



MARYLAND 32

ALTERNATE BIKE ROUTE STUDY

SPRING 2019

MOT MARYLAND DEPARTMENT OF TRANSPORTATION

STATE HIGHWAY ADMINISTRATION

PRODUCED BY **RK&K**

Acknowledgments

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Introduction

Overview

The Maryland Department of Transportation State Highway Administration (MDOT SHA) is dedicated to providing safe bicycle facilities throughout the State of Maryland. Previously, MD 32 was identified as a candidate for dualization to reduce ongoing congestion in the region. The dualization project from MD 108 to Linden Church Road (Phase 1, Complete) and Linden Church Road to I-70 (Phase 2, In Progress) is permanently removing bicycle access to MD 32 by establishing through-highway access controls along the corridor between MD 108 and Burntwoods Road. Per the Maryland Annotated Code 8-601.1(a), "The Administrations may not construct any project that will result in the severance or destruction of an existing major route for bicycle transportation traffic, unless the project provides for construction of a reasonable alternative route or such a route already exists." In an effort to meet this requirement, MDOT SHA identified Ten Oaks Road as a potential replacement bicycle route for the MD 32 corridor.

Purpose & Needs

The purpose of the MD 32 Bicycle Alternate Route Study is to 1) identify a viable and safe alternative bicycle route in order to address the elimination of existing bicycle related infrastructure along MD 32 associated with the dualization of this roadway and 2) identify potential improvements along the identified alternative route meant to enhance bicycle travel from a safety standpoint along the roadway. This study includes a thorough analysis of existing conditions and potential safety improvement opportunities along the alternative route, as well as existing constraints related to implementation. The study includes suggestions for limiting potential utility and right-of-way impacts, as well as next steps for implementation.

Study Area

The study area for this evaluation includes Ten Oaks Road between MD 108 and Burntwoods Road. Needs along the corridor were defined based on the character of the roadway including average annual daily traffic (AADT), the typical section, and surrounding land use.

The northern section of the roadway, between Brighton Dam Road and Burntwoods Road, has an AADT of 5985 vehicles and is surrounded by rural, low-density residential land use. The 5.5 mile roadway segment generally allows for bicycle travel on the roadway. Given this consideration, a field study was completed to identify

areas of concern for bicycle travel at pinch points along the route.

A pinch point is a roadway segment that presents challenges to a cyclist sharing the roadway with vehicles. Five roadway characteristics were considered as contributing factors to pinch point, including a narrow shoulder, a turn lane conflict, a steep road grade, a steep slope along one side of the roadway, and limited site distance for drivers. For this study, a pinch point existed if two or more of these five characteristics were present in a segment.

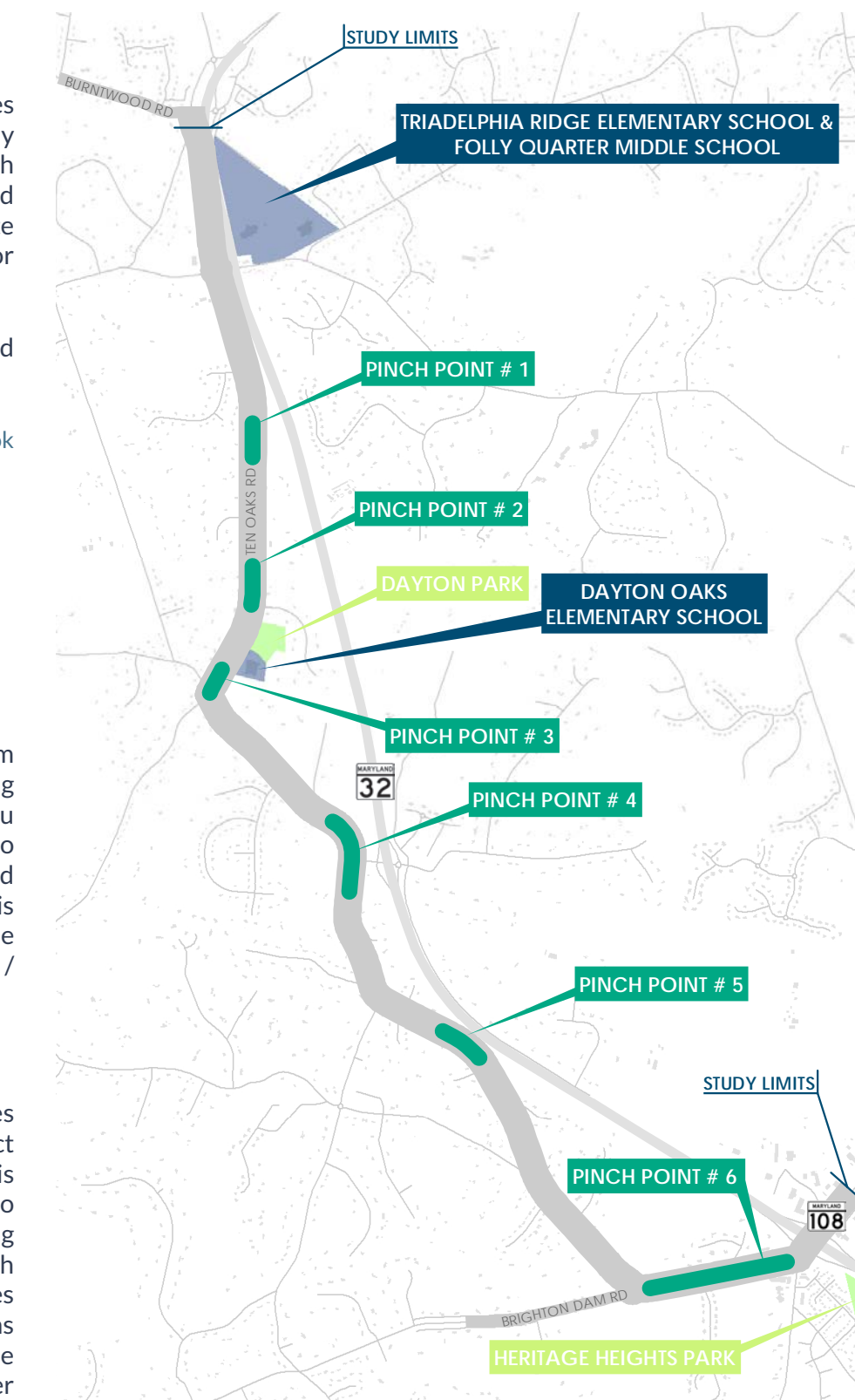
Five pinch points were identified in this northern Ten Oaks Road segment as listed below.

- Pinch Point 1 - West Side Between Rye River Drive & Oakwood Overlook Ct.
- Pinch Point 2 - West Side Between Oakwood Overlook Ct. & Rutherford Way
- Pinch Point 3 - Both Sides Between Dayton Oaks School and Green Bridge Road
- Pinch Point 4 - Both Sides Between Green Bridge Road & Aerie Ct.
- Pinch Point 5 - West Side Between Talon Ct. & Smallwood Ct.

The southern section of Ten Oaks Road, between Brighton Dam Road and MD 108, has an AADT of 6635 vehicles. The surrounding residential and commercial land use becomes more dense as you progress toward the MD 108 intersection. The roadway also widens as you approach MD 108, congestion is much greater, and speeds increase compared to the northern section. As a result, this study considered a continuous improvement to separate bicycle and vehicular traffic. This section is referred to as Pinch Point 6 / Suburban Section.

In This Plan

The following document presents an overview of the opportunities and constraints for installing new bicycle facilities along the project study area. An overview of the fieldwork and desktop analysis performed to determine these opportunities and constraints is also included. Following a review of potential user-types for cycling along the corridor, the proposed alternatives are presented with detailed concept plans and anticipated impacts. Cost estimates for each alternative are included along with key considerations generated from previous analysis. Next steps for implementing the recommended alternatives are presented, including stakeholder engagement and project funding.





Opportunities + Constraints

Overview

In order to develop concept-level designs for the Ten Oaks Road corridor, it was critical to understand the existing layout and traffic conditions of the project study area. MDOT SHA previously identified five pinch points along the northern and suburban section of Ten Oaks Road that presented additional challenges for cyclists. To determine the opportunities and constraints for new cycling infrastructure along the study corridor, several field visits were conducted to evaluate the pinch points, review the existing conditions, and identify potential conflicts. Additional analysis was conducted to identify opportunities and constraints related to natural resources, stormwater management, utilities, roadway design, right-of-way, and traffic. The concept plans on the following pages illustrate the final outcomes from this fieldwork and associated desktop analysis.

Study Area Description

The study area for this study has been divided into the northern and suburban section. Detailed descriptions are provided below:

Northern Section - Traveling in a southerly direction, the northern section of Ten Oaks Road is primarily a two lane, open section roadway fronted by rural/low density land use development. Approximately two-tenths of a mile north of the Triadelphia Road intersection, commercial development begins to appear such as frontage improvements consisting of curb, gutter, a center turn lane, and sporadic sidewalk improvements along the east side of Ten Oaks Road. South of the Triadelphia Road intersection, Ten Oaks Road once again reverts to a two lane open section roadway fronted by rural/low density land use development for the most part. The roadway eventually passes Dayton Oak Elementary School before intersecting with Linthicum Road at a 4-way stop. At this juncture, Ten Oaks Road then heads slightly eastward, once again as a two lane open section roadway fronted by rural/low density land use development. The Linden Church Road intersection provides a connection with both eastbound/westbound MD 32 ramps. The northern section terminates at Brighton Dam Road which features a three-pronged roundabout.

Suburban Section - Traveling in an easterly direction, the southern segment of Ten Oaks Road continues as a two lane open section roadway fronted by rural/low density land use development; however, the roadway widens as land use becomes more intense approaching MD 108, including higher density residential development and commercial uses. The suburban section terminates at the three-legged signalized MD 108 intersection which ultimately connects with eastbound/westbound MD 32 to the north.

Previous & Current Studies

In 2016, the Howard County Department of Transportation (HCDOT) released the Clarksville Pike Streetscape Plan and Design Guidelines. The plan identifies Clarksville Pike (MD 108) as a priority corridor for streetscape improvements that will lead to sustainable, pedestrian-oriented development. As part of HCDOT's efforts to implement the recommendations in the plan, they have engaged the services of an engineering firm to examine the portion of MD 108 surrounding the MD 32 interchange, including the intersection of MD 108 with Ten Oaks Road. The preliminary designs for the intersection have been developed and are incorporated into the recommended alternative maps presented in this study. No costs associated with the HCDOT plans are included.

Natural Resources

Ten Oaks Road runs through a combination of rural and sub-urban areas in Howard County. The surrounding land includes waterways, wetlands, parks, forested areas, and 100-year flood plains. The presence of these natural resources create several site constraints that will require further analysis and coordination with multiple organizations.

For the study corridor, a request for review of Rare, Threatened, and Endangered species (RTE) records within the proposed work areas should be submitted to the Maryland Department of Natural Resources (MDNR) Wildlife and Heritage Division, MDNR Project Review Division (PRD - Fisheries Division), and the US Fish and Wildlife Service (USFWS). Additionally, although the Ten Oaks corridor does not appear to directly impact existing wetlands, a wetland delineation should be performed to confirm any impacts to jurisdictional water resources. Any impacts identified would require coordination with the Maryland Department of the Environment (MDE) and US Army Corps of Engineers (USACE); the submittal of a Joint Federal/State Permit Application (JPA) may be required as well.

Due to the proximity of forested areas, a Natural Resources Inventory/Forest Stand Delineation (NRI/FSD) should be performed to identify forest/hedgerow boundaries, specimen trees (> 30 inches in Diameter at Breast Height), and right-of-way trees within and adjacent to the proposed work areas. Depending on the analysis, a MDNR Roadside Tree Permit and additional tree mitigation may be required.

Finally, a request for review of cultural and historical resources should be submitted to the Maryland Historical Trust (MHT) to confirm if any cultural and historic resources exist within the proposed work areas.

Stormwater Management

Stormwater management is critical to mitigating the effects of sediments, nutrients, and other contaminants found in stormwater runoff. In cases where potential improvements would increase the amount of impervious surface in the study area, stormwater management mitigation would be required as a result of the increased stormwater runoff. The state of Maryland has developed several comprehensive stormwater management treatments including but not limited to the following:

- Swales - open drainage channels designed to detain and promote stormwater filtration
- Bio-retention ponds - shallow depressions designed to collect stormwater before filtering through fabricated planting soil media
- Vegetated Buffers - vegetated protective zones of variable width along the sides of existing waterways

Given the existing conditions around the Ten Oaks Road corridor, there are several site constraints that limit feasibility of implementing stormwater management for the project. Major site constraints include limited available right-of-way, guardrails, utility poles, and large trees. Existing roadway grades near Ten Oaks Road may require acquiring significant site grading to install stormwater facilities. If on-site implementation of stormwater management has been demonstrated to the maximum extent practicable, a waiver or variance may be sought for remaining stormwater requirements.

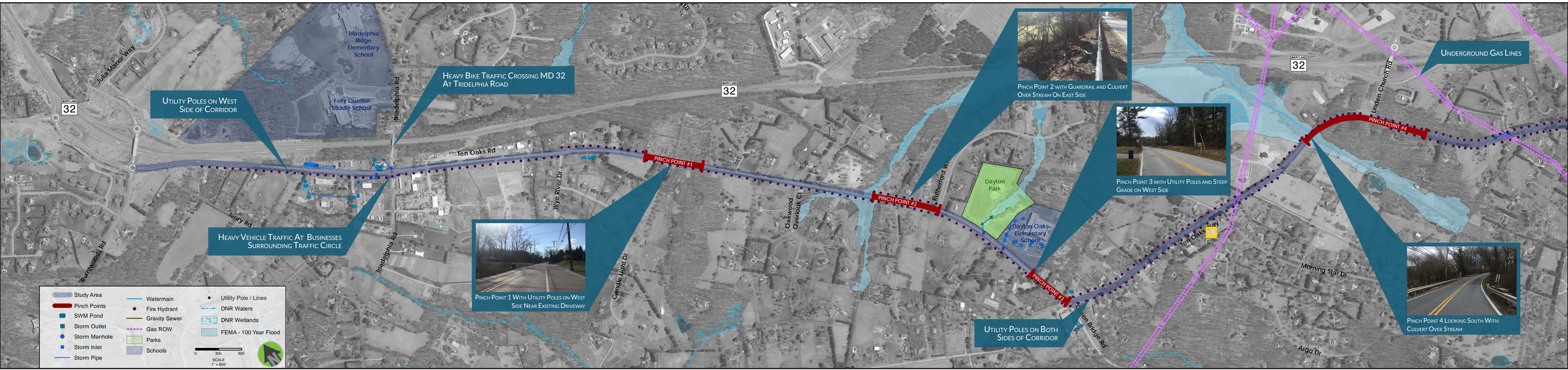
Utilities

Throughout the study corridor, there are several utility poles located directly adjacent to the roadway. Relocations of these utility poles may be required based on the proposed improvements, requiring coordination with the utility companies and any other entities that use the poles to provide service. Analysis also revealed several additional utilities along the study corridor, including underground gas lines, water mains, storm inlets, storm manholes, and fire hydrants. There is a particularly high concentration of utilities near the intersection of Ten Oaks Road and MD 108 as a result of the large number of nearby businesses. These utilities will present several site constraints depending on the proposed improvements and will require extensive coordination with the corresponding owners.

Opportunities & Constraints Maps - The following maps contain summary notes and key features examined during the opportunities and constraints analysis described above.

OPPORTUNITIES & CONSTRAINTS

Northern Section Burntwoods Road to Pinch Point #4



OPPORTUNITIES & CONSTRAINTS

Northern & Suburban Section Pinch Point #4 to MD 108





Recommended Alternatives

Overview

The project team analyzed the existing conditions and previously reviewed opportunities and constraints to develop recommended alternative designs for the study area. For the purpose of this study, MDOT SHA determined that the most likely cyclists user type was “Enthusied and Confident” based on field observations and roadway design. As a result, the recommended alternatives have been crafted to accommodate this user type.

Due to the prominent land-use types and the character of the roadway along the study corridor, several types of cycling infrastructure were considered for the proposed alternatives. The following four treatments were initially considered:

- » Route Signage
- » Pinch Point Treatment (Shoulder Bikeways, Bike-Climbing Shoulders)
- » Corridor/Shoulder Widening
- » Shared-Use Path (SUP)

Based on the determined user type, surrounding land uses, natural resources constraints, right-of-way constraints, and funding requirements, widening the roadway throughout the entire corridor was eliminated from consideration. The preliminary cost estimate for the roadway widening has been included in Appendix A for reference. Additionally and for many of the same reasons, the shared-use path alternative for the entire corridor was eliminated from consideration. However, a shared use path along the suburban section of the corridor was considered as a result of the concerns noted in this section.

For the remaining treatments, alternative concept plans, cost estimates, and anticipated impacts were developed.

Alternative A - Route Signage

- The first alternative includes installing new route signage throughout the MD 32 corridor. While no new infrastructure will be provided for cyclists, the new signage will clearly delineate the bike route and make automobiles more aware of potential cyclists throughout the corridor. This option has the lowest cost and environmental impact of the three alternatives considered.

Alternative B - Pinch Point 1-5 Treatments

- The second alternative focused on addressing specific sections along the corridor that are particularly difficult for cyclists to navigate due to a narrowed roadway and difficult sight lines. For these “pinch points,” infrastructure improvements were developed to provide additional roadway space for cyclists and eliminate conflicts with automobile traffic. In many cases, multiple recommendations were created for a single pinch point to provide options with varying costs and environmental impacts. Recommendations included bikeable shoulders, off-road paths, and traffic circles.

Alternative C - Pinch Point 6 SUP

- The third alternative focused on a corridor-wide treatment that would provide improved cycling infrastructure throughout the study area. With the roadway widening and a SUP throughout the entire corridor eliminated due to cost, treatments specifically tailored to the pinch point 6/suburban section were considered. Ultimately, a SUP on the north and south sides of the suburban section was chosen to alleviate concerns along the corridor, along with additional signage and roadway improvements noted in the alternatives above.

HIGH STRESS TOLERANCE

STRONG + FEARLESS

People willing to bicycle with limited or no bicycle-specific infrastructure.

ENTHUSED + CONFIDENT

People willing to bicycle if some bicycle-specific infrastructure is in place.

INTERESTED, BUT CONCERNED

People willing to bicycle if high-quality bicycle infrastructure is in place.

“NO WAY, NO HOW”

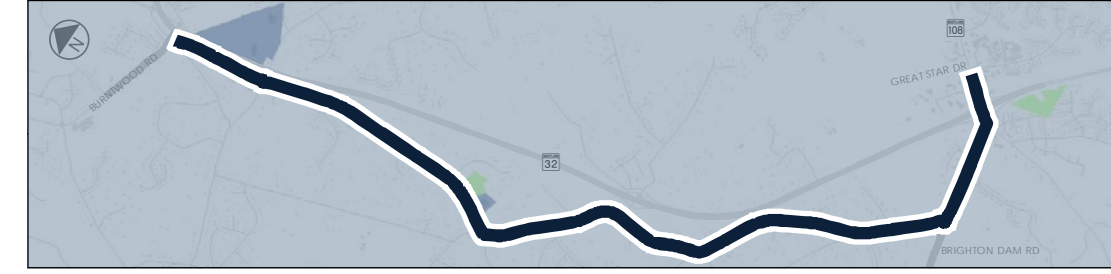
People unwilling to bicycle even if high-quality bicycle infrastructure is in place.

LOW STRESS TOLERANCE

Source: Adapted from Roger Geller.

SIGNAGE PLAN

Alternative A Route Signage Throughout Entire Ten Oaks Road Corridor



IMPACTS AND FACILITY SUMMARY

	EXISTING	IMPACT	NOTES
TRAVEL LANES	VARIABLES	-	-
TREES + NATURAL RESOURCES	YES	-	-
GUARDRAIL	YES	-	-
CULVERT	YES	-	-
UTILITIES	YES	-	-

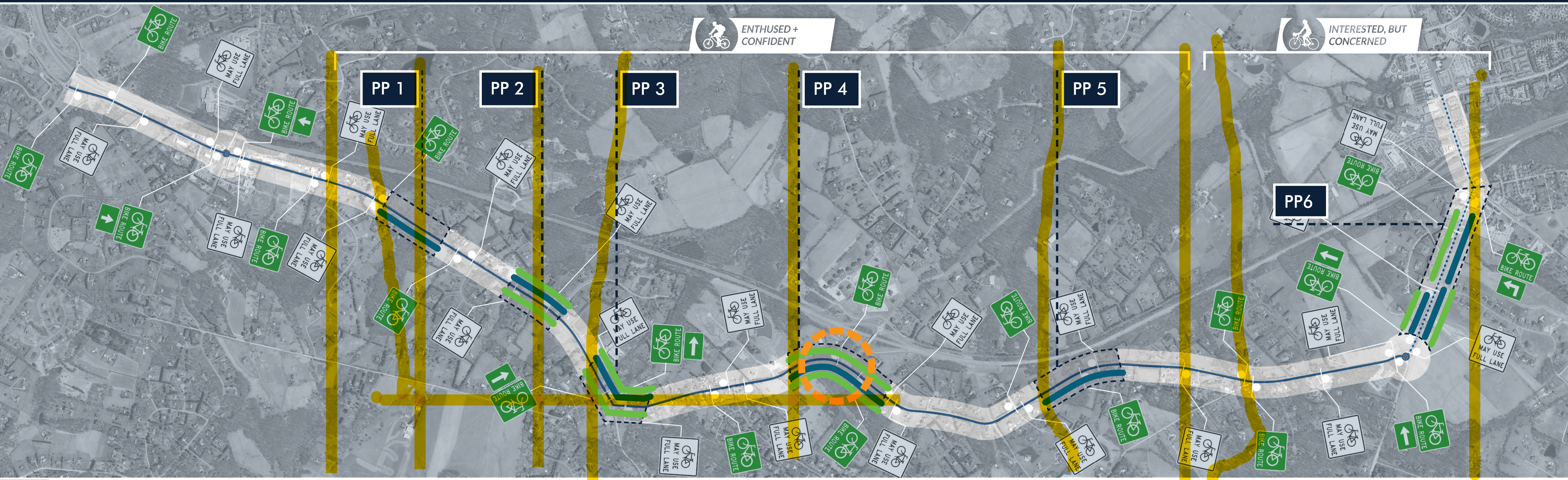
	EAST	WEST
SHOULDER/ROADWAY WIDENING		

	EAST	WEST
POTENTIAL ROW IMPACTS <small>(no survey completed at this time)</small>		

OPINION OF PROBABLE COST <small>(see appendix A for details)</small>	\$35,724
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PINCH POINT LAYOUT PLAN

The map below summarizes Pinch Point and Shared Use Path recommendations and their alternatives—blue lines indicate a facility on one side of the roadway, green lines show facilities on both sides, and the orange circle shows a third alternative at Pinch Point 4. At the right, the chart provides a side-by-side comparison of the benefits of each recommendation's alternatives. Detailed layout sheets begin on page 14.



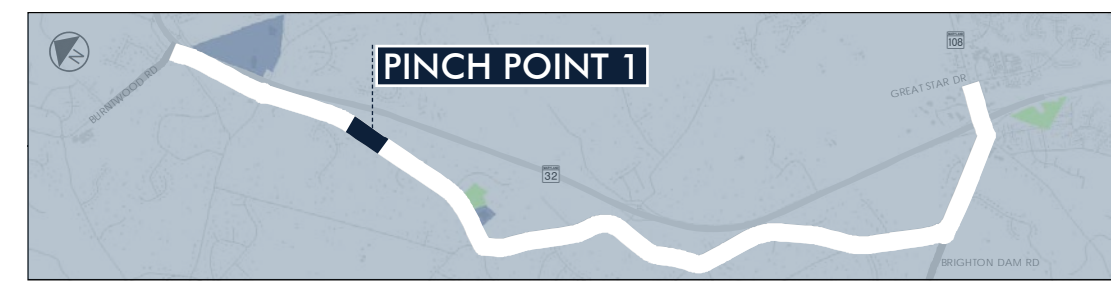
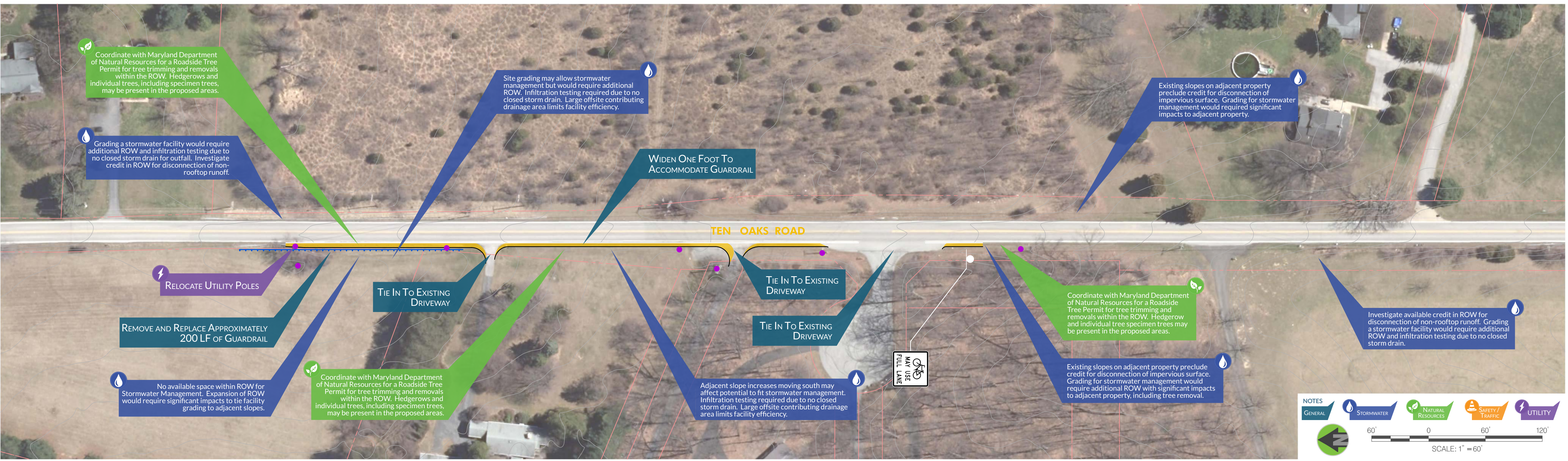
	SINGLE-SIDE				DOUBLE-SIDED				
	COST	UTILITY IMPACTS	TREE IMPACTS	PARCEL IMPACTS	COST	UTILITY IMPACTS	TREE IMPACTS	PARCEL IMPACTS	SAFETY
PP 1	✓	✓	✓						
PP 2	✓	✓	✓	✓			✓		✓
PP 3	✓	✓	✓	✓			✓		✓
PP 4	✓	✓	✓	✓					✓
PP 5	✓	✓							
PP 6		✓		✓	✓	✓	✓		✓
	SINGLE-SIDE				DOUBLE-SIDED				
	COST	UTILITY IMPACTS	TREE IMPACTS	PARCEL IMPACTS	COST	UTILITY IMPACTS	TREE IMPACTS	PARCEL IMPACTS	SAFETY

LESS IMPACTS, GREATER BENEFITS

PINCH POINT 1

Alternative B1 | West, SINGLE-SIDE

Bicycle-Friendly Shoulder on West Side of Ten Oaks Road



IMPACTS AND FACILITY SUMMARY

	EXISTING	IMPACT	NOTES
TRAVEL LANES	11' 10'	YES	2,615 SF INCREASE FOR PAVED SHOULDERS
TREES + NATURAL RESOURCES	YES	-	-
GUARDRAIL	YES	YES	236 LF GUARDRAIL ADDED
CULVERT	NO	-	-
UTILITIES	YES	YES	RELOCATION OF 4 POLES REQUIRED

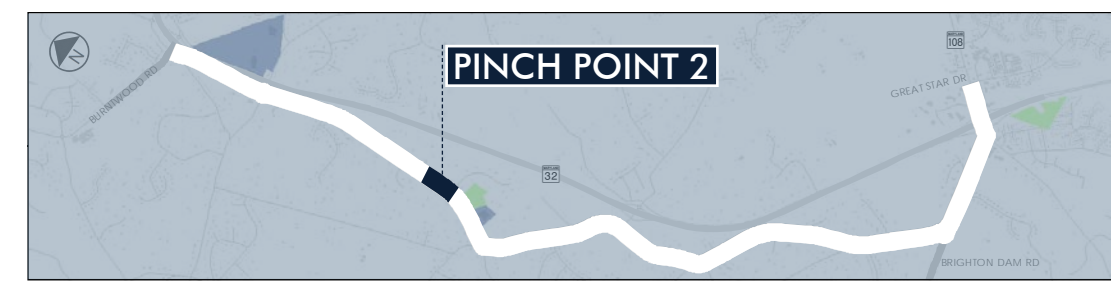
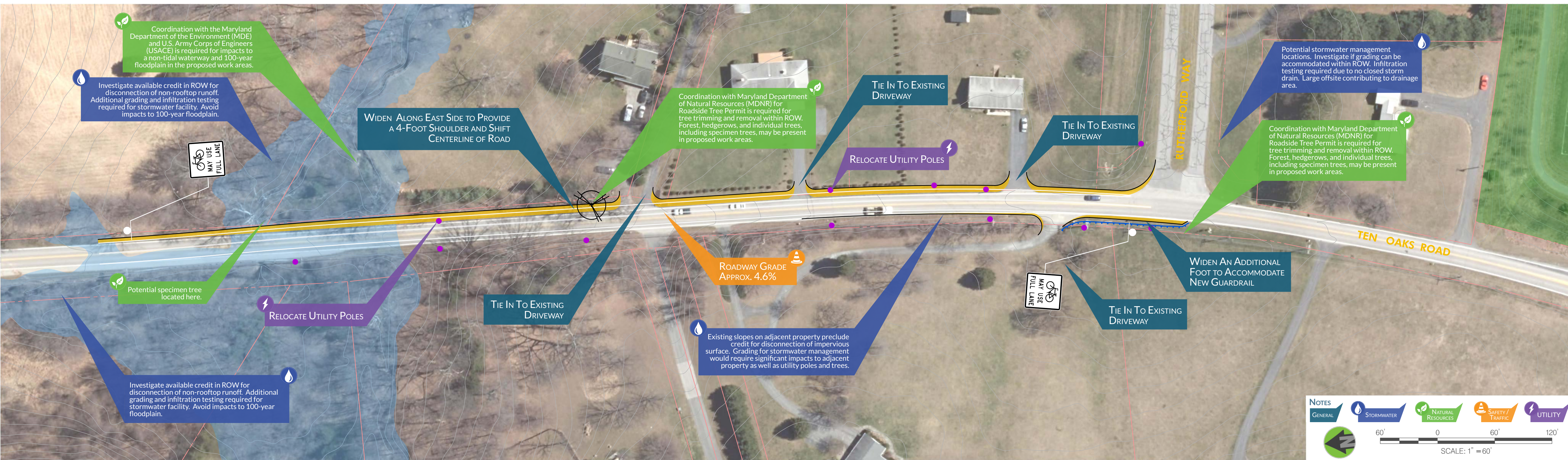
	EAST	WEST
SHOULDER/ROADWAY WIDENING		
POTENTIAL ROW IMPACTS <small>(no survey completed at this time)</small>		4
OPINION OF PROBABLE COST <small>(see appendix A for details)</small>	\$398,498	

Pinch Point Criteria:

- Shoulder Width
- Sight Distance
- Road Grade

PINCH POINT 2

Alternative B1 | East, SINGLE-SIDE Bicycle-Friendly Shoulder on East Side of Ten Oaks Road



IMPACTS AND FACILITY SUMMARY

	EXISTING	IMPACT	NOTES
TRAVEL LANES	11' 10'	YES	5,203 SF INCREASE FOR PAVED SHOULDERS
TREES + NATURAL RESOURCES	YES	YES	REMOVAL OF 1 TREE REQUIRED
GUARDRAIL	NO	YES	126 LF GUARDRAIL ADDED
CULVERT	NO	-	-
UTILITIES	YES	YES	RELOCATION OF 6 POLES REQUIRED

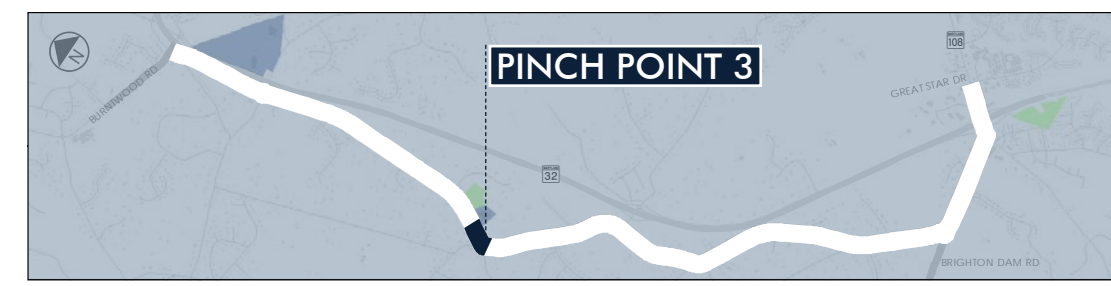
	EAST	WEST
SHOULDER/ROADWAY WIDENING	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
POTENTIAL ROW IMPACTS <small>(no survey completed at this time)</small>	5	1
OPINION OF PROBABLE COST <small>(see appendix A for details)</small>	\$842,651	

Pinch Point Criteria:

- Shoulder Width
- Sight Distance
- Road Grade

PINCH POINT 3

Alternative B1 | East, SINGLE-SIDE Bicycle-Friendly Shoulder on East Side of Ten Oaks Road



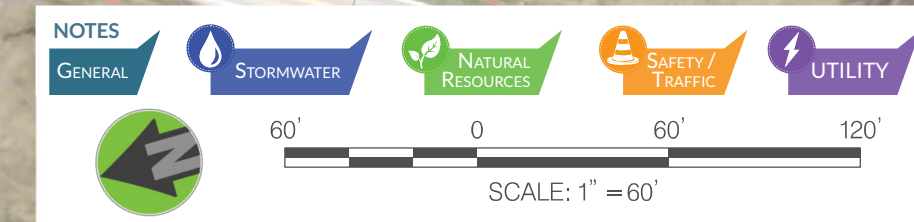
IMPACTS AND FACILITY SUMMARY

	EXISTING	IMPACT	NOTES
TRAVEL LANES	11' 10'	-	-
TREES + NATURAL RESOURCES	YES	YES	REMOVAL OF 1 TREES REQUIRED
GUARDRAIL	YES	-	-
CULVERT	NO	-	-
UTILITIES	YES	-	-

	EAST	WEST
SHOULDER/ROADWAY WIDENING	<input checked="" type="checkbox"/>	<input type="checkbox"/>
POTENTIAL ROW IMPACTS <small>(no survey completed at this time)</small>	3	
OPINION OF PROBABLE COST <small>(see appendix A for details)</small>	\$257,113	

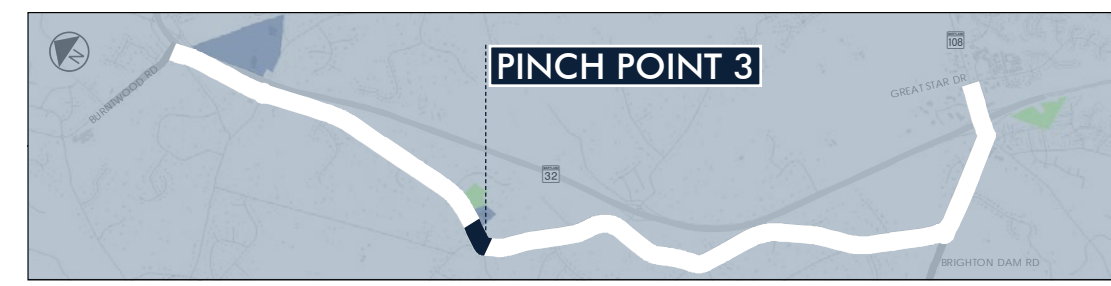
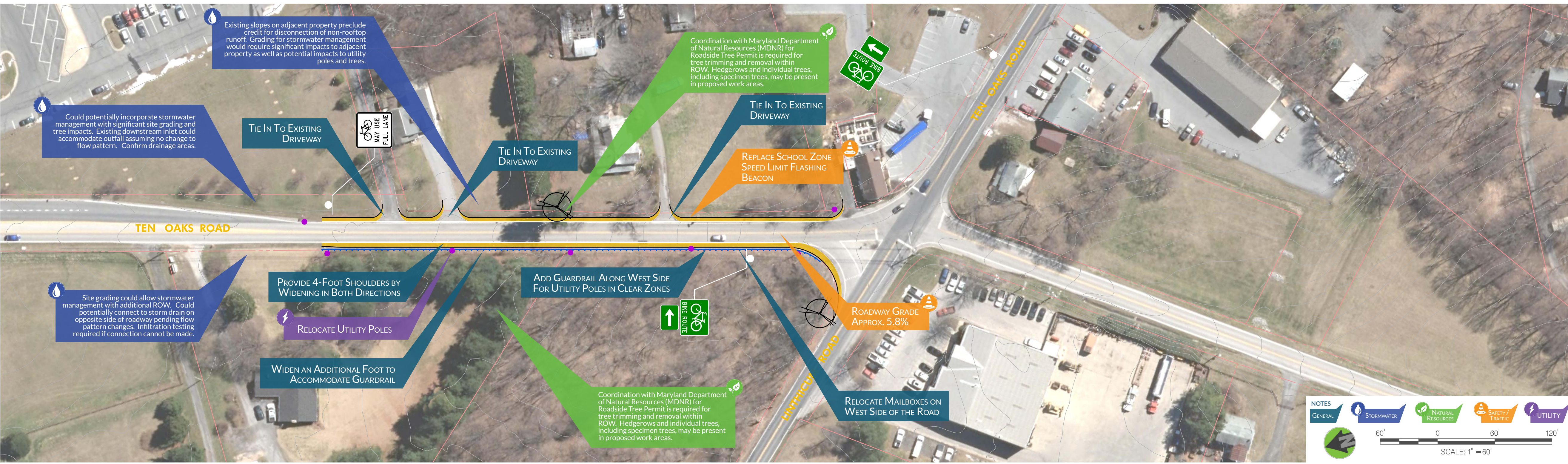
Pinch Point Criteria:

- Shoulder Width
- Sight Distance
- Road Grade



PINCH POINT 3

Alternative B2 | DOUBLE-SIDED Bicycle-Friendly Shoulder on East + West Side of Ten Oaks Road



IMPACTS AND FACILITY SUMMARY

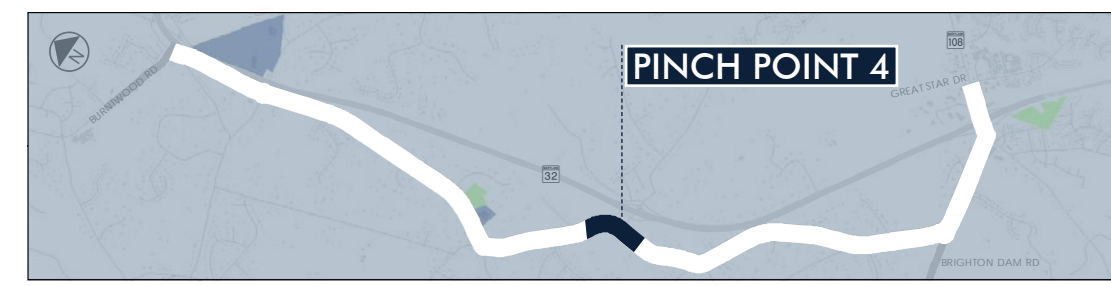
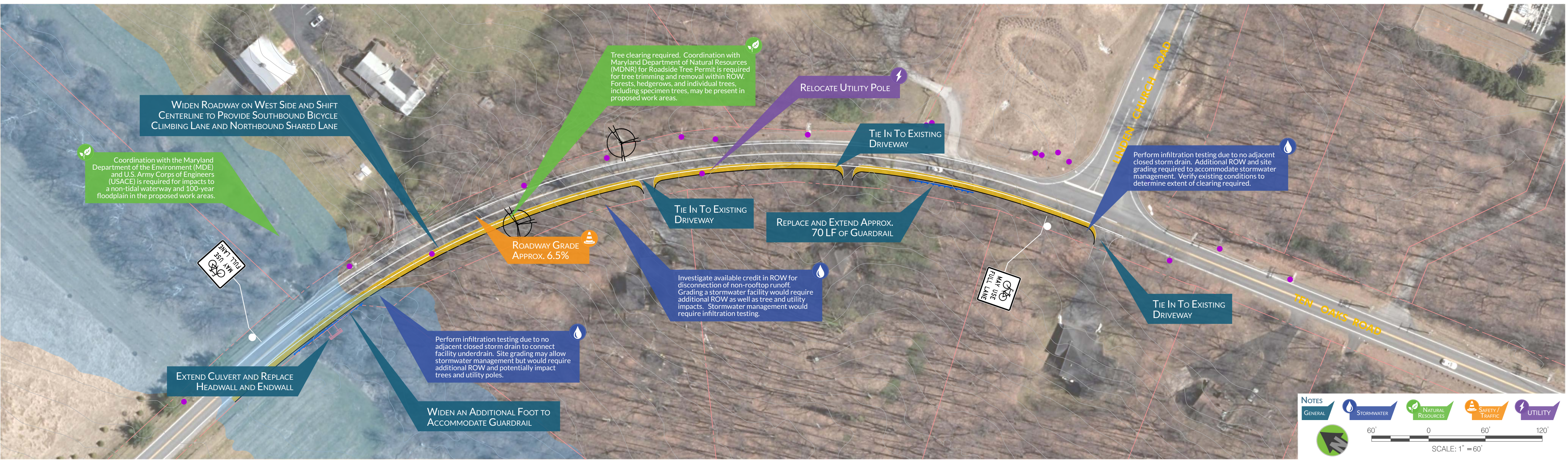
	EXISTING	IMPACT	NOTES
TRAVEL LANES	11' 10'	YES	3,478 SF INCREASE FOR PAVED SHOULDERS
TREES + NATURAL RESOURCES	YES	YES	REMOVAL OF 1 TREES REQUIRED
GUARDRAIL	YES	YES	526 LF GUARDRAIL ADDED
CULVERT	NO	-	-
UTILITIES	YES	YES	RELOCATION OF 4 POLES REQUIRED

	EAST	WEST
SHOULDER/ROADWAY WIDENING		
POTENTIAL ROW IMPACTS <small>(no survey completed at this time)</small>	EAST: 3	WEST: 2
OPINION OF PROBABLE COST <small>(see appendix A for details)</small>	\$979,164	

- Pinch Point Criteria:**
- Shoulder Width
 - Sight Distance
 - Road Grade

PINCH POINT 4

Alternative B1 | West, SINGLE-SIDE Bicycle-Friendly Shoulder on West Side of Ten Oaks Road



IMPACTS AND FACILITY SUMMARY

	EXISTING	IMPACT	NOTES
TRAVEL LANES	11' 10'	YES	5,006 SF INCREASE FOR PAVED SHOULDERS
TREES + NATURAL RESOURCES	YES	YES	REMOVAL OF 1 TREE REQUIRED
GUARDRAIL	YES	YES	159 LF GUARDRAIL ADDED
CULVERT	YES	YES	1 CULVERT EXTENSION REQUIRED
UTILITIES	YES	YES	RELOCATION OF 2 POLES REQUIRED

	EAST	WEST
SHOULDER/ROADWAY WIDENING		<input checked="" type="checkbox"/>
POTENTIAL ROW IMPACTS <small>(no survey completed at this time)</small>		4
OPINION OF PROBABLE COST <small>(see appendix A for details)</small>	\$995,794	

Pinch Point Criteria:

- Shoulder Width
- Sight Distance
- Road Grade

PINCH POINT 4

Alternative B2 | CIRCLE

Traffic Circle at Linden Church Road

Traffic Circles - The Maryland State Highway Administration (SHA) began implementing modern roundabouts, also known as traffic circles or circular at-grade intersections, in 1993. They are an effective intersection design which reduces the numbers of intersection conflict points while operating at slower speeds. This type of intersection has successfully replaced many traditional intersections that had exhibited recurring crash problems and/or operational problems. Roundabouts operate continuously, but at much slower speeds than traditional intersections and normally result in very little delay. Normal operating speeds within roundabouts are between 20 and 30 mph.

Reason for Implementation - Constructed a traffic circle would significantly enhance safety for cyclists by slowing traffic approaching and leaving the pinch point area. Current traffic along Ten Oaks Road consistently travels at speeds in excess of the speed limit en route to MD 32. This high speed traffic, combined with sight distance issues around the end, present a consistent threat to cyclist using the corridor. Slowing the traffic with the proposed traffic circle design will create a lower stress environment for cyclists and decrease the chances of a crash resulting from a vehicle not seeing a cyclist along the road.

Coordination with the Maryland Department of the Environment (MDE) and U.S. Army Corps of Engineers (USACE) is required for impacts to a non-tidal waterway and 100-year floodplain in the proposed work areas.

ROADWAY GRADE APPROX. 6.5%

Investigate available credit in ROW for disconnection of non-rooftop runoff. Grading a stormwater facility would require additional ROW as well as tree and utility impacts. Stormwater management would require infiltration testing.

RELOCATE DRIVEWAY AND ENTRANCE WITHIN PROPERTY BOUNDARY

RELOCATE UTILITY POLES

NEW TRAFFIC CIRCLE - INSCRIBED
CIRCLE DIAMETER = 110 FEET

Perform infiltration testing due to no adjacent closed storm drain. Additional ROW and site grading required to accommodate stormwater management. Verify existing conditions to determine extent of clearing required.

Coordination with Maryland Department of Natural Resources (MDNR) for Roadside Tree Permit is required for tree trimming and removal within ROW. Forests, hedgerows, and individual trees, including specimen trees, may be present in proposed work areas.

TIE IN WITH EXISTING 4-FOOT SHOULDERS

TIE IN WITH EXISTING 4-FOOT SHOULDERS

NOTES

- GENERAL
- STORMWATER
- NATURAL RESOURCES
- SAFETY / TRAFFIC
- UTILITY

60' 0 60' 120'

SCALE: 1" = 60'



IMPACTS AND FACILITY SUMMARY

	EXISTING	IMPACT	NOTES
TRAVEL LANES	11' 10'	YES	4,187 SF INCREASE FOR PAVED SHOULDERS
TREES + NATURAL RESOURCES	YES	-	-
GUARDRAIL	YES	-	-
CULVERT	YES	-	-
UTILITIES	YES	YES	RELOCATION OF 4 POLES REQUIRED

SHOULDER/ROADWAY WIDENING	EAST	WEST

POTENTIAL ROW IMPACTS <small>(no survey completed at this time)</small>	EAST	WEST
	1	2

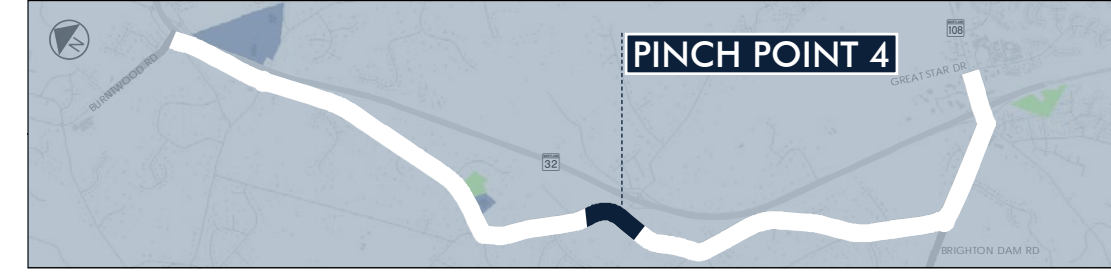
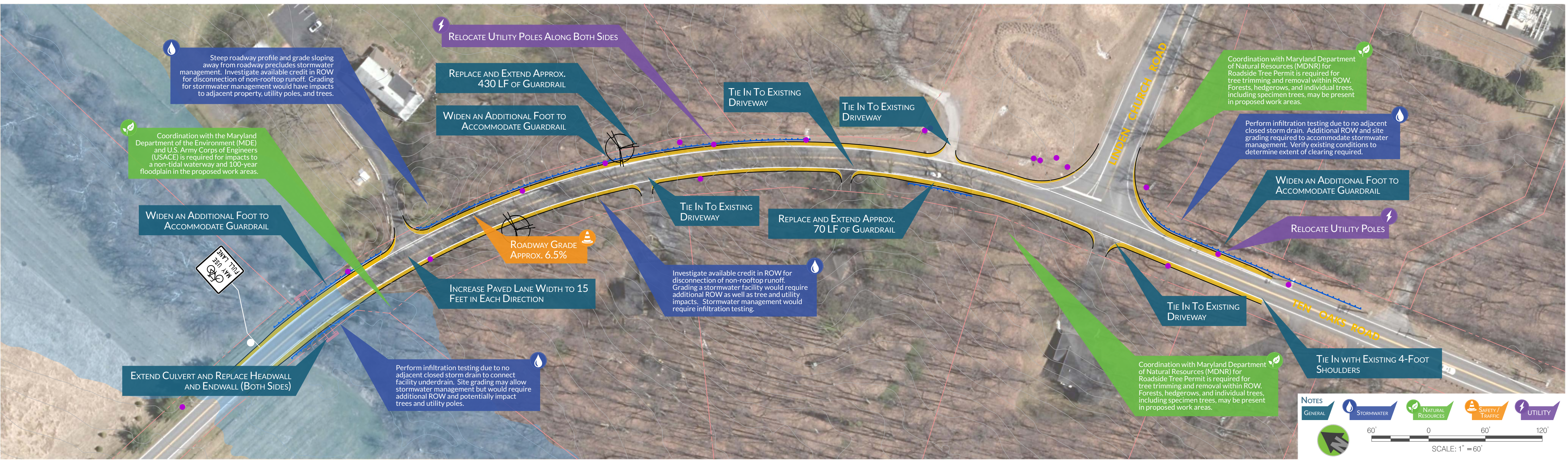
OPINION OF PROBABLE COST <small>(see appendix A for details)</small>	
	\$1,106,923

Pinch Point Criteria:

- Shoulder Width
- Sight Distance
- Road Grade

PINCH POINT 4

Alternative B3 | DOUBLE-SIDED Bicycle-Friendly Shoulder on East + West Side of Ten Oaks Road

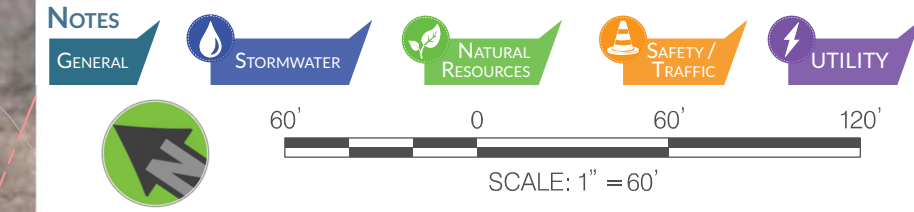


IMPACTS AND FACILITY SUMMARY

	EXISTING	IMPACT	NOTES
TRAVEL LANES	11' 10'	YES	8,152 SF INCREASE FOR PAVED SHOULDERS
TREES + NATURAL RESOURCES	YES	YES	REMOVAL OF 2 TREES REQUIRED
GUARDRAIL	YES	YES	992 LF GUARDRAIL ADDED
CULVERT	YES	YES	1 CULVERT EXTENSION REQUIRED
UTILITIES	YES	YES	RELOCATION OF 10 POLES REQUIRED

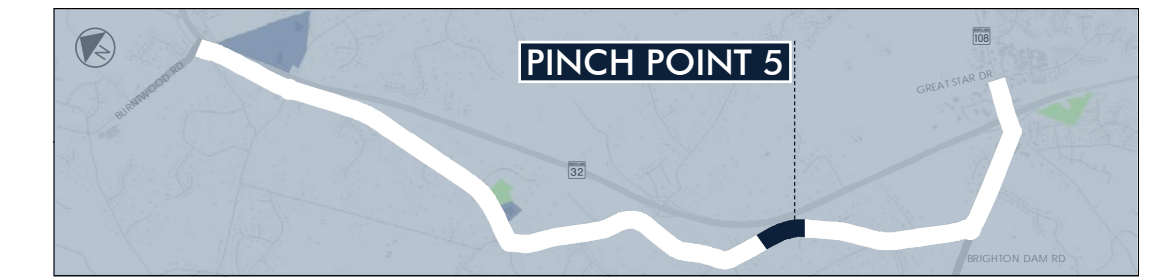
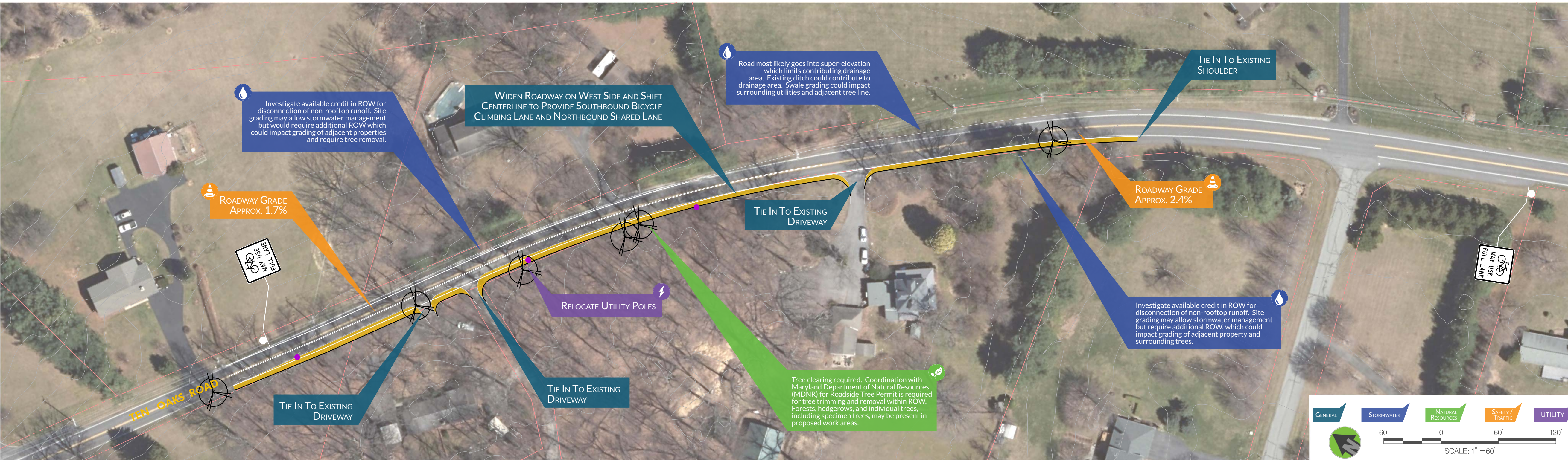
	EAST	WEST
SHOULDER/ROADWAY WIDENING	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
POTENTIAL ROW IMPACTS <small>(no survey completed at this time)</small>	4	4
OPINION OF PROBABLE COST <small>(see appendix A for details)</small>	\$1,976,087	

- Pinch Point Criteria:**
- Shoulder Width
 - Sight Distance
 - Road Grade



PINCH POINT 5

Alternative B1 | West, SINGLE-SIDE Bicycle Friendly Shoulder on West Side of Ten Oaks Road



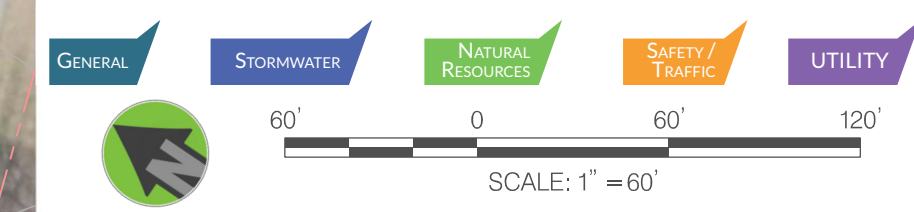
IMPACTS AND FACILITY SUMMARY

	EXISTING	IMPACT	NOTES
TRAVEL LANES	11' 10'	YES	4,879 SF INCREASE FOR PAVED SHOULDERS
TREES + NATURAL RESOURCES	YES	YES	REMOVAL OF 5 TREES REQUIRED
GUARDRAIL	NO	-	-
CULVERT	NO	-	-
UTILITIES	YES	YES	RELOCATION OF 3 POLES REQUIRED

	EAST	WEST
SHOULDER/ROADWAY WIDENING		<input checked="" type="checkbox"/>
POTENTIAL ROW IMPACTS <small>(no survey completed at this time)</small>		4
OPINION OF PROBABLE COST <small>(see appendix A for details)</small>	\$666,202	

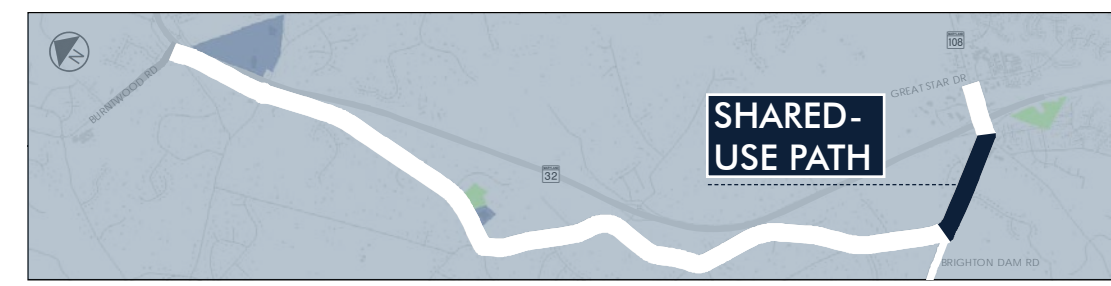
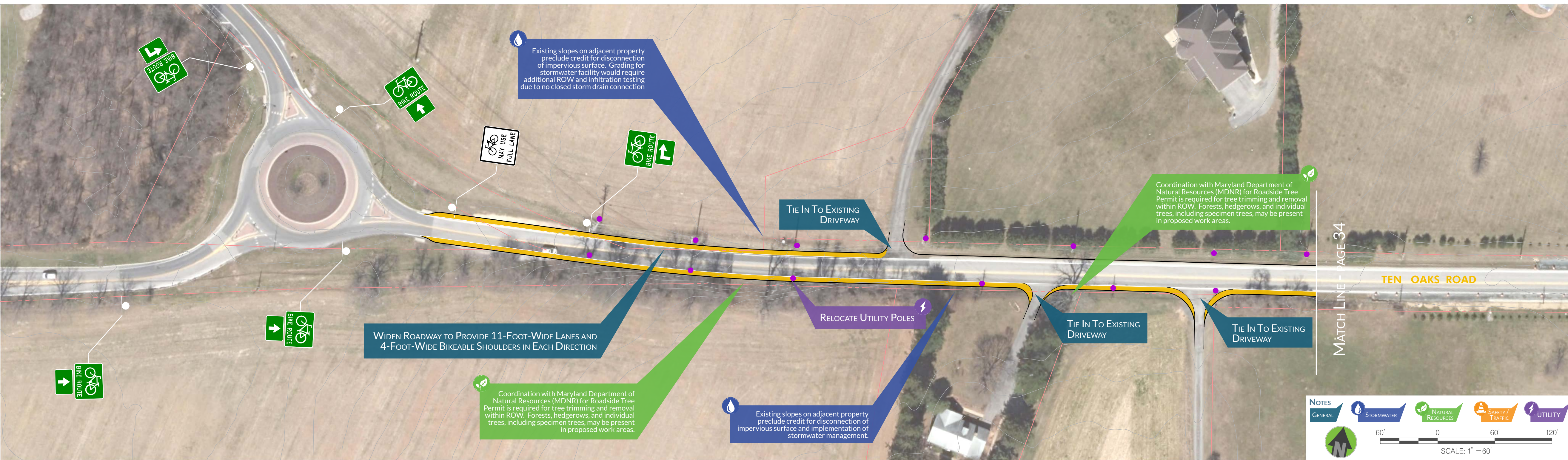
Pinch Point Criteria:

- Shoulder Width
- Sight Distance
- Road Grade



PINCH POINT 6

Alternative C1 Bicycle Lanes + North Side Shared-Use Path Along Ten Oaks Road



IMPACTS AND FACILITY SUMMARY

	EXISTING	IMPACT	NOTES
TRAVEL LANES	11' 11'	YES	24,403 SF INCREASE FOR PAVED SHOULDERS
TREES + NATURAL RESOURCES	YES	-	-
GUARDRAIL	NO	-	-
CULVERT	NO	-	-
UTILITIES	YES	YES	RELOCATION OF 20 POLES REQUIRED

	NORTH	SOUTH
SHOULDER/ROADWAY WIDENING		

	NORTH	SOUTH
POTENTIAL ROW IMPACTS <small>(no survey completed at this time)</small>	11	5

OPINION OF PROBABLE COST <small>(see appendix A for details)</small>	\$3,186,181 (TOTAL)
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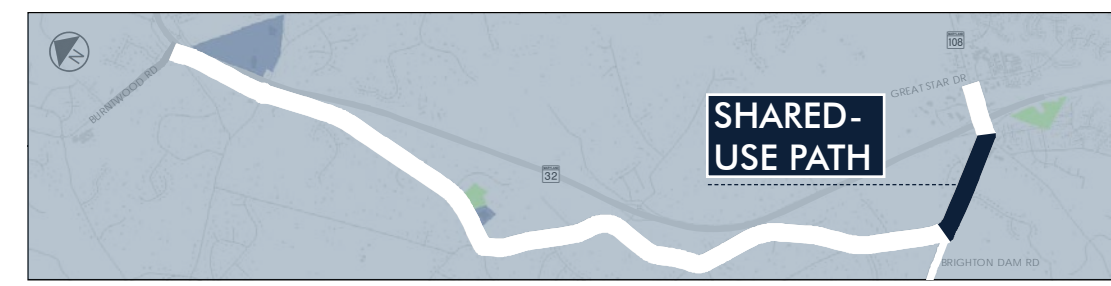
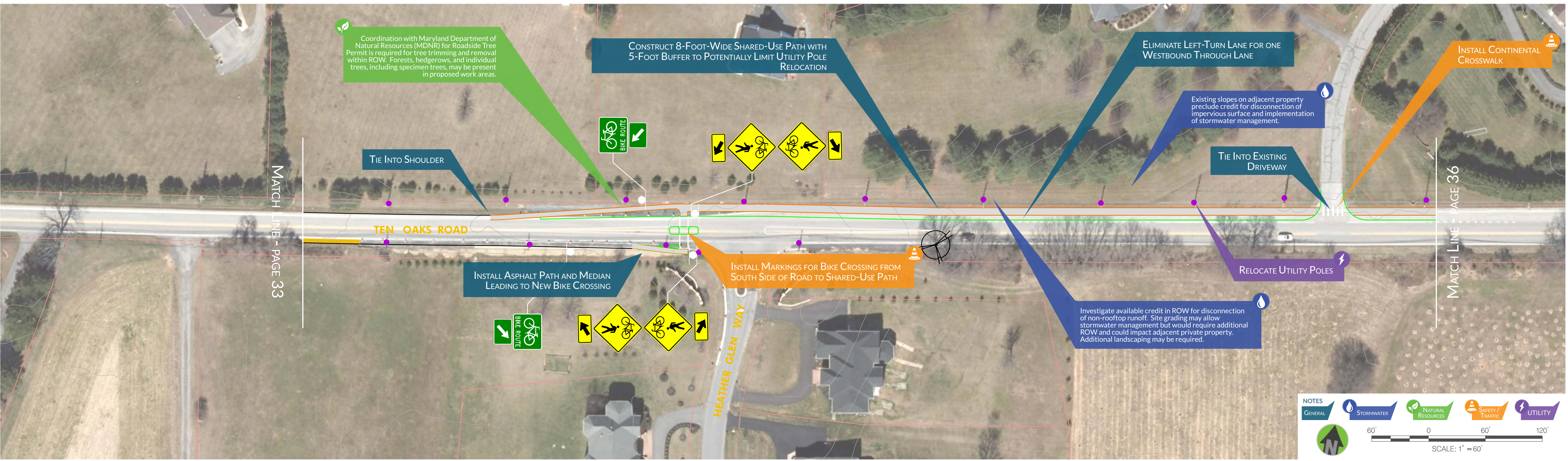
NOTES

- STORMWATER
- NATURAL RESOURCES
- SAFETY / TRAFFIC
- UTILITY

SCALE: 1" = 60'

PINCH POINT 6

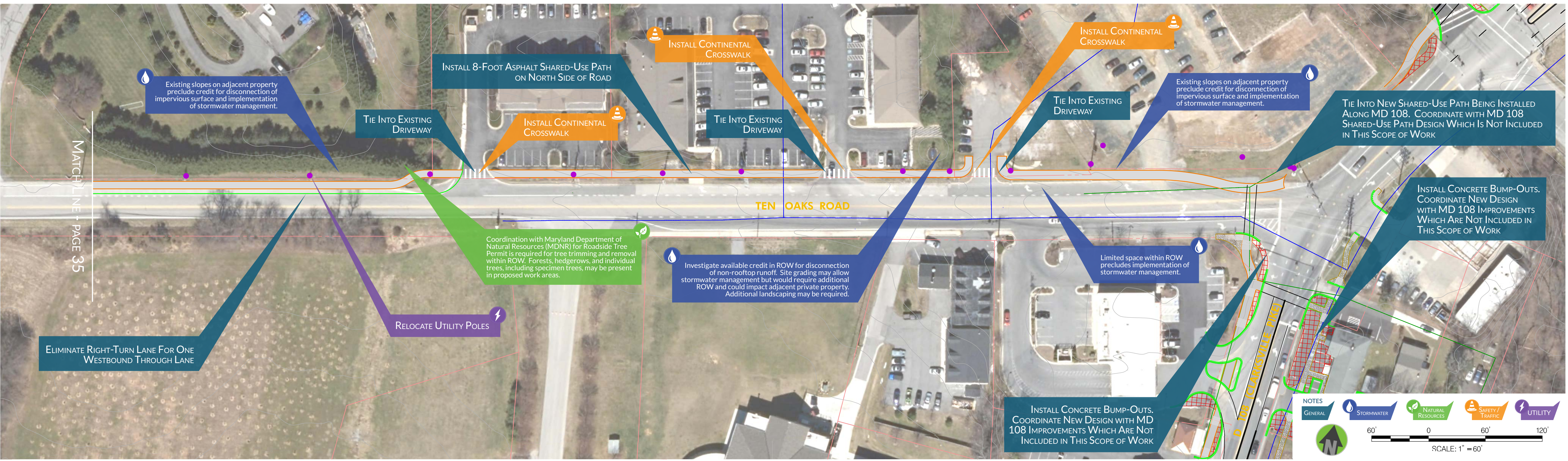
Alternative C1
Bike Lanes + North Side Shared-Use Path Along Ten Oaks Road



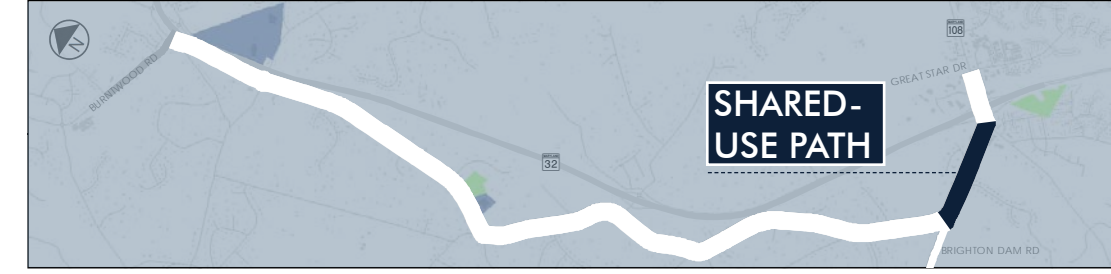
Please refer to the table on page 33.

PINCH POINT 6

Alternative C1 Bike Lanes + North Side Shared-Use Path Along Ten Oaks Road



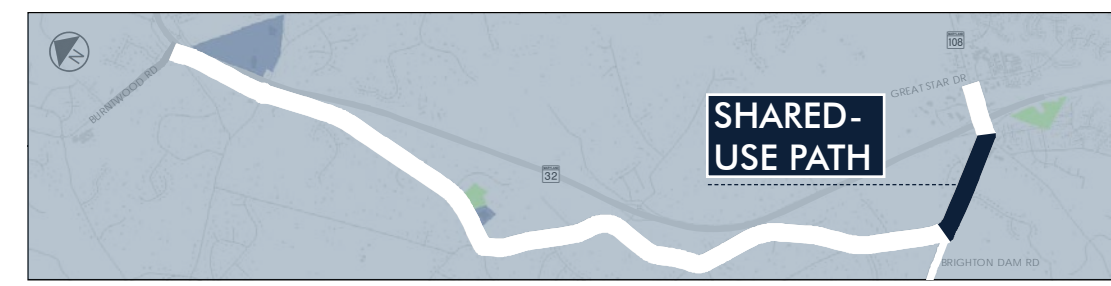
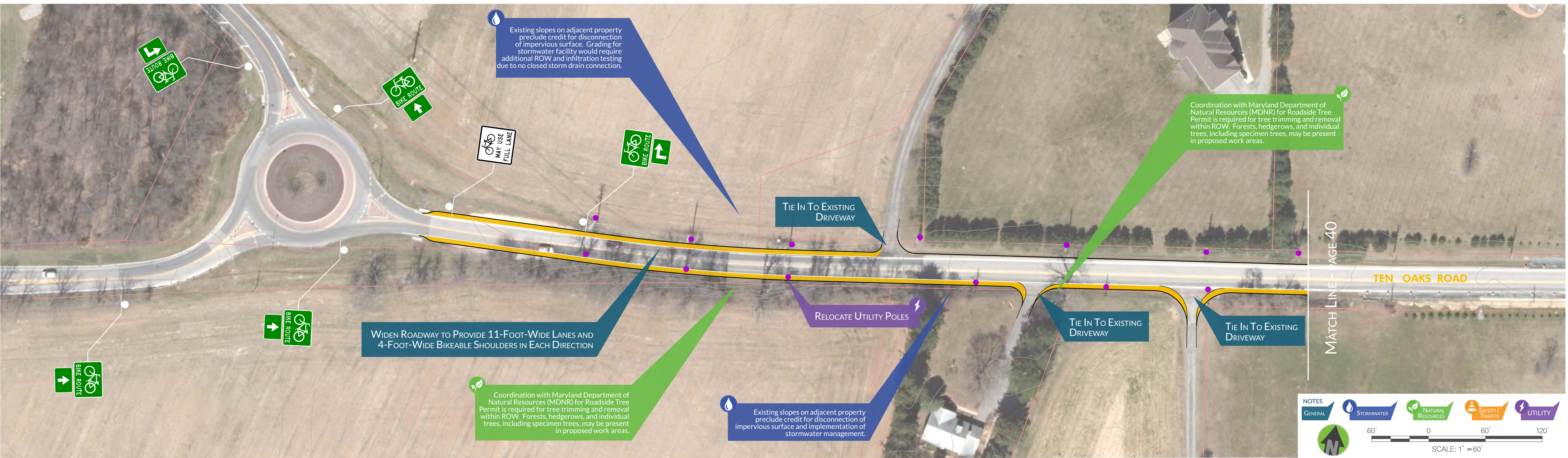
MATCH LINE - PAGE 35



Please refer to the table on page 33.

PINCH POINT 6

Alternative C2 Bike Lanes + South Side Shared-Use Path Along Ten Oaks Road



IMPACTS AND FACILITY SUMMARY

	EXISTING	IMPACT	NOTES
TRAVEL LANES	11' 11'	YES	23,403 SF INCREASE FOR PAVED SHOULDERS
TREES + NATURAL RESOURCES	YES	YES	REMOVAL OF 1 TREE REQUIRED
GUARDRAIL	NO	-	-
CULVERT	NO	-	-
UTILITIES	YES	YES	RELOCATION OF 13 POLES REQUIRED

SHOULDER/ROADWAY WIDENING	NORTH	SOUTH

POTENTIAL ROW IMPACTS <small>(no survey completed at this time)</small>	NORTH	SOUTH
	2	10

OPINION OF PROBABLE COST <small>(see appendix A for details)</small>	
	\$3,210,898 (TOTAL)

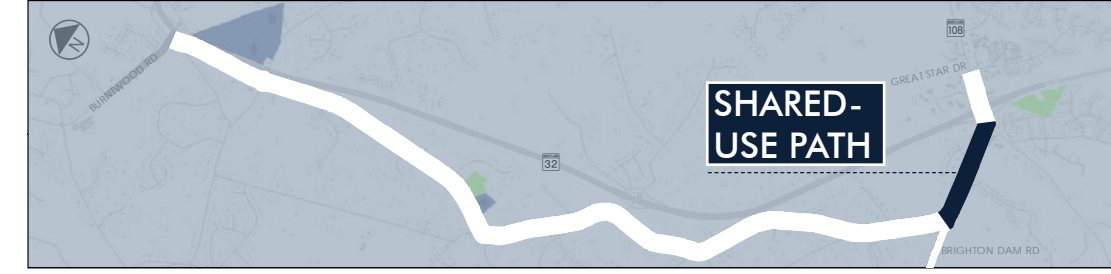
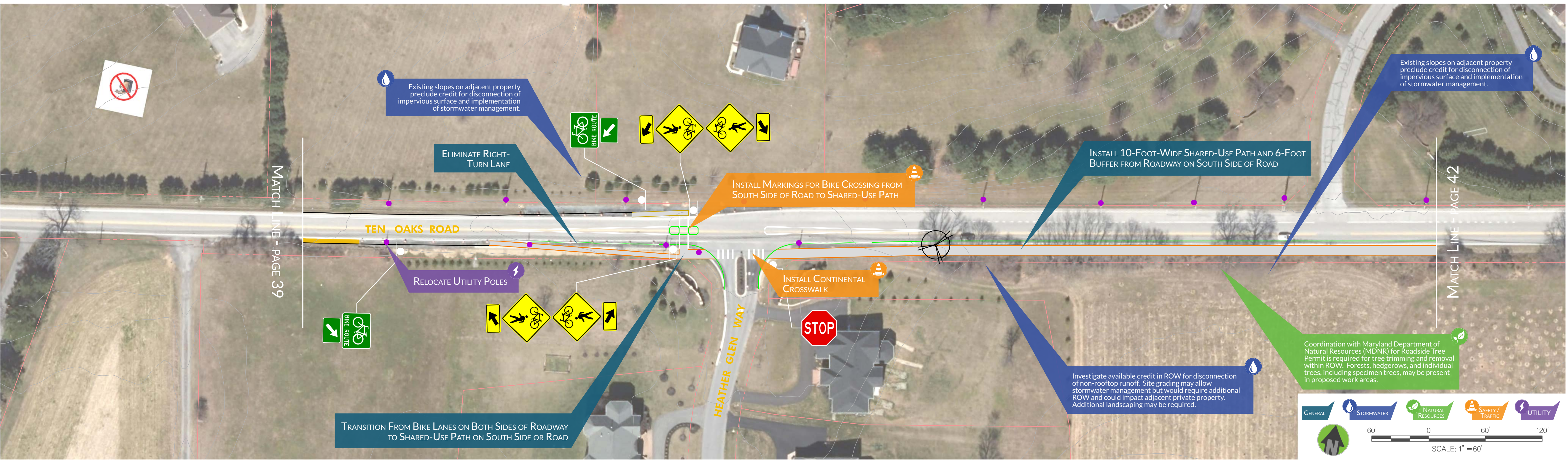
NOTES

- GENERAL
- STORMWATER
- NATURAL RESOURCES
- SAFETY / TRAFFIC
- UTILITY

SCALE: 1" = 60'

PINCH POINT 6

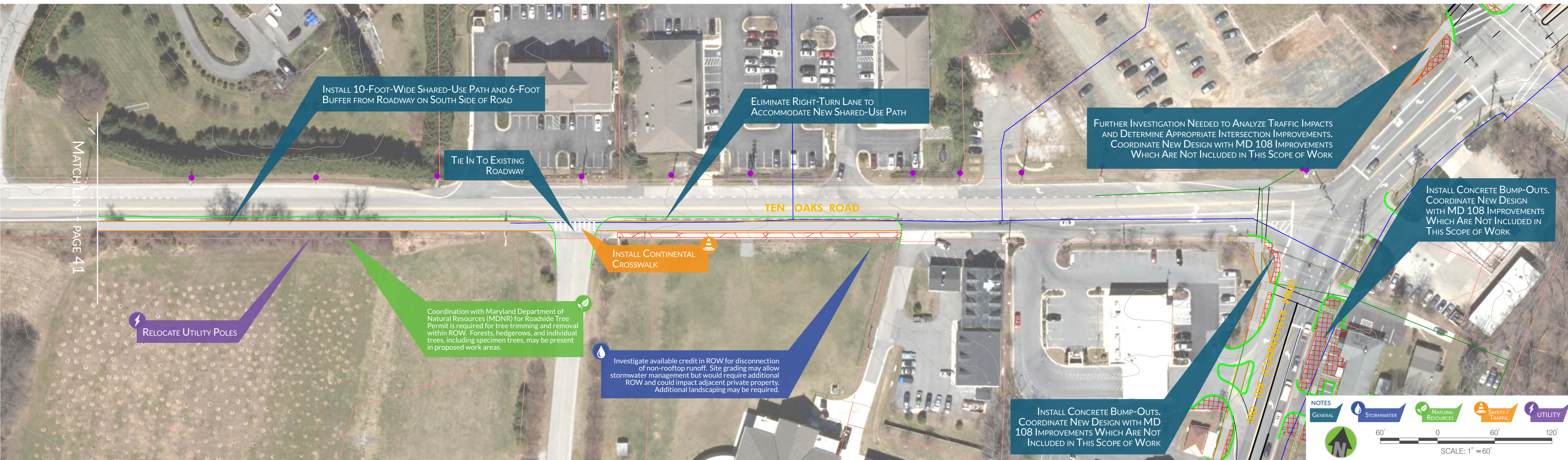
Alternative C2
Bike Lanes + South Side Shared-Use Path Along Ten Oaks Road



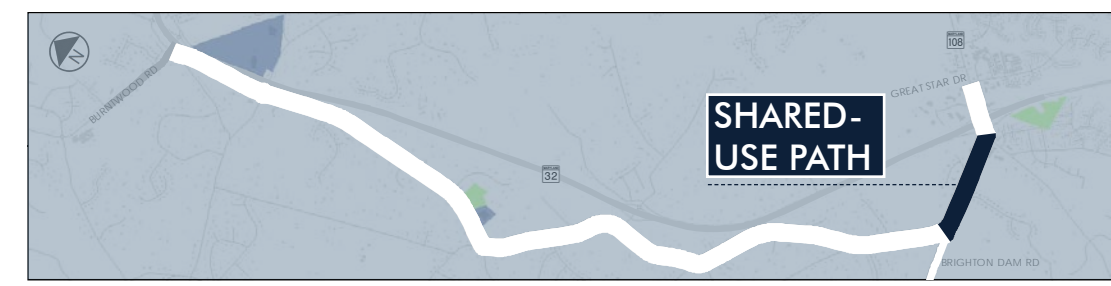
Please refer to the table on page 39.

PINCH POINT 6

Alternative C2 Bike Lanes + South Side Shared-Use Path Along Ten Oaks Road



MATCH LINE - PAGE 41



Please refer to the table on page 39.



Next Steps

Implementation Strategies

This study identified a need for improving the bicycle comfort level along Ten Oaks Road between MD 108 and Burntwoods Road at specific locations. A range of concepts were identified to address these needs.

The improvements identified in this study could be funded through an MDOT SHA project, as prioritized by Howard County in their annual transportation priorities letter, or through the MDOT grant programs, as summarized on the following page. A phased implementation approach to establishing the Alternate MD 32 Bicycle Route is recommended as follows:

- 1. Signage** - Signage to establish the bicycle route is identified as the first implementation priority. Design and construction of the signage concept in this report is estimated at \$35,724 and could be funded by an MDOT grant program or an MDOT SHA project.
- 2. Prioritize Pinch Point Improvements** - Due to the rural nature and low traffic along Ten Oaks Road between Brighton Dam Road and Burntwoods Road, improvements at the five identified pinch points are identified as second priority. A public process for choosing and prioritizing improvements at the five pinch points is recommended. A combination of state and federal funding sources can be explored to advance improvements at each location.
- 3. Pinch Point 6 / Suburban Section Shared Use Path** - The shared use path concepts along Ten Oaks Road, between Brighton Dam Road and MD 108, would address the narrow, more congested segment of Ten Oaks Road and is proposed as the high capital improvement priority. Both shared use path concepts are estimated at approximately \$3.2 million each. A combination of state and federal funding sources can be explored. MDOT SHA could work with HCDOT to coordinate improvements with their ongoing MD 108 project to ensure the new facilities noted in this study tie-in directly to the facilities being installed by HCDOT.

The phased approach noted above will enable concepts to be implemented through a flexible approach that can best leverage available funding opportunities.

The Benefits of Community Champions

While the majority of the design, engineering, and implementation work for transportation projects are typically handled by government agencies, there is an immense benefit in establishing local “Community Champions” for the project early in the development process. The residents and local stakeholders near the project area should identify several local leaders to continually mobilize project support and serve as points of contact for agencies to disseminate major project information and updates. They can also engage additional third parties and local organizations that may not have been involved in the engagement process to date.



Bicycle & Pedestrian Project Grant Programs

MDOT Administers several grant assistance programs to promote transportation alternatives that facilitate access to everyday needs, support local economies, and enhance qualities of life.



Transportation Alternatives Program (TAP)

roads.maryland.gov/Index.aspx?PageId=144

- **Funding** - Federal TAP allocation administered by MDOT SHA (State Highway Administration) in coordination with Metropolitan Planning Organizations (MPOs).
- **Objective** - Enhancing the cultural, aesthetic, historic, and environmental aspects of the intermodal transportation system.
- **Eligible Applicants** - local governments, regional transportation authorities, transit agencies, natural resource or public land agencies, tribal governments, and other local and governmental entities with oversight of transportation or recreational trail.
- **Requirements** - 20% cash match, project must meet one of the nine TAP categories, comply with all applicable state and federal regulations and service a transportation purpose.

Safe Routes to School Program (SRTS)

roads.maryland.gov/Index.aspx?PageId=735

- **Funding** - Federal TAP allocation administered by MDOT SHA.
- **Objective** - Supporting infrastructure and non-infrastructure activities that enable and encourage children to safely walk, bicycle, or roll to school.
- **Requirements** - 20% cash match, must benefit elementary and middle school children in grades K-8, and must be located within a 2 mile radius of a school.

Recreational Trails Program

www.sha.maryland.gov/Index.aspx?PageId=98

- **Funding** - Federal TAP allocation administered by MDOT SHA
- **Objective** - Developing community-based, motorized, and non-motorized recreational trail projects.
- **Preferred Projects** - Connect communities with natural/cultural areas or tourism areas, have broad-based community support, link or complete existing trails, mitigate impacts on the natural environment, and involve youth conservation corps or service groups.

Transportation/Land Use Connections (TLC) Program

www.mwcog.org/transportation/planning-areas/land-use-coordination/tlc-program

- **Funding** - Administered by the Metropolitan Washington Council of Governments (MWCOC).
- **Objective** - Providing technical assistance for local jurisdictions in planning matters relating to coordination of transportation and land use.

Highway Safety Grants Program

www.mva.maryland.gov/safety/mhso/grants-management.htm

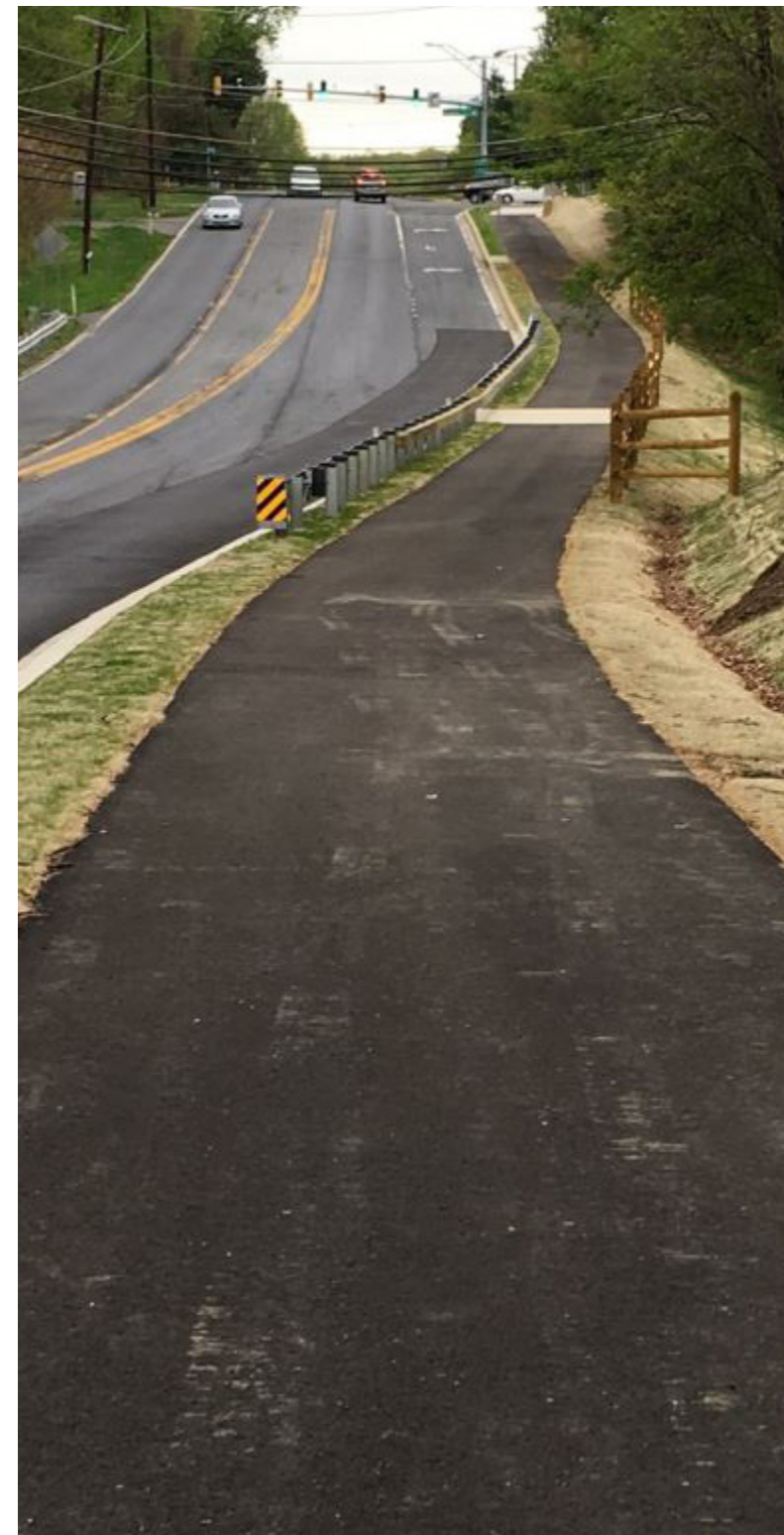
- **Funding** - Federal allocation administered by MDOT MVA (Motor Vehicle Administration).
- **Objective** - Reducing the number of motor vehicle-related crashes, deaths, and injuries on Maryland highways.
- **Requirements** - Match one of the top safety priorities and implement the strategies identified in the Strategic Highway Safety Program.



Bikeways Program

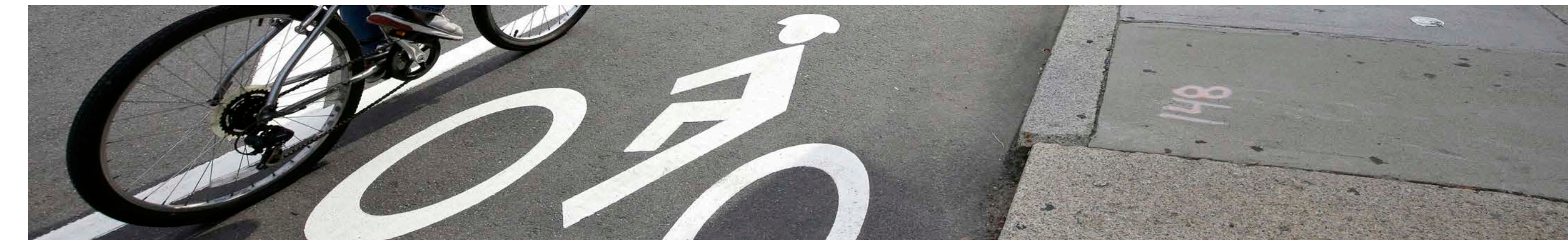
www.mdot.maryland.gov/Bikeways

- **Funding** - State transportation funds administered by MDOT TSO (Transportation Secretary's Office).
- **Objective** - Promote biking as a fun, healthy, and environmentally-friendly transportation alternative.
- **Eligible Projects** - Enhance bicycle access within 3 miles of a rail transit station or major bus transit hub, address bicycle network gaps, identified as a priority in County's most recent Annual Priority Letter, or enhance access within a Sustainable Community or designated Maryland Main Street.



MD 32 Preliminary Cost Estimate Summary

Alternate	Section	Location	Treatment	Cost
Alt. A	Norther & Suburban	Entire Corridor	Signage	\$ 35,724
Alt. B	Northern	Pinch Point 1 (B1)	Roadway Widening (West)	\$ 398,498
Alt. B	Northern	Pinch Point 2 (B1)	Roadway Widening (East)	\$ 842,651
Alt. B	Northern	Pinch Point 2 (B2)	Roadway Widening (West & East)	\$ 1,374,840
Alt. B	Northern	Pinch Point 3 (B1)	Roadway Widening (East)	\$ 257,113
Alt. B	Northern	Pinch Point 3 (B2)	Roadway Widening (West & East)	\$ 979,164
Alt. B	Northern	Pinch Point 4 (B2)	Roadway Widening (West)	\$ 995,794
Alt. B	Northern	Pinch Point 4 (B3)	Traffic Circle	\$ 1,106,923
Alt. B	Northern	Pinch Point 4 (B1)	Roadway Widening (West & East)	\$ 1,976,087
Alt. B	Northern	Pinch Point 5 (B1)	Roadway Widening (West)	\$ 666,202
Alt. C	Suburban	Pinch Point 6 / Suburban Section (C1)	Roadway Widening & Shared Use Path (North)	\$ 3,186,181
Alt. C	Suburban	Pinch Point 6 / Suburban Section (C2)	Roadway Widening & Shared Use Path (South)	\$ 3,210,898



Preliminary Cost Estimate

The concepts developed in this report include a wide range of treatments designed to improve the bicycle comfort level on Ten Oaks Road between MD 108 and Burntwoods Road at specific locations. In order to begin the process of implementing these improvements and seek out corresponding funding, cost estimates were developed for the alternatives identified.

In developing the cost estimates, the Cost Per Mile (CPM) methodology described in the MDOT SHA 2017 Highway Construction Cost Estimating Manual was used to determine the total costs for each improvement option. This method was chosen due to the conceptual nature of the current improvements. Additional planning and design work will be required to provide the sufficient engineering detail required for a final construction cost estimate. However, the cost estimates developed can be used by project stakeholders to help prioritize certain types of improvements and seek project funding in grant applications. The table to the left provides a summary of the cost estimates for each of the improvements presented in this report. As noted previously, due to the very large costs associated with widening the entire roadway and acquiring the associated ROW, the costs for the corridor widening alternate have not been included in the summary table. However, the cost estimate for the entire corridor widening has been included in the Appendix A - Cost Estimate for reference.

For additional details, assumptions, and clarifications, please refer to Appendix A - Cost Estimates.



Appendix

Cost Estimate

MD 32 Alternate Bicycle Route Study
Alternate A - Signage

Cost Per Mile Estimate					
Item	Unit	Unit Cost	Quantity	Cost	
Category 1 - Preliminary				40%	\$0
40% of Categories 2, 4, 5 & 6					
Categories 2, 5 & 6 - Roadway (Grading, Paving & Shoulders)					\$0
Collector CPM	LM ¹	\$1,800,000	0	\$0	
Milling/Resurfacing CPM	LM ¹	\$100,000	0	\$0	
Removal of Existing Curb and Gutter	LF	\$15	0	\$0	
Removal of Existing Pavement	CY	\$50	0	\$0	
Removal of Existing Sidewalk	CY	\$150	0	\$0	
PCC Pavement (For Driveways)	SY	\$130	0	\$0	
Curb and Gutter	LF	\$45	0	\$0	
5" Concrete Sidewalk	SF	\$16	0	\$0	
Thermoplastic Pavement Markings	LF	\$1.50	0	\$0	
Traffic Barrier W-Beam End Treatment, Single Face	EA	\$2,500	0	\$0	
Traffic Barrier W-Beam, Single Face	LF	\$25	0	\$0	
Single Face F-Shape Concrete Barrier	LF	\$200	0	\$0	
Category 3 - Drainage					\$0
20% of Categories 2, 4, 5 & 6					
Stormwater Management	LS	\$0	1	\$0	
Category 4 - Structures					\$0
Bridge Over Water	SF	\$320	0	0	
Bridge Over Roadway or Highway	SF	\$200	0	0	
Bridge Deck Replacement	SF	\$115	0	0	
Bridge Superstructure Replacement	SF	\$200	0	0	
Bridge Deck Overlay (Latex Modified Concrete)	SF	\$25	0	0	
Bridge Removal	SF	\$45	0	0	
Box Culverts	SF	\$325	0	0	
Category 7 - Landscaping					\$0
Turfgrass Establishment	SY	\$1.50	0	\$0	
Refertilizing	SY	\$0.80	0	\$0	
Type D Soil Stabilization Matting	SY	\$5.00	0	\$0	
Tree, Shrub and Perennial Installation & Establishment	LS	\$2,400	0	\$0	
Tree Branch Pruning	LS	\$2,500	0	\$0	
Tree Root Pruning	LF	\$10	0	\$0	
Category 8 - Traffic					\$21,000
Pedestrian/Ornamental Lighting (Both Sides of Road)					
Mainline Signing	EA	\$500	42	\$21,000	
Category 8 - Utilities					\$0
6% of Categories 2, 4, 5, and 6					
Electric / Telecom Poles	POLE	\$30,000	0	\$0	
Subtotal					\$21,000
Contingency				40%	\$8,400
Construction Total					\$29,400
Admin/Overhead				8.2%	\$2,411
Project Planning Overhead Additive				12.3%	\$3,913
Total Cost					\$35,724

MD 32 Alternate Bicycle Route Study
Alternate B - Pinch Point #1 - Concept B1

Cost Per Mile Estimate					
Item	Unit	Unit Cost	Quantity	Cost	
Category 1 - Preliminary				40%	\$45,349
40% of Categories 2, 4, 5 & 6					
Categories 2, 5 & 6 - Roadway (Grading, Paving & Shoulders)					\$113,373
Collector CPM	LM ¹	\$1,800,000	0.05	\$90,000	
Milling/Resurfacing CPM	LM ¹	\$100,000	0.14	\$14,000	
Removal of Existing Curb and Gutter	LF	\$15	0	\$0	
Removal of Existing Pavement	CY	\$50	0	\$0	
Removal of Existing Sidewalk	CY	\$150	0	\$0	
PCC Pavement (For Driveways)	SY	\$130	0	\$0	
Curb and Gutter	LF	\$45	0	\$0	
5" Concrete Sidewalk	SF	\$16	0	\$0	
Thermoplastic Pavement Markings	LF	\$1.50	665	\$998	
Traffic Barrier W-Beam End Treatment, Single Face	EA	\$2,500	1	\$2,500	
Traffic Barrier W-Beam, Single Face	LF	\$25	235	\$5,875	
Single Face F-Shape Concrete Barrier	LF	\$200	0	\$0	
Category 3 - Drainage					\$22,675
20% of Categories 2, 4, 5 & 6					
Stormwater Management	LS	\$0	0	\$0	
Category 4 - Structures					\$0
Bridge Over Water	SF	\$320	0	0	
Bridge Over Roadway or Highway	SF	\$200	0	0	
Bridge Deck Replacement	SF	\$115	0	0	
Bridge Superstructure Replacement	SF	\$200	0	0	
Bridge Deck Overlay (Latex Modified Concrete)	SF	\$25	0	0	
Bridge Removal	SF	\$45	0	0	
Box Culverts	SF	\$325	0	0	
Category 7 - Landscaping					\$15,558
Turfgrass Establishment	SY	\$1.50	1,312	\$1,968	
Refertilizing	SY	\$0.80	1,312	\$1,050	
Type D Soil Stabilization Matting	SY	\$5.00	1,312	\$6,560	
Tree, Shrub and Perennial Installation & Establishment	LS	\$2,400	1	\$2,400	
Tree Branch Pruning	LS	\$2,500	1	\$2,500	
Tree Root Pruning	LF	\$10	108	\$1,080	
Category 8 - Traffic					\$500
Pedestrian/Ornamental Lighting (Both Sides of Road)					
Mainline Signing	EA	\$500	1	\$500	
Category 8 - Utilities					\$36,802
6% of Categories 2, 4, 5, and 6					
Electric / Telecom Poles	POLE	\$30,000	1	\$30,000	
Subtotal					\$234,256
Contingency				40%	\$93,702
Construction Total					\$327,958
Admin/Overhead				8.2%	\$26,893
Project Planning Overhead Additive				12.3%	\$43,647
Total Cost					\$398,498

MD 32 Alternate Bicycle Route Study
Alternate B - Pinch Point #2 - Concept B1

Cost Per Mile Estimate					
Item	Unit	Unit Cost	Quantity	Cost	
Category 1 - Preliminary				40%	\$92,875
40% of Categories 2, 4, 5 & 6					
Categories 2, 5 & 6 - Roadway (Grading, Paving & Shoulders)					\$232,188
Collector CPM	LM ¹	\$1,800,000	0.10	\$180,000	
Milling/Resurfacing CPM	LM ¹	\$100,000	0.44	\$44,000	
Removal of Existing Curb and Gutter	LF	\$15	0	\$0	
Removal of Existing Pavement	CY	\$50	0	\$0	
Removal of Existing Sidewalk	CY	\$150	0	\$0	
PCC Pavement (For Driveways)	SY	\$130	0	\$0	
Curb and Gutter	LF	\$45	0	\$0	
5" Concrete Sidewalk	SF	\$16	0	\$0	
Thermoplastic Pavement Markings	LF	\$1.50	3,325	\$4,988	
Traffic Barrier W-Beam End Treatment, Single Face	EA	\$2,500	0	\$0	
Traffic Barrier W-Beam, Single Face	LF	\$25	128	\$3,200	
Single Face F-Shape Concrete Barrier	LF	\$200	0	\$0	
Category 3 - Drainage				20%	\$46,438
20% of Categories 2, 4, 5 & 6					
Stormwater Management	LS	\$0	0	\$0	
Category 4 - Structures					\$0
Bridge Over Water	SF	\$320	0	\$0	
Bridge Over Roadway or Highway	SF	\$200	0	\$0	
Bridge Deck Replacement	SF	\$115	0	\$0	
Bridge Superstructure Replacement	SF	\$200	0	\$0	
Bridge Deck Overlay (Latex Modified Concrete)	SF	\$25	0	\$0	
Bridge Removal	SF	\$45	0	\$0	
Box Culverts	SF	\$325	0	\$0	
Category 7 - Landscaping					\$18,919
Turfgrass Establishment	SY	\$1.50	1,304	\$1,956	
Refertilizing	SY	\$0.80	1,304	\$1,043	
Type D Soil Stabilization Matting	SY	\$5.00	1,304	\$6,520	
Tree, Shrub and Perennial Installation & Establishment	LS	\$3,900.00	1	\$3,900	
Tree Branch Pruning	LF	\$2,500.00	1	\$2,500	
Tree Root Pruning	LF	\$10.00	300	\$3,000	
Category 8 - Traffic					\$1,000
Pedestrian/Ornamental Lighting (Both Sides of Road)	MI	\$1,408,000	0	\$0	
Mainline Signing	EA	\$500	2	\$1,000	
Category 8 - Utilities				6%	\$103,931
6% of Categories 2, 4, 5, and 6					
Electric / Telecom Poles	POLE	\$30,000	3	\$90,000	
Subtotal					\$495,350
Contingency				40%	\$198,140
Construction Total					\$693,491
Admin/Overhead				8.2%	\$56,866
Project Planning Overhead Additive				12.3%	\$92,294
Total Cost					\$842,651

MD 32 Alternate Bicycle Route Study
Alternate B - Pinch Point #2 - Concept B2

Cost Per Mile Estimate					
Item	Unit	Unit Cost	Quantity	Cost	
Category 1 - Preliminary				40%	\$129,220
40% of Categories 2, 4, 5 & 6					
Categories 2, 5 & 6 - Roadway (Grading, Paving & Shoulders)					\$287,950
Collector CPM	LM ¹	\$1,800,000	0.12	\$216,000	
Milling/Resurfacing CPM	LM ¹	\$100,000	0.34	\$34,000	
Removal of Existing Curb and Gutter	LF	\$15	0	\$0	
Removal of Existing Pavement	CY	\$50	0	\$0	
Removal of Existing Sidewalk	CY	\$150	0	\$0	
PCC Pavement (For Driveways)	SY	\$130	0	\$0	
Curb and Gutter	LF	\$45	0	\$0	
5" Concrete Sidewalk	SF	\$16	0	\$0	
Thermoplastic Pavement Markings	LF	\$1.50	2,300	\$3,450	
Traffic Barrier W-Beam End Treatment, Single Face	EA	\$2,500	5	\$12,500	
Traffic Barrier W-Beam, Single Face	LF	\$25	880	\$22,000	
Single Face F-Shape Concrete Barrier	LF	\$200	0	\$0	
Category 3 - Drainage				20%	\$64,610
20% of Categories 2, 4, 5 & 6					
Stormwater Management	LS	\$0	0	\$0	
Category 4 - Structures					\$35,100
Bridge Over Water	SF	\$320	0	\$0	
Bridge Over Roadway or Highway	SF	\$200	0	\$0	
Bridge Deck Replacement	SF	\$115	0	\$0	
Bridge Superstructure Replacement	SF	\$200	0	\$0	
Bridge Deck Overlay (Latex Modified Concrete)	SF	\$25	0	\$0	
Bridge Removal	SF	\$45	0	\$0	
Box Culverts	SF	\$325	108	\$35,100	
Category 7 - Landscaping					\$60,934
Turfgrass Establishment	SY	\$1.50	3,568	\$5,352	
Refertilizing	SY	\$0.80	3,568	\$2,854	
Type D Soil Stabilization Matting	SY	\$5	3,568	\$17,840	
Tree, Shrub and Perennial Installation & Establishment	LS	\$18,607.20	1	\$18,607	
Tree Branch Pruning	LF	\$5,000	1	\$5,000	
Tree Root Pruning	LF	\$10	1,128	\$11,280	
Category 8 - Traffic					\$1,000
Pedestrian/Ornamental Lighting (Both Sides of Road)	MI	\$1,408,000	0	\$0	
Mainline Signing	EA	\$500	2	\$1,000	
Category 8 - Utilities				6%	\$229,383
6% of Categories 2, 4, 5, and 6					
Electric / Telecom Poles	POLE	\$30,000	7	\$210,000	
Subtotal					\$808,197
Contingency				40%	\$323,279
Construction Total					\$1,131,475
Admin/Overhead				8.2%	\$92,781
Project Planning Overhead Additive				12.3%	\$150,584
Total Cost					\$1,374,840

MD 32 Alternate Bicycle Route Study
Alternate B - Pinch Point #3 - Concept B1

Cost Per Mile Estimate					
Item	Unit	Unit Cost	Quantity	Cost	
Category 1 - Preliminary				40%	\$33,515
40% of Categories 2, 4, 5 & 6					
Categories 2, 5 & 6 - Roadway (Grading, Paving & Shoulders)					\$83,788
Collector CPM	LM ¹	\$1,800,000	0.04	\$72,000	
Milling/Resurfacing CPM	LM ¹	\$100,000	0.1	\$11,000	
Removal of Existing Curb and Gutter	LF	\$15	0	\$0	
Removal of Existing Pavement	CY	\$50	0	\$0	
Removal of Existing Sidewalk	CY	\$150	0	\$0	
PCC Pavement (For Driveways)	SY	\$130	0	\$0	
Curb and Gutter	LF	\$45	0	\$0	
5" Concrete Sidewalk	SF	\$16	0	\$0	
Thermoplastic Pavement Markings	LF	\$1.50	525	\$788	
Traffic Barrier W-Beam End Treatment, Single Face	EA	\$2,500	0	\$0	
Traffic Barrier W-Beam, Single Face	LF	\$25	0	\$0	
Single Face F-Shape Concrete Barrier	LF	\$200	0	\$0	
Category 3 - Drainage				20%	\$16,758
20% of Categories 2, 4, 5 & 6					
Stormwater Management	LS	\$0	0	\$0	
Category 4 - Structures					\$0
Bridge Over Water	SF	\$320	0	\$0	
Bridge Over Roadway or Highway	SF	\$200	0	\$0	
Bridge Deck Replacement	SF	\$115	0	\$0	
Bridge Superstructure Replacement	SF	\$200	0	\$0	
Bridge Deck Overlay (Latex Modified Concrete)	SF	\$25	0	\$0	
Bridge Removal	SF	\$45	0	\$0	
Box Culverts	SF	\$325	0	\$0	
Category 7 - Landscaping					\$11,056
Turfgrass Establishment	SY	\$1.50	720	\$1,080	
Refertilizing	SY	\$0.80	720	\$576	
Type D Soil Stabilization Matting	SY	\$5	720	\$3,600	
Tree, Shrub and Perennial Installation & Establishment	LS	\$1,500	1	\$1,500	
Tree Branch Pruning	LF	\$2,500	1	\$2,500	
Tree Root Pruning	LF	\$10	180	\$1,800	
Category 8 - Traffic					\$1,000
Pedestrian/Ornamental Lighting (Both Sides of Road)	MI	\$1,408,000	0	\$0	
Mainline Signing	EA	\$500	2	\$1,000	
Category 8 - Utilities				6%	\$5,027
6% of Categories 2, 4, 5, and 6					
Electric / Telecom Poles	POLE	\$30,000	0	\$0	
Subtotal					\$151,143
Contingency				40%	\$60,457
Construction Total					\$211,601
Admin/Overhead				8.2%	\$17,351
Project Planning Overhead Additive				12.3%	\$28,161
Total Cost					\$257,113

MD 32 Alternate Bicycle Route Study
Alternate B - Pinch Point #3 - Concept B2

Cost Per Mile Estimate					
Item	Unit	Unit Cost	Quantity	Cost	
Category 1 - Preliminary				40%	\$96,824
40% of Categories 2, 4, 5 & 6					
Categories 2, 5 & 6 - Roadway (Grading, Paving & Shoulders)					\$242,060
Collector CPM	LM ¹	\$1,800,000	0.1	\$198,000	
Milling/Resurfacing CPM	LM ¹	\$100,000	0.3	\$26,000	
Removal of Existing Curb and Gutter	LF	\$15	0	\$0	
Removal of Existing Pavement	CY	\$50	0	\$0	
Removal of Existing Sidewalk	CY	\$150	0	\$0	
PCC Pavement (For Driveways)	SY	\$130	0	\$0	
Curb and Gutter	LF	\$45	0	\$0	
5" Concrete Sidewalk	SF	\$16	0	\$0	
Thermoplastic Pavement Markings	LF	\$1.50	1,540	\$2,310	
Traffic Barrier W-Beam End Treatment, Single Face	EA	\$2,500	1	\$2,500	
Traffic Barrier W-Beam, Single Face	LF	\$25	530	\$13,250	
Single Face F-Shape Concrete Barrier	LF	\$200	0	\$0	
Category 3 - Drainage				20%	\$48,412
20% of Categories 2, 4, 5 & 6					
Stormwater Management	LS	\$0	1	\$0	
Category 4 - Structures					\$0
Bridge Over Water	SF	\$320	0	\$0	
Bridge Over Roadway or Highway	SF	\$200	0	\$0	
Bridge Deck Replacement	SF	\$115	0	\$0	
Bridge Superstructure Replacement	SF	\$200	0	\$0	
Bridge Deck Overlay (Latex Modified Concrete)	SF	\$25	0	\$0	
Bridge Removal	SF	\$45	0	\$0	
Box Culverts	SF	\$325	0	\$0	
Category 7 - Landscaping					\$22,780
Turfgrass Establishment	SY	\$1.50	1,552	\$2,328	
Refertilizing	SY	\$0.80	1,552	\$1,242	
Type D Soil Stabilization Matting	SY	\$5.00	1,552	\$7,760	
Tree, Shrub and Perennial Installation & Establishment	LS	\$4,200.00	1	\$4,200	
Tree Branch Pruning	LF	\$2,500.00	1	\$2,500	
Tree Root Pruning	LF	\$10.00	475	\$4,750	
Category 8 - Traffic					\$1,000
Pedestrian/Ornamental Lighting (Both Sides of Road)	MI	\$1,408,000	0	\$0	
Mainline Signing	EA	\$500	2	\$1,000	
Category 8 - Utilities				6%	\$164,524
6% of Categories 2, 4, 5, and 6					
Electric / Telecom Poles	POLE	\$30,000	5	\$150,000	
Subtotal					\$575,599
Contingency				40%	\$230,240
Construction Total					\$805,839
Admin/Overhead				8.2%	\$66,079
Project Planning Overhead Additive				12.3%	\$107,246
Total Cost					\$979,164

MD 32 Alternate Bicycle Route Study
Alternate B - Pinch Point #4 - Concept B1

Cost Per Mile Estimate					
Item	Unit	Unit Cost	Quantity	Cost	
Category 1 - Preliminary				40%	\$132,314
40% of Categories 2, 4, 5 & 6					
Categories 2, 5 & 6 - Roadway (Grading, Paving & Shoulders)					\$283,985
Collector CPM	LM ¹	\$1,800,000	0.13	\$234,000	
Milling/Resurfacing CPM	LM ¹	\$100,000	0.39	\$39,000	
Removal of Existing Curb and Gutter	LF	\$15	0	\$0	
Removal of Existing Pavement	CY	\$50	0	\$0	
Removal of Existing Sidewalk	CY	\$150	0	\$0	
PCC Pavement (For Driveways)	SY	\$130	0	\$0	
Curb and Gutter	LF	\$45	0	\$0	
5" Concrete Sidewalk	SF	\$16	0	\$0	
Thermoplastic Pavement Markings	LF	\$1.50	2,990	\$4,485	
Traffic Barrier W-Beam End Treatment, Single Face	EA	\$2,500	1	\$2,500	
Traffic Barrier W-Beam, Single Face	LF	\$25	160	\$4,000	
Single Face F-Shape Concrete Barrier	LF	\$200	0	\$0	
Category 3 - Drainage				20%	\$66,157
20% of Categories 2, 4, 5 & 6					
Stormwater Management	LS	\$0	1	\$0	
Category 4 - Structures					\$46,800
Bridge Over Water	SF	\$320	0	\$0	
Bridge Over Roadway or Highway	SF	\$200	0	\$0	
Bridge Deck Replacement	SF	\$115	0	\$0	
Bridge Superstructure Replacement	SF	\$200	0	\$0	
Bridge Deck Overlay (Latex Modified Concrete)	SF	\$25	0	\$0	
Bridge Removal	SF	\$45	0	\$0	
Box Culverts	SF	\$325	144	\$46,800	
Category 7 - Landscaping					\$35,272
Turfgrass Establishment	SY	\$1.50	1,600	\$2,400	
Refertilizing	SY	\$0.80	1,600	\$1,280	
Type D Soil Stabilization Matting	SY	\$5	1,600	\$8,000	
Tree, Shrub and Perennial Installation & Establishment	LS	\$10,092	1	\$10,092	
Tree Branch Pruning	LS	\$2,500	1	\$2,500	
Tree Root Pruning	LF	\$10	1,100	\$11,000	
Category 8 - Traffic					\$1,000
Pedestrian/Ornamental Lighting (Both Sides of Road)	MI	\$1,408,000	0	\$0	
Mainline Signing	EA	\$500	2	\$1,000	
Category 8 - Utilities				6%	\$19,847
6% of Categories 2, 4, 5, and 6					
Electric / Telecom Poles	POLE	\$30,000	0	\$0	
Subtotal					\$585,375
Contingency				40%	\$234,150
Construction Total					\$819,525
Admin/Overhead				8.2%	\$67,201
Project Planning Overhead Additive				12.3%	\$109,067
Total Cost					\$995,794

MD 32 Alternate Bicycle Route Study
Alternate B - Pinch Point #4 - Concept B2

Cost Per Mile Estimate					
Item	Unit	Unit Cost	Quantity	Cost	
Category 1 - Preliminary				40%	\$112,780
40% of Categories 2, 4, 5 & 6					
Categories 2, 5 & 6 - Roadway (Grading, Paving & Shoulders)					\$281,949
Collector CPM	LM ¹	\$1,800,000	0.1	\$216,000	
Milling/Resurfacing CPM	LM ¹	\$100,000	0.2	\$23,000	
Removal of Existing Curb and Gutter	LF	\$15	0	\$0	
Removal of Existing Pavement	CY	\$50	0	\$0	
Removal of Existing Sidewalk	CY	\$150	0	\$0	
PCC Pavement (For Driveways)	SY	\$130	227	\$29,539	
Curb and Gutter	LF	\$45	230	\$10,350	
5" Concrete Sidewalk	SF	\$16	0	\$0	
Thermoplastic Pavement Markings	LF	\$1.50	2,040	\$3,060	
Traffic Barrier W-Beam End Treatment, Single Face	EA	\$2,500	0	\$0	
Traffic Barrier W-Beam, Single Face	LF	\$25	0	\$0	
Single Face F-Shape Concrete Barrier	LF	\$200	0	\$0	
Category 3 - Drainage				20%	\$56,390
20% of Categories 2, 4, 5 & 6					
Stormwater Management	LS	\$0	0	\$0	
Category 4 - Structures					\$0
Bridge Over Water	SF	\$320	0	\$0	
Bridge Over Roadway or Highway	SF	\$200	0	\$0	
Bridge Deck Replacement	SF	\$115	0	\$0	
Bridge Superstructure Replacement	SF	\$200	0	\$0	
Bridge Deck Overlay (Latex Modified Concrete)	SF	\$25	0	\$0	
Bridge Removal	SF	\$45	0	\$0	
Box Culverts	SF	\$325	0	\$0	
Category 7 - Landscaping					\$45,667
Turfgrass Establishment	SY	\$1.50	3,064	\$4,596	
Refertilizing	SY	\$0.80	3,064	\$2,451	
Type D Soil Stabilization Matting	SY	\$5	3,064	\$15,320	
Tree, Shrub and Perennial Installation & Establishment	LS	\$14,500	1	\$14,500	
Tree Branch Pruning	LS	\$2,500	1	\$2,500	
Tree Root Pruning	LF	\$10	630	\$6,300	
Category 8 - Traffic					\$17,000
Pedestrian/Ornamental Lighting (Both Sides of Road)	MI	\$1,408,000	0	\$0	
Mainline Signing	EA	\$500	34	\$17,000	
Category 8 - Utilities				6%	\$136,917
6% of Categories 2, 4, 5, and 6					
Electric / Telecom Poles	POLE	\$30,000	4	\$120,000	
Subtotal					\$650,702
Contingency				40%	\$260,281
Construction Total					\$910,983
Admin/Overhead				8.2%	\$74,701
Project Planning Overhead Additive				12.3%	\$121,239
Total Cost					\$1,106,923

MD 32 Alternate Bicycle Route Study
Alternate B - Pinch Point #4 - Concept B3

Cost Per Mile Estimate					
Item	Unit	Unit Cost	Quantity	Cost	
Category 1 - Preliminary				40%	\$230,855
40% of Categories 2, 4, 5 & 6					
Categories 2, 5 & 6 - Roadway (Grading, Paving & Shoulders)					\$419,188
Collector CPM	LM ¹	\$1,800,000	0.19	\$342,000	
Milling/Resurfacing CPM	LM ¹	\$100,000	0.45	\$45,000	
Removal of Existing Curb and Gutter	LF	\$15	0	\$0	
Removal of Existing Pavement	CY	\$50	0	\$0	
Removal of Existing Sidewalk	CY	\$150	0	\$0	
PCC Pavement (For Driveways)	SY	\$130	0	\$0	
Curb and Gutter	LF	\$45	0	\$0	
5" Concrete Sidewalk	SF	\$16	0	\$0	
Thermoplastic Pavement Markings	LF	\$1.50	3,125	\$4,688	
Traffic Barrier W-Beam End Treatment, Single Face	EA	\$2,500	3	\$7,500	
Traffic Barrier W-Beam, Single Face	LF	\$20	1,000	\$20,000	
Single Face F-Shape Concrete Barrier	LF	\$200	0	\$0	
Category 3 - Drainage				20%	\$115,428
20% of Categories 2, 4, 5 & 6					
Stormwater Management	LS	\$0	1	\$0	
Category 4 - Structures					\$157,950
Bridge Over Water	SF	\$320	0	\$0	
Bridge Over Roadway or Highway	SF	\$200	0	\$0	
Bridge Deck Replacement	SF	\$115	0	\$0	
Bridge Superstructure Replacement	SF	\$200	0	\$0	
Bridge Deck Overlay (Latex Modified Concrete)	SF	\$25	0	\$0	
Bridge Removal	SF	\$45	0	\$0	
Box Culverts	SF	\$325	486	\$157,950	
Category 7 - Landscaping					\$83,090
Turfgrass Establishment	SY	\$1.50	4,720	\$7,080	
Refertilizing	SY	\$0.80	4,720	\$3,776	
Type D Soil Stabilization Matting	SY	\$5	4,720	\$23,600	
Tree, Shrub and Perennial Installation & Establishment	LS	\$23,634	1	\$23,634	
Tree Branch Pruning	LS	\$5,000	1	\$5,000	
Tree Root Pruning	LF	\$10	2,000	\$20,000	
Category 8 - Traffic					\$500
Pedestrian/Ornamental Lighting (Both Sides of Road)	MI	\$1,408,000	0	\$0	
Mainline Signing	EA	\$500	1	\$500	
Category 8 - Utilities				6%	\$154,628
6% of Categories 2, 4, 5, and 6					
Electric / Telecom Poles	POLE	\$30,000	4	\$120,000	
Subtotal					\$1,161,638
Contingency				40%	\$464,655
Construction Total					\$1,626,294
Admin/Overhead				8.2%	\$133,356
Project Planning Overhead Additive				12.3%	\$216,437
Total Cost					\$1,976,087

MD 32 Alternate Bicycle Route Study
Alternate B - Pinch Point #5 - Concept B1

Cost Per Mile Estimate					
Item	Unit	Unit Cost	Quantity	Cost	
Category 1 - Preliminary				40%	\$74,109
40% of Categories 2, 4, 5 & 6					
Categories 2, 5 & 6 - Roadway (Grading, Paving & Shoulders)					\$185,273
Collector CPM	LM ¹	\$1,800,000	0.1	\$144,000	
Milling/Resurfacing CPM	LM ¹	\$100,000	0.4	\$38,000	
Removal of Existing Curb and Gutter	LF	\$15	0	\$0	
Removal of Existing Pavement	CY	\$50	0	\$0	
Removal of Existing Sidewalk	CY	\$150	0	\$0	
PCC Pavement (For Driveways)	SY	\$130	0	\$0	
Curb and Gutter	LF	\$45	0	\$0	
5" Concrete Sidewalk	SF	\$16	0	\$0	
Thermoplastic Pavement Markings	LF	\$1.50	2,182	\$3,273	
Traffic Barrier W-Beam End Treatment, Single Face	EA	\$2,500	0	\$0	
Traffic Barrier W-Beam, Single Face	LF	\$25	0	\$0	
Single Face F-Shape Concrete Barrier	LF	\$200	0	\$0	
Category 3 - Drainage				20%	\$37,055
20% of Categories 2, 4, 5 & 6					
Stormwater Management	LS	\$0	0	\$0	
Category 4 - Structures					\$0
Bridge Over Water	SF	\$320	0	\$0	
Bridge Over Roadway or Highway	SF	\$200	0	\$0	
Bridge Deck Replacement	SF	\$115	0	\$0	
Bridge Superstructure Replacement	SF	\$200	0	\$0	
Bridge Deck Overlay (Latex Modified Concrete)	SF	\$25	0	\$0	
Bridge Removal	SF	\$45	0	\$0	
Box Culverts	SF	\$325	0	\$0	
Category 7 - Landscaping					\$83,572
Turfgrass Establishment	SY	\$1.50	6,240	\$9,360	
Refertilizing	SY	\$0.80	6,240	\$4,992	
Type D Soil Stabilization Matting	SY	\$5	6,240	\$31,200	
Tree, Shrub and Perennial Installation & Establishment	LS	\$25,800	1	\$25,800	
Tree Branch Pruning	LS	\$2,500	1	\$2,500	
Tree Root Pruning	LF	\$10	972	\$9,720	
Category 8 - Traffic					\$500
Pedestrian/Ornamental Lighting (Both Sides of Road)	MI	\$1,408,000	0	\$0	
Mainline Signing	EA	\$500	1	\$500	
Category 8 - Utilities				6%	\$11,116
6% of Categories 2, 4, 5, and 6					
Electric / Telecom Poles	POLE	\$30,000	0	\$0	
Subtotal					\$391,625
Contingency				40%	\$156,650
Construction Total					\$548,275
Admin/Overhead				8.2%	\$44,959
Project Planning Overhead Additive				12.3%	\$72,968
Total Cost					\$666,202

MD 32 Alternate Bicycle Route Study
Alternate B - Additional Cost Items

Cost Per Mile Estimate					
Item	Unit	Unit Cost	Quantity	Cost	
Category 1 - Preliminary				40%	\$0
40% of Categories 2, 4, 5 & 6					
Categories 2, 5 & 6 - Roadway (Grading, Paving & Shoulders)					\$0
Collector CPM	LM ¹	\$1,800,000	0.00	\$0	
Milling/Resurfacing CPM	LM ¹	\$100,000	0.0	\$0	
Removal of Existing Curb and Gutter	LF	\$15	0	\$0	
Removal of Existing Pavement	CY	\$50	0	\$0	
Removal of Existing Sidewalk	CY	\$150	0	\$0	
PCC Pavement (For Driveways)	SY	\$130	0	\$0	
Curb and Gutter	LF	\$45	0	\$0	
5" Concrete Sidewalk	SF	\$16	0	\$0	
Thermoplastic Pavement Markings	LF	\$1.50	0	\$0	
Traffic Barrier W-Beam End Treatment, Single Face	EA	\$2,500	0	\$0	
Traffic Barrier W-Beam, Single Face	LF	\$25	0	\$0	
Single Face F-Shape Concrete Barrier	LF	\$200	0	\$0	
Category 3 - Drainage					\$40,000
20% of Categories 2, 4, 5 & 6					
Stormwater Management	LS	\$40,000	1	\$40,000	
Category 4 - Structures					\$0
Bridge Over Water	SF	\$320	0	0	
Bridge Over Roadway or Highway	SF	\$200	0	0	
Bridge Deck Replacement	SF	\$115	0	0	
Bridge Superstructure Replacement	SF	\$200	0	0	
Bridge Deck Overlay (Latex Modified Concrete)	SF	\$25	0	0	
Bridge Removal	SF	\$45	0	0	
Box Culverts	SF	\$325	0	0	
Category 7 - Landscaping					\$0
Category 7 - Total					
LS	\$0.00	1	0		
Category 8 - Traffic					\$17,000
Pedestrian/Ornamental Lighting (Both Sides of Road)					
MI	\$1,408,000	0	\$0		
Mainline Signing	EA	\$500	34	\$17,000	
Category 8 - Utilities					\$0
6% of Categories 2, 4, 5, and 6					
Electric / Telecom Poles	POLE	\$30,000		\$0	
Subtotal					\$57,000
Contingency				40%	\$22,800
Construction Total					\$79,800
Admin/Overhead				8.2%	\$6,544
Project Planning Overhead Additive				12.3%	\$10,620
Total Cost					\$96,964

MD 32 Alternate Bicycle Route Study
Alternate C1 - North Side Shared Use Path

Cost Per Mile Estimate					
Item	Unit	Unit Cost	Quantity	Cost	
Category 1 - Preliminary				40%	\$298,316
40% of Categories 2, 4, 5 & 6					
Categories 2, 5 & 6 - Roadway (Grading, Paving & Shoulders)					\$745,790
Collector CPM	LM ¹	\$1,800,000	0.12	\$216,000	
Milling/Resurfacing CPM	LM ¹	\$100,000	0.52	\$52,000	
Removal of Existing Curb and Gutter	LF	\$15	0	\$0	
Removal of Existing Pavement	CY	\$50	0	\$0	
Removal of Existing Sidewalk	CY	\$150	0	\$0	
PCC Pavement (For Driveways)	SY	\$130	0	\$0	
Curb and Gutter	LF	\$45	0	\$0	
5" Concrete Sidewalk	SF	\$16	295	\$4,720	
Shared Use Path Asphalt Surface 1.5"	TON	\$125	1,532	\$191,500	
Shared Use Path Asphalt Base 2.5"	TON	\$95	2,546	\$241,870	
Shared Use Path GAB 4"	SY	\$13	1,924	\$25,012	
Shared Use Path Excavation	CY	\$30	321	\$9,630	
Thermoplastic Pavement Markings	LF	\$1.50	3,372	\$5,058	
Traffic Barrier W-Beam End Treatment, Single Face	EA	\$2,500	0	\$0	
Traffic Barrier W-Beam, Single Face	LF	\$25	0	\$0	
Single Face F-Shape Concrete Barrier	LF	\$200	0	\$0	
Category 3 - Drainage					\$223,737
30% of Categories 2, 4, 5 & 6					
Stormwater Management	LS	\$0		\$223,737	
Category 4 - Structures					\$0
Bridge Over Water	SF	\$320	0	\$0	
Bridge Over Roadway or Highway	SF	\$200	0	\$0	
Bridge Deck Replacement	SF	\$115	0	\$0	
Bridge Superstructure Replacement	SF	\$200	0	\$0	
Bridge Deck Overlay (Latex Modified Concrete)	SF	\$25	0	\$0	
Bridge Removal	SF	\$45	0	\$0	
Box Culverts	SF	\$325	0	\$0	
Category 7 - Landscaping					\$36,808
Category 7 - Total					
Turfgrass Establishment	SY	\$1.50	10,360	\$15,540	
Refertilizing	SY	\$0.80	10,360	\$8,288	
Tree, Shrub and Perennial Installation & Establishment	LS	\$2,400	1	\$2,400	
Tree Branch Pruning	LS	\$5,000	1	\$5,000	
Tree Root Pruning	LF	\$10	558	\$5,580	
Category 8 - Traffic					\$313,760
Pedestrian/Ornamental Lighting (Both Sides of Road)					
MI	\$1,408,000	0.2	\$309,760		
Mainline Signing	EA	\$500	8	\$4,000	
Category 8 - Utilities					\$254,579
10% of Categories 2, 4, 5, and 6					
Electric / Telecom Poles	POLE	\$30,000	6	\$180,000	
Subtotal					\$1,872,990
Contingency				40%	\$749,196
Construction Total					\$2,622,186
Admin/Overhead				8.2%	\$215,019
Project Planning Overhead Additive				12.3%	\$348,976
Total Cost					\$3,186,181

MD 32 Alternate Bicycle Route Study
Alternate C2 - South Side Shared Use Path

Cost Per Mile Estimate					
Item	Unit	Unit Cost	Quantity	Cost	
Category 1 - Preliminary				40%	\$287,423
40% of Categories 2, 4, 5 & 6					
Categories 2, 5 & 6 - Roadway (Grading, Paving & Shoulders)					\$718,559
Collector CPM	LM ¹	\$1,800,000	0.12	\$216,000	
Milling/Resurfacing CPM	LM ¹	\$100,000	0.52	\$52,000	
Removal of Existing Curb and Gutter	LF	\$15	0	\$0	
Removal of Existing Pavement	CY	\$50	0	\$0	
Removal of Existing Sidewalk	CY	\$150	0	\$0	
PCC Pavement (For Driveways)	SY	\$130	0	\$0	
Curb and Gutter	LF	\$45	0	\$0	
5" Concrete Sidewalk	SF	\$16	300	\$4,800	
Shared Use Path Asphalt Surface 1.5"	TON	\$125	1,443	\$180,375	
Shared Use Path Asphalt Base 2.5"	TON	\$95	2,398	\$227,810	
Shared Use Path GAB 4"	SY	\$13	1,812	\$23,556	
Shared Use Path Excavation	CY	\$30	302	\$9,060	
Thermoplastic Pavement Markings	LF	\$1.50	3,305	\$4,958	
Traffic Barrier W-Beam End Treatment, Single Face	EA	\$2,500	0	\$0	
Traffic Barrier W-Beam, Single Face	LF	\$25	0	\$0	
Single Face F-Shape Concrete Barrier	LF	\$200	0	\$0	
Category 3 - Drainage					\$215,568
30% of Categories 2, 4, 5 & 6					
Stormwater Management	LS	\$0		\$215,568	
Category 4 - Structures					\$0
Bridge Over Water	SF	\$320	0	\$0	
Bridge Over Roadway or Highway	SF	\$200	0	\$0	
Bridge Deck Replacement	SF	\$115	0	\$0	
Bridge Superstructure Replacement	SF	\$200	0	\$0	
Bridge Deck Overlay (Latex Modified Concrete)	SF	\$25	0	\$0	
Bridge Removal	SF	\$45	0	\$0	
Box Culverts	SF	\$325	0	\$0	
Category 7 - Landscaping					\$52,094
Category 7 - Total					
Turfgrass Establishment	SY	\$1.50	10,280	\$15,420	
Refertilizing	SY	\$0.80	10,280	\$8,224	
Tree, Shrub and Perennial Installation & Establishment	LS	\$11,150	1	\$11,150	
Tree Branch Pruning	LS	\$5,000	1	\$5,000	
Tree Root Pruning	LF	\$10	1,230	\$12,300	
Category 8 - Traffic					\$272,020
Pedestrian/Ornamental Lighting (Both Sides of Road)					
MI	\$1,408,000	0.2	\$267,520		
Mainline Signing	EA	\$500	9	\$4,500	
Category 8 - Utilities					\$341,856
10% of Categories 2, 4, 5, and 6					
Electric / Telecom Poles	POLE	\$30,000	9	\$270,000	
Subtotal					\$1,887,519
Contingency				40%	\$755,008
Construction Total					\$2,642,527
Admin/Overhead				8.2%	\$216,687
Project Planning Overhead Additive				12.3%	\$351,683
Total Cost					\$3,210,898

MD 32 Alternate Bicycle Route Study
Removed Alternate - Roadway Widening & ROW Acquisition

Cost Per Mile Estimate					
Item	Unit	Unit Cost	Quantity	Cost	
Categories 1-8					\$30,263,573
Collector CPM	LM ¹	\$5,600,000	5.1	\$28,724,747	
Milling/Resurfacing CPM	LM ¹	\$100,000	15.4	\$1,538,826	
Category 3 - Drainage					\$40,000
Stormwater Management					
LS	\$40,000	1	\$40,000		
Category 8 - Utilities					\$1,815,814
6% of CPM cost					
			6%	\$1,815,814	
Subtotal					\$32,119,388
Contingency				40%	\$12,847,755
Construction Total					\$44,967,143
Admin/Overhead				8.2%	\$3,687,306
Project Planning Overhead Additive				12.3%	\$5,984,497
Total Cost					\$54,638,946

Assumptions & Clarifications

1. Assumed resurfacing of existing lane where widening.
2. Estimate does not include quantities or costs for retaining walls or noise barriers.
3. Assumed no additional lighting as part of concept improvements.
4. Right-of-way (ROW) costs not included in estimates. See parcel impact map for potential ROW impacts.
5. Utility costs can vary significantly based on final design; additional analysis required to refine current utility cost estimates.
6. Cost estimates prepared are in 2019 dollars; inflation has not been factored into current estimates.