analyses were performed for Existing traffic volumes for the study area intersections. The analyses were performed using the Synchro Software Package (Version 11), which utilizes methodologies contained in the *Highway Capacity Manual (6th Edition)* for signalized and unsignalized intersections. The keys steps in preparing the network were as follows:

- Modifying VDOT-provided Synchro files to include all study intersections and geometry within the corridor
- Inputting AM and PM peak hour TMC data for all study intersections, including peak hour factors
- Inputting heavy truck percentages
- Volume Balancing, where appropriate
- Origin-Destination adjustments along John Marr Drive between Little River Turnpike and Little River Turnpike Access Road

The TMC data indicated that the study intersections had various AM and PM intersection-specific peak hours. For the volumes at each intersection to be properly balanced, the network peak hour was used, which represented the highest total network volume across all study intersections. The network peak hour was found to be 7:45 AM to 8:45 AM for the morning and 5:00 PM to 6:00 PM for the evening. Several measures of effectiveness (MOE) generated by Synchro software were used to analyze existing operations at the seven intersections along the study corridor. Highway Capacity Manual (HCM) 6th Edition methodology was used to report MOEs from Synchro at unsignalized intersections. HCM 2000 methodology was used to report MOEs from Synchro at signalized intersections due to limitations of HCM6 methodology to analyze current signal operations.

Regarding the origin-destination adjustments, this is a feature within Synchro that allows manual changes to the default proportional volume assignments between nodes considering turning volumes departing an upstream node and turning volumes assigned to the downstream node. The TMC data was collected in such a manner that distinguished the assignment of left, through, and right-turn movements from the signalized intersection at Little River Turnpike to the Little River Turnpike Access Road or continuing south along John Marr Drive. Similar data collection occurred in the northbound direction between the Little River Turnpike Access Road and Little River Turnpike. These refinements to volume assignments better represent operations and the interaction of vehicles between the two closely-spaced intersections.

Table 2 below summarize the findings from the MOE for the three signalized intersections, including average vehicular delay, level of service (LOS), available storage, and 95th percentile queue length. Overall intersection delay is not reported for unsignalized intersections since delay cannot be calculated for uncontrolled through movements along John Marr Drive. Movements for which delay cannot be calculated are indicated with “(-)” in the table. MOEs for AM and PM peak hour existing conditions for all seven intersections can be found in **Appendix C**.

Table 2: Existing AM and PM Peak Hour Results

Approach	Movement	Storage Length	Existing AM		Existing PM	
			LOS+Delay	95th % Queue Length	LOS+Delay	95th % Queue Length
Intersection 1: John Marr Drive & Backlick Road						
Overall Intersection		-	B (19.5)	-	C (22.3)	-
Eastbound (John Marr Drive)	EBTLR	-	D (40.9)	135	D (41.0)	124
	EB Approach	-	D (40.9)	-	D (41.0)	-
Westbound (John Marr Drive)	WBL	-	B (18.6)	106	C (28.9)	m289
	WBTR	-	B (15.6)	92	B (12.0)	m230
	WB Approach	-	B (17.2)	-	C (21.4)	-
Northbound (Backlick Road)	NBLTR	-	B (15.8)	233	B (18.3)	172
	NB Approach	-	B (15.8)	-	B (18.3)	-
Southbound (Backlick Road)	SBLTR	-	B (11.3)	83	B (17.8)	192
	SB Approach	-	B (11.3)	-	B (17.8)	-
Intersection 2: John Marr Drive & Pep Boys Driveway						
Eastbound (Pep Boys Driveway)	EBLTR	-	A (0.0)	-	B (14.5)	0
	EB Approach	-	A (0.0)	-	B (14.5)	-
Westbound (Driveway)	WBLTR	-	B (13.7)	0	B (12.6)	3
	WB Approach	-	B (13.7)	-	B (12.6)	-
Northbound (John Marr Drive)	NBLT	-	A (7.6)	0	A (8.4)	0
	NBTR	-	A (0.0)	-	A (0.0)	-
Southbound (John Marr Drive)	SBLT	-	A (8.4)	0	A (8.1)	0
	SBTR	-	A (0.0)	-	A (0.0)	-
Intersection 3: John Marr Drive & Little River Turnpike						
Overall Intersection		-	D (45.4)	-	D (54.7)	-
Eastbound (Little River Turnpike)	EBL	850	F (91.2)	276	F (95.3)	304
	EBT	-	C (22.3)	415	C (32.0)	430
	EBR	835	B (16.2)	0	C (24.3)	0
	EB Approach	-	C (33.3)	-	D (43.1)	-
Westbound (Little River Turnpike)	WBL	290	F (83.1)	89	F (84.6)	166
	WBT	-	C (34.7)	763	D (37.8)	487
	WBR	-	B (16.4)	1	B (14.5)	16
	WB Approach	-	D (37.1)	-	D (43.5)	-
Northbound (John Marr Drive)	NBLT	-	E (70.9)	243	E (77.7)	228
	NBR	245	F (83.7)	290	E (75.6)	196
	NB Approach	-	E (75.3)	-	E (77.1)	-
Southbound (John Marr Drive)	SBL	200	F (94.5)	125	E (65.9)	m250
	SBTR	-	F (95.0)	120	F (84.0)	378
	SB Approach	-	F (94.8)	-	E (80.0)	-
Intersection 3A: John Marr Drive & Little River Turnpike Access Road						
Eastbound (Little River Turnpike Access Road)	EBLTR	-	A (8.8)	0	C (15.5)	3
	EB Approach	-	A (8.8)	-	C (15.5)	-
Westbound (Little River Turnpike Access Road)	WBT	-	B (14.9)	8	C (16.1)	10
	WB Approach	-	B (14.9)	-	C (16.1)	-
Northbound (John Marr Drive)	NBLT	-	A (0.0)	0	A (8.5)	0
	NBR	-	(-)	-	(-)	-
	NB Approach	-	A (0.0)	-	A (0.1)	-
Southbound (John Marr Drive)	SBLTR	-	A (0.0)	-	A (0.2)	-
	SB Approach	-	A (0.4)	-	A (0.7)	-

Table 2 (continued): Existing AM and PM Peak Hour Results

Approach	Movement	Storage Length	Existing AM		Existing PM	
			LOS+Delay	95th % Queue Length	LOS+Delay	95th % Queue Length
Intersection 4: John Marr Drive & Tom Davis Drive						
Eastbound (Tom Davis Drive)	EBLTR		B (11.2)	8	C (15.6)	35
	EB Approach	-	B (11.2)	-	C (15.6)	-
Westbound (Driveway)	WBLTR		C (16.1)	8	D (27.8)	58
	WB Approach	-	C (16.1)	-	D (27.8)	-
Northbound (John Marr Drive)	NBL	100	A (7.7)	5	A (8.3)	5
	NBT	-	(-)	-	(-)	-
	NBR	100	(-)	-	(-)	-
	NB Approach	-	A (0.9)	-	A (1.1)	-
Southbound (John Marr Drive)	SBL	150	A (8.4)	0	A (8.4)	3
	SBT	-	(-)	-	(-)	-
	SBR	150	(-)	-	(-)	-
	SB Approach	-	A (0.3)	-	A (0.4)	-
Intersection 5: John Marr Drive & United Bank						
Eastbound (United Bank Driveway)	EBLTR		B (12.2)	0	B (12.0)	3
	EB Approach	-	B (12.2)	-	B (12.0)	-
Westbound (Driveway)	WBLTR		B (13.5)	0	C (15.4)	18
	WB Approach	-	B (13.5)	-	C (15.4)	-
Northbound (John Marr Drive)	NBL	150	A (7.5)	0	A (8.0)	0
	NBT	-	(-)	-	(-)	-
	NBR	150	(-)	-	(-)	-
	NB Approach	-	A (0.1)	-	A (0.3)	-
Southbound (John Marr Drive)	SBL	90	A (8.4)	0	A (8.2)	5
	SBT	-	(-)	-	(-)	-
	SBR	150	(-)	-	(-)	-
	SB Approach	-	A (0.5)	-	A (1.5)	-
Intersection 6: John Marr Drive & Columbia Pike						
Overall Intersection		-	C (20.2)	-	C (24.5)	-
Eastbound (Columbia Pike)	EBLTR	-	C (34.0)	156	D (40.3)	211
	EB Approach	-	C (34.0)	-	D (40.3)	-
Westbound (Columbia Pike)	WBLTR	-	B (12.4)	118	B (16.3)	271
	WB Approach	-	B (12.4)	-	B (16.3)	-
Northbound (John Marr Drive)	NBL	250	D (37.6)	m28	D (38.4)	m64
	NBT	-	D (36.9)	m22	D (36.0)	m40
	NBR	-	B (11.0)	126	B (13.7)	112
	NB Approach	-	B (13.0)	-	B (20.0)	-
Southbound (Chatelain Road)	SBLT	-	D (38.5)	35	D (37.2)	56
	SBR	150	D (37.8)	0	D (35.9)	0
	SB Approach	-	D (38.2)	-	D (36.7)	-

m: Volume for 95th percentile queue is metered by upstream signal

The four unsignalized intersections did not have significant delay results. The highest delay for any side street approach at unsignalized intersections was 16.1 seconds in the AM peak hour and 27.8 seconds in the PM peak hour, both on the westbound approach at John Marr Drive and Tom Davis Drive. This is primarily attributed to the fact that through volume is present on the side street at this

intersection, requiring gaps in both directions of traffic for a through vehicle to travel through the intersections.

From the MOE results for the intersection of John Marr Drive with Backlick Road, it can be concluded that the intersection operations are acceptable during the AM peak hour. During the AM peak hour, the overall intersection operates at LOS B; the worst intersection movement is the eastbound approach, which operates at LOS D. The same is true for this intersection during the PM peak hour, during which the intersection operates with an overall intersection LOS C and the eastbound side approach operates at LOS D.

The intersection of John Marr Drive at Little River Turnpike operates poorly under existing conditions, with several movements operating at LOS F during both AM and PM peak hours. Overall, the PM peak hour operations are worse than the AM peak hour operations. During the PM peak hour, the eastbound left-turn movement experiences the most delay of any movement at 95.3 seconds of average delay. The primary factors contributing to poor operations are cycle length and volume. AM and PM peak hour signal operations run a cycle length of 180 seconds. This inherently increases delay as certain movements can experience a dwell time of up to three minutes waiting for the signal phase to be served. Where demand exceeds capacity, that delay can be even greater. Note that Little River Turnpike through movements receive nearly 50 percent of the cycle time while John Marr Drive, which operates split phase (i.e. northbound and southbound operate separately), receives less than 40 percent of the cycle length combined.

During the AM peak hour, the intersection of John Marr Drive at Columbia Pike operates with an overall intersection LOS C. The southbound approach experiences the most delay, operating at LOS D. The same is true for this intersection during the PM peak hour, during which the overall intersection operates with at LOS C while the eastbound and southbound approaches operate at LOS D. Note that this intersection operates split phase along Columbia Pike, and a significant proportion of the cycle length (up to 50 percent) is allocated to just the southbound approach.

Road Diet Assessment

Geometry

Using the information from the analysis of existing roadway geometry and traffic conditions, an assessment of the impact of the proposed road diet was completed. The modifications of the corridor include the removal of one eastbound and one westbound through lane to install bike lanes along the north and south curbs. **Figure 6** shows the existing cross section of the corridor south of Little River Turnpike (undivided), while **Figure 7** shows the existing cross section north of Little River Turnpike. The potential build conditions for John Marr Drive south of Little River Turnpike are shown in **Figure 8**, while **Figure 9** shows a typical cross section for the Build conditions north of Little River Turnpike. The key difference in these typical sections is the presence of a raised median and dedicated left and right turn lanes. Cross section graphics do not include existing gutter pans, which represent additional horizontal space to accommodate reconfiguration of the roadway width for bikes. Graphics were created using Streetmix. Gutter pans along John Marr Drive were measured to be 1.5 feet.

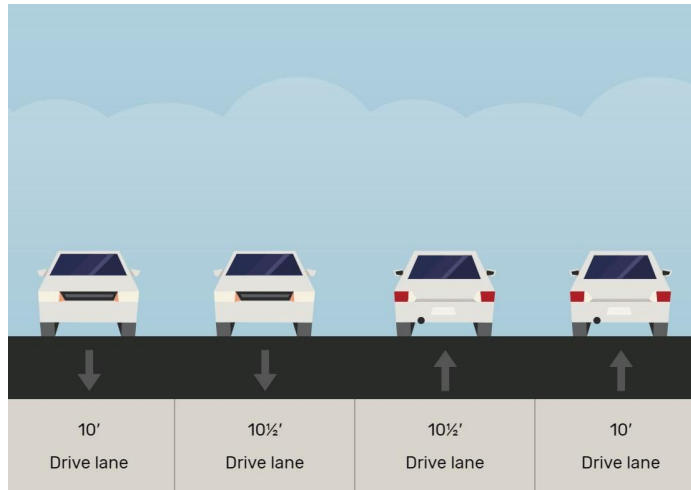


Figure 6: John Marr Drive Existing Cross Section (south of Little River Turnpike)

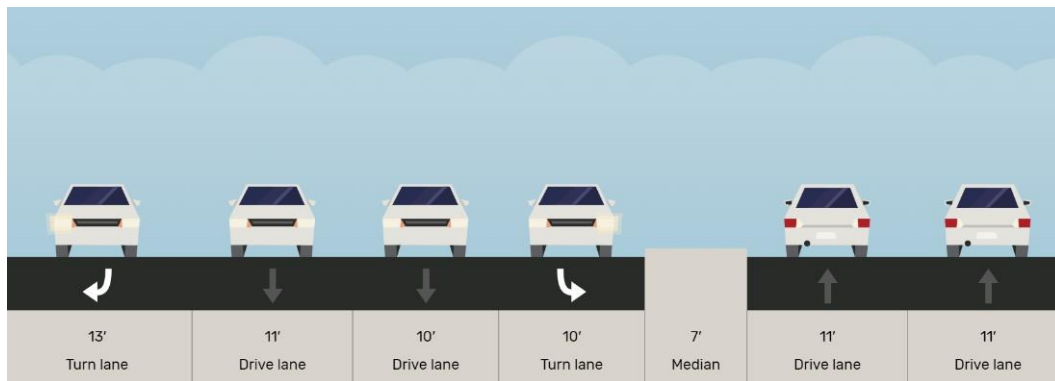


Figure 7: John Marr Drive Existing Cross Section (north of Little River Turnpike)

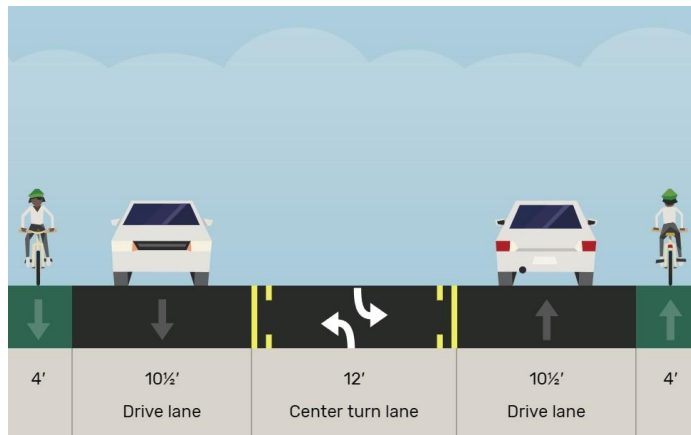


Figure 8: John Marr Drive Build Conditions Cross Section (South of Little River Turnpike)

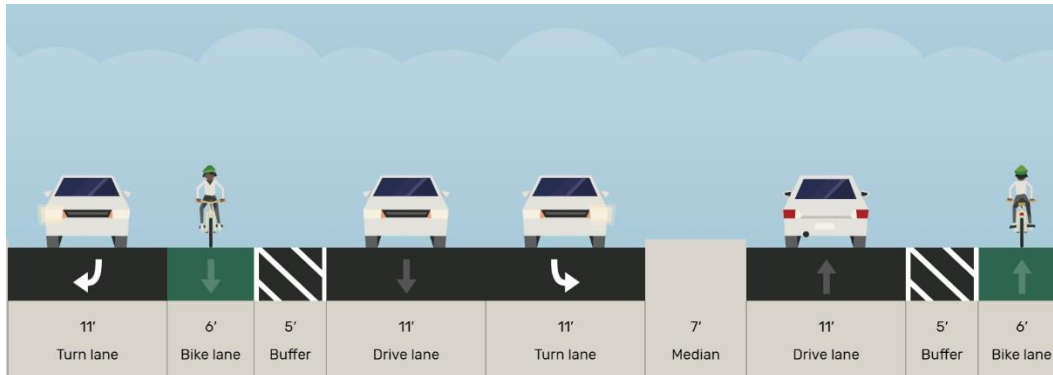


Figure 9: John Marr Drive Build Conditions Cross Section (North of Little River Turnpike)

Potential changes to the geometry at the intersection of John Marr Drive and Backlick Road are recommended as follows to accommodate bike lanes at the intersection (east of Backlick Road):

- Removal of one existing eastbound travel lane
- Reconfigure the east leg of the intersection to provide the following:
 - One westbound bike lane
 - One westbound through and right-turn lane
 - One exclusive westbound left-turn lane
 - One eastbound travel lane
 - One eastbound bike lane

Figure 10 illustrates the modifications proposed at this signalized intersection outlined above (cross section and plan view). In the plan view schematic, red arrows represent vehicle travel lanes and green arrows represent bicycle travel lanes. The 4-foot bike lane will begin on the east leg of the intersection and continue along the south curb along John Marr Drive. The same would occur for the bike lane in the westbound direction.

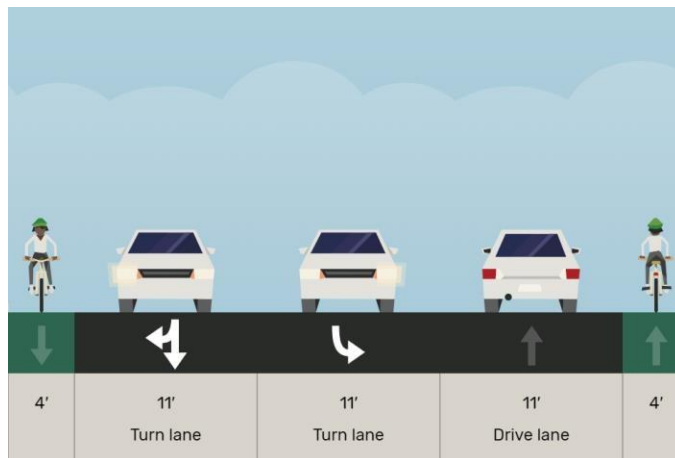


Figure 10: Intersection of John Marr Drive and Backlick Road Build Conditions Cross Section and Plan View

Potential changes to the geometry at the intersection of John Marr Drive and Little River Turnpike are recommended as follows to accommodate bike lanes at the intersection:

- Removal of one existing southbound and northbound travel lane (north and south of the intersection)
- Reconfigure the south leg of the intersection to provide the following:
 - One southbound bike lane
 - One southbound travel lane
 - One shared northbound through and left turn lane
 - One northbound bike lane
 - One northbound right-turn lane
- Reconfigure the north leg of the intersection to provide the following:
 - One southbound right-turn lane
 - One southbound bike lane
 - One shared southbound through and left-turn lane
 - One northbound travel lane
 - One northbound buffered bike lane

Figure 11 and **Figure 12** illustrate the modifications proposed at this signalized intersection outlined above (cross section and plan view). The bike lane will continue through the intersection along the east curb of John Marr Drive in the northbound direction and be separated from the right-turn lane in the southbound direction. Due to the width of the corridor, the bike lanes will not be buffered from Backlick Road to Little River Turnpike. North of Little River Turnpike, bike lanes will be buffered.

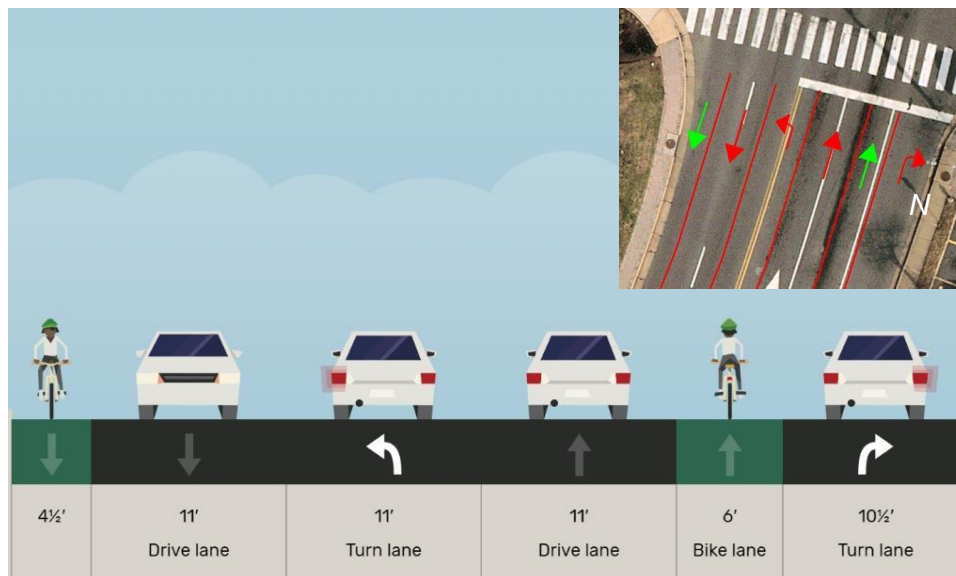


Figure 11: Intersection of John Marr Drive and Little River Turnpike Build Conditions Cross Section and Plan View (South of John Marr Drive)

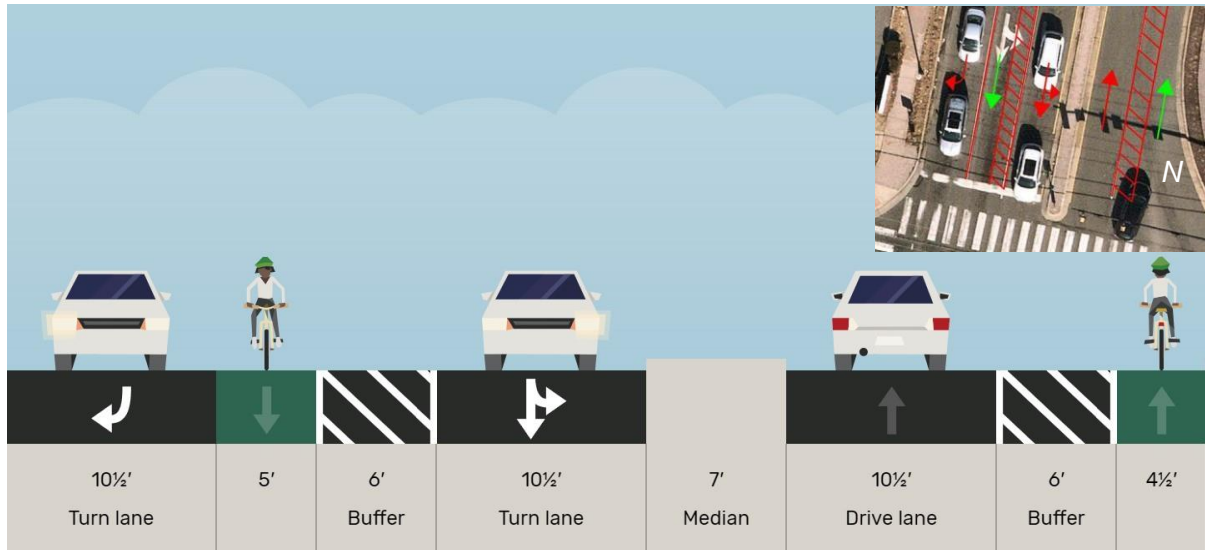


Figure 12: Intersection of John Marr Drive and Little River Turnpike Build Conditions Cross Section and Plan View (North of John Marr Drive)

Potential changes to the geometry at the intersection of John Marr Drive and Columbia Pike for Build conditions are recommended as follows to accommodate bike lanes at the intersection:

- Removal of one southbound travel lane
- Removal of one northbound travel lane
- The exclusive northbound left and through lanes become a shared through and left-turn lane, while the exclusive right-turn lane is maintained

Figure 13 illustrates the modifications proposed at this signalized intersection outlined above (cross section and plan view).

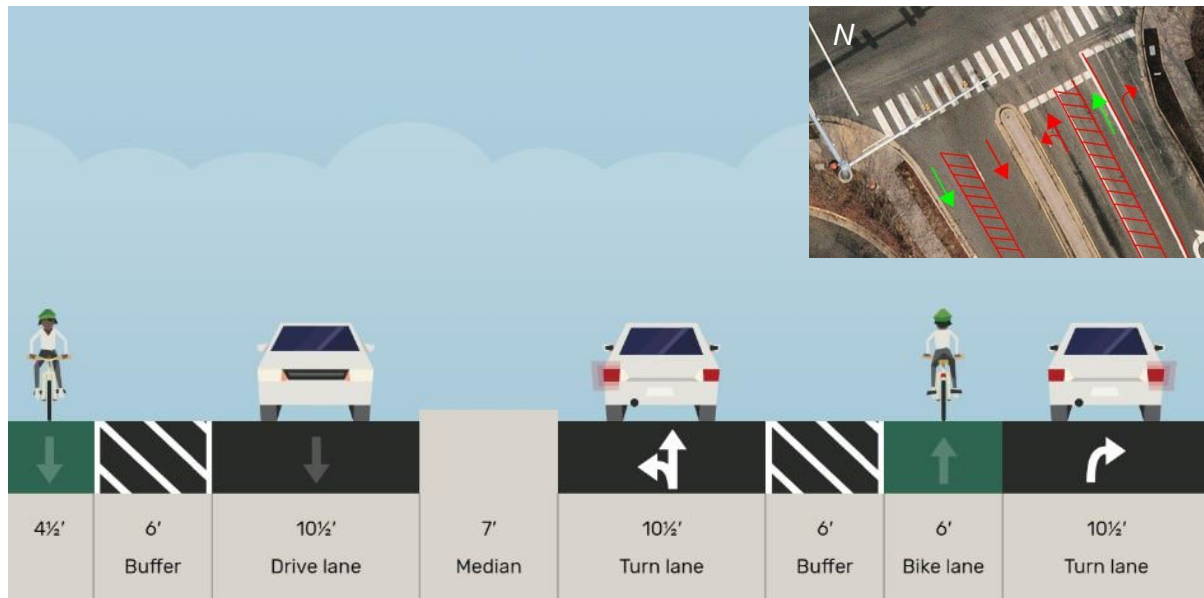


Figure 13: Intersection of John Marr Drive and Columbia Pike Build Conditions Cross Section and Plan View

Potential Crash Mitigation

The Virginia state preferred crash modification factors (CMF) list was referenced to identify appropriate modification factors and the potential impact on crash likelihood along the corridor. There was only one reported crash that involved a pedestrian at the intersection of John Marr Drive and Tom Davis Drive in the past three years. The relevant CMF is described as follows:

- **Add Pedestrian Hybrid Beacon (PHB)**, CMF = 0.453 this factor applies to vehiclepedestrian crashes and has a service life of 20 years.

Applying this CMF will reduce the number of crashes to less than one expected crash (0.547 crashes) in three years.

Related to vehicle countermeasures, there is a CMF for roadway segments with the countermeasure of a road diet. A road diet is also another fundamental component of this study as a means of creating space for bicyclists within the roadway. The road diet countermeasure is specific to the conversion of a four-lane undivided roadway to two travel lanes with a center turn lane. John Marr Drive, from Little River Turnpike to Columbia Pike is currently a divided roadway with existing center left-turn lanes. Since the proposed configuration does not meet that criterion, this CMF cannot be applied. However, from Backlick Road to Little River Turnpike the corridor is a four-lane undivided roadway. The CMF can be applied in this area, and the relevant CMF is described as follows:

- **Road Diet (4U to 3T)**, CMF = 0.71 this factor applies to all crashes and has a service life of 20 years.

Within the section of John Marr Drive where the undivided, four-lane section exists, there were a total of three crashes over a three-year period. Applying this CMF will reduce the number of crashes from approximately 1 crash per year to less than 1 crash per year (0.71 crashes).

Future Growth Assessment (Prepared by FCDOT)

FCDOT compiled for this study VDOT’s estimated daily traffic volumes for the past 20 years. There is a clear downward trend in volume on John Marr Drive. John Marr Drive is located in the Community Business Center (CBC) of Annandale. The CBC has not seen significant redevelopment in many years, population has declined and has had a commercial revitalization program since 1987. As a result, traffic volumes have declined on John Marr Drive since 2001. The data is visualized in **Figure 14** and **Figure 15**.

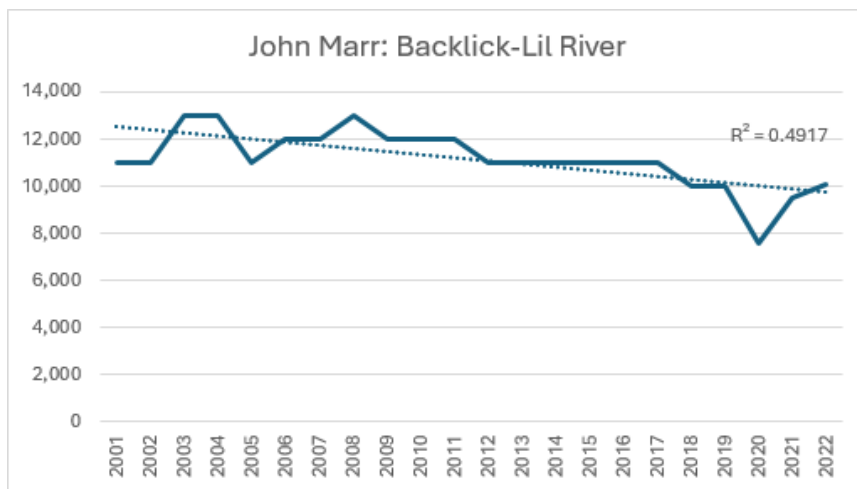


Figure 14: John Marr Drive daily traffic volumes between Backlick Road and Little River Turnpike

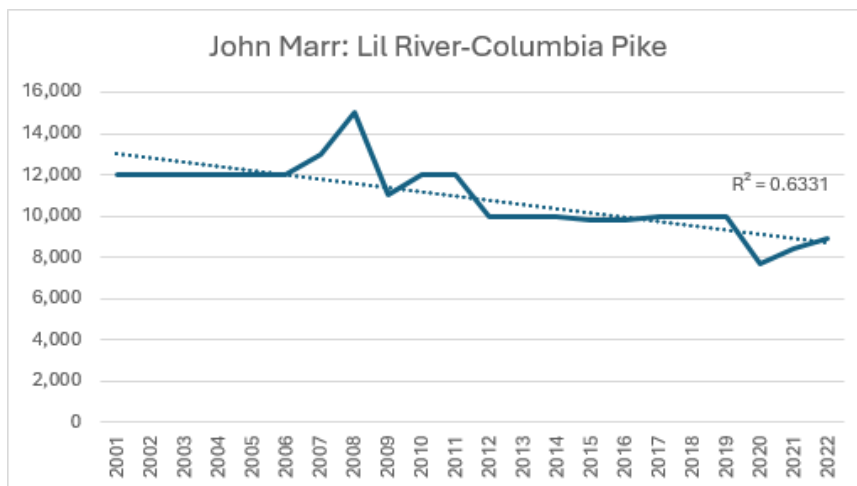


Figure 15: John Marr Drive daily traffic volumes between Little River Turnpike and Columbia Pike

While a new mixed-use residential redevelopment was recently approved on John Marr Drive, it will partially replace an auto-oriented strip mall and likely reduce overall trips. This particular mixed-use development has fewer parking spaces than required and is designed to encourage more walking and bicycling trips. It also includes a transportation demand management plan with an enforceable goal of a 20% reduction in peak hour auto trips. Future phases of the redevelopment will likely disperse traffic via a future grid of streets.

Fairfax County's Comprehensive Plan for the Annandale CBC encourages residential, pedestrian-oriented redevelopment. The Plan envisions a vibrant mix of land uses that will allow people to live within walking distance of jobs and retail. One of the objectives is to include elements of "complete streets" such as the proposed road diet and bike lane design proposed for John Marr Dr. The plan states that an overall minimum level of service "E" desired for collectors and local streets in the Center and that transportation demand management can help mitigate future traffic impacts. The proposed bike lanes on John Marr Dr will encourage some people to make trips by bicycle or walking instead of driving. This LOS E was formalized by an August 2016 memorandum of understanding between FCDOT and VDOT. Based on the slow pace of redevelopment and the type of redevelopment, FCDOT does not anticipate traffic volume growth over the next decade and did not include it in this analysis.

Build Traffic Analysis

The Build traffic conditions were analyzed using the same process as the Existing conditions. This includes updating the lane geometry in Synchro and evaluating the operations at the study intersections. The Synchro results can be referenced in **Appendix D**. As with the existing conditions, MOEs were evaluated to understand the impact to operations of each intersection under the Build conditions. The results of the Build traffic analysis are summarized in **Table 3** and **Table 4**.

The removal of a travel lane along John Marr Drive has minimal impact on delay for the signalized intersection at Backlick Road, particularly given that the existing geometry on the westbound approach is maintained. The intersection operations are acceptable in the AM peak hour, with an overall intersection LOS C, with the eastbound approach experiencing the worst delay of all approaches at LOS D. Similar operations are expected during the PM peak hour. The eastbound through movement queues increase under the Build scenario to 224 feet during the AM peak hour and 198 feet during the PM peak hour.

The removal of the southbound through lane at the intersection with Little River Turnpike has notable impacts on delays and queues. The eastbound left-turn and southbound through movement delays increase to 128 seconds and 115 seconds, respectively, during the AM peak hour. Given the 180-second cycle length, this indicates that on average, vehicles must wait at least one signal cycle to clear this intersection. Queues for the westbound through lane movement are expected to exceed 900 feet.

Similar to the AM peak hour, PM peak hour operations in the Build scenario at the intersection of John Marr Drive and Little River Turnpike are characterized by significant delay and queuing for several movements. The westbound left-turn and northbound through movement delays increase to 125 and 156 seconds, respectively. Queues for the southbound through and left-turn lane are expected to reach 750 feet, and the westbound left-turn queue of 416 feet also exceeds the available storage of 290 feet.

Under Build conditions, the intersection of John Marr Drive and Columbia Pike is expected to operate similar to existing conditions. During the AM peak hour, the intersection is expected to operate with an overall LOS B, with the southbound approach operating at LOS D, nearly matching existing conditions delay. During the PM peak hour, the intersection operates at LOS C, with the southbound approach operating at LOS D. The proposed geometry removes the exclusive northbound through lane and combines the movement with the left turn, which was assigned storage, and the exclusive northbound right-turn lane operates with continuous storage as the effective through movement from upstream intersections. Given that no other geometric or operational changes are proposed, the intersection operations remain stable, and in fact, improve slightly under the Build conditions in the AM peak hour. This is a result of improved progression between Little River Turnpike and Columbia Pike. The increased green time for the northbound approach at this intersection provides a continuous green band through to Columbia Pike, effectively resulting in zero delay for right-turning vehicles arriving at this intersection from John Marr Drive south of Little River Turnpike.

In addition to increased delay at signalized intersections for most cases, side street movements also experience an increase in delay and queuing at unsignalized intersections. This is primarily a result of the reduction in travel lanes along John Marr Drive, which results in fewer gaps in traffic for side street movements to occur. HCM6 results during the AM and PM peak hours indicate the highest delay occurs for the westbound approach at the intersection with Tom Davis Drive. This is due to queue spillback along John Marr Drive from Little River Turnpike in addition to fewer gaps in mainline traffic.

Table 3: AM Peak Hour Existing and Build Conditions Results

Approach	Movement	Storage Length	No Build AM		Build Movement	Build AM	
			LOS+Delay	95th % Queue Length		LOS+Delay	95th % Queue Length
Intersection 1: John Marr Drive & Backlick Road							
Overall Intersection		-	B (19.5)	-		C (21.6)	-
Eastbound (John Marr Drive)	EBLTR	-	D (40.9)	135	EBLT	D (40.4)	224
	EB Approach	-	D (40.9)	-	EBR	C (27.4)	0
Westbound (John Marr Drive)	WBL	-	B (18.6)	106	WB Approach	D (39.1)	-
	WBTR	-	B (15.6)	92	WBL	B (12.4)	m29
	WB Approach	-	B (17.2)	-	WBTR	A (6.4)	m10
Northbound (Backlick Road)	NBLTR	-	B (15.8)	233	NBT	A (9.6)	-
	NB Approach	-	B (15.8)	-	NB Approach	C (21.2)	306
Southbound (Backlick Road)	SBLTR	-	B (11.3)	83	SBT	B (14.6)	107
	SB Approach	-	B (11.3)	-	SB Approach	B (14.6)	-
Intersection 2: John Marr Drive & Pep Boys Driveway							
Eastbound (Pep Boys Driveway)	EBLTR	-	A (0.0)	-	EBLTR	A (0.0)	-
	EB Approach	-	A (0.0)	-	EB Approach	A (0.0)	-
Westbound (Driveway)	WBLTR	-	B (14.1)	0	WBLTR	B (14.8)	0
	WB Approach	-	B (14.1)	-	WB Approach	B (14.8)	-
Northbound (John Marr Drive)	NBLT	-	A (7.7)	0	NBL	A (7.6)	0
	NBTR	-	A (0.0)	-	NBTR	(-)	-
	NB Approach	-	A (0.0)	-	NB Approach	A (0.0)	-
Southbound (John Marr Drive)	SBLT	-	A (8.5)	0	SBL	A (8.4)	0
	SBTR	-	A (0.0)	-	SBTR	(-)	-
	SB Approach	-	A (0.0)	-	SB Approach	A (0.0)	-
Intersection 3: John Marr Drive & Little River Turnpike							
Overall Intersection		-	D (45.4)	-		E (56.0)	-
Eastbound (Little River Turnpike)	EBL	850	F (91.2)	276	EBL	F (128.7)	#364
	EBT	-	C (22.3)	415	EBT	C (35.0)	511
	EBR	835	B (16.2)	0	EBR	C (25.2)	0
	EB Approach	-	C (33.3)	-	EB Approach	D (49.9)	-
Westbound (Little River Turnpike)	WBL	290	F (83.1)	89	WBL	F (95.7)	178
	WBT	-	C (34.7)	763	WBT	D (45.4)	793
	WBR	-	B (16.4)	1	WBR	B (19.5)	18
	WB Approach	-	D (37.1)	-	WB Approach	D (47.6)	-
Northbound (John Marr Drive)	NBL	-	A (0.0)	0	NBL	E (56.1)	m31
	NBLT	-	E (70.9)	243	NBT	E (79.1)	381
	NBR	245	F (83.7)	290	NBR	E (62.3)	220
	NB Approach	-	E (75.3)	-	NB Approach	E (72.4)	-
Southbound (John Marr Drive)	SBLT	200	F (94.5)	125			
	SBTR	-	F (95.3)	120	SBLT	F (115.6)	#313
	SB Approach	-	F (95.1)	-	SBR	E (73.8)	m4
Intersection 3A: John Marr Drive & Little River Turnpike Access Road							
Eastbound (Little River)	EBLTR	-	A (8.8)	0	EBLTR	A (9.1)	0
	EB Approach	-	A (8.8)	-	EB Approach	A (9.1)	-
Westbound (Little River)	WBLTR	-	C (15.4)	8	WBLTR	B (14.8)	8
	WB Approach	-	C (15.4)	-	WB Approach	B (14.8)	-
Northbound (John Marr Drive)	NBLT	-	(-)	-	NBLT	(-)	-
	NB Approach	-	A (0.0)	-	NB Approach	A (0.0)	-
Southbound (John Marr Drive)	SBLTR	-	A (0.0)	-	SBLTR	A (0.0)	-
	SB Approach	-	A (0.3)	-	SB Approach	A (0.4)	-

Table 3 (continued): AM Peak Hour Existing and Build Conditions Results

Approach	Movement	Storage Length	Existing AM		Build Movement	Build AM	
			LOS+Delay	95th % Queue Length		LOS+Delay	95th % Queue Length
Intersection 4: John Marr Drive & Tom Davis Drive							
Eastbound (Tom Davis Drive)	EBLTR		B (11.3)	8	EBLTR	B (12.0)	8
	EB Approach	-	B (11.3)	-	EB Approach	B (12.0)	-
Westbound (Driveway)	WBLTR		C (16.5)	8	WBLTR	C (17.0)	8
	WB Approach	-	C (16.5)	-	WB Approach	C (17.0)	-
Northbound (John Marr Drive)	NBL	100	A (7.7)	5	NBL	A (7.6)	5
	NBT	-	(-)	-	NBT	(-)	-
	NBR	100	(-)	-	NBR	(-)	-
	NB Approach	-	A (0.9)	-	NB Approach	A (0.9)	-
Southbound (John Marr Drive)	SBL	150	A (8.5)	0	SBL	A (8.4)	0
	SBT	-	(-)	-	SBT	(-)	-
	SBR	150	(-)	-	SBR	(-)	-
	SB Approach	-	A (0.3)	-	SB Approach	A (0.3)	-
Intersection 5: John Marr Drive & United Bank							
Eastbound (United Bank Driveway)	EBLTR		B (12.3)	0	EBLTR	C (15.1)	0
	EB Approach	-	B (12.3)	-	EB Approach	C (15.1)	-
Westbound (Driveway)	WBLTR		B (13.8)	0	WBLTR	B (14.2)	0
	WB Approach	-	B (13.8)	-	WB Approach	B (14.2)	-
Northbound (John Marr Drive)	NBL	150	A (7.5)	0	NBL	A (7.5)	0
	NBT	-	(-)	-	NBT	(-)	-
	NBR	150	(-)	-	NBR	(-)	-
	NB Approach	-	A (0.0)	-	NB Approach	A (0.1)	-
Southbound (John Marr Drive)	SBL	90	A (8.5)	0	SBL	A (8.4)	0
	SBT	-	(-)	-	SBT	(-)	-
	SBR	150	(-)	-	SBR	(-)	-
	SB Approach	-	A (0.4)	-	SB Approach	A (0.5)	-
Intersection 6: John Marr Drive & Columbia Pike							
Overall Intersection		-	C (20.3)	-		B (17.2)	-
Eastbound (Columbia Pike)	EBLTR	-	C (34.0)	156	EBLTR	C (34.0)	156
	EB Approach	-	C (34.0)	-	EB Approach	C (34.0)	-
Westbound (Columbia Pike)	WBLTR	-	B (12.4)	118	WBLTR	B (12.5)	120
	WB Approach	-	B (12.4)	-	WB Approach	B (12.5)	-
Northbound (John Marr Drive)	NBL	250	D (37.8)	m29		A (0.0)	0
	NBT	-	D (37.2)	m22	NBLT	C (31.3)	m34
	NBR	-	B (11.1)	129	NBR	A (1.1)	m0
	NB Approach	-	B (13.1)	-	NB Approach	A (3.3)	-
Southbound (Chatelain Road)	SBLT	-	D (38.5)	35	SBLT	D (38.3)	34
	SBR	150	D (37.8)	0	SBR	D (37.6)	0
	SB Approach	-	D (38.2)	-	SB Approach	D (38.0)	-

#: 95th percentile volume exceeds capacity, queue may be longer

m: Volume for 95th percentile queue is metered by upstream signal

Table 4: PM Peak Hour Existing and Build Conditions Results

Approach	Movement	Storage Length	Existing PM		Build Movement	Build PM	
			LOS+Delay	95th % Queue Length		LOS+Delay	95th % Queue Length
Intersection 1: John Marr Drive & Backlick Road							
Overall Intersection		-	D (40.9)	-		C (23.8)	-
Eastbound (John Marr Drive)	EBLTR	-	C (33.7)	1165	EBLT	D (41.3)	198
			B (16.2)	0	EBR	C (29.2)	4
Westbound (John Marr Drive)	EB Approach	-	D (37.3)	-	EB Approach	D (38.9)	-
	WBL	-	F (109.1)	116	WBL	C (27.3)	m145
	WBTR	-	C (26.0)	823	WBTR	B (19.1)	m100
Northbound (Backlick Road)	WB Approach	-	C (25.4)	-	WB Approach	C (23.7)	-
	NBLTR	-	F (107.0)	84	NBT	C (20.4)	187
Southbound (Backlick Road)	NB Approach	-	F (106.3)	-	NB Approach	C (20.4)	-
	SBLTR	-	F (121.9)	404	SBT	B (19.8)	204
	SB Approach	-	F (107.4)	-	SB Approach	B (19.8)	-
Intersection 2: John Marr Drive & Pep Boys Driveway							
Eastbound (Pep Boys Driveway)	EBLTR		B (12.7)	23	EBLTR	C (17.1)	0
	EB Approach	-	B (12.7)	-	EB Approach	C (17.1)	-
Westbound (Driveway)	WBLTR		C (22.1)	28	WBLTR	B (14.9)	5
	WB Approach	-	C (22.1)	-	WB Approach	B (14.9)	-
Northbound (John Marr Drive)	NBLT	-	A (8.4)	8	NBL	A (8.4)	0
	NBTR	-	A (0.3)	-	NBTR	(-)	-
	NB Approach	-	A (2.4)	-	NB Approach	A (0.0)	-
Southbound (John Marr Drive)	SBLT	-	A (7.9)	0	SBL	A (8.1)	0
	SBTR	-	A (0.0)	-	SBTR	(-)	-
	SB Approach	-	A (0.2)	-	SB Approach	A (0.0)	-
Intersection 3: John Marr Drive & Little River Turnpike							
Overall Intersection		-	E (56.4)	-		E (74.5)	-
Eastbound (Little River Turnpike)	EBL	850	F (96.7)	317	EBL	F (119.0)	#372
	EBT	-	C (33.7)	459	EBT	E (56.2)	540
	EBR	835	C (25.1)	0	EBR	D (41.1)	0
	EB Approach	-	D (44.8)	-	EB Approach	E (67.0)	-
Westbound (Little River Turnpike)	WBL	290	F (84.6)	173	WBL	F (125.2)	#416
	WBT	-	D (40.0)	517	WBT	E (56.1)	563
	WBR	-	B (15.0)	17	WBR	B (13.5)	14
	WB Approach	-	D (45.1)	-	WB Approach	E (63.7)	-
Northbound (John Marr Drive)	NBL	-	A (0.0)	0	NBL	E (68.5)	114
	NBLT	-	E (78.8)	237	NBT	F (155.5)	#355
	NBR	245	E (75.9)	201	NBR	E (76.5)	168
	NB Approach	-	E (78.0)	-	NB Approach	F (116.5)	-
Southbound (John Marr Drive)	SBLT	200	E (65.4)	m260			
	SBTR	-	F (86.6)	#420	SBLT	F (86.5)	#750
			A (0.0)	0	SBR	E (55.5)	m77
	SB Approach	-	F (82.0)	-	SB Approach	E (80.0)	-
Intersection 3A: John Marr Drive & Little River Turnpike Access Road							
Eastbound (Little River)	EBLTR		C (16.1)	5	EBLTR	B (15.0)	3
	EB Approach	-	C (16.1)	-	EB Approach	B (15.0)	-
Westbound (Little River)	WBLTR		C (16.8)	13	WBLTR	C (17.7)	13
	WB Approach	-	C (16.8)	-	WB Approach	C (17.7)	-
Northbound (John Marr Drive)	NBLT	-	A (0.0)	-	NBLT	A (0.0)	-
	NB Approach	-	A (0.1)	-	NB Approach	A (0.1)	-
Southbound (John Marr Drive)	SBLTR	-	A (0.2)	-	SBLTR	A (0.0)	-
	SB Approach	-	A (0.7)	-	SB Approach	A (0.6)	-

Table 4 (continued): PM Peak Hour Existing and Build Conditions Results

Approach	Movement	Storage Length	No Build PM		Build Movement	Build PM	
			LOS+Delay	95th % Queue Length		LOS+Delay	95th % Queue Length
Intersection 4: John Marr Drive & Tom Davis Drive							
Eastbound (Tom Davis Drive)	EBLTR		B (10.4)	8	EBLTR	C (17.8)	40
	EB Approach	-	B (10.4)	-	EB Approach	C (17.8)	-
Westbound (Driveway)	WBLTR		B (11.4)	5	WBLTR	E (47.0)	90
	WB Approach	-	B (11.4)	-	WB Approach	E (47.0)	-
Northbound (John Marr Drive)	NBL	100	A (7.8)	3	NBL	A (8.3)	5
	NBT	-	A (0.1)	-	NBT	(-)	-
	NBR	100	(-)	-	NBR	(-)	-
	NB Approach	-	A (1.0)	-	NB Approach	A (1.1)	-
Southbound (John Marr Drive)	SBL	150	A (7.7)	0	SBL	A (8.3)	3
	SBT	-	A (0.0)	-	SBT	(-)	-
	SBR	150	(-)	-	SBR	(-)	-
	SB Approach	-	A (0.2)	-	SB Approach	A (0.4)	-
Intersection 5: John Marr Drive & United Bank							
Eastbound (United Bank Driveway)	EBLTR				EBLTR	B (13.8)	3
	EB Approach	-	A (0.8)	-	EB Approach	B (13.8)	-
Westbound (Driveway)	WBLTR				WBLTR	C (18.5)	23
	WB Approach	-	A (0.7)	-	WB Approach	C (18.5)	-
Northbound (John Marr Drive)	NBL	150			NBL	A (8.0)	0
	NBT	-			NBT	(-)	-
	NBR	150			NBR	(-)	-
	NB Approach	-	C (15.6)	-	NB Approach	A (0.3)	-
Southbound (John Marr Drive)	SBL	90			SBL	A (8.2)	5
	SBT	-			SBT	(-)	-
	SBR	150			SBR	(-)	-
	SB Approach	-	B (13.6)	-	SB Approach	A (1.5)	-
Intersection 6: John Marr Drive & Columbia Pike							
Overall Intersection			-	C (26.1)	-	C (26.4)	-
Eastbound (Columbia Pike)	EBLTR	-	D (53.2)	56	EBLTR	D (40.3)	211
	EB Approach	-	D (53.2)	-	EB Approach	D (40.3)	-
Westbound (Columbia Pike)	WBLTR	-	E (55.9)	200	WBLTR	B (17.2)	272
	WB Approach	-	D (50.6)	-	WB Approach	B (17.2)	-
Northbound (John Marr Drive)	NBL	250	B (13.1)	26		A (0.0)	0
	NBT	-	C (24.2)	299	NBLT	D (49.4)	m58
	NBR	-	A (0.0)	0	NBR	C (20.1)	m95
	NB Approach	-	C (23.7)	-	NB Approach	C (27.9)	-
Southbound (Chatelain Road)	SBLT	-	B (19.3)	296	SBLT	D (36.2)	56
	SBR	150	A (0.0)	0	SBR	C (34.9)	0
	SB Approach	-	B (18.5)	-	SB Approach	D (35.7)	-

#: 95th percentile volume exceeds capacity, queue may be longer
m: Volume for 95th percentile queue is metered by upstream signal

Conclusions and Recommendations

The majority of John Marr Drive has existing roadway geometry that can be modified to introduce bike lanes with little impact to study corridor intersection operations. The one exception is at the signalized intersection of John Marr Drive and Little River Turnpike, particularly during the weekday PM peak hour. The primary factor contributing to increased delay is associated with changing the geometry at the intersection. As existing signal operations already function poorly with several movements operating at LOS F, removing one of the through lanes along John Marr Drive, in combination with redistributing green time around the intersection, will cause more delay at this intersection. While the MOEs for the Build condition at Little River Turnpike indicate worsened conditions, this would likely occur with most impact during the peak 15 minutes of the AM and PM weekday commuting time periods. During field observations, which concluded around 10:00 AM on a Tuesday, vehicular demand at this intersection was noticeably low, with small, concentrated platoons along Little River Turnpike and periods of unutilized green time along the Little River Turnpike corridor in the absence of vehicular demand. While drivers may experience increased delay, the increase is of a magnitude that would likely go unnoticed given the overall intersection delay increases by less than 20 seconds during the AM and PM peak hours. While delay is better balanced around the intersection, there could be potential progression impacts along Little River Turnpike. It is recommended this be further evaluated before implementing any bike lane improvements.

The proposed bike lanes along John Marr Drive will provide a useful connection between the existing bike lanes west of Backlick Road and a future bike facility proposed (planning stage) along Columbia Pike. While the operational impacts are expected to affect commuters, the delay impact at Little River Turnpike is not substantial, and the logical bike connection outweighs the minor inconvenience to drivers. Outside of peak periods, it is unlikely the average driver will notice much of a delay impact.

Based on the outcome of the road diet assessment, it is recommended that the following be considered as part of the implementation of bike lanes on John Marr Drive between Backlick Road and Columbia Pike:

- John Marr Drive, South of Little River Turnpike
 - Maintain the existing westbound left turn and shared through and right-turn lanes at Backlick Road
 - Reconfigure the eastbound approach at Backlick Road to provide a shared through and left-turn lane and an exclusive right-turn lane, crossing the existing bike lane from the curb to the left side of the right-turn lane
 - Maintain one eastbound and one westbound travel lane with a center turn lane east of Backlick Road
 - Install bike lanes (4' bike lane, 1.5' gutter pan) beginning at Backlick Road up to Little River Turnpike
 - Reconfigure the northbound approach to provide a shared through and left-turn lane and an exclusive right-turn lane
 - Remove one westbound left-turn lane (striping) On the northbound approach to Little River Turnpike, cross the proposed bike lane from the curb to the left side of the right-turn lane

- John Marr Drive, North of Little River Turnpike
 - Reconfigure the southbound approach to provide a shared through and left-turn lane and an exclusive right-turn lane
 - On the southbound approach to Little River Turnpike, cross the proposed bike lane from the curb to the left side of the right-turn lane
 - Maintain one northbound and one southbound travel lane
 - Install a buffered bike lane within the existing rightmost travel lane (6' buffer, 6' bike lane, which includes the 1.5' gutter pan when a right-turn lane is not present) from Little River Turnpike to Columbia Pike.
 - Bike lanes will not be buffered at existing transit stop; instead, skip markings should be installed to indicate the space is not a travel lane for vehicles, but that buses may cross to service the transit stop
- Other considerations
 - Existing signal heads and lane control signs will need to be reconfigured to match proposed geometry at Little River Turnpike, namely:
 - Remove the 3-section arrow signal head on the southbound approach
 - Remove the R3-5 (left) and R3-6 (through and right) signs on the southbound approach mast arm
 - Install an R3-5 (right) on the southbound approach mast arm
 - Remove the R3-5a sign on the northbound approach mast arm
 - Remove the R3-8 advance lane control sign on the southbound approach located at Tom Davis Drive
 - Consider operating the longer 180-second cycle length at Little River Turnpike (and along the corridor) during the AM and PM peak periods for a limited duration to minimize delay and queue spillback, and instead operating a lower cycle length to be more responsive to demand and minimize queue spillback