Acknowledgments

This plan was made possible by the contributions and support of the Maryland Department of Transportation State Highway Administration, the Howard County Office of Transportation, and the various stakeholders who provided input throughout the project. These stakeholders and organizations were instrumental in developing the recommendations presented in this plan and the project team greatly appreciates the support they provided throughout the MD 32 Bicycle Alternate Route Study.

CONSULTANT TEAM

Melissa Miklus
Nathan George
Collin Hayward

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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 by the Maryland Administration (MDOT SHA) as a candidate for dualization to reduce ongoing congestion in the region. The dualization project from MD 108 to I-70 (Phase 2, In Progress) is permanently removing bicycle facilities throughout the State of Maryland. Previously, MD 32 served 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 meet this requirement, MDOT SHA identified Ten Oaks Road as a potential replacement bicycle route for the MD 32 corridor. 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
An overview of the evaluation includes the Oak Road between MD 108 and Blackwood Road. Needs along the corridor were identified based on the character of the roadway including average annual daily traffic (AADT), the typical section, and surrounding land use.

In This Plan
The following document presents an overview of the opportunities and constraints for establishing a bicycle facility along the project study area. An overview of the objectives and analysis methodology to complete the study is presented. This section outlines the proposed alternatives, including the purpose of each alternative, the recommended improvements for each alternative, and the evaluation criteria.

In This Plan
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Opportunities + Constraints

Study Area Description

The study area is located in the Maryland suburbs of Howard County. Its general boundaries are defined by the north-south MD 32 corridor, which runs from the Monoco Road rest area north to Route 108, and is bounded by the east-west Baltimore-Washington Parkway to the north and the CSX railroad tracks to the south. The northern section of the study area begins at the junction of MD 32 to the north. The preliminary designs for the intersection have been developed and are incorporated into the recommended alternative.

Previous & Current Studies

The plan identifies Clarksville Pike (MD 108) as a priority corridor for streetscape improvements that will lead to sustainable, pedestrian-friendly environments. The plan identifies Clarksville Pike (MD 108) as a priority corridor for streetscape improvements that will lead to sustainable, pedestrian-friendly environments. The plan identifies Clarksville Pike (MD 108) as a priority corridor for streetscape improvements that will lead to sustainable, pedestrian-friendly environments. The plan identifies Clarksville Pike (MD 108) as a priority corridor for streetscape improvements that will lead to sustainable, pedestrian-friendly environments. The plan identifies Clarksville Pike (MD 108) as a priority corridor for streetscape improvements that will lead to sustainable, pedestrian-friendly environments.

Natural Resources

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, and/or the Maryland Department of the Environment (MDDE) Endangered Species Coordination Office (ESCO) to confirm any impacts to jurisdictional water resources. Any impacts identified would require coordination with the Maryland Department of the Environment (MDDE) and US Army Corps of Engineers (USACE); and/or the Maryland Department of Natural Resources (MDNR) Forest Stand Delineation (FSD) should be performed to identify any impacts to jurisdictional water resources. Any impacts identified would require coordination with the utility companies and any other entities that use the existing conditions around the Ten Oaks Road corridor. There are several utility poles located adjacent to the roadway. Relocations of these utility poles may be required based on the proposed improvements, requiring coordination with multiple organizations.

Utilities

Given the existing conditions around Ten Oaks Road 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 multiple organizations.

Stormwater Management

Given the existing conditions around Ten Oaks Road 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 multiple organizations.

Opportunities & Constraints Maps

The following maps contain summary notes and key features examined during the opportunities and constraints analysis described above.

Utilities

The plan identifies Clarksville Pike (MD 108) as a priority corridor for streetscape improvements that will lead to sustainable, pedestrian-friendly environments. The plan identifies Clarksville Pike (MD 108) as a priority corridor for streetscape improvements that will lead to sustainable, pedestrian-friendly environments. The plan identifies Clarksville Pike (MD 108) as a priority corridor for streetscape improvements that will lead to sustainable, pedestrian-friendly environments. The plan identifies Clarksville Pike (MD 108) as a priority corridor for streetscape improvements that will lead to sustainable, pedestrian-friendly environments. The plan identifies Clarksville Pike (MD 108) as a priority corridor for streetscape improvements that will lead to sustainable, pedestrian-friendly environments. The plan identifies Clarksville Pike (MD 108) as a priority corridor for streetscape improvements that will lead to sustainable, pedestrian-friendly environments. The plan identifies Clarksville Pike (MD 108) as a priority corridor for streetscape improvements that will lead to sustainable, pedestrian-friendly environments.
Northern Section
Burntwoods Road to Pinch Point #4

OPPORTUNITIES & CONSTRAINTS

Pinch Point 1: Heavy vehicle traffic at businesses surrounding traffic circle
Pinch Point 2: Guardrail and culvert over stream on east side
Pinch Point 3: Utility poles and steep grade on west side
Pinch Point 4: Looking south with culvert over stream

Heavy truck traffic crossing MD-32 at Terrell Road
Heavy van traffic at businesses surroundings Bacon Circle

Utility poles on west side of corridor
Underground gas lines

 Maryland Alternate Bike Route Study
Spring 2019

OPPORTUNITIES & CONSTRAINTS

Northern Section
Burntwoods Road to Pinch Point #4

OPPORTUNITIES & CONSTRAINTS

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Pinch Point 2: Guardrail and culvert over stream on east side
Pinch Point 3: Utility poles and steep grade on west side
Pinch Point 4: Looking south with culvert over stream

Heavy truck traffic crossing MD-32 at Terrell Road
Heavy van traffic at businesses surroundings Bacon Circle

Utility poles on west side of corridor
Underground gas lines
OPPORTUNITIES & CONSTRAINTS

Northern & Suburban Section
Pinch Point #4 to MD 108

- Utility Poles / Lines
- Heavy vehicle traffic due to multiple businesses and MD 32 intersection
- Pinch Point 4 with utility pole on east side and sight line issue
- Pinch Point 5 with utility pole on east side and sight line issue
- Traffic circle at Ten Oaks Road and Brighton Dam Road
- Ten Oaks Road approaching MD 108 intersection

Utility Poles on Both Sides of Corridor

DNR Waters
DNR Wetlands
FEMA - 100 Year Flood

Study Areas
- Parks
- Schools
- Gas ROW
- Fire Hydrant
- Watermain
- Gravity Sewer
- Storm Pipe
- KJ
- gW

0 300 600
Overview

The project team analyzed the existing conditions and previous studies, and constraints to develop recommended alternative designs for the study area. The project team determined that the most likely cyclists user type was “Enthused and Confident” based on field observations and roadway design. These treatment alternatives have been crafted to accommodate this user type.

Due to the prominent land-use types and the character of the corridor along the MD 32 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. The consultants determined that a corridor-wide treatment 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.

Alternative A - Route Signage

The first alternative includes adding 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 an alternative to the roadway widening throughout the study area. With the roadway entering and leaving the SUP, 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.

Recommended Alternatives

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Description</th>
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<tbody>
<tr>
<td>A</td>
<td>Route Signage</td>
</tr>
<tr>
<td>B</td>
<td>Pinch Point 1-5 Treatments</td>
</tr>
<tr>
<td>C</td>
<td>Pinch Point 6 SUP</td>
</tr>
</tbody>
</table>

The recommended alternatives were included in Appendix A for reference. People unwilling to bicycle even if high-quality bicycle infrastructure is in place.

“NO WAY, NO HOW”

HIGH STRESS TOLERANCE

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

“INTERESTED, BUT CONCERNED”

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

“ENTHUSED + CONFIDENT”

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

“STRONG + FEARLESS”

People more willing to bicycle if bicycle infrastructure is in place.

Source: Adapted from Roger Geller.
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.
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
UTILITIES
GUARDRAIL
CULVERT
TREES + NATURAL RESOURCES

PINCH POINT 1 Alternative B1 | West, SINGLE-SIDE
Bicycle-Friendly Shoulder on West Side of Ten Oaks Road

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

11' | 10' YES 2,615 SF INCREASE FOR PAVED SHOULDERS

YES YES RELOCATION OF 4 POLES REQUIRED

YES YES 236 LF GUARDRAIL ADDED

YES - -

YES - -

OPINION OF PROBABLE COST (see appendix A for details)

POTENTIAL ROW IMPACTS (no survey completed at this time)

EAST WEST SHOULDER/ROADWAY WIDENING

$398,498

4

stormwater natural resources safety / traffic utility general notes

Widen one foot to accommodate guardrail

tie in to existing driveway

remove and replace approximately 200 LF of guardrail

relocate utility poles

Coordinate with Maryland Department of Natural Resources for a Roadside Tree Permit for tree trimming and removals within the ROW. Hedgerows and individual trees, including specimen trees, may be present in the proposed areas.

Grading a stormwater facility would require additional ROW and infiltration testing due to no closed storm drain for outfall. Investigate credit in ROW for disconnection of non-rooftop runoff.

Site grading may allow stormwater management but would require additional ROW. Infiltration testing required due to no closed storm drain. Large offsite contributing drainage area limits facility efficiency.

Existing slopes on adjacent property preclude credit for disconnection of impervious surface. Grading for stormwater management would require significant impacts to adjacent property, including tree removal.

No available space within ROW for Stormwater Management. Expansion of ROW grading to adjacent slopes.

Adjacent slope increases moving south may affect potential to fit stormwater management. Infiltration testing required due to no closed storm drain. Large offsite contributing drainage area limits facility efficiency.

Existing slopes on adjacent property preclude credit for disconnection of impervious surface. Grading for stormwater management would require additional ROW with significant impacts to adjacent property, including tree removal.

Investigate available credit in ROW for disconnection of non-rooftop runoff. Grading a stormwater facility would require additional ROW and infiltration testing due to no closed storm drain.

Coordinate with Maryland Department of Natural Resources for a Roadside Tree Permit for tree trimming and removals within the ROW. Hedgerows and individual trees, including specimen trees, may be present in the proposed areas.

Coordinating with Geographic Information Services, Hydrology, and Stormwater Management, it was determined that there is no direct potential for disconnection of impervious surface due to the nature of the proposed roadway widening. Additionally, the proposed roadway widening does not meet the criteria for a higher level of stormwater management as indicated by the area on the map.
### IMPACTS AND FACILITY SUMMARY

<table>
<thead>
<tr>
<th>IMPACT</th>
<th>EXISTING</th>
<th>IMPACT NOTES</th>
<th>TRAVEL LANES</th>
<th>UTILITIES</th>
<th>GUARDRAIL</th>
<th>CULVERT</th>
<th>TREES + NATURAL RESOURCES</th>
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<tr>
<td>Pinch Point Criteria:</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>- Shoulder Width</td>
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<td>- Sight Distance</td>
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<td></td>
<td></td>
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<tr>
<td>- Road Grade</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

**Potential Stormwater Management Locations:**

- Investigate if grading can be accommodated within ROW. Infiltration testing required due to no closed storm drain. Large offsite contributing to drainage area.

- Potential stormwater management locations. Tie in to existing driveway and road. Additional grading and infiltration testing required for stormwater facility. Avoid impacts to 100-year floodplain.

- Investigate available credit in ROW for disconnection of non-rooftop runoff. Additional grading and infiltration testing required for stormwater facility. Avoid impacts to 100-year floodplain.

- Any existing slopes on adjacent property preclude credit for disconnection of impervious surface. Grading for stormwater management would require significant impacts to adjacent property as well as utility poles and trees.

- Investigate available credit in ROW for disconnection of non-rooftop runoff. Additional grading and infiltration testing required for stormwater facility. Avoid impacts to 100-year floodplain.

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

- 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.

- Potential specimen tree located here.

- Investigate any special permit requirements, such as wetland can be accommodated within ROW. Infiltration testing required due to no closed storm drain. Large offsite contributing to drainage area.

- Investigate any special permit requirements, such as wetland.

- Investigate any special permit requirements, such as wetland.

- Investigate any special permit requirements, such as wetland.
**Pinch Point Criteria:**
- Shoulder Width
- Sight Distance
- Road Grade

**Opinion of Probable Cost**
(see appendix A for details)
$1,374,840

**Potential ROW Impacts**
(No survey completed at this time)

**East West Shoulder/Way Widening**

<table>
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<th>Impact</th>
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<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Roadway</td>
<td>YES</td>
<td>-</td>
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</table>

- 4,103 SF increase for paved shoulders
- 889 LF guardrail added
- Relocation of 10 poles required
- Removal of 1 tree required

**Alternative B2 | Double-Sided**
Bicycle-Friendly Shoulder on West + East Side of Ten Oaks Road

**Stormwater Natural Resources Safety/Traffic Utility General Notes**

- Investigate available credit in ROW for disconnection of non-rooftop runoff. Additional grading and infiltration testing required for stormwater facility. Avoid impacts to 100-year floodplain.
- Existing slopes on adjacent property preclude credit for disconnection of impervious. Grading for stormwater management would require significant impacts to adjacent property as well as utility poles and trees.

**Potential Stormwater Management Locations. Investigate if grading can be accommodated within ROW. Infiltration testing required due to no closed storm drain. Large offsite contributing to drainage area.**

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

**Coordination with 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.**

**Potential Specimen Tree Located Here.**

**Investigate availability of credit for disconnection of non-rooftop runoff. Additional grading and infiltration testing required for stormwater facility. Avoid impacts to 100-year floodplain.**

**Investigate if grading can be accommodated within ROW. Infiltration testing required due to no closed storm drain. Large offsite contributing to drainage area.**

**Tie in to existing driveway.**

**Extend Culvert and Replace HeadWall and EndWall.**
**PINCH POINT 3**

Alternative B1 | East, SINGLE-SIDE

Bicycle-Friendly Shoulder on East Side of Ten Oaks Road

---

**IMPACTS AND FACILITY SUMMARY**

<table>
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<tr>
<th>TRAVEL LANES</th>
<th>Utilities</th>
<th>Guardrail</th>
<th>Culvert</th>
<th>Trees + Natural Resources</th>
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<tr>
<td>YES</td>
<td>YES</td>
<td>-</td>
<td>-</td>
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</tbody>
</table>

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

Opinion of probable cost (see appendix A for details):
$257,113

Potential ROW impacts (no survey completed at this time):
- 3

- East West Potential Row Impacts

- Stormwater
  - Natural resources
  - Safety / Traffic Utility General notes

- Roadway grade approx. 5.8%
  - Increase paved width northbound lane from 10.5 feet to 15 feet into shoulder

- Site grading could allow stormwater management with additional ROW. Could potentially connect to storm drain on opposite side of roadway pending flow pattern changes. Infiltration testing required if connection cannot be made.

- Existing slopes on adjacent property preclude credit for disconnection of non-rooftop runoff. Grading for stormwater management would require significant impacts to adjacent property as well as potential impacts to utility poles and trees.

- Could potentially incorporate stormwater management with significant site grading and tree impacts. Existing downstream inlet could accommodate outfall assuming no change to flow pattern. Confirm drainage areas.

- Coordination with Maryland Department of Natural Resources (MDNR) for Roadside Tree Permit is required for tree trimming and removal within ROW. Hedgerows, and individual trees, including specimen trees, may be present in proposed work areas.
PINCH POINT 3

Alternative B2 | DOouble-Sided

Bicycle-Friendly Shoulder on East + West Side of Ten Oaks Road

**Impact and Facility Summary**

- **Travel Lanes**: Yes
- **Trees + Natural Resources**: Yes
- **Guardrail**: Yes
- **Culvert**: Yes
- **Utilities**: Yes

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

**Opinion of Probable Cost**
- See appendix A for details
- $979,164

**Potential ROW Impacts**
- No survey completed at this time
- 3,278 SF increase for paved shoulders
- 10 LF guardrail added
- Relocation of 4 poles required
- Removal of 1 tree required

Alternative B2 | Double-Sided

- Bicycle-Friendly Shoulder on East + West Side of Ten Oaks Road

**Safety / Traffic Notes**
- Bridge replacement
- School Zone
- Speed limit flashing Beacon

**Utility General Notes**
- Tie in to existing Drive Way

**Roadway Grade**
- Approx. 5.8%

**Relocate School Zone**
- Speed limit flashing Beacon

**Provide 4 Foot Shoulder Widening in Both Directions**
- Widen an additional foot to accommodate guardrail

**Provide Utility Pads**
- Widen an additional foot to accommodate guardrails

**Utility Pad**
- Provide 4 Foot Shoulder Widening in Both Directions

**Widen an additional foot to accommodate guardrails**
- Provide Utility Pads

**Existing slopes on adjacent property preclude credit for disconnection of non-rooftop runoff. Grading for stormwater management would require significant impacts to adjacent property as well as potential impacts to utility poles and trees.**

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

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

**Relocate Utility Poles**
- Provide Utility Pads

**Provide 4 Foot Shoulder Widening in Both Directions**
- Widen an additional foot to accommodate guardrail

**Utility Pad**
- Provide 4 Foot Shoulder Widening in Both Directions

**Widen an additional foot to accommodate guardrails**
- Provide Utility Pads

**Existing slopes on adjacent property preclude credit for disconnection of non-rooftop runoff. Grading for stormwater management would require significant impacts to adjacent property as well as potential impacts to utility poles and trees.**

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

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**Provide Utility Pads**
- Widen an additional foot to accommodate guardrails

**Utility Pad**
- Provide 4 Foot Shoulder Widening in Both Directions

**Widen an additional foot to accommodate guardrails**
- Provide Utility Pads

**Existing slopes on adjacent property preclude credit for disconnection of non-rooftop runoff. Grading for stormwater management would require significant impacts to adjacent property as well as potential impacts to utility poles and trees.**

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

**Provide Utility Pads**
- Widen an additional foot to accommodate guardrails

**Utility Pad**
- Provide 4 Foot Shoulder Widening in Both Directions

**Widen an additional foot to accommodate guardrails**
- Provide Utility Pads

**Existing slopes on adjacent property preclude credit for disconnection of non-rooftop runoff. Grading for stormwater management would require significant impacts to adjacent property as well as potential impacts to utility poles and trees.**

**Coordination with Maryland Department of Natural Resources (MDNR) for Roadside Tree Permit is required for tree trimming and removal within ROW. Hedgerows and individual trees, including specimen trees, may be present in proposed work areas.**
PINCHE POINT 4

**Alternative B1 | West, SINGLE-SIDE**

Bicycle-Friendly Shoulder on West Side of Ten Oaks Road

---

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

**Opinion of Probable Cost**
(see appendix A for details)

$995,794

---

**Potential ROW Impacts**

- Shoulder/Right of Way Widening
- East West Potential ROW Impacts

(No survey completed at this time)

4

---

**IMPAIRMENTS AND FACILITIES SUMMARY**

<table>
<thead>
<tr>
<th>IMPAIRMENT</th>
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</tr>
</tbody>
</table>

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**Existing Impact Notes**

- Turf, Vegetation, Stormwater
- Safety / Traffic Utility Notes

---

**Utilities**

- Roadway Grade
  - Approx. 6.5%

---

**Utility Pole**

- Widen an additional foot to accommodate Guardrail

---

**Tree 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.

---

**Coordination**

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

---

**Stormwater Management**

- Perform infiltration testing due to no adjacent closed storm drain to connect facility underdrain. Site grading may allow stormwater management but would require additional ROW and potentially impact trees and utility poles.

---

**Infiltration Testing**

- 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.

---

**Utility Pole**

- relocate Utility Pole

---

**Widen an Additional Foot to Accommodate Guardrail**

- Widen road Right of Way on West side and shift centerline to provide Southbound Bicycle climbing lane and Northbound shared lane.
Traffic Circle: 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 have 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 traffic circles 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 cyclists 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.

IMPACTS AND FACILITY SUMMARY

<table>
<thead>
<tr>
<th>TRAVEL LAKES</th>
<th>UTILITIES</th>
<th>GUARDRAIL</th>
<th>CULVERT</th>
<th>TREES + NATURAL RESOURCES</th>
</tr>
</thead>
</table>

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

OPINION OF PROBABLE COST (see appendix A for details)
$1,106,923

POTENTIAL ROW IMPACTS (no survey completed at this time)

- EAST WEST SHOULDER/ROADWAY WIDENING
- 11' | 10' YES

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. 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 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. Investigators must be notified in advance of work in potential wetlands.

Coordination with the 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.

Relocate Drive Way and Entrance Within Property Boundary

PITCH POINT CIRCULAR

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

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

**Opinion of Probable Cost** (see appendix A for details)
$1,976,087

**Potential ROW Impacts** (no survey completed at this time)
- 44

**Project Benefits:**
- Stormwater management
- Safety/traffic
- General notes
- Utility

**Impacts and Facility Summary**

<table>
<thead>
<tr>
<th>Existing Impact Notes</th>
<th>Travel Lanes</th>
<th>Utilities</th>
<th>Guardrail</th>
<th>Culvert</th>
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**Extends Existing Drainage:**
- 1 Culvert Extension Required
- 8,152 SF Increase for Paved Shoulders
- 992 LF Guardrail Added
- Relocation of 10 Poles Required
- Removal of 2 Trees Required

**Utility:**
- Perform infiltration testing due to no adjacent closed storm drain to connect facility underdrain. Site grading may allow stormwater management but would require additional ROW and potentially impact trees and utility poles.

**Natural Resources:**
- Steep roadway profile and grade sloping away from roadway precludes stormwater management. Investigate available credit in ROW for disconnection of non-rooftop runoff. Grading for stormwater management would have impacts to adjacent property, utility poles, and trees.

**General Notes:**
- Coordination with the 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.

**Utility:**
- 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.

**Natural Resources:**
- 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.

**Safety:**
- Investigate available credit in ROW for disconnection of non-rooftop runoff. Grading for stormwater management would have impacts to adjacent property, utility poles, and trees.

**Travel Lanes:**
- 3-4 LF of the Right for More Speeding

**Utilities:**
- 600 LF Guardrail Added
- Post of Guardrail Added
- Relocation of Supplies Required

**Infiltration:**
- Yes

**Existing Condition:**
- Shoulder Width
- Sight Distance
- Road Grade
- Trees + Natural Resources

**Notes:**
- Yes

**Location:**
- Pinch Point Criteria

**Map:**
- Crushed Utility Poles Across Both Sides
- Replace and Extend Approx. 435 LF of Guardrail
- Tie In To Existing Drainage
- Tie In To Existing Drainage
- Tie In To Existing Drainage
- Tie In To Existing Drainage
- Tie In To Existing Drainage
- Tie In To Existing Drainage
PINCH POINT 5

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

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

Oppinion of Probable Cost (see appendix A for details): $666,202

Sho sho ne/roadway widening:
- East West
- Potential Row Impacts (no survey completed at this time)
- Yes

Relocation of 3 poles required

Tree 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.

Roadway grade:
- Approx. 2.4%
- Approx. 1.7%

Investigate available credit in ROW for disconnection of non-rooftop runoff. Site grading may allow stormwater management but require additional ROW, which could impact grading of adjacent property and require tree removal.

Road most likely goes into super-elevation which limits contributing drainage area. Existing ditch could contribute to drainage area. Swale grading could impact surrounding utilities and adjacent tree line.

Impacts and Facility Summary:

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<td>Safety / Traffic</td>
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</table>

Bike friendly shoulder on West Side of Ten Oaks Road continues to provide surface level bike comfort and shoulder separation.

Tie in to existing roadway and/or driveway.

Tie in to existing roadway and/or driveway.

Tie in to existing roadway and/or driveway.

Tie in to existing shoulder.

Investigate available credit in ROW for disconnection of non-rooftop runoff. Site grading may allow stormwater management but require additional ROW which could impact grading of adjacent properties and require tree removal.

Relocate Utility Poles.
**PINCH POINT 6**

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

**IMPACTS AND FACILITY SUMMARY**

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<td>TIE IN TO EXISTING DRIVEWAY(S)</td>
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<td>-</td>
<td>YES</td>
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<tr>
<td>Widen roadWAY to Provide 11-foot-Wide lanes and 4-foot-Wide Bikeable shoulders in each direction</td>
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<td>-</td>
<td>YES</td>
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<tr>
<td>Existing slopes on adjacent property preclude credit for disconnection of impervious surface. Grading for stormwater facility would require additional ROW and infiltration testing due to no closed storm drain connection.</td>
<td>YES</td>
<td>-</td>
<td>YES</td>
</tr>
<tr>
<td>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.</td>
<td>YES</td>
<td>-</td>
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<tr>
<td>RELOCATION OF UTILITY POLES</td>
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</tbody>
</table>

**WIDEN ROADWAY TO PROVIDE 11-FOOT-WIDE LANE AND 4-FOOT-WIDE BIKEABLE SHOULDERS IN EACH DIRECTION**

- **Existing slopes on adjacent property preclude credit for disconnection of impervious surface. Grading for stormwater facility would require additional ROW and infiltration testing due to no closed storm drain connection.**
- **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.**
- **RELOCATION OF UTILITY POLES**
Alternative C1
Bike Lanes + North Side Shared-Use Path Along Ten Oaks Road

**PINCH POINT 6**

**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.**

**Stormwater Natural Resources Safety / Traffic Utility General Notes**

**Investigate available credit in ROW for disconnection of non-rooftop runoff. Site grading may allow stormwater management but would require additional ROW and could impact adjacent private property. Additional landscaping may be required.**

**Install continental crosswalk relocating utility poles.**

**Tie into existing drive way.**

**Construct 8-foot-wide shared-use path with 5-foot buffer to potentially limit utility pole relocation.**

**Existing slopes on adjacent property preclude credit for disconnection of impervious surface and implementation of stormwater management.**
Alternative C1  
Bike Lanes + North Side Shared-Use Path Along Ten Oaks Road

**PINCH POINT 6**

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

**EXISTING IMPACT NOTES**

- Travel Lanes
- Utilities
- Guardrail
- Culvert
- Trees + Natural Resources

**OPINION OF PROBABLE COST**  
(see appendix A for details)  
$3,186,181 (TOTAL)

**POTENTIAL ROW IMPACTS**  
(no survey completed at this time)

- **Yes**
- **No**

7,017 SF INCREASE FOR PAVED SHOULDERS

- **Yes**
- **No**
- **Yes**

RELOCATION OF XXX POLES

- **Yes**
- **No**

REMOVAL OF XXX TREES

- **Yes**
- **No**

LIMITED SPACE WITHIN ROW PRECLUDES IMPLEMENTATION OF STORMWATER MANAGEMENT.

- **Yes**
- **No**

**STORMWATER NATURAL RESOURCES SAFETY / TRAFFIC**

**GENERAL NOTES**

- **Yes**
- **No**

**MATCH LINE**

- **Yes**
- **No**

**TIE INTO EXISTING DRIVEWAY**

- **Yes**
- **No**

**TIE INTO NEW DRIVEWAY**

- **Yes**
- **No**

**INSTALL CONTINENTAL CROSSWALK**

- **Yes**
- **No**

**INSTALL CONCRETE BUMP-OUTS**

- **Yes**
- **No**

**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.

**INVESTIGATE AVAILABLE CREDIT IN ROW FOR DISCONNECTION OF NON-ROOF TOP RUNOFF. SITE GRADING MAY ALLOW STORMWATER MANAGEMENT BUT WOULD REQUIRE ADDITIONAL ROW AND COULD IMPACT ADJACENT PRIVATE PROPERTY. ADDITIONAL LANDSCAPING MAY BE REQUIRED.

Please refer to the table on page 33.
Alternative C2
Bike Lanes + South Side Shared-Use Path Along Ten Oaks Road

PINCH POINT 6

**IMPACTS AND FACILITY SUMMARY**

<table>
<thead>
<tr>
<th>EXISTING IMPACT NOTES</th>
<th>TRAVEL LANES</th>
<th>UTILITIES</th>
<th>GUARDRAIL</th>
<th>CULVERT</th>
<th>TREES + NATURAL RESOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>POTENTIAL ROW IMPACTS</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
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</table>

**POTENTIAL ROW IMPACTS**

- NORTH SOUTH
  - SHOULDER/ROADWAY WIDENING
  - YES

- NORTH SOUTH
  - SOUTH SIDE BIKE LANE WIDENING
  - YES

- NORTH SOUTH
  - SOUTH SIDE BIKE LANE WIDENING
  - YES

- NORTH SOUTH
  - SOUTH SIDE BIKE LANE WIDENING
  - YES

**EXISTING IMPACT NOTES**

- TRAVEL LANES:
  - NORTH SOUTH
    - YES

- UTILITIES:
  - NORTH SOUTH
    - YES

- GUARDRAIL:
  - YES

- CULVERT:
  - YES

- TREES + NATURAL RESOURCES:
  - YES

**ADVOCATED PROJECT COST**

- $3,210,898 (TOTAL)

**GENERAL Notes**

- 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.

- Existing slopes on adjacent property preclude credit for disconnection of impervious surface and implementation of stormwater management.

- Existing slopes on adjacent property preclude credit for disconnection of impervious surface. Grading for stormwater facility would require additional ROW and infiltration testing due to no closed storm drain connection.
Alternative C2
Bike Lanes + South Side Shared-Use Path Along Ten Oaks Road

**PINCH POINT 6**

---

**Notes**
- Stormwater
- Natural resources
- Safety / Traffic
- Utility
- General

---

**Investigate available credit in ROW for disconnection of non-rooftop runoff. Site grading may allow stormwater management but would require additional ROW and could impact adjacent private property. Additional landscaping may be 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.**

**Existing slopes on adjacent property preclude credit for disconnection of impervious surface and implementation of stormwater management.**

**Install markings for Bike crossing from south side of road to shared-Use Path.**

**Install continental crosswalk.**

**Relocate Utility Poles.**

Please refer to the table on page 39.
**PINCH POINT 6**

**Alternative C2**

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

**EXISTING IMPACT NOTES**

- TRAVEL Lanes
- UTILITIES
- GUARDRAIL
- CULVERT
- TREES + NATURAL RESOURCES

**OPINION OF PROBABLE COST**

(see appendix A for details)

$3,210,898 (TOTAL)

**POTENTIAL ROW IMPACTS**

(no survey completed at this time)

- NORTH SOUTH SHOULDER/ROADWAY WIDENING

- 11' | 11'

YES YES NO -

- 3,153 SF INCREASE FOR PAVED SHOULDERS
- RELOCATION OF XXX XXX POLES
- REMOVAL OF XXX XXX TREES

**Alternative C2**

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

**Eliminate right-turn lane to accommodate new shared-use path**

**Investigate available credit in ROW for disconnection of non-rooftop runoff. Site grading may allow stormwater management but would require additional ROW and could impact adjacent private property.**

**Additional landscaping may be required.**

**Please refer to the table on page 39.**
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 program 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. **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 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 issues monitored by the Traffic Monitoring Study. The estimated costs for the shared use path concepts are $3.2 million at each location. A combination of state and federal funding sources can be explored to advance improvements at each location.

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 continuously 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.
Bikeways Program

- Funding: Federal, state, and local funding
- Objectives: Provide safe and accessible facilities for bicyclists
- Eligible Projects: Projects that improve bicycle facilities
- Requirements: Projects must meet state, federal, and local requirements
- Expected Outcomes: Improved safety and connectivity for bicyclists

Highway Safety Grants Program

- Funding: Federal, state, and local funding
- Objectives: Reduce traffic fatalities and serious injuries
- Eligible Projects: Projects that improve highway safety
- Requirements: Projects must meet state, federal, and local requirements
- Expected Outcomes: Reduced fatalities and injuries

Transportation Alternatives Program (TAP)

- Funding: Federal, state, and local funding
- Objectives: Enhance the cultural, aesthetic, historic, and environmentally-friendly transportation system
- Eligible Projects: Projects that improve transportation system
- Requirements: Projects must meet state, federal, and local requirements
- Expected Outcomes: Improved transportation system

Highway Safety Grants Program

- Funding: Federal, state, and local funding
- Objectives: Reduce traffic fatalities and serious injuries
- Eligible Projects: Projects that improve highway safety
- Requirements: Projects must meet state, federal, and local requirements
- Expected Outcomes: Reduced fatalities and injuries

Transportation Alternatives Program (TAP)

- Funding: Federal, state, and local funding
- Objectives: Enhance the cultural, aesthetic, historic, and environmentally-friendly transportation system
- Eligible Projects: Projects that improve transportation system
- Requirements: Projects must meet state, federal, and local requirements
- Expected Outcomes: Improved transportation system

MD 32 Preliminary Cost Estimate Summary

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Section</th>
<th>Location</th>
<th>Treatment</th>
<th>Cost</th>
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<tbody>
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For additional detail, assumptions, and clarifications, please refer to Appendix A - Cost Estimates.
### Cost Estimate

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### DRAFT OPINION OF PROBABLE COST

**Category 1 - Preliminary**
- Electric / Telecom Poles: 50 feet, 300 units, $30,000 (500 units total)
- Soils 12” & 18” mat: 720 square yards, $2,500
- Refertilizing: 720 square yards, $4,000
- Turfgrass Establishment: 720 square yards, $10,000

**Category 2 - Roadway**
- Bridge Removal: 25 feet, 1 unit, $45
- Bridge Superstructure Replacement: 200 feet, 1 unit, $200
- Bridge Deck Replacement: 115 feet, 1 unit, $115
- Bridge Over Roadway or Highway: 200 feet, 1 unit, $200
- Bridge Over Water: 320 square feet, 1 unit, $320

**Category 3 - Drainage**
- Traffic Barrier W-Beam, Single Face: 880 linear feet, $25
- Traffic Barrier W-Beam End Treatment, Single Face: 5 units, $2,500
- Curb and Gutter: 0 linear feet, $0
- Removal of Existing Sidewalk: 0 cubic yards, $0
- Removal of Existing Curb and Gutter: 0 linear feet, $0

**Category 4 - Utilities**
- Milling/Resurfacing: 200 square feet, $100,000

**Category 5 - Roadway**
- Traffic Barrier W-Beam, Single Face: 0 linear feet, $0
- Traffic Barrier W-Beam End Treatment, Single Face: 0 units, $0
- Curb and Gutter: 0 linear feet, $0
- Removal of Existing Sidewalk: 0 cubic yards, $0
- Removal of Existing Curb and Gutter: 0 linear feet, $0

**Category 6 - Roadway**
- Traffic Barrier W-Beam, Single Face: 0 linear feet, $0
- Traffic Barrier W-Beam End Treatment, Single Face: 0 units, $0
- Curb and Gutter: 0 linear feet, $0
- Removal of Existing Sidewalk: 0 cubic yards, $0
- Removal of Existing Curb and Gutter: 0 linear feet, $0

**Category 7 - Drainage**
- Box Culverts: 108 square feet, $325
- Tree Branch Pruning: 1 unit, $2,500
- Tree, Shrub and Perennial Installation & Establishment: 1 unit, $18,607
- Refertilizing: 720 square yards, $4,000
- Turfgrass Establishment: 720 square yards, $10,000

**Category 8 - Traffic**
- Tree Root Pruning: 475 linear feet, $10
- Tree, Shrub and Perennial Installation & Establishment: 1 unit, $18,607
- Type D Soil Stabilization Matting: 1,304 square yards, $5

**Paving**
- PCC Pavement (For Driveways): 0 square yards, $0

**Paving**
- Grading, Paving & Shoulder: 200 square feet, $40

**Utilities**
- Water & Sewer: 0 linear feet, $0

**Paving**
- Chain Link Fence: 0 linear feet, $0

### Summary

**Total Cost**
- $2,500

### Cost Breakdown

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<tr>
<th>Item</th>
<th>Unit</th>
<th>Quantity</th>
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<td>Soils 12” &amp; 18” mat</td>
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<td>Turfgrass Establishment</td>
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<td>Bridge Deck Replacement</td>
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**Total Cost**
- $2,500
### DRAFT OPINION OF PROBABLE COST
3/11/2020

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**Category**: Planner

**Project**: MD Bicycle Route Study

**Overview**

- **Alternate B - Pinch Point #4 - Concept B1**
  - Total Cost: $995,794
  - Planning Costs: $283,985
  - Total Overhead: 12.3%

- **Alternate B - Pinch Point #4 - Concept B2**
  - Total Cost: $1,626,294
  - Planning Costs: $281,949
  - Total Overhead: 12.3%

- **Alternate B - Pinch Point #4 - Concept B3**
  - Total Cost: $650,702
  - Planning Costs: $252,995
  - Total Overhead: 12.3%

**Cost Breakdown**

- **Category 1 - Traffic**
  - Tree Root Pruning: $10,000

- **Category 2 - Stormwater Management**
  - Type D Soil Stabilization Matting: $15,320

- **Category 3 - Bridge**
  - Bridge Over Water: $320

- **Category 4 - Structures**
  - Bridge Superstructure Replacement: $200

- **Category 5 - Miscellaneous**
  - Traffic Barrier W-Beam End Treatment: $2,500

- **Category 6 - Landscaping**
  - Refertilizing: $3,776

- **Category 7 - Traffic**
  - Traffic Barrier W-Beam: $4,000

- **Category 8 - Bridge**
  - Bridge Deck Overlay: $0

**Utilities**

- $154,628

**Construction**

- $46,800

**Contingency**

- $66,157

**Overhead**

- $283,985

**Project & Planning**

- Total: $819,525

**Mainline Signing**

- EA: $500

**Pedestrian/Ornamental Lighting**

- MI: $1,408,000

**PCC Pavement**

- SY: $130

**Refertilizing**

- SY: $3,776

**Traffic Barrier W-Beam**

- LF: $25

**Thermoplastic Pavement Markings**

- LF: $1.50

**Tree Branch Pruning**

- LS: $2,500

**Tree, Shrub and Perennial Installation & Establishment**

- LS: $25,800

**Type D Soil Stabilization Matting**

- SY: $5

**Curb and Gutter**

- LF: $45

**Curb and Gutter (Asphalt)**

- LF: $45

**Curb and Gutter (Concrete)**

- LF: $45

**PCC Pavement (For Driveways)**

- SY: $130

**Refertilizing**

- SY: $3,776

**Traffic Barrier W-Beam End Treatment**

- EA: $2,500

**Pedestrian/Ornamental Lighting (Both Sides of Road)**

- MI: $1,408,000

**PCC Pavement**

- SY: $130

**Mainline Signing**

- EA: $500

**Pedestrian/Ornamental Lighting**

- MI: $1,408,000

**Mainline Signing**

- EA: $500

**Pedestrian/Ornamental Lighting**

- MI: $1,408,000
**Assumptions & Clarifications**

1. Assumed resurfacing of existing lane where widening.
2. Estimates do not include quantities or costs for retaining walls or noise barriers.
3. Assumed in additional lighting as part of standard improvements.
4. Right-of-way (ROW) costs included in estimates, but not part of project cost.
5. LID costs vary significantly based on final design, additional analysis required to forecast costs.
6. Cost estimates prepared are in 2019 dollars; inflation has not been factored into current estimates.