

MEMORANDUM

January 18, 2023

To: Frederick Alie, Joe Kelley, Mark Mishler

Organization: Frederick County

From: Megan McCarty Graham, PE; Jin-Mi Matsunaga, EIT; Kabir Khurana, EIT

Project: New Design Road Bikeway Study

Re: New Design Road – Final Report

Toole Design has been requested by Frederick County to conduct bikeway facility feasibility analysis along New Design Road in Frederick County, MD. The scope of this project is to analyze existing conditions and various options for a bicycle and pedestrian facilities and provide three options for typical sections. The corridor is approximately 0.8 miles long and is bounded by proposed bicycle facilities on the north and south sides. The options have been narrowed down to one final recommendation, documented with a final report and concept drawing. The purpose of this memo is to document the existing conditions, propose typical sections, and discuss tradeoffs along New Design Road within Frederick County.

Project Goals

The proposed bikeway along New Design Road will provide a missing link to an important regional bicycle connection between the C&O Canal Towpath, which connects Washington, D.C. to Cumberland, MD and beyond, and the City of Frederick, the second largest incorporated city in Maryland.¹ This connection will allow easier access from the City of Frederick to the C&O Canal Towpath and attract riders from all over the region to experience Frederick and the greater region.

The project goal is to provide a safe, high-comfort, low stress, navigable bicycle and pedestrian facility for all ages and abilities that will work towards the goals of the Frederick County Bikeways and Trails Master Plan. The New Design Road corridor serves as a vital link in the countywide bicycle network due to its connection over I-270 and I-70 which generally limit the options that a bicyclist can travel through. Working through major constraints of the two bridges, one underpass, and two signalized intersections is an important part of reaching the project goal. The existing conditions data collected will be the basis for providing recommendations that meet both the project goals and the context of corridor.

¹ <https://www.canaltrust.org/plan/co-canal-towpath/>

Methodology

A desktop review and field review were completed and consisted of documenting roadway characteristics including land use context, number of travel lanes, curb to curb width, travel lane width, AADT, posted speed (mph), existing facilities for non-motorized users, presence of utilities, ADA facilities, and other key observations for each roadway segment. Our existing conditions review documents the potential impacts and challenges in implementing different bicycle and pedestrian facilities along the corridor and the transitions between the proposed facilities to the north and south of the project study limits. Our typical sections reflect different facilities that could be implemented depending on factors such as impact of disturbance, funding, vehicle impacts, and quality of facility. Tradeoffs between different sections are based on the desire to get the most out of the existing conditions while recognizing that providing a safe facility through the New Design corridor is crucial to completing the missing link between the C&O Canal Towpath and Frederick.

Design User

The goal of the project is to design a comfortable all ages and abilities bicycle and pedestrian facility that is easy and intuitive to ride and promotes mobility for all users wherever they need to get within the region. The design user is an interested but concerned bicyclist. As shown in **Figure 1**, an interested but concerned bicyclist is often not comfortable with unprotected bicycle lanes and prefer off-street or protected and separate bicycle facilities. They may not bike at all if facilities do not meet their perceived comfort level. This generally makes up the largest segment of the population and is therefore the most critical to design for if a facility is to meet the all ages and abilities designation and the network that it is a part of is desired to be a low-stress bicycle network that appeals to a wide cross section of users.² **Appendix A** shows the Frederick County Bikeways and Trails Plan which shows New Design Road as a planned bicycle connection stretching to the southern portion of the county.³

² 2022 DRAFT AASHTO Guide for the Development of Bicycle Facilities

³ Frederick County Bikeways and Trails Plan

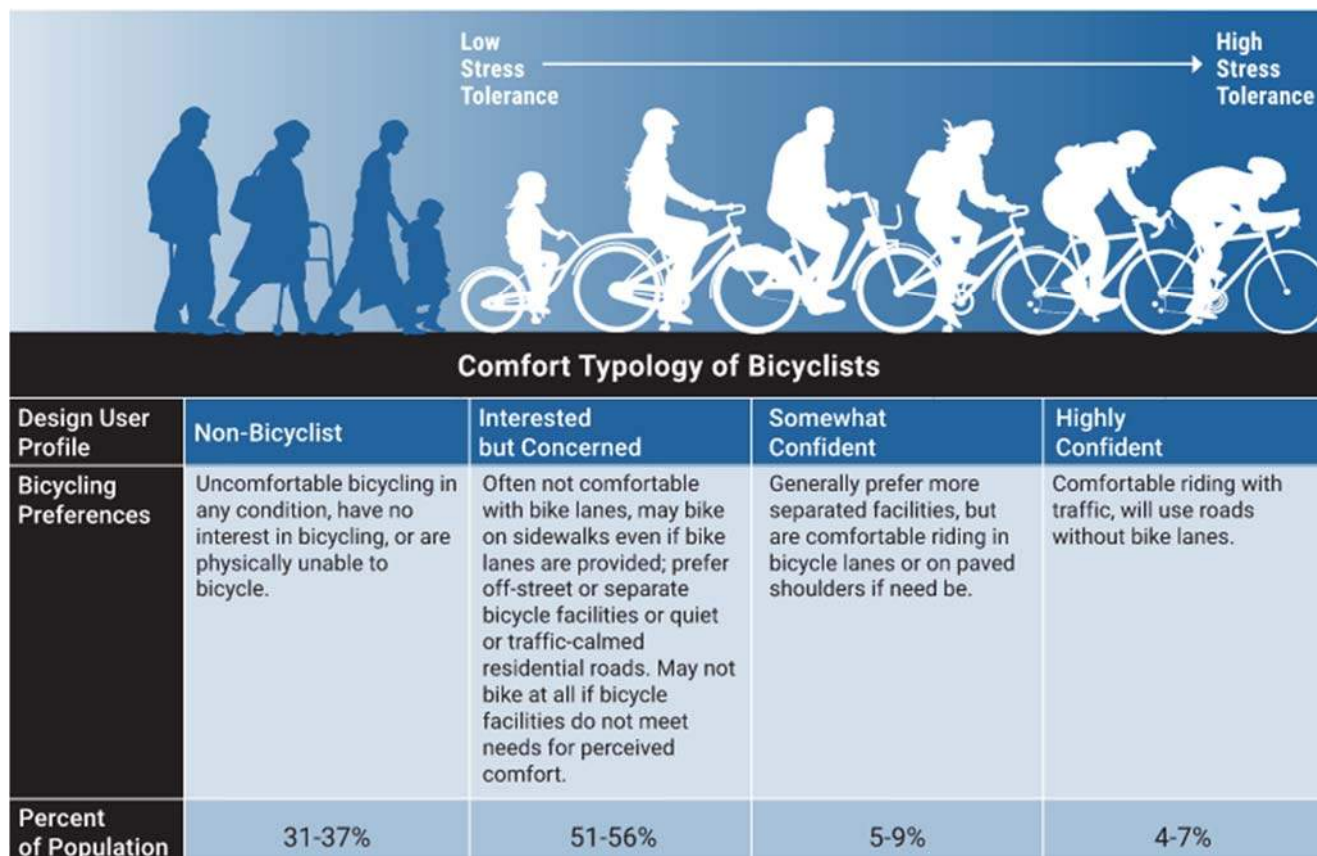


Figure 1. Comfort Typology of Bicyclists⁴

Bikeway Selection Design Criteria

Bikeway selection is a context-sensitive decision that requires engineering judgement; it starts with taking into consideration the basic information of roadway volumes and speeds, identifying the design users, selecting the best facility type, and refining that selection within the context of other variables, such as right-of-way, project scope, and budget. The FHWA Bikeway Selection Guide outlines this process in more detail and was used to identify the proposed typical sections in this report.

The quality of protection and separation from motor vehicle traffic will have a significant impact on the comfort and safety of bicyclists. Generally, the higher the speed and/or volume of a roadway, the more protective the recommended bikeway; shared lanes, bike boulevards, and conventional bike lanes are typically only recommended where speeds are low, and volumes are low to moderate.

The FHWA Bikeway Selection Guide includes a figure used for initial selection of a preferred bikeway type for urban, suburban, and rural contexts and is shown below as **Figure 2**. Based on this figure, a roadway with a posted speed of 35 mph and an AADT of just under 19,000 vehicles per day on New Design Road, the preferred

⁴ FHWA Bikeway Selection Guide

facility type would be separated bicycle lanes or a shared use path. While this guidance is a recommendation rather than a requirement, implementing a facility that does not provide as much separation as recommended is likely to result in lower volumes of bicycle riders and serve fewer types of users.

For New Design Road, any bicycle facility without grade separation or vertical protection would not adequately serve the design user and would not accomplish the project goal of designing for the design user. Designing a facility that is separated and protected accounts for the differential in operating speeds between vehicles and bicycles on New Design Road.

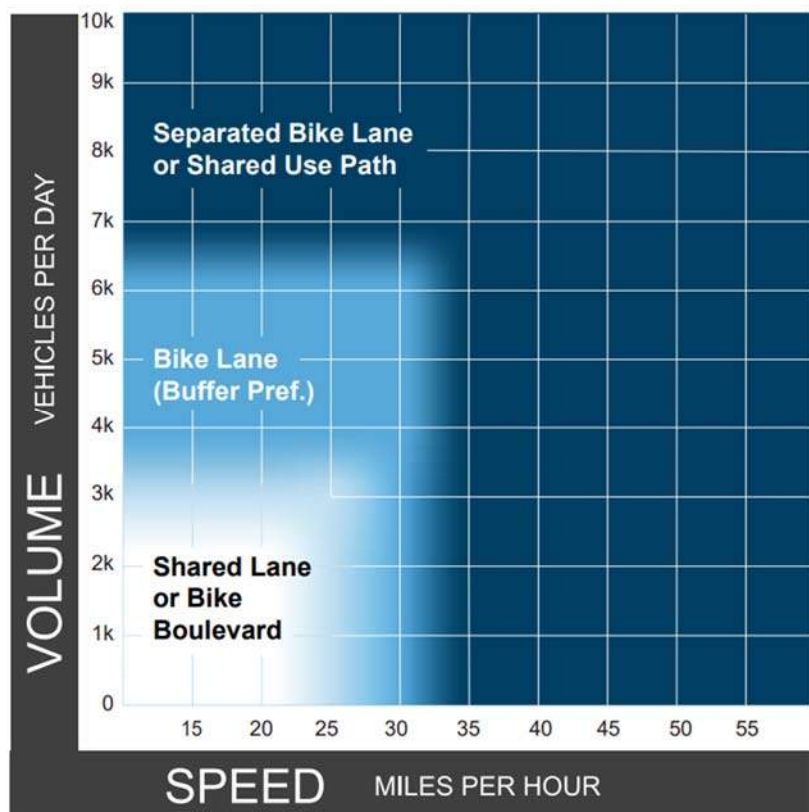


Figure 2. Preferred Bikeway Types for Different Land Use Contexts⁴

Data Sources

Toole Design conducted a desktop review of the corridor via Google Maps and Google Streetview and field verification of the project area on November 7, 2022. Traffic volumes, or Annual Average Daily Traffic (AADT) counts were collected from MDOT GIS Traffic Count Data.⁵ Photos of the corridor were collected from Streetview.⁶ Photos and videos were taken during field verification.

⁵ <https://data-maryland.opendata.arcgis.com/datasets/mdot-sha-annual-average-daily-traffic-aadt-segments/explore?location=39.392652%2C-77.405188%2C14.85>

⁶ <https://www.google.com/maps/@39.3934815,-77.4202023,1891m/data=!3m1!1e3>

Assessing the Road Functional Classification

New Design Road is classified as an urban primary arterial by the city of Frederick and that designation extends to the intersection at Crestwood Boulevard, as shown in **Appendix B**.⁷ As per the Frederick County Complete and Green Streets Plan in **Appendix C**, arterial roads carry a moderate to high level of traffic and primarily focus on traffic throughput.⁸ New Design Road in this northern section of Frederick County has a variety of surrounding land uses including educational, commercial, industrial, and residential. Due to the significance of the connection between the C&O Canal Towpath and Frederick, New Design Road may have a larger amount of bicycle traffic relative to other roads of similar size and classification. Mixed use areas such as nearby residential and commercial activity can stimulate pedestrian activity in the area and the adjacent middle school can create a wide cross section of pedestrians and bicyclists who are both riding through the neighborhood and riding within. New Design Road would benefit from the designation of a collector as it exists in the suburban-urban fringe of Frederick and is supported by a wide variety of land uses, trip types, and mobility types. The collector road designation allows for more bicycle and pedestrian facilities and narrower lane widths, which promote slower speeds, more attentive drivers, and decrease crossing distances for pedestrians.

⁷ City of Frederick 2030 Roadway Classification

⁸ Frederick County Complete and Green Streets Plan

Corridor Alignment

The New Design Road corridor study limits begin just south of the signalized intersection of New Design Road and Crestwood Boulevard and stretch approximately 0.8 miles north to the Frederick County–City of Frederick line just north of the New Design Road I-270 bridge. It crosses an unsignalized intersection with Foxcroft Drive and a signalized intersection with Guilford Drive.



Figure 3. View of the New Design Road Corridor

Existing Conditions

The existing conditions desktop review consisted of documenting roadway characteristics including lane configurations, land use context, number of travel lanes, curb to curb width, travel lane width, AADT, posted speed (mph), existing facilities for non-motorized users, presence of utilities, ADA facilities, and other key observations for each roadway segment. The following sections begin at the southernmost intersection of the corridor and move north to the project limits.

The Average Daily Traffic (ADT) is approximately 19,000 along New Design Road, and the posted speed limit throughout the project corridor is 35mph.

Intersection of Crestwood Boulevard and New Design Road

The project limits begin at the signalized intersection of Crestwood Boulevard and New Design Road. New Design Road is a four-lane, median divided highway with northbound lanes approaching the intersection with a dedicated left and right turn slip lane. The lanes are 11'-12'. Southbound New Design Road approaching the intersection has a left turn lane and two through lanes with 10'-12' lanes. Eastbound Crestwood Boulevard at the intersection has two left turn lanes onto northbound New Design Road, one through lane, and one through-right turn lane with 10'-12' lanes. Westbound Crestwood Boulevard has two through lanes, a left turn lane, and a right turn lane. The turn lanes are 9'-10' and the through lanes are 11' wide. Each receiving leg has two lanes, 11'-14' wide. The curb-to-curb width is 83' on the southern leg of New Design Road and 74' on the northern leg.

There are sidewalks on both sides of New Design Road on the southern approach to the intersection and a sidewalk only on the western side of New Design Road north of the intersection. There are no pedestrian facilities on the east side of New Design Rd north of the intersection throughout the entire project corridor.

Crestwood Boulevard has sidewalks on both sides of the road on the western side of the intersection and on the northern side of the eastern approach. There are marked, high-visibility crosswalks on all legs of the intersection, including across the slip lane on the southeastern corner of the intersection. There are curb ramps at each corner of the intersection; however, at three of the four intersection corners, there is one curb ramp for every two crosswalks and the detectable warning surfaces do not face the other end of their respective crosswalk; they instead point to the center of the intersection.

There are proposed buffered bicycle lanes on New Design Road south of the intersection and no existing bicycle facilities north of the intersection. Crestwood Plaza, a shopping plaza is located on the northwest corner of the intersection. Housing developments lie on the southwest and northeast corners of the intersection, with no direct access to New Design Road, and a church is located on the southeastern corner.



Figure 8. View of Crestwood/New Design intersection, with New Design Road running North-South

New Design Road from Crestwood Boulevard to Foxcroft Drive

New Design Road continues north of the intersection as a four-lane, median divided highway with 11' travel lanes. The curb-to-curb width is 63'-75' with a 4'-6' shoulder present on both sides of the road and drainage structures on both sides of the road and along the median. There is a continuous 5'-6' sidewalk along the west side. There are overhead utilities along the western side of the corridor through this stretch that are approximately 5'-7' off the edge of the road. There are no bicycle facilities on this portion of the corridor. The existing typical section is shown in **Figure 5**.

There is a housing development on the east side of New Design Road, although there is no direct access from New Design Road itself. On the western side of New Design Road lies Crestwood Plaza, a suburban-style shopping plaza anchored by tenants such as Food Lion, Walgreens, Bruster's Real Ice Cream, and FCB Bank. Currently, there is access from New Design Road to Crestwood Plaza from the southbound lanes only functioning as a right in-right out entrance and exit for vehicles.



Figure 9. View of New Design Road looking northbound just north of Crestwood Boulevard

Intersection of Foxcroft Drive and New Design Road

Approximately 820' north-northwest of the Crestwood-New Design intersection is the intersection of Foxcroft Drive and New Design Road. This is an unsignalized intersection where New Design Road has a free flow north-south movement and Foxcroft Drive is stop-controlled. There is a left turn lane in place of the median on each direction on New Design Road to facilitate left turn movements on to Foxcroft Drive and Foxcroft Drive has two lanes on the eastern leg and three lanes on the western leg with a dedicated right turn lane to southbound New Design Road. The curb-to-curb width at the intersection is 62'. The lanes are 11'-12' wide with 10' center turn lanes. The existing typical section is shown in **Figure 6**.

There are three marked high-visibility crosswalks at this intersection that connect to sidewalks on both sides of the road on Foxcroft Drive and on the western side of New Design Road. Both crosswalk legs across Foxcroft are marked and the third crosswalk is the southern crossing of New Design Road. There are detectable warning surfaces on every corner of the intersection, however the southeastern and southwestern corners of the intersection have one curb ramp for two crosswalks coming in and each curb ramp faces the center of the intersection. The crosswalk across New Design Road spans 78' and crosses five lanes of traffic with no pedestrian median refuge in the center. This was analyzed to be an unsafe crossing due to the high approach speeds, long crossing distance, and lack of roadway lighting, median refuge, and adequate advance warning of crosswalk to vehicles approaching.

Foxcroft Drive to the east of the intersection enters the housing development and provides access between houses and New Design Road. To the west on Foxcroft Drive lies the Crestwood Middle School and back entrance to the Crestwood Plaza with more housing developments further west. There are no bicycle facilities on New Design Road or Foxcroft Drive at this intersection.



Figure 10. View of Foxcroft/New Design intersection and uncontrolled pedestrian crossing, looking northbound from New Design Road

New Design Road from Foxcroft Drive to I-270 Bridge

New Design Road continues north for another approximately 640' before crossing over I-270. It is a 4 lane, median divided highway with 35 mph posted speed limit and 11' travel lanes with a curb-to-curb width of about 62'.

There is a guardrail on both sides of the section that go all the way to the edge of the bridge and drainage structures on the outside curbs. There is a 5' sidewalk on the west side of the corridor that continues onto the top of the bridge and no bicycle facilities present. There are overhead utilities 10'-20' behind the face of guardrail on the east side of New Design Road.

On the southbound approach to the crosswalk across New Design Road, there is a S1-1 “School” sign with a W16-9P “Ahead” sign and R2-6aP “Fines Double” sign underneath and flashing lights around the signs. The middle school is to the west and housing is located to the east.



Figure 11. View of New Design Road looking northbound just north of Foxcroft Drive

New Design Road from I-270 Bridge to Guilford Drive

New Design Road continues over I-270 and under a ramp from I-270 to I-70 before intersecting with Guilford Drive. Across the bridge over I-270, the curb-to-barrier width is 61’ and the cross section from west to east comes out as a 5’ sidewalk, 4’ shoulder, 12’ travel lane, 12’ travel lane, 4’ median, 12’ travel lane, 12’ travel lane, and 5’ shoulder.

There are tall fences on the sides of the bridge and there are no bicycle facilities present. The corridor then goes under the ramp 200’ after the bridge. The cross section remains consistent, but a 5’ sidewalk is introduced on the eastern side and immediately ends 225’ later. The bridge piers are immediately adjacent to the sidewalk on the top of retaining walls on both sides. This presents a constrained situation when analyzing improvements to this section of New Design Road because the piers must remain in place. There are drainage structures on both sides of the street, overhead utilities of the eastern side, and the concrete wall turns into guardrail on the western side of the corridor down 600’ to the intersection of Guilford Drive.



Figure 12. View of New Design Road Bridge over I-270



Figure 13. View of New Design Road underpass under ramp

Intersection of Guilford Drive and New Design Road

Guilford Drive is a 4 lane, median divided boulevard that feeds into a large shopping area which connects to MD 85. The intersection of New Design Road and Guilford Drive is a signalized T intersection with sidewalk on the western side of New Design Road and northern side of Guilford Drive. Westbound Guilford Drive has one 12' left turn lane and one 12' dual turn lane, and eastbound Guilford Drive has two 11' receiving lanes. Northbound New Design Road has two 11-12' through lanes and one 11' right turn lane while southbound has two 11-12' through lanes and one 10' left turn lane onto Guilford Drive. The curb-to-curb width is 71' on the south leg and 62' on the north leg. The existing typical section is shown in **Figure 7**.

There is one marked high-visibility crosswalk on the northern crossing of New Design Road with curb ramps. There are also marked bicycle lanes in the northbound and southbound directions of the northern leg of the intersection. The bicycle lanes are unprotected, only striped with paint, and do not provide a low stress facility for bikers and would only be used by more confident riders; therefore, the bicycle lane functions as the shoulder of road as it has been for the rest of the corridor. For southbound users, the bicycle lane markings end at the intersection of Guilford Drive and New Design Road.

Guilford Drive connects major shopping plazas such as Frederick Crossing, Evergreen Square, and the Walmart Plaza, and a large industrial park to New Design Road.



Figure 14. View of Guilford/New Design intersection

New Design Road from Guilford Drive to Frederick County/City of Frederick Line

250' north-northeast of the previous intersection is the New Design Road bridge over I-70. It is a median divided bridge with four lanes and a sidewalk on the western side of the street with striped bicycle lanes in both directions. The curb-to-barrier width of the bridge is 62' with a cross section of a 5' bicycle lane, two 11-12' travel lane, 6' painted median with 4' of the median raised, two 11-12' travel lane, and 5' bicycle lane. The bridge is about 330' long and presents another constrained condition in which to fit a bicycle facility.

The Frederick County-Frederick City line is at the northern terminus of the bridge. A shared use path proposed by the City of Frederick will be built on the rest of New Design Road north to the intersection of New Design Road and South Market Street. The side on which the shared use path will lie has not been determined yet.. The transition between the proposed facility and the shared use path will occur at the county-city line and will transition users into the more urban area of Frederick.



Figure 15. View of New Design Road Bridge over I-70

Existing Pedestrian Accommodations

At the intersection of Crestwood Boulevard and New Design Road, there are marked crosswalks, however curbs ramps and detectable warning surface are not aligned in the direction of the crosswalk. The southern crosswalk across New Design Road is also skewed in the middle of the road. These issues present challenges to the vision disability community who rely on detectable warning surfaces and curb ramps to orient themselves to the crosswalk and who do not expect changes in crosswalk trajectory, risking people walking out towards the vehicle path instead of reaching the opposite curb ramp. There are no pedestrian facilities on the east side of New Design Road, forcing all pedestrians to the west side. The sidewalk on the west side of New Design Road has the ability to serve pedestrian traffic circulating out of the Crestwood Plaza shopping center, but the sidewalks do not directly connect to the sidewalks adjacent to the storefronts, presenting mobility and safety challenges to the community members who are forced to walk in the street to access the plaza. The intersection of Foxcroft Drive/New Design Road presents major challenges to pedestrian safety, specifically the uncontrolled crossing of New Design Road. Crestwood Middle School is located directly adjacent to the intersection and this crossing is extremely unsafe to children who are more prone to miscalculating gaps in traffic and traffic speeds and might be less visible to drivers coming downhill from the I-270 bridge. Pedestrians are able to use the western sidewalk on New Design Road to access the shopping areas of Guilford Drive or continue down the street into the city, the terminus of New Design Road, and eventually into the urban areas of Frederick.



Figure 16. View of the southern leg of the Crestwood/New Design Road intersection, with a single curb ramp on the southwestern corner of the intersection and a skewed crosswalk

Existing Typical Sections

The existing typical sections are illustrated below. **Figure 4** shows the typical section for the corridor. **Figures 5, 6, and 7** show the typical section at each intersection of the project. All typical sections are oriented as if the viewer is traveling in the northbound direction.

New Design Road

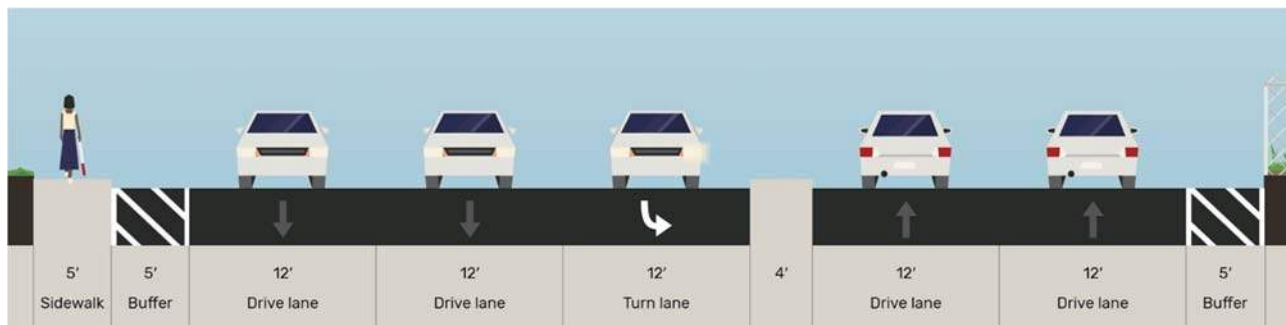


Figure 4. Existing Typical Section

New Design Road at Intersection of Crestwood Boulevard & New Design Road

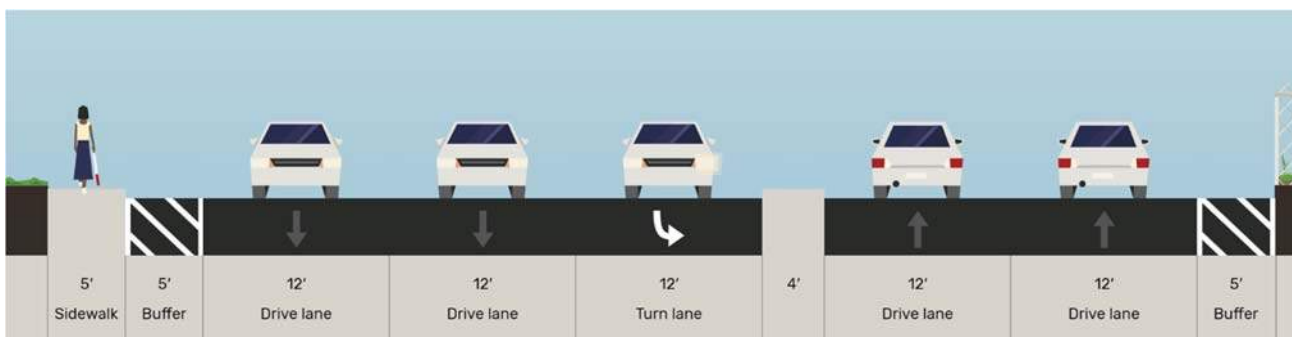


Figure 5. Intersection Typical Section

New Design Road at Intersection of Foxcroft Drive & New Design Road



Figure 6. Intersection Typical Section

New Design Road at Intersection of Guilford Drive & New Design Road

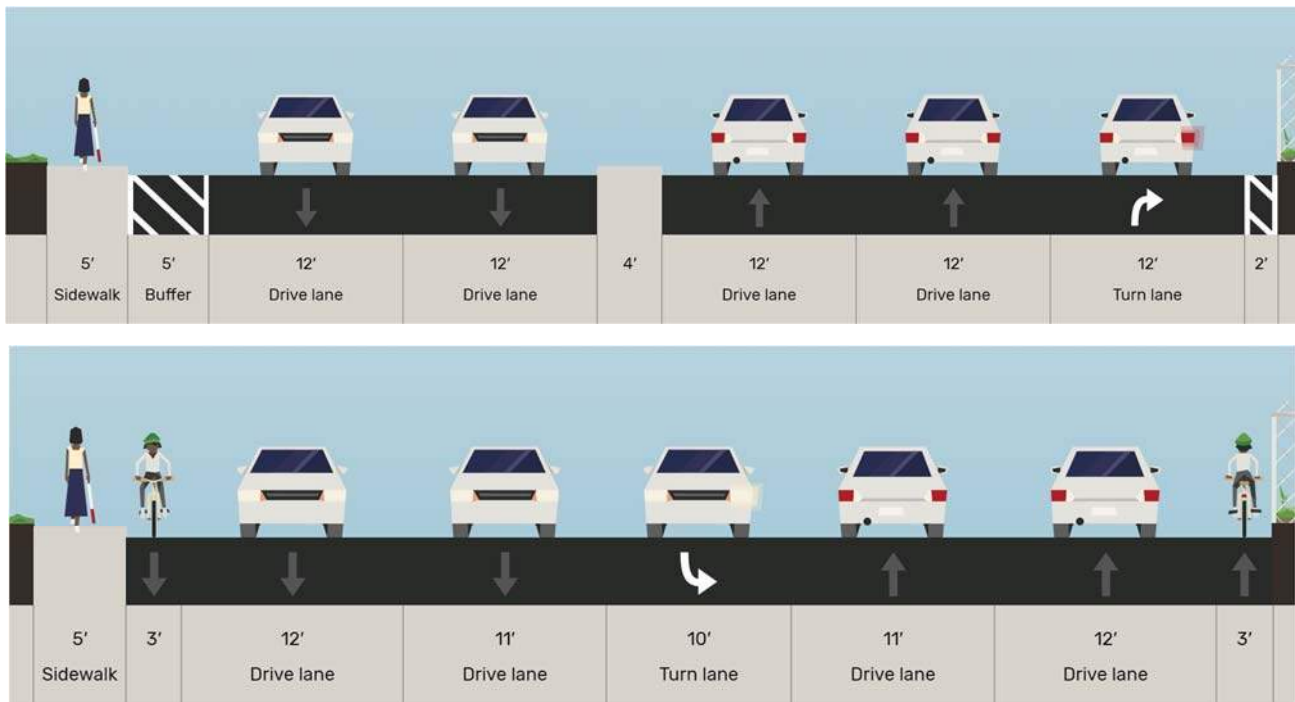


Figure 7. Intersection Typical Section (Top – Looking South; Bottom – Looking North)

Proposed Typical Sections

The following typical sections are three options created after analyzing existing conditions, County guidelines and policies, and best practice guidance in bikeway and pedestrian design. Each option has a typical section through the linear portion of the corridor and a typical section at intersections. Additionally, a summary of tradeoffs analyzing both the benefits and challenges of each option is provided. Based on these graphics and analysis, the County will select the preferred option that would best meet the project goals, address bicycle and pedestrian mobility, and fit the context of New Design Road. All options assumed project work would be completed within existing right of way.

Option 1 – Shared Use Path

Option 1 proposes a shared use path (SUP). Option 1A proposes a SUP on the west side of New Design Road. This option utilizes the existing sidewalk space and proposes a wider, 15-foot-wide path. Option 1B proposes a 10-foot-wide SUP on the east side of New Design Road. Both options propose four travel lanes (two in each direction), an asphalt path along the roadway, and a concrete path on the bridges. The existing concrete median would be removed. At intersections, through lanes would become turn-through lanes. Maintaining dedicated turn lanes would require narrowing the path and/or buffer space. This option requires the most amount of construction; existing curb on one side of New Design Road would be reconstructed, roadway pavement would be removed, and drainage structures would be relocated. Utility coordination and environmental permitting may be required.

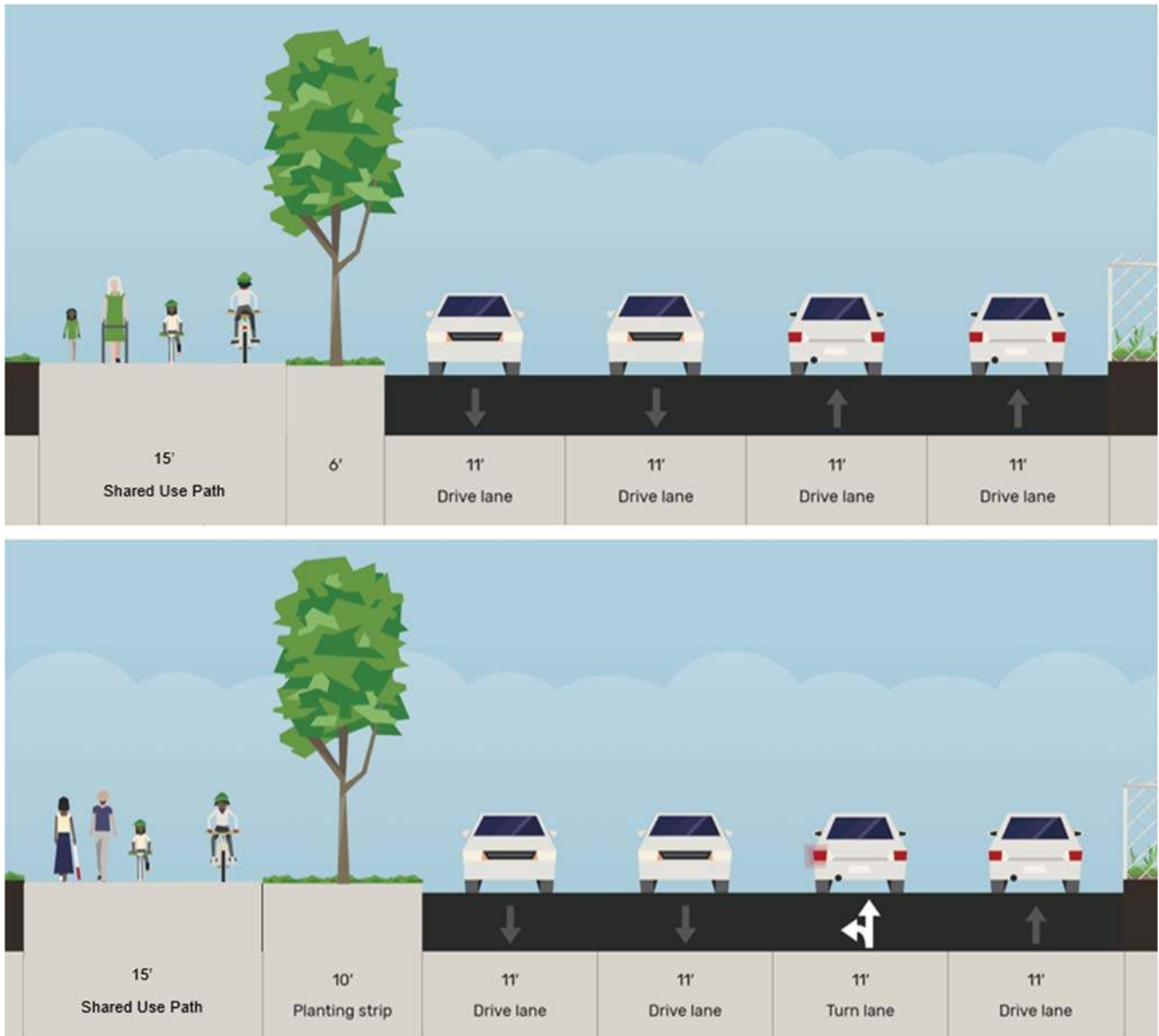


Figure 17. Shared Use Path Option 1A on West Side of New Design Road (Top – Mainline; Bottom – Intersection)

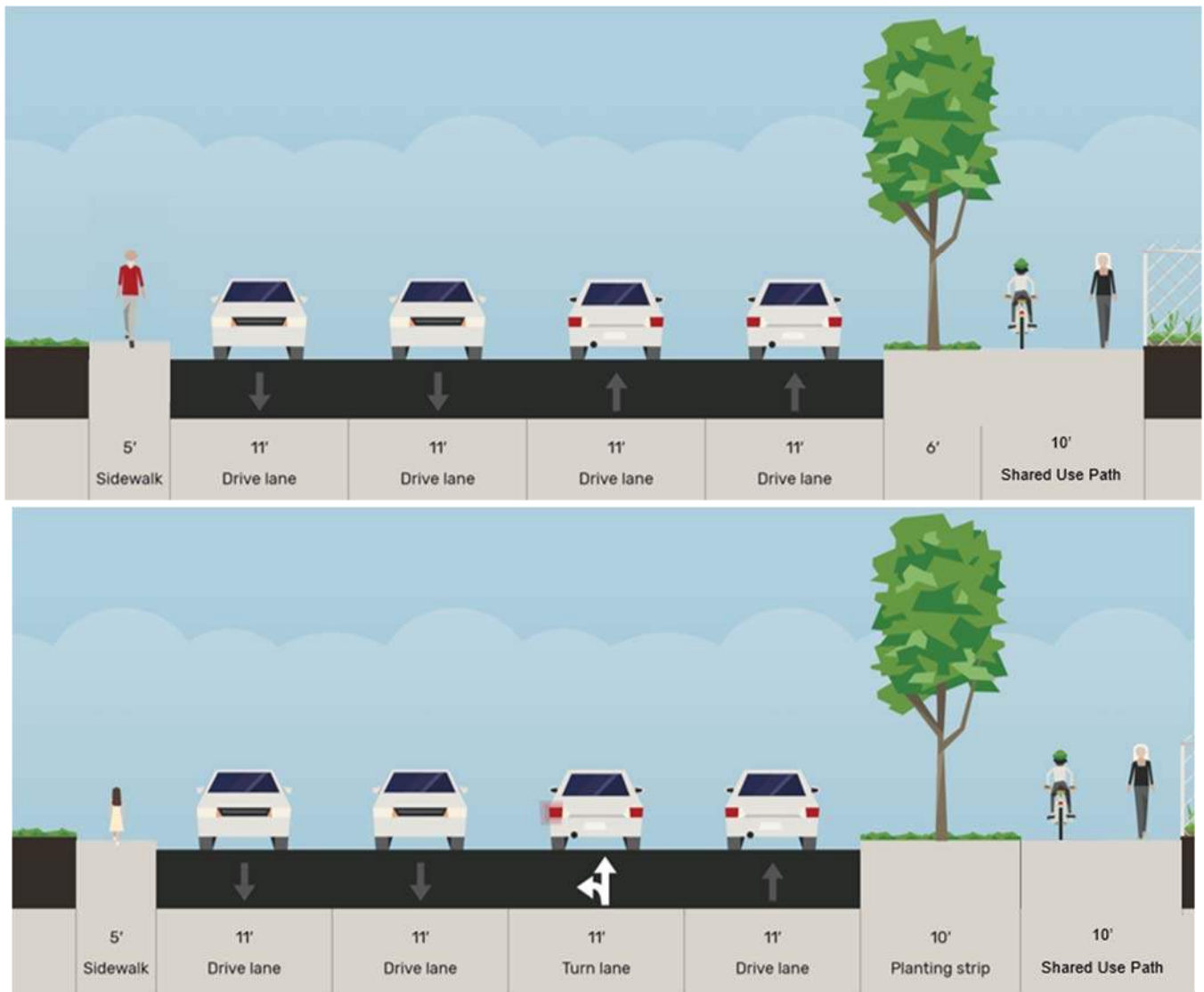


Figure 18. Shared Use Path Option 1B on East Side of New Design Road (Top – Mainline; Bottom – Intersection)

Benefits

- Provides a separate, bicycle and pedestrian facility that encourages use by all ages and abilities.
- Utilizes the existing 5' sidewalk space and proposes a wider facility for shared use.
- No additional ROW is required.
- The buffer space provides an opportunity to add trees to the planting strip between vehicular traffic and the SUP. Trees would provide shade for path users and additional separation from vehicular traffic. Adding vertical elements visually narrows the roadway, which is shown to slow vehicles and enhances the environment for path users.
- Eliminating the median and turn lanes would decrease the crossing distance at intersections (Foxcroft, Guilford) reducing conflicts and making crossings safer for pedestrians.
- Offsetting bicyclists and pedestrians from the roadway improves visibility at intersections.

Challenges

- Requires adding concrete to the bridge deck, which may not be feasible or approved by MDOT SHA.
- Requires removal of the existing raised concrete median to accommodate the new lane configuration.
- Requires relocation of drainage structures on the northwest side of New Design Road.
- May require utility coordination and environment permitting.
- Requires adjustment of traffic signal head locations to align with new travel lane locations.
- Elimination of turn lanes at intersections would require a traffic study.
- Drivers would stop in lane to make left and right turn maneuvers, which may increase motorist travel times through the corridor. Where left turn volumes are less than 100 vehicles/hour and gaps in traffic are available, removal of a turn lane may not have much effect on travel time for motorists.
- Counterflow direction of bicycle travel may not be expected by motorists and can increase crash risk as compared to one-way separated bike lane operations.

Option 2 – Pair of One-Way Separated Bicycle Lanes

Option 2 proposes a pair of one-way separated bicycle lanes. This option proposes eliminating two travel lanes and adding one-way bike lanes on each side of New Design Road. The typical section includes two 11-foot travel lanes (one in each direction), a striped and raised 14-foot median, and a pair of one-way 8-foot bicycle lanes with a 4-foot buffer. The 4-foot buffer between the vehicular travel lane includes alternating pre-cast, noncontinuous curb and flex posts. The curb and flex posts can be installed without reconstructing roadway pavement.

Discussion with MDOT SHA will be required to determine if these elements can be added to the bridges. The existing concrete median could be maintained. Street trees could be added and would require reconstruction of the median at desired locations. The remaining median width could be striped or reconstructed. Any median reconstruction may require utility coordination and environmental permitting. This option could be constructed as a quick build project.

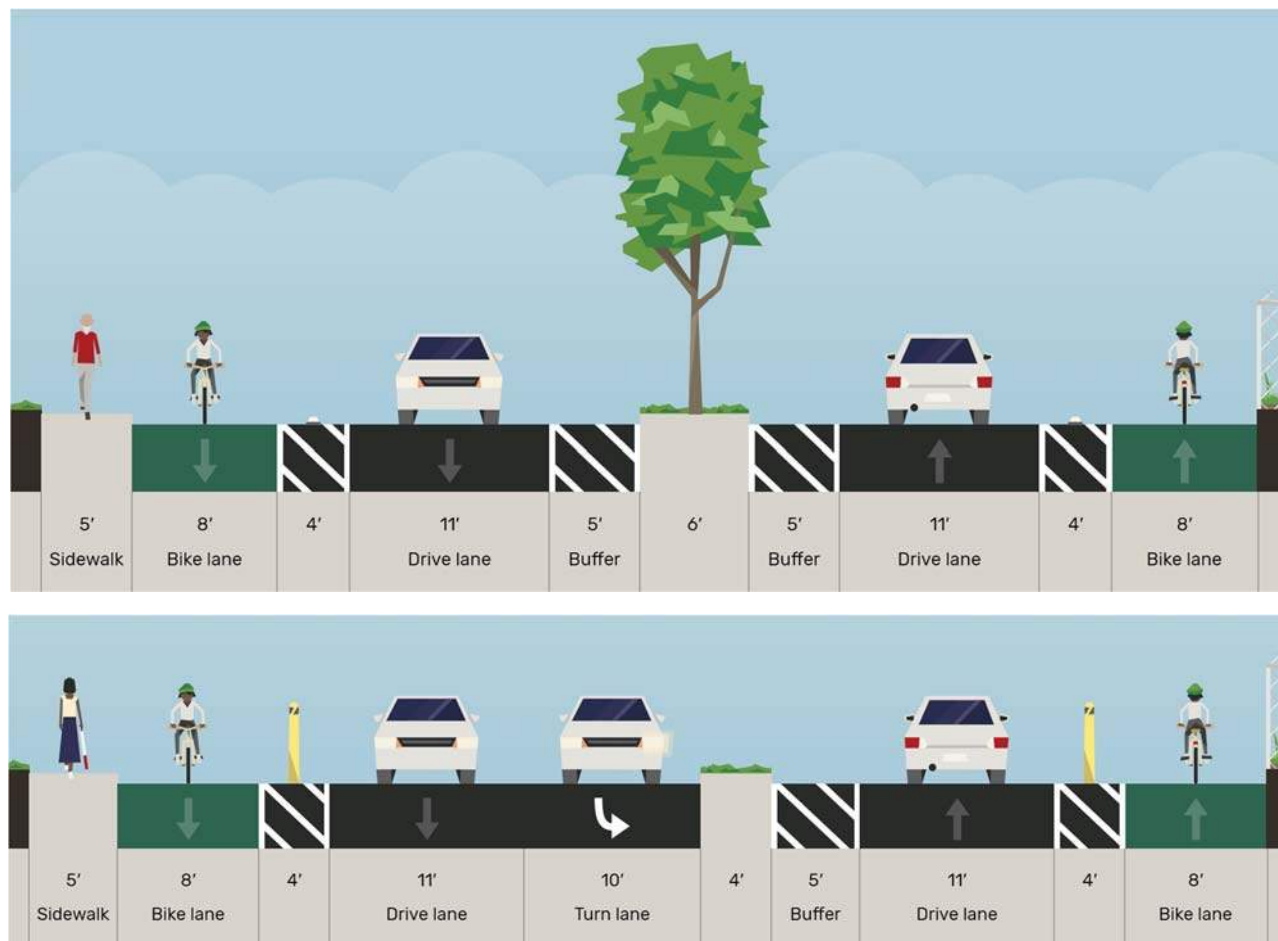


Figure 19. Separated Bicycle Lane on Both Sides of New Design Road (Top – Mainline; Bottom – Intersection)

Benefits

- Provides a separate, buffered facility for the design user.
- Utilizes existing curb-to-curb width. No additional ROW is required.
- Minimal construction required: drainage structures and existing curb can remain in place. Construction could be completed as a quick build project.
- The median provides an opportunity to add street trees.
- Minimal construction would be needed. Drainage structures can remain. Existing median could be maintained or rebuilt in various locations.
- The median area can be used as a turn pocket at intersections.
- A road diet would provide a safer and more desirable environment for pedestrians. Eliminating travel lanes creates safer crossings by eliminating “multiple threat” crossings.
- The intersection design for a pair of one-way separated bicycle lanes is simpler compared to a two-way separated bikeway. Additionally, transitions to the facilities to the north and south of this project would be simpler.
- Bicyclists have access to destinations on both sides of the road. Drivers are more likely to anticipate bicyclists riding in the same direction.

Challenges

- Traffic analysis would be needed to support the removal of vehicular travel lanes.

- Traffic signals would be adjusted to align with new travel lane locations.
- Buffer width may vary at intersections.

Option 3 – Two-Way Separated Bike Lane

Option 3 proposes a two-way separated bicycle lane facility on the east side of New Design Road. This option proposes eliminating one travel lane in the northbound direction. The typical section includes three 11-foot travel lanes (two in the southbound direction and one in the northbound direction), maintaining the existing, raised 6-foot median, and two 6-foot bicycle lanes with a 4-foot buffer. The 4-foot buffer between the vehicular travel lanes includes alternating pre-cast, noncontinuous curb and flex posts. The curb and flex posts can be installed without reconstructing roadway pavement. Discussion with MDOT SHA will be required to determine if these elements can be added to the bridges. The existing concrete median could be maintained. Street trees could be added and would require reconstruction of the median at desired locations. Any median reconstruction may require utility coordination and environmental permitting.

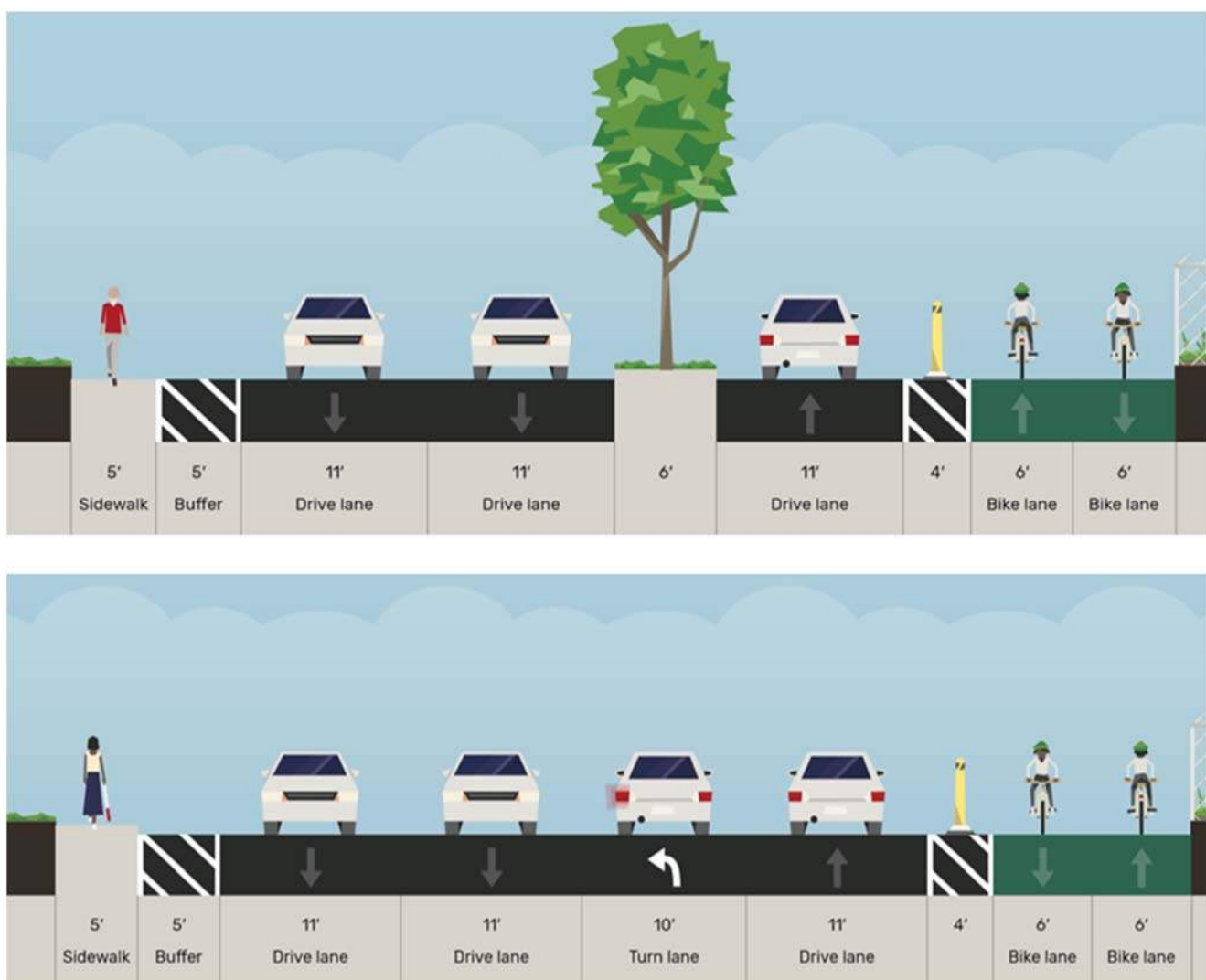


Figure 20. Two-Way Separated Bicycle Lane on East Side of New Design Road (Top – Mainline; Bottom – Intersection)

Benefits

- Provides a separate, buffered facility for bicyclists.
- Utilizes existing curb-to-curb width. No additional ROW is required.
- Minimal construction required: drainage structures and existing curb can remain in place.
- The existing median can be repurposed into a turn pocket at intersections.

Challenges

- Counterflow direction of bicycle travel may not be expected by motorists and can increase crash risk as compared to one-way separated bike lane operations.
- Traffic analysis would be needed to support the removal of a vehicular travel lane in the northbound direction.
- Traffic signals would be adjusted to align with new travel lane locations.
- Buffer width may vary at intersections.

Pedestrian Recommendations

Pedestrian accommodations across the suburban context of New Design Road are paramount because conditions that favor higher vehicle travel speeds should not come at the detriment to pedestrian safety and mobility. At the intersection of Crestwood Boulevard and New Design Road, proposed improvements can include realigning and adding more curb ramps to better serve the intersection and straightening the skewed crosswalk across the southern leg of New Design Road.⁹ Leading pedestrian intervals can be implemented to allow pedestrians to begin walking into the intersection before the adjacent travel lane has a green phase. This allows pedestrians to get into the crosswalk before vehicles can begin turning. This increases their visibility and decreases the occurrences of right-hook crashes, where vehicles turn right without noticing vulnerable users in their blind spot.¹⁰ A pedestrian median refuge can also be implemented at any intersection and can easily be made with the existing medians that are in place across the corridor. A pedestrian median refuge must be at least 6' wide to be considered a true refuge, which allows for two 2' detectable warning surfaces on each side of the island and a minimum 2' waiting area.¹¹

At Crestwood Plaza, a safe connection with marked crosswalks can be built to connect the sidewalk and the plaza. At the intersection of Foxcroft Drive and New Design Road, significant countermeasures can be implemented to create a safer crossing for all users across New Design Road. These include additional advance warning signs, curb extensions, a pedestrian refuge island, a pedestrian hybrid beacon, narrowing lane widths at the approach, and providing adequate lighting.¹² These countermeasures can help to increase drivers' attention to pedestrians, decrease the crossing distance, cut the crossing distance into smaller pieces, and slow vehicle speeds at the crosswalk location. With the proliferation of housing developments in the area, safe pedestrian facilities for all users walking to and from the school is a critical component when assessing the mobility of the corridor.

⁹ Accessible Sidewalks and Street Crossings Guide

¹⁰ NACTO Urban Street Design Guide, Leading Pedestrian Interval

¹¹ NACTO Urban Street Design Guide, Pedestrian Safety Islands

¹² FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations

Selection of Preferred Typical Section

The County identified Option 2 - Pair of One-Way Separated Bike Lanes as the preferred typical section. A concept design was developed for this option and an updated planning-level cost estimate was completed. The cost opinion includes major pay items and approximate quantities to determine a preliminary opinion of probable construction cost (OPC). The construction cost is higher than the initial cost option presented in the draft report submitted to Frederick County by Toole Design on November 2, 2022. This cost opinion includes median extensions and curb ramp reconstructions, which were not included in the original cost opinion. A 30% contingency was added to cover items that are undefined or typically unknown early in the planning phase of a project. It does not include easement and right-of-way acquisition; permitting, inspection, or construction management; engineering, surveying, geotechnical investigation, environmental documentation, special site remediation, escalation, or the cost for ongoing maintenance **Table 1** below shows the opinion of probable cost for the preferred option. The detailed cost opinion is included in **Appendix D**.

Description	Concept OPC
Pair of Separated Bike Lanes	\$1,184,043

Table 1. Summary of Cost Opinion for Preferred Typical Section

Proposed Conceptual Design

The proposed conceptual design for the one-way separated bicycle lanes analyzes the intersections, transitions, and context-sensitive decisions that appear along the 0.8-mile corridor.

South of the Crestwood Boulevard – New Design Road intersection, Frederick County has plans to install protected bicycle lanes that connect to this project's limits. The proposed design includes removal of the right turn slip lane, which is dangerous for bicyclists and pedestrians. The proposed northbound lane configuration includes a right turn lane pocket and bicycle mixing zone in place of the right-turn slip lane. This design provides clear demarcation of bicycle space and is safer for all modes. The intersection has been modified to include safer bicycle and pedestrian crossings, with bicycle conflict markings and shorter crossing distances, respectively. Effective turning radii have been reduced to slow vehicles to increase motorist yielding behavior towards bicycles and pedestrians.

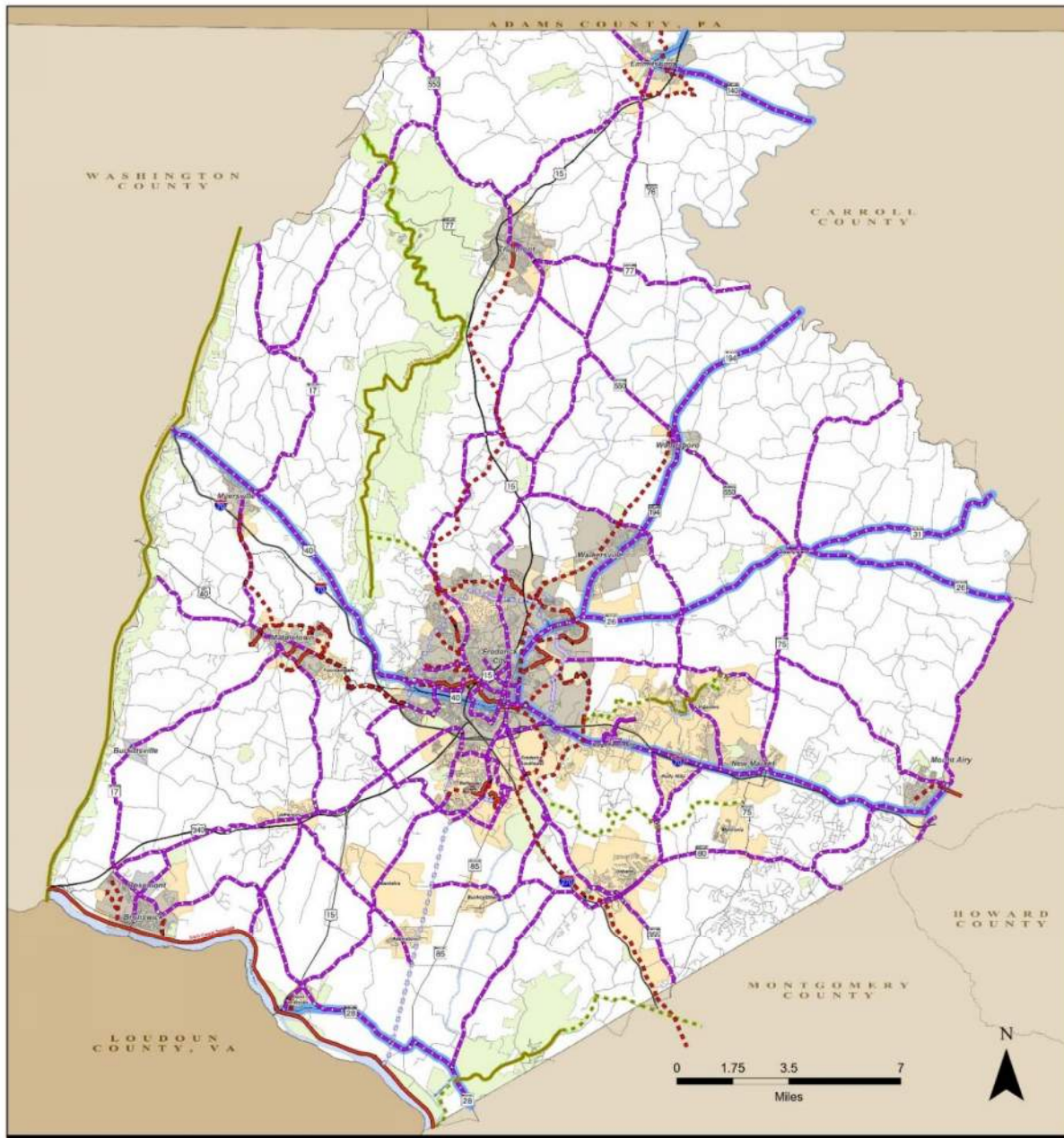
North of the Crestwood Boulevard intersection, there is one lane of vehicular traffic and one separated bicycle lane in either direction separated by an existing median. The bicycle lane is separated from vehicle travel lanes with flexible bollards and parking stops.

At the Foxcroft Drive – New Design Road intersection, there were many existing safety issues presented by the high vehicular speeds on New Design Road and the sweeping geometry of the intersection. The bicycle and pedestrian crossings were shortened, and a median refuge has been introduced to decrease pedestrian crossing distances across New Design Road. The bicycle crossings are recessed for better visibility for motorists to yield to crossing bicyclists. The effective turning radius has been reduced to eliminate sweeping, high-speed turns that are dangerous to vulnerable road users.

One vehicular lane and separated bicycle lane continues across the I-270 bridge and underpass, but no reconstruction will occur on the bridge deck. Across the bridge deck, no concrete separation is proposed, and instead double frequency flex posts are proposed.

At the intersection of Guilford Drive – New Design Road, a median refuge has been proposed to the pedestrian crossing. There is once again no reconstruction on the bridge over I-70 and the separated bicycle lanes tie into existing at the northern terminus of the bridge as New Design Road enters the City of Frederick. The project ties into existing bicycle lanes with the assumption that it will one day connect with the City of Frederick's bicycle facility that will help bicyclists access the urban areas within.

Appendix A – Frederick County Bikeways and Trails Plan



Frederick County Bikeways & Trails Plan

- | Existing | Proposed | |
|----------|----------|------------------------|
| | | Multi Use Trails |
| | | Natural Surface Trails |
| | | Side Path |
| | | On-Street Bikeways |
| | | MDOT Bike Routes |
| | | Parks |
| | | Municipalities |
| | | Community Growth Areas |



Frederick County, Maryland
Division of Planning and Permitting

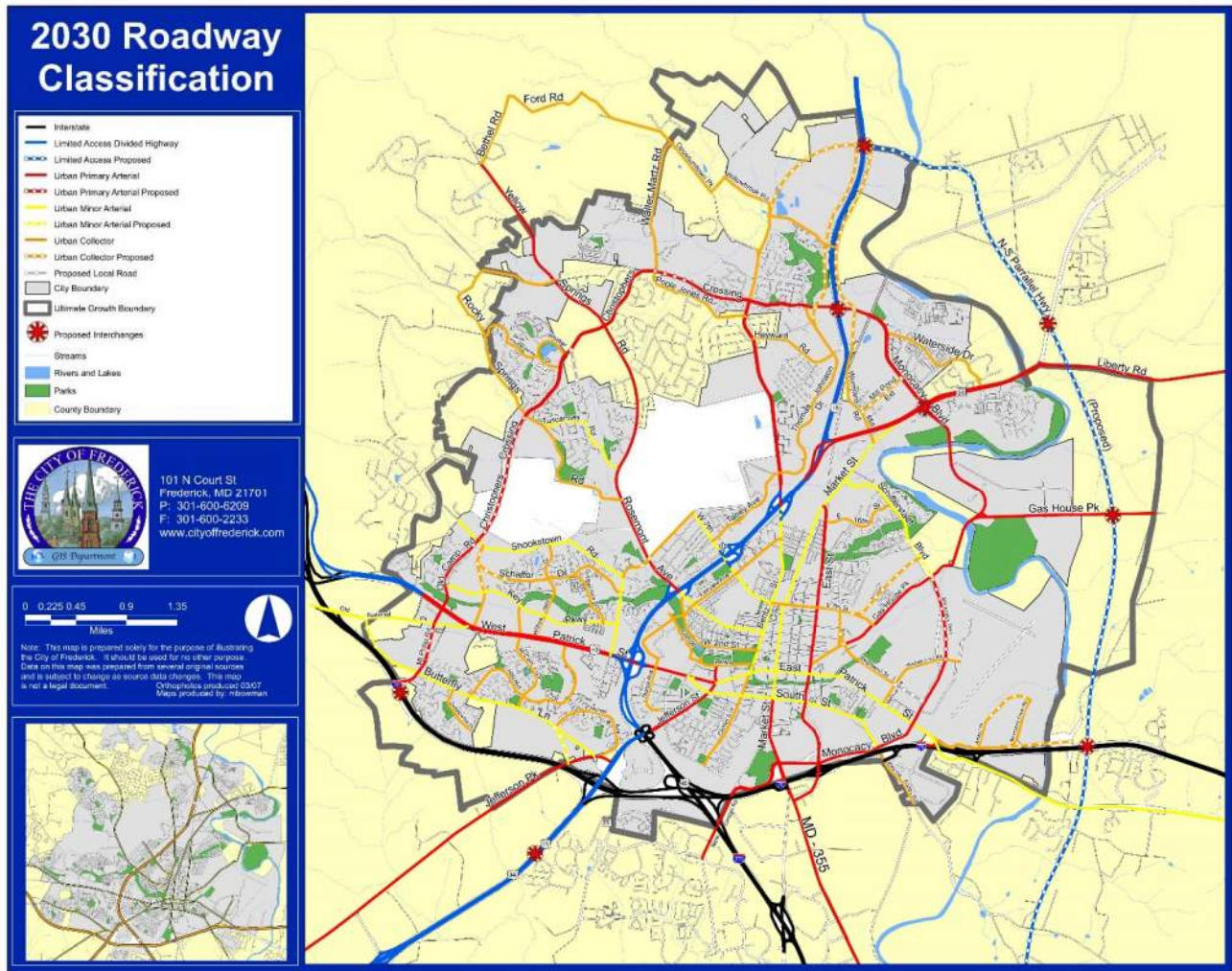
January 03, 2018
Frederick County GIS

Projection: NAD 1983 State Plane Maryland FIPS 1900 Feet
While efforts have been made to ensure the accuracy of this map, Frederick County accepts no liability or responsibility for errors, omissions, or positional inaccuracies in the content of this map. Reference on this map is at the risk of the user. This map is for illustrative purposes only and should not be used for surveying, engineering, or site-specific analysis.

00001

00001

Appendix B – Frederick 2030 Roadway Classification



Appendix C – Frederick County Complete and Green Streets Plan



FREEWAY / EXPRESSWAY (F/E)

According to the Livable Frederick Master Plan (LFMP) for Frederick County, a Freeway / Expressway is a divided highway that carries a high volume of traffic at high design speeds for interstate and inter-county travel. It connects the major centers of activity and provides uninterrupted flow from origin to destination. Access on a Freeway / Expressway is fully controlled by grade separated interchanges. These roads are intended primarily for vehicular mobility, with buses sometimes using these roads as well. Medians and roadway lighting are always recommended, but roundabouts, on-street parking, speeds humps/cushions, and dedicated transit facilities or features are not recommended on Freeways / Expressways. Pedestrian and bicycle accommodations are not recommended along this roadway type due to the high travel speeds and lack of access points to destinations. Freeways / Expressways in Frederick County include I-70, I-270, and US 340. The recommended roadway, pedestrian, bicycle, and transit design features for Freeways / Expressways are the same for all context zones, so context-specific guidance for design features of this roadway type is not included in this manual.

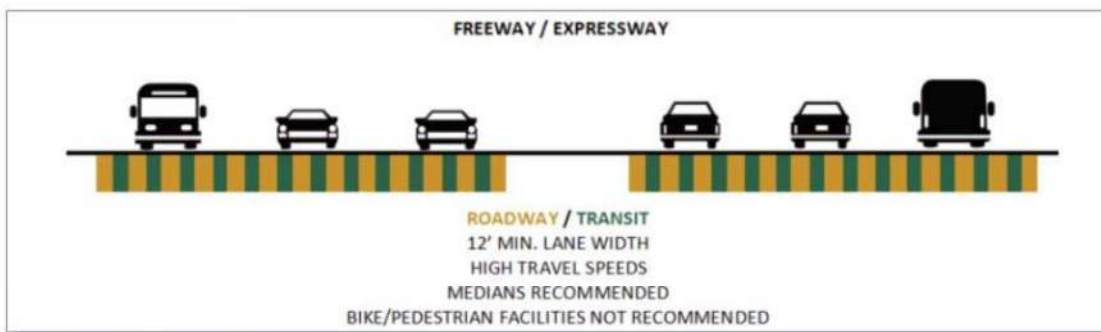


Figure 4: Freeway / Expressway Typical Section

ARTERIAL ROAD (AR)

An Arterial Road carries a moderate to high volume of traffic for travel within the County, or for travel to and from adjacent counties. These roads typically provide access to the interstate system and collector roads. Access to and from these roadways is typically allowed from intersecting public streets, but not directly with adjoining parcels. Signalized intersections may be present but are not common along Arterial Roads, especially in a rural and suburban context zone. Mobility for vehicles and buses is the primary focus, and pedestrian and bicycle facilities are not typically recommended for major arterials within a rural context due to safety concerns and access limitations. When located in a suburban or suburban activity center context zone, pedestrian and bicycle accommodations may be included in the form of an off-road shared-use facility with a horizontal buffer from the roadway.

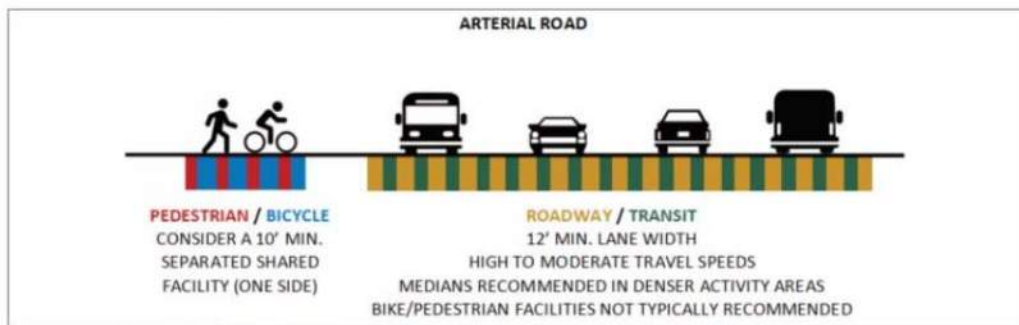


Figure 5: Arterial Road Typical Section



COLLECTOR (CL)

A Collector combines and distributes moderate traffic from neighborhoods to the arterial roadway system. These roads may allow some direct access to adjacent properties such as community shopping areas, schools, parks, and residential developments. Signalized intersections are not typical on Collector roads, as most access points connect to Collector roads at stop-controlled intersections. Mobility for vehicles and buses are the primary focus of these roadways, however, pedestrian and bicycle facilities may be implemented along Collector roadways between destination points that are reasonably close to one another. Pedestrian facilities should typically only be included on Collectors within a suburban activity center or traditional town center context zone. Destinations in a rural or suburban context may be too far apart to justify a pedestrian connection in most locations.

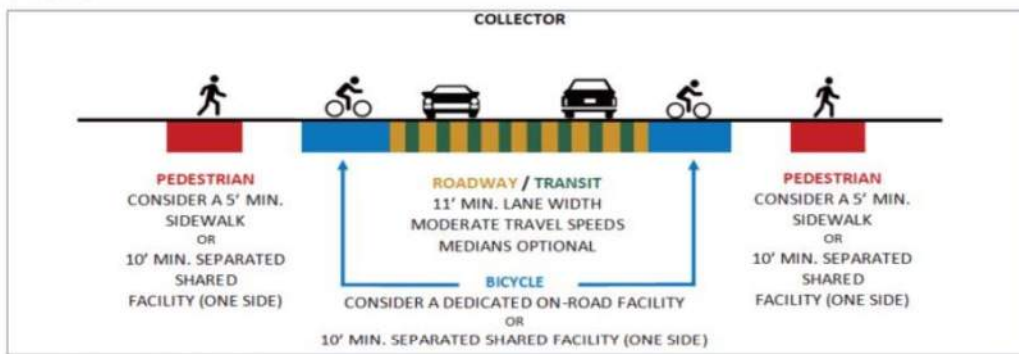


Figure 6: Collector Typical Section

BOULEVARD / PARKWAY (B/P)

A Boulevard / Parkway connects a moderate to high volume of traffic between prominent places, buildings, parks, or plazas and emphasize throughput of traffic. These roadways may or may not have urban characteristics, and typically have a shared center left turn lane or median between multiple travel lanes. Signalized intersections are common along Boulevard / Parkways. These roadways are typically found in suburban, suburban activity centers, and traditional town center context zones. Bicycle accommodations are usually provided in the form of a shared-use path or on-road bicycle facility. In a suburban context, pedestrian facilities can be included between close destination points and prominent places along Boulevards / Parkways. Within suburban activity centers or traditional town centers, sidewalks or shared-use paths are more common along these roadways.

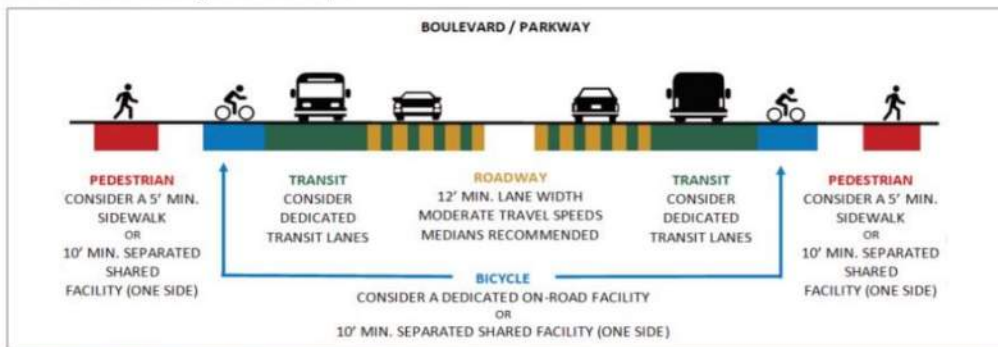


Figure 7: Boulevard / Parkway Typical Section

Appendix D – Opinion of Probable Cost

New Design Road - Bikeway Feasibility

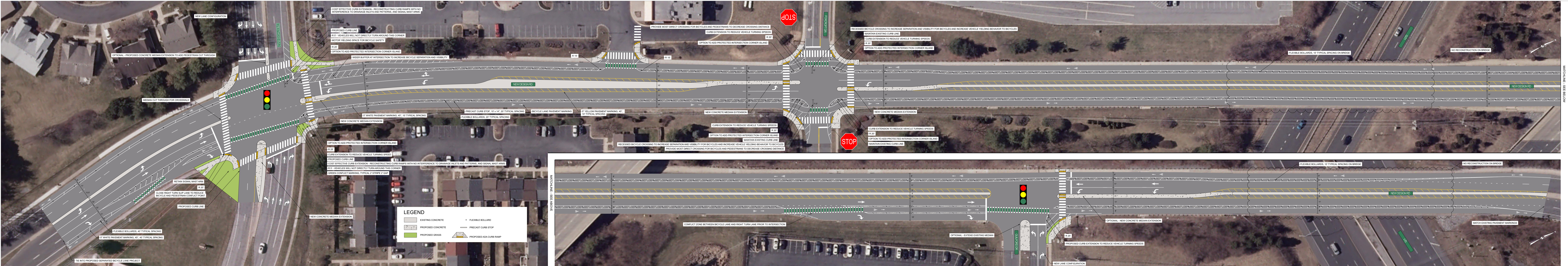
1/18/2023



Prepared By: JMM

Reviewed By: RLP

OPINION OF COST - CONCEPT PLAN - OPTION 2 PAIR OF SEPARATED BIKE LANES				
Work Item	Unit	Quantity	Unit Cost	Total Cost
Grading				
SAW CUTS	LF	576	\$6	\$3,456
REMOVAL OF EXISTING PAVEMENT	CY	338	\$100	\$33,800
Subtotal				\$37,256
Pavement Markings				
REMOVAL OF EXISTING PAVEMENT LINE MARKINGS, ANY WIDTH	LF	12,705	\$2	\$25,410
REMOVAL OF EXISTING PAVEMENT LETTERS, SYMBOLS, ARROW, AND NUMBERS	SF	486	\$7	\$3,402
WHITE PREFORMED THERMOPLASTIC PAVEMENT MARKING LEGENDS AND SYMBOLS	SF	2,660	\$23	\$61,180
5 INCH WHITE CONTRAST PAVEMENT MARKING TAPE	LF	3,732	\$8	\$29,856
5 INCH WHITE THERMOPLASTIC PAVEMENT MARKINGS	LF	21,558	\$2	\$43,116
24 INCH WHITE THERMOPLASTIC PAVEMENT MARKINGS	LF	120	\$10	\$1,200
GREEN PREFORMED THERMOPLASTIC PAVEMENT MARKING	SF	768	\$16	\$12,288
Subtotal				\$176,452
Shoulders				
STANDARD TYPE A COMBINATION CURB AND GUTTER 12 INCH GUTTER PAN 8 INCH MINIMUM DEPTH	LF	1,295	\$65	\$84,175
MONOLITHIC CONCRETE MEDIAN 2 FEET 0 INCH WIDE TYPE A-1	LF	63	\$82	\$5,166
MONOLITHIC CONCRETE MEDIAN 4 FEET 0 INCH WIDE TYPE A-1	LF	59	\$135	\$7,965
MONOLITHIC CONCRETE MEDIAN 6 FEET 0 INCH WIDE TYPE A-1	LF	373	\$140	\$52,220
5 INCH CONCRETE SIDEWALK	SF	5,215	\$15	\$78,225
FLEXIBLE BOLLARDS	EA	391	\$100	\$39,100
PRECAST CURB STOP	LF	2,660	\$100	\$266,000
Subtotal				\$532,851
Subtotal Above Categories				\$746,559
Lump Sum Items				
CLEARING AND GRUBBING	LS	1	2%	\$14,931
MOBILIZATION	LS	1	5%	\$37,328
MAINTENANCE OF TRAFFIC	LS	1	5%	\$37,328
EROSION AND SEDIMENT CONTROL	LS	1	5%	\$37,328
LANDSCAPING	LS	1	5%	\$37,328
Subtotal				\$164,243
Total Project Length = 0.8 mi		30% Contingency:		\$273,241
Bridge Length = 622 ft; Roadway Length = 3593 ft		Total Estimated Cost:		\$1,184,043
Cost Opinion Disclaimer:				
<p>Opinions of probable cost were developed by identifying major pay items and establishing rough quantities to determine a rough order of magnitude cost. Additional pay items have been assigned approximate lump sum prices based on a percentage of the anticipated construction cost. Planning-level cost opinions include a 30% contingency to cover items that are undefined or are typically unknown early in the planning phase of a project. Unit costs are based on 2022 dollars and were assigned based on historical cost data from the Maryland Department of Transportation State Highway Administration. Cost opinions do not include easement and right-of-way acquisition; permitting, inspection, or construction management; engineering, surveying, geotechnical investigation, environmental documentation, special site remediation, escalation, or the cost for ongoing maintenance. The overall cost opinions are intended to be general and used only for planning purposes. Toole Design Group, LLC makes no guarantees or warranties regarding the cost estimate herein. Construction costs will vary based on the ultimate project scope, actual site conditions and constraints, schedule, and economic conditions at the time of construction.</p>				



11-150001-00000-0010131-001_2-New Design Rd -Bicycle Feasibility Study - PRODUCTION - CAD (11-14-23) -#425001-0010131-001-2-11-150001-00000-0010131-001_2

MATCHLINE - SEE BELOW

MATCHLINE - SEE ABOVE

MATCH EXISTING PAVEMENT MARKINGS

LEGEND

	EXISTING CONCRETE		FLEXIBLE BOLLARD
	PROPOSED CONCRETE		PRECAST CURB STOP
	PROPOSED GRASS		PROPOSED ADA CURB RAMP

THIS IS A PRELIMINARY CONCEPT. FIELD VERIFICATION, SITE CONDITION ASSESSMENTS, ENGINEERING ANALYSIS AND DESIGN ARE NECESSARY PRIOR TO IMPLEMENTING ANY OF THE RECOMMENDATIONS CONTAINED HEREIN.

PRELIMINARY CONCEPT - NOT FOR CONSTRUCTION