

State Hill Road



WALLACE
MONTGOMERY

Bear Creek Lodge
Macungie, PA

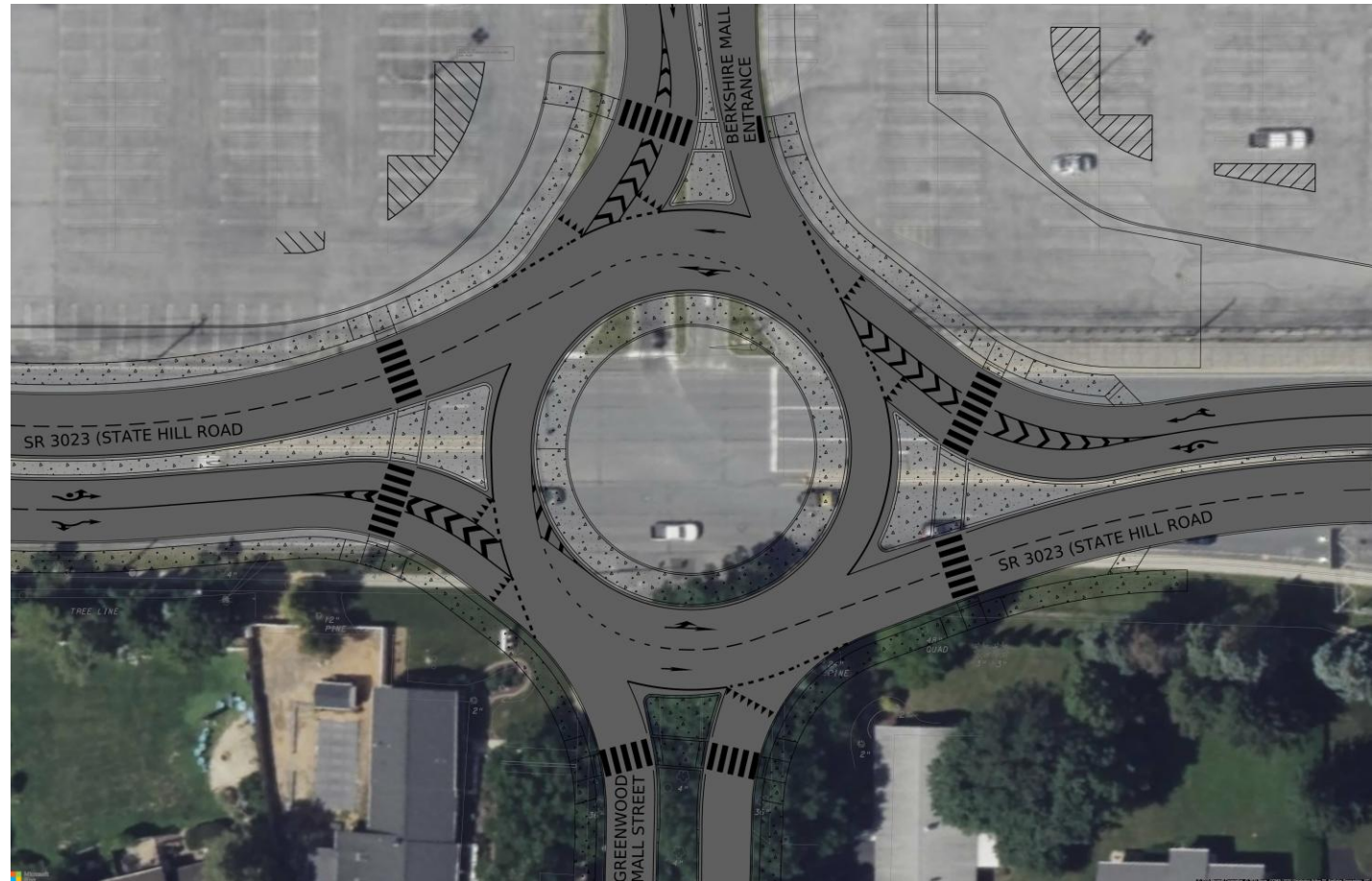


September 29, 2025

Overview



- **Project Team**
- **Project Overview**
- **Terminology**
- **Geometry Considerations**
 - Engineering Judgment
 - Inscribed Diameter
 - Truck and Bus Turning Movements
 - Path Overlap vs. Fastest Path
 - Sight Distance Checks
 - High Angle Yield
 - View Angles
- **Traffic Analysis**



Project Team



- PennDOT District 5-0 – Owner
- RK&K – Consultant Project Manager
- Wallace Montgomery - Prime
 - Drive – Traffic Support
 - ASC – Environmental
 - AEG – Survey / Geotech / ROW
 - Arrow – ROW Acquisition
- Kittelson – Peer Review

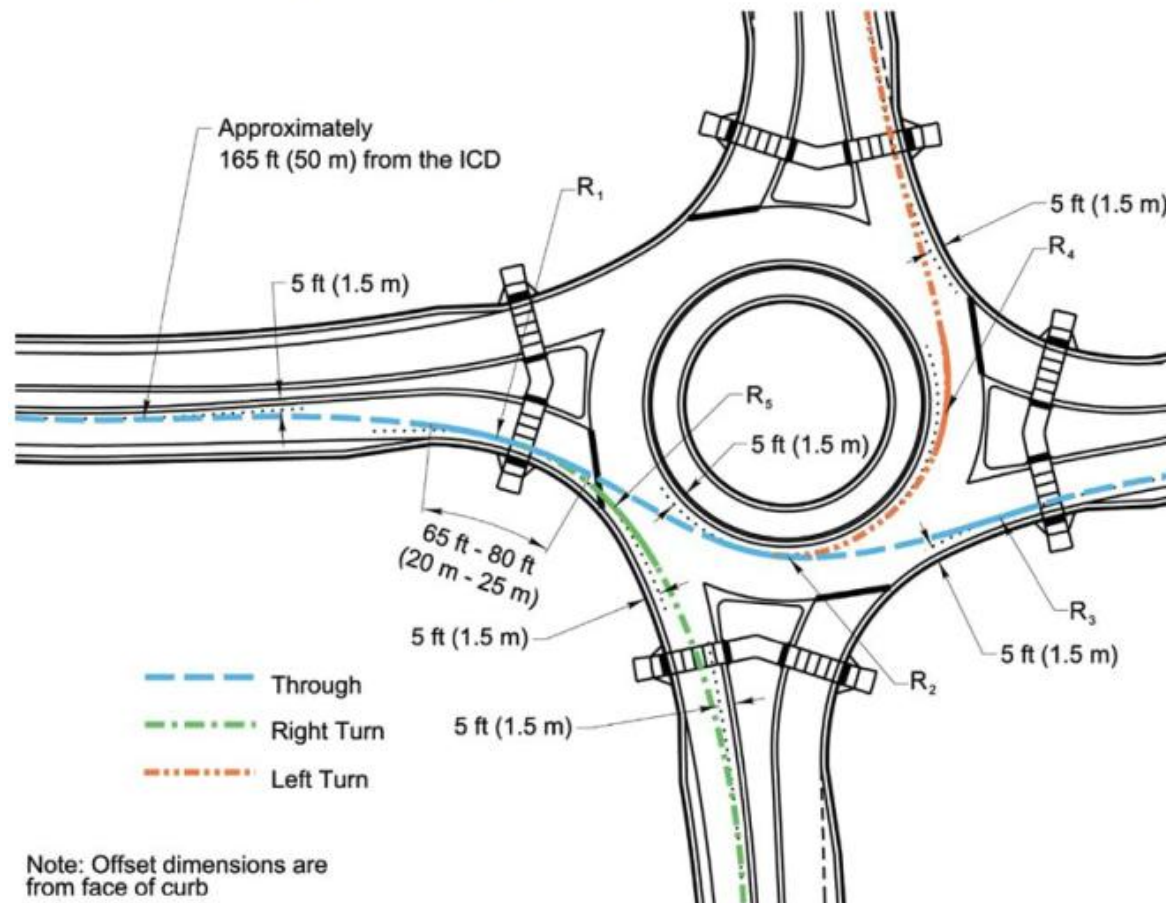


Terminology



- Fastest Path

Exhibit 9.7. Fastest paths at a single-lane roundabout.



- **Roundabout Cases**

- Case 1 (straddle lanes):

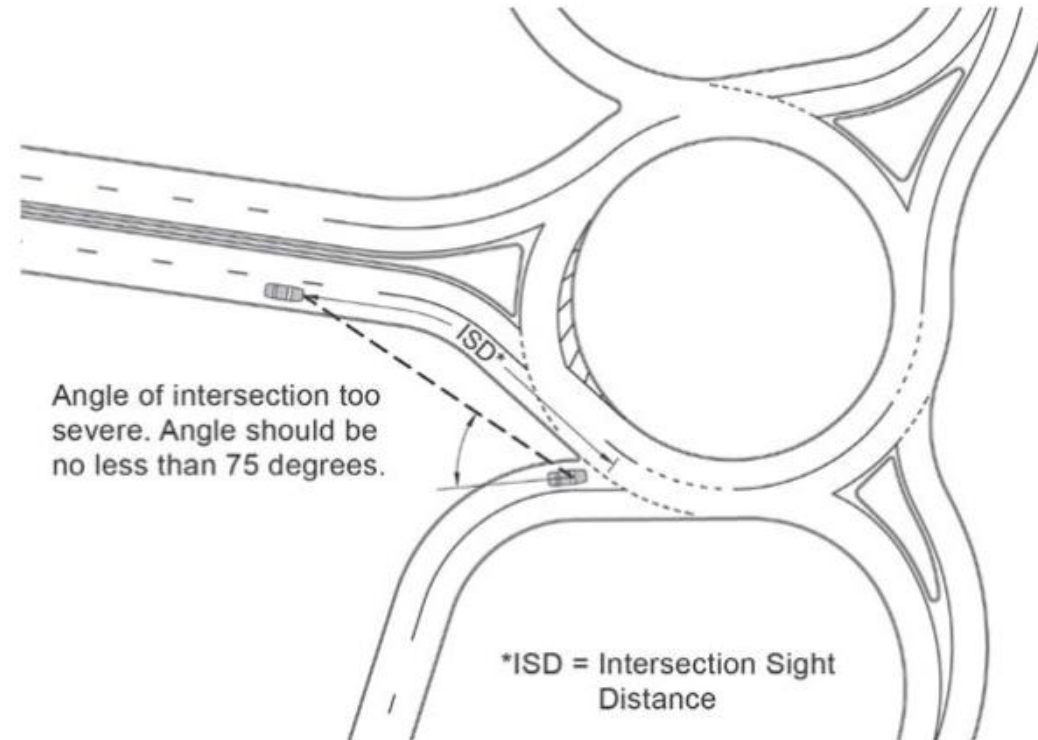
Roundabouts which are designed to allow trucks to encroach into adjacent lanes as they approach, enter, circulate, and exit the intersection. Refer to Figure 10.13 for an example of a Case 1 design. Where a single-lane roundabout approach flares to a multilane entry, Case 1 design is preferred as the truck can easily block out other vehicles as it approaches the entry, see Figure 10.14.

- Case 2:

Roundabouts which are designed to accommodate trucks in-lane as they approach and enter the roundabout but may require trucks to encroach into adjacent lanes as they circulate and exit the intersection. Case 2 roundabouts have a painted “gore” area between lanes on the approaches. Refer to Figure 10.15 for an example of a Case 2 design. Case 2 design is preferred on four-lane facilities as these configurations can be more difficult for a truck to block out other vehicles approaching the roundabout.

- View Angles or Angle of Visibility

Exhibit 9.20. Example design with severe angle of visibility to left.



SOURCE: *NCHRP Report 672* and Tian et al. (2, 6).

Project Overview

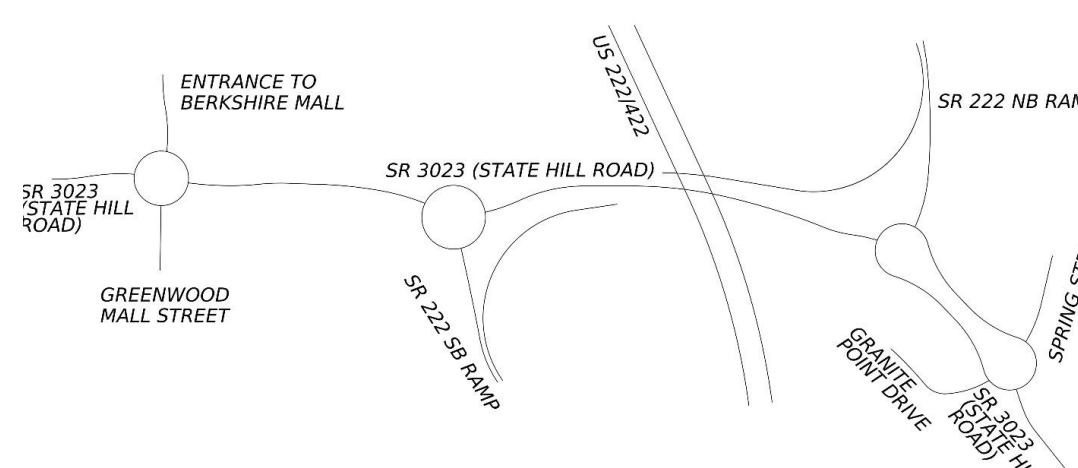
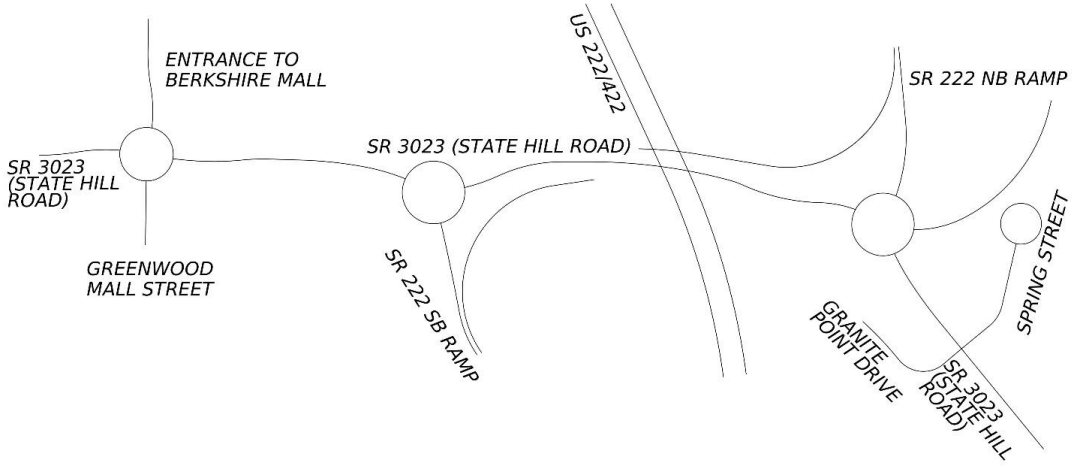
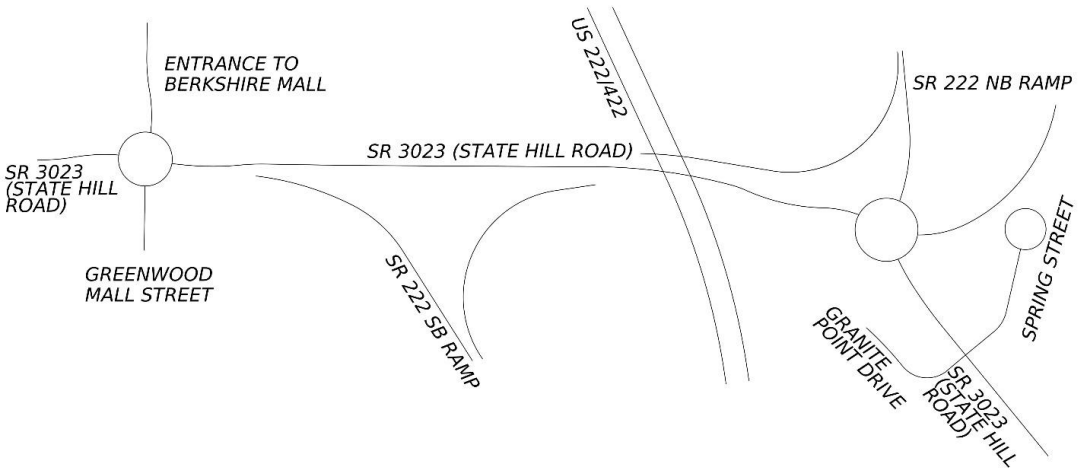
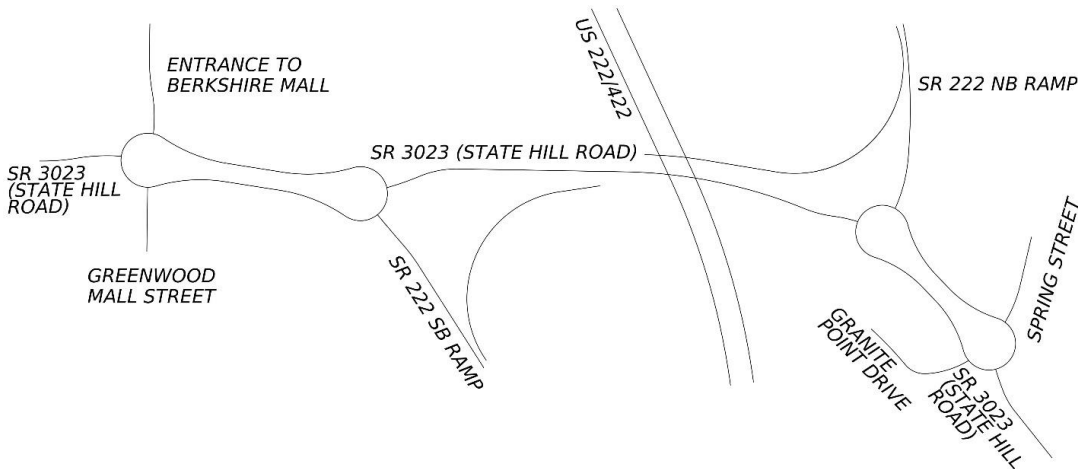
SR 3023 State Hill Road | Berks County, PA



Project Overview

SR 3023 State Hill Road | Berks County, PA

E05144 | PennDOT District 5-0



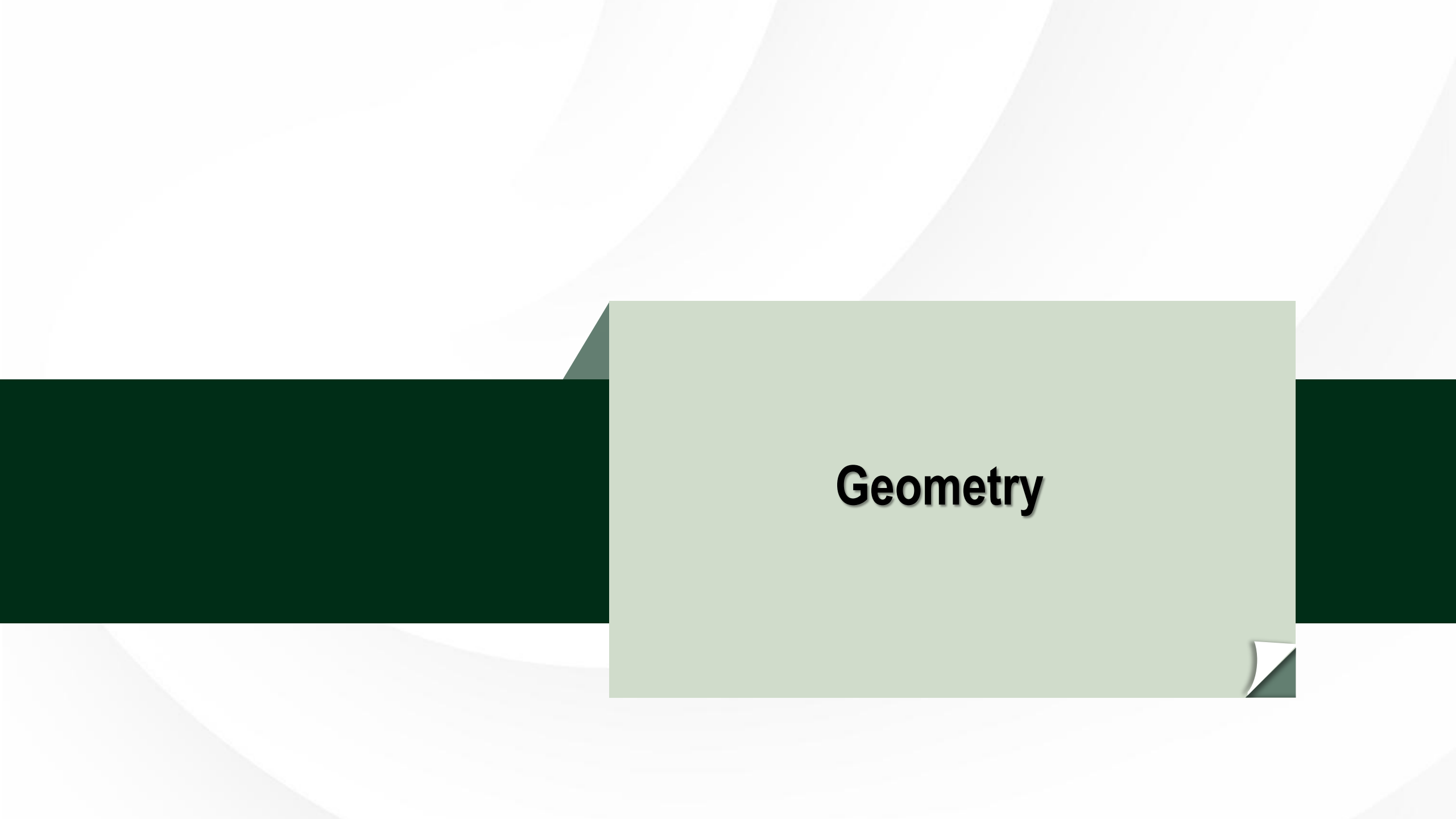
Project Overview

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Site Constraints

- Terrain
- Bridges and Retaining Walls
- Land Use



Geometry

Design Considerations and Engineering Judgement



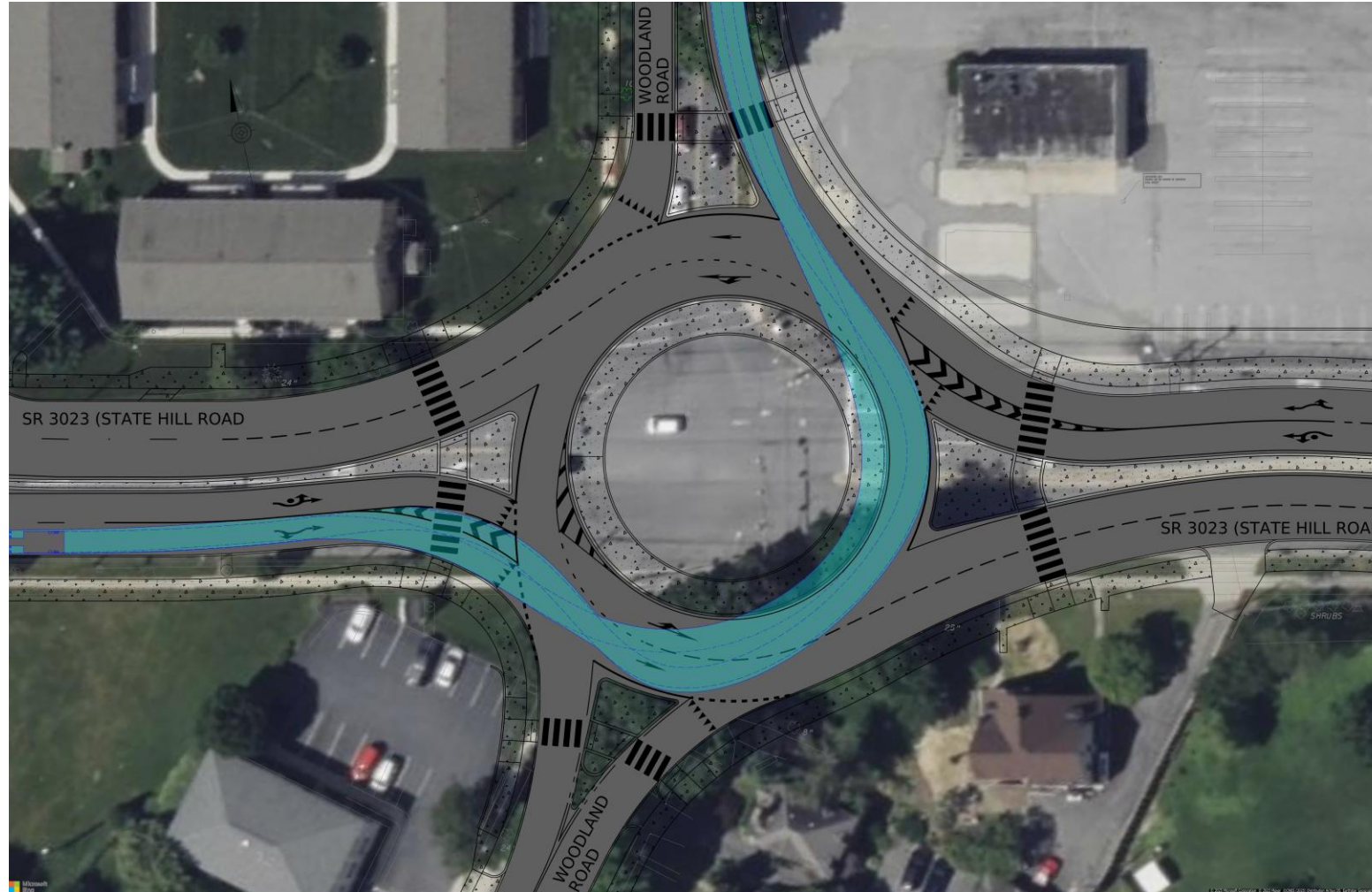
Geometric Design Performance Checks

- Design Vehicle/Truck Case
- Inscribed Diameter
- Fastest Paths / Slow and Consistent Speeds for All Movements
- Path Overlap
- Sight Distance
- View Angles

Truck/Design Vehicle Turning Movements



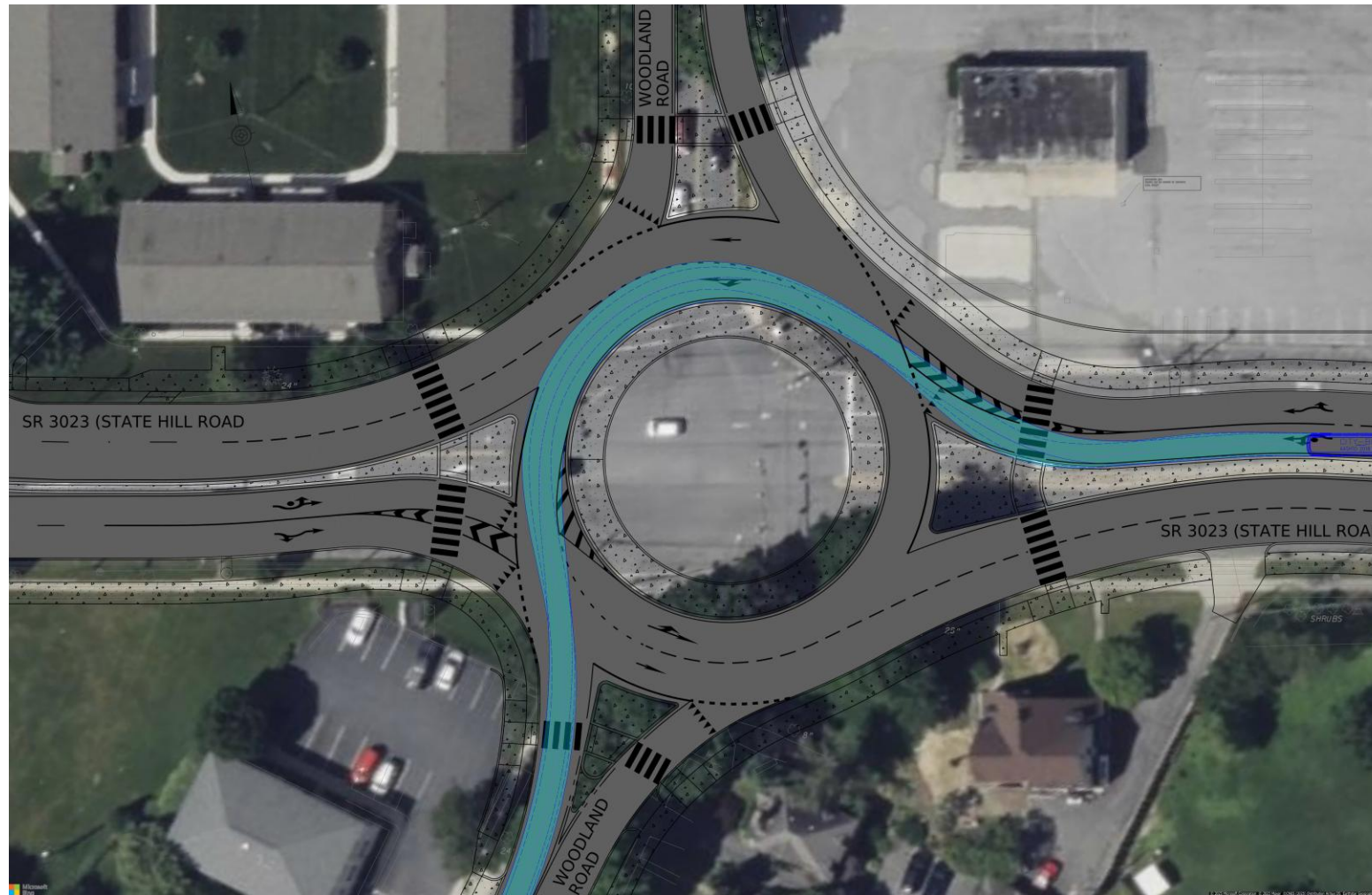
Woodland Roundabout (State Hill Road Section 04S) – WB-62 MODIFIED



Lane Widths & Turning Movements



Woodland Roundabout (State Hill Road Section 04S) – CITY BUS



Roundabout Category Comparison

- PUB-13 (DM-2) Exhibit 6.12.7 and NCHRP 1043 Exhibit 2.9

Roundabout Feature	Mini-Roundabout	Compact Roundabout	Single-Lane Roundabout	Multilane Roundabout
Center Island	Traversable	May be traversable	Non-traversable, but typically includes truck apron	Non-traversable, but typically includes truck apron
Splitter Islands	May be traversable with one-stage pedestrian crossing	May be traversable with one-stage pedestrian crossing	Non-traversable with one-stage or two-stage pedestrian crossing, depending on dimensions of pedestrian refuge	Non-traversable with two-stage pedestrian crossing
Common Inscribed Circle Diameter (ICD) range*	45 ft to 90 ft	65 ft to 120 ft	90 ft to 180 ft	150 ft to 200 ft
Maximum number of circulating lanes conflicting with each entry	1	1	1	2+

*ICD is measured to the outer edge of the traveled way of the circulatory roadway.
These values are not to be used as design constraints or targets.

Inscribed Diameter



US 422 / 222 SB Ramp Roundabout (State Hill Road Section 05S)

- 160' Diameter

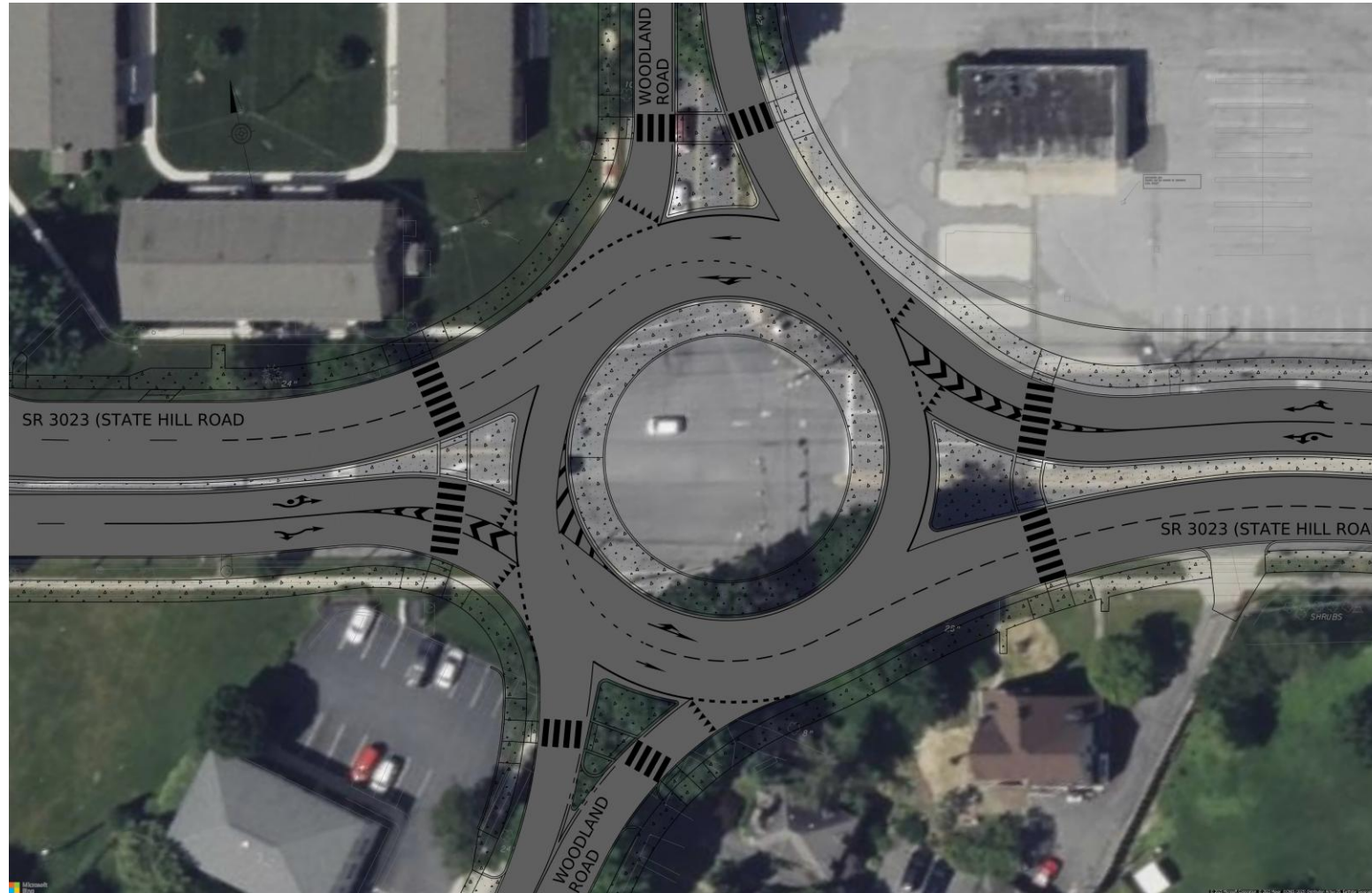


Inscribed Diameter



Woodland Roundabout (State Hill Road Section 04S)

- 180' Diameter

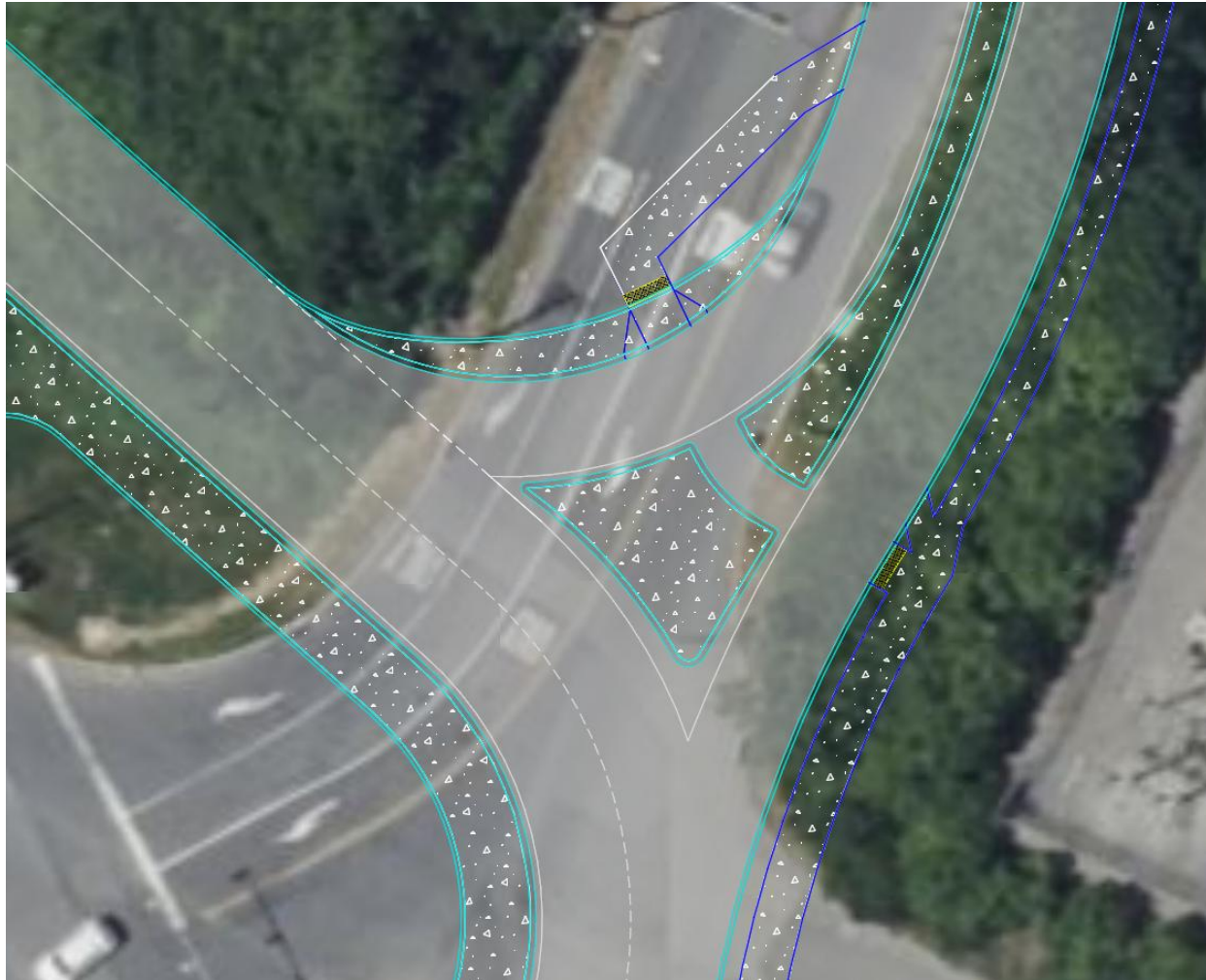


Inscribed Diameter



Spring Street Roundabout (State Hill Road Section 05S)

- Outside Truck Apron

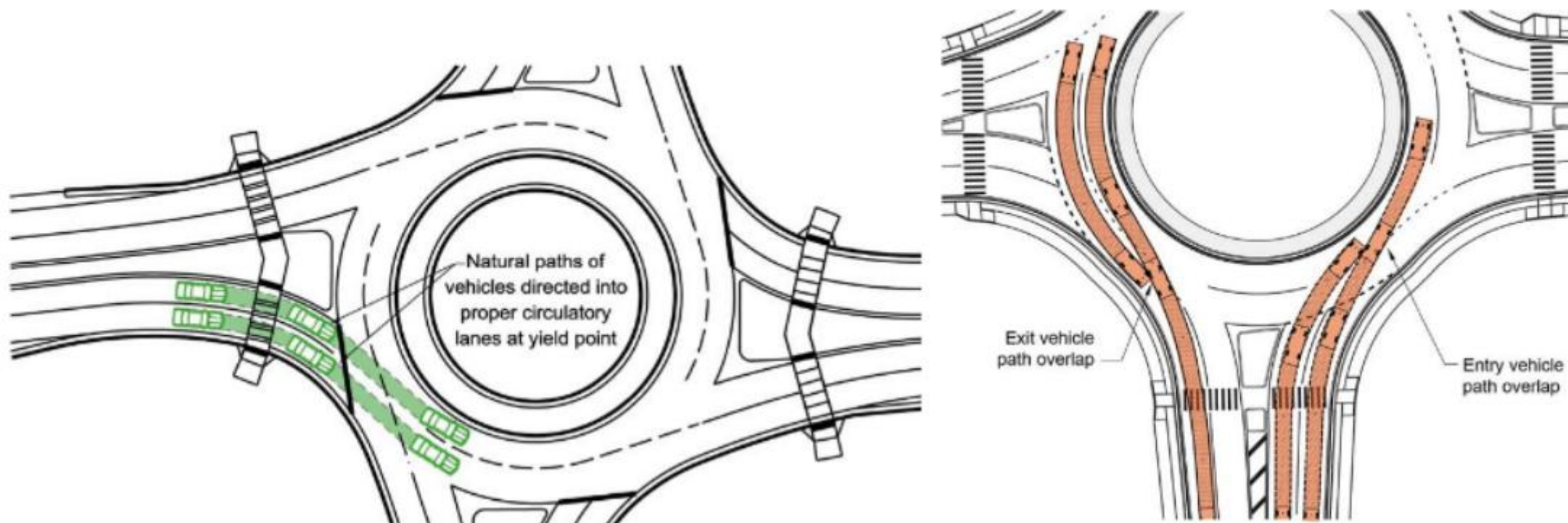


Path Overlap Vs. Fastest Path

DM-2 Exhibit 6.12.11 and NCHRP 1043, Section 9.6

- Adding tangents to exits and entrances reduces path overlap

Exhibit 6.12.11 Path Alignment Configurations



Path Overlap Vs. Fastest Path



SR 422 / 222 SB Ramp (State Hill Road Section 05S)

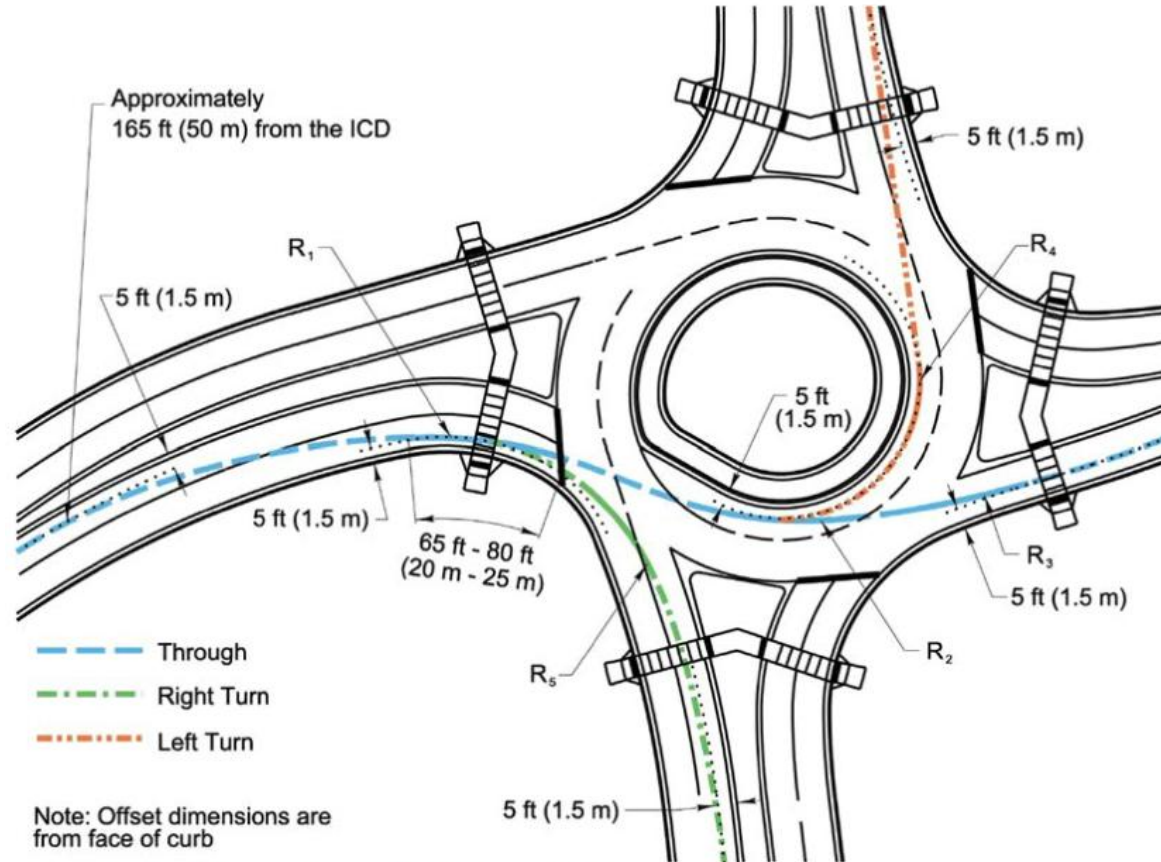


Path Overlap Vs. Fastest Path

Fastest Paths

- NCHRP 1043

Exhibit 9.8. Fastest paths at a multilane roundabout.

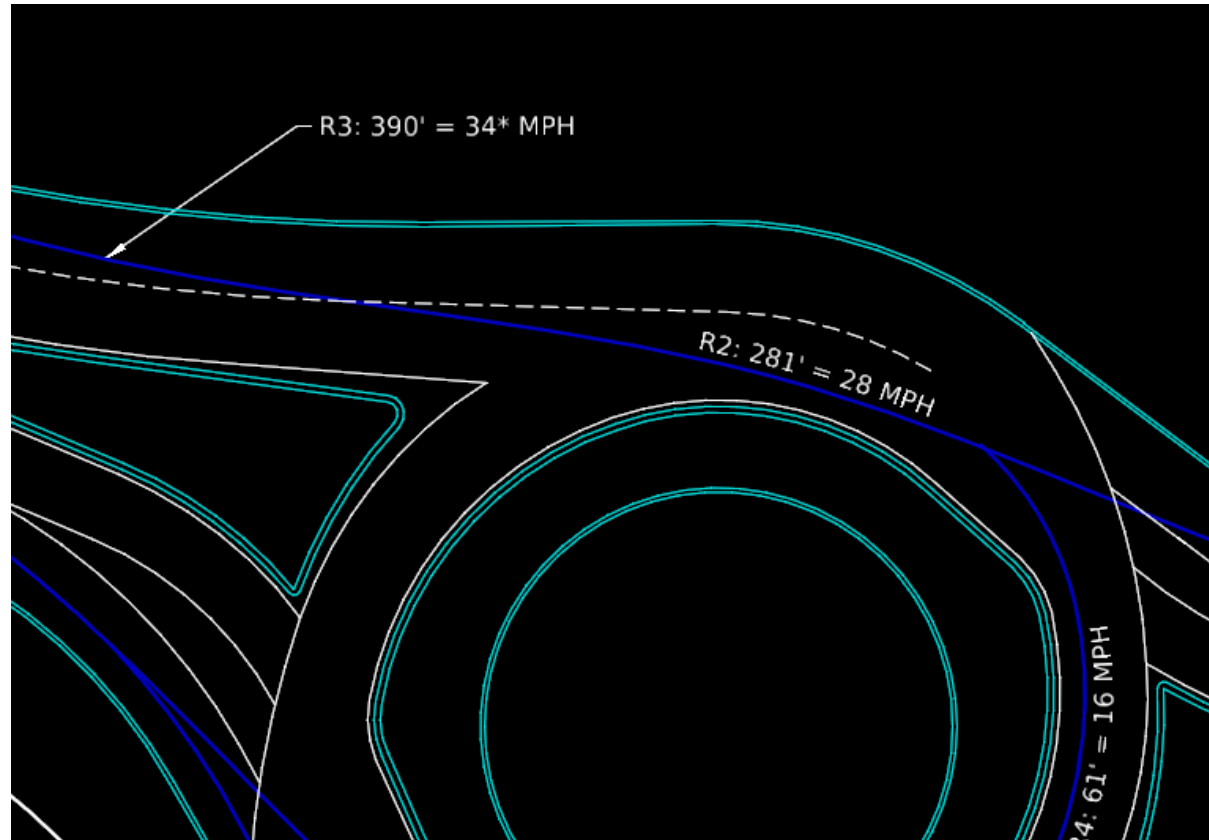


SOURCE: Adapted from Georgia Department of Transportation (3).

Path Overlap Vs. Fastest Path



SR 422 / 222 SB Ramp (State Hill Road Section 05S)

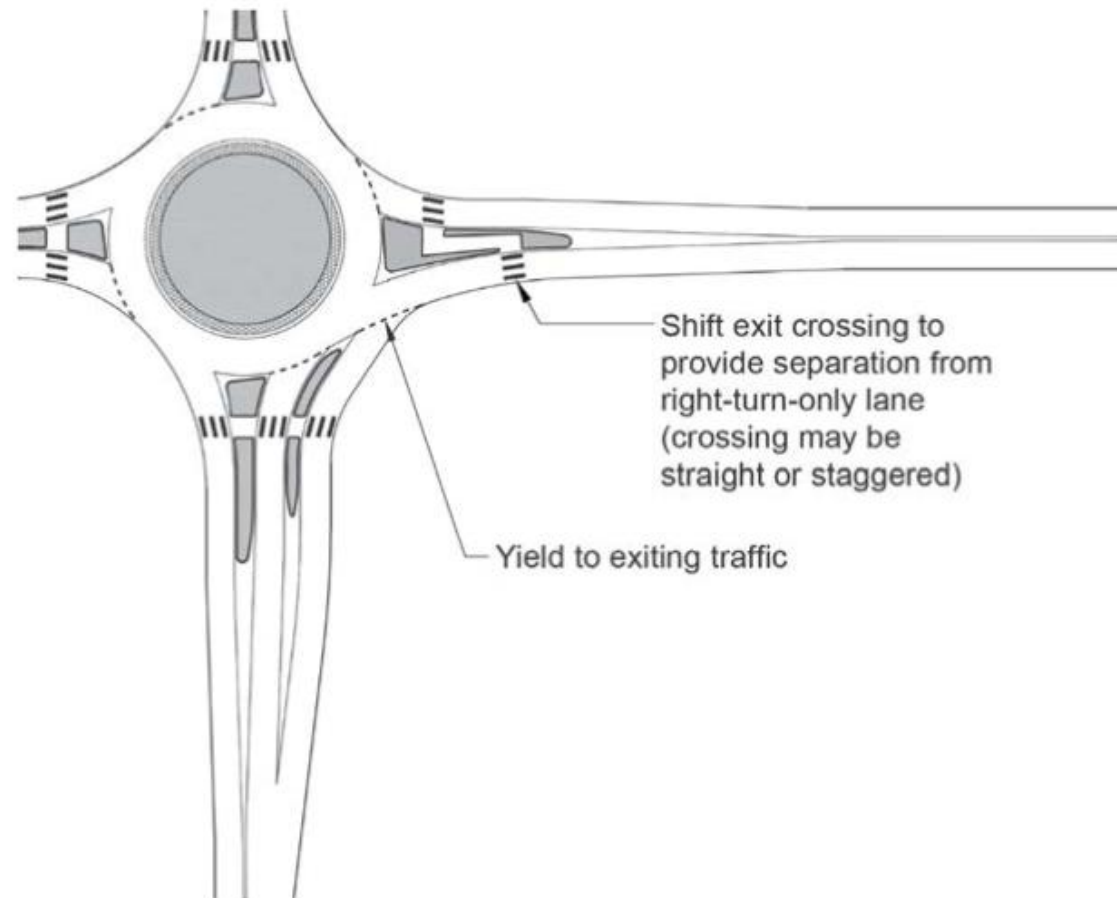


High Angle Yield



NCHRP 1043

Exhibit 10.80. Yielding right-turn bypass lane.

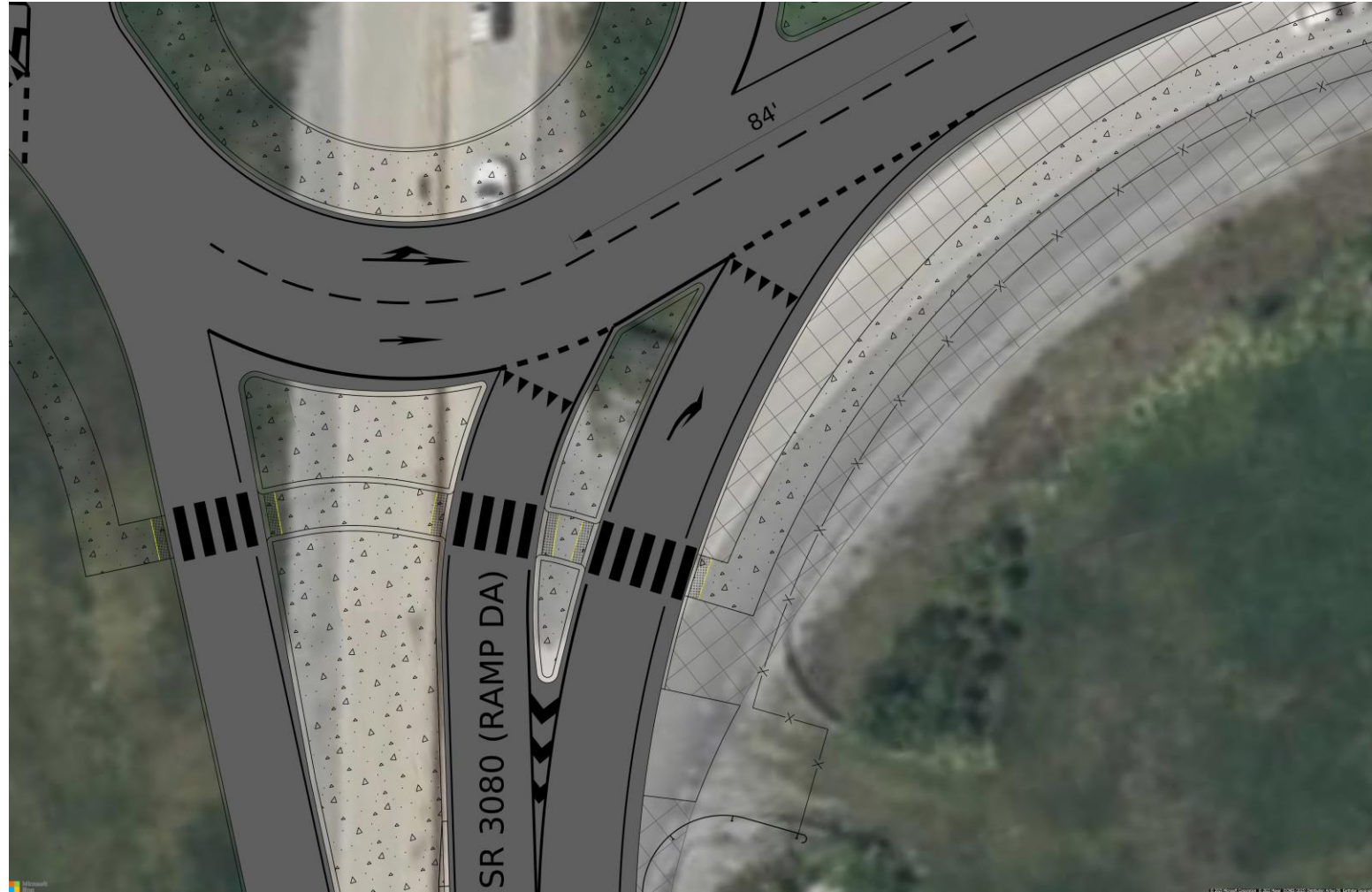


SOURCE: *NCHRP Report 672 (2)*.

High Angle Yield

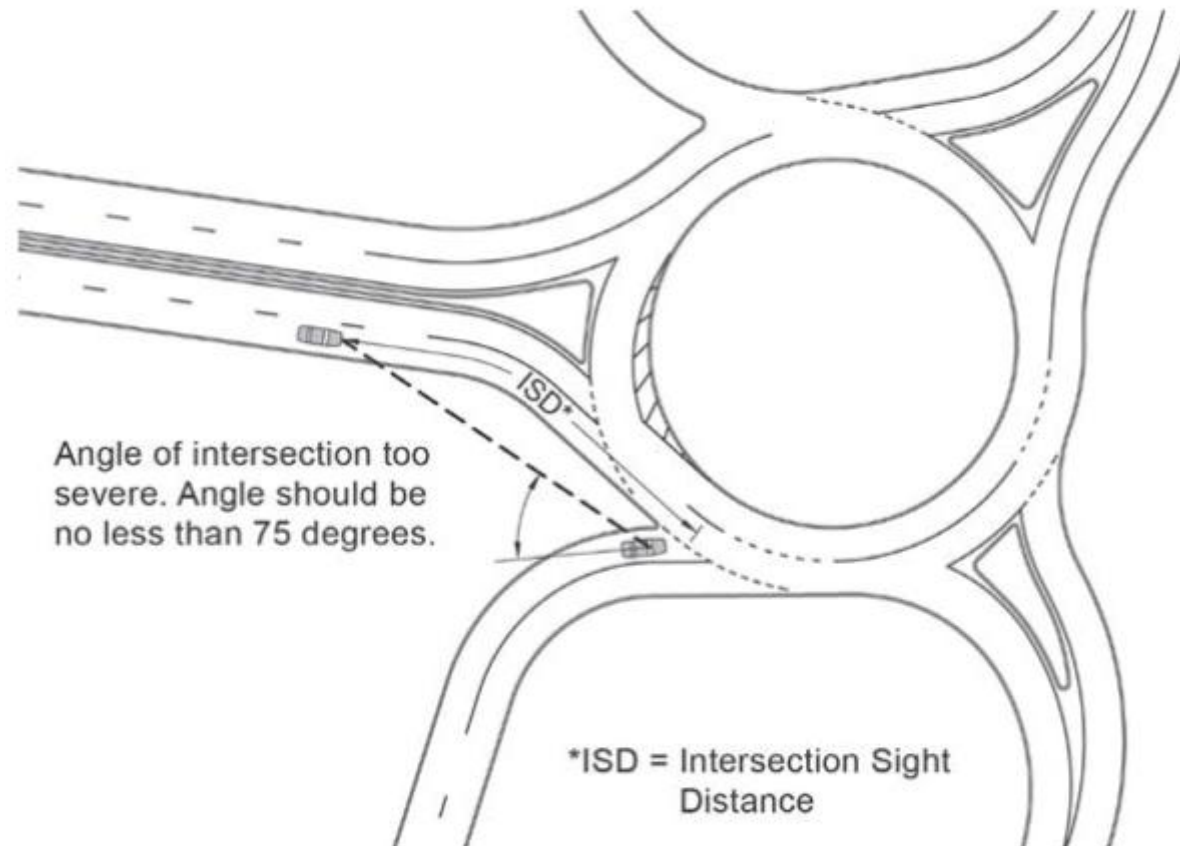


SR 422 / 222 SB Ramp (State Hill Road Section 05S)



NCHRP 1043

Exhibit 9.20. Example design with severe angle of visibility to left.

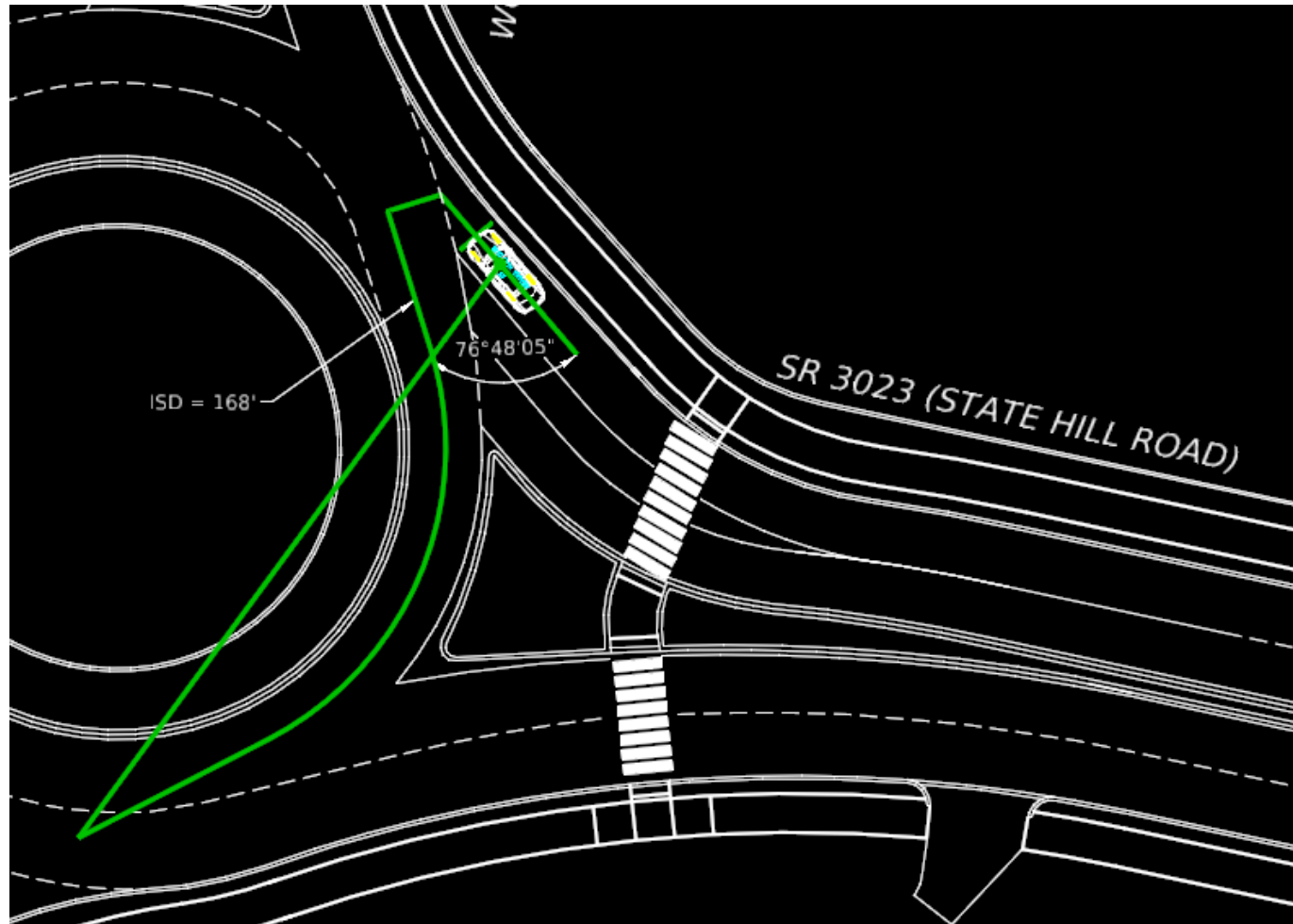


SOURCE: *NCHRP Report 672* and Tian et al. (2, 6).

View Angles



Woodland Roundabout Westbound Approach



Woodland Roundabout Northbound Approach

- Red - Current Design
- Blue - Realignment



Sight Distance Checks



Sight Distance Check Conflicts

- Gabion Wall – Westbound Approach at Berkshire Mall Roundabout

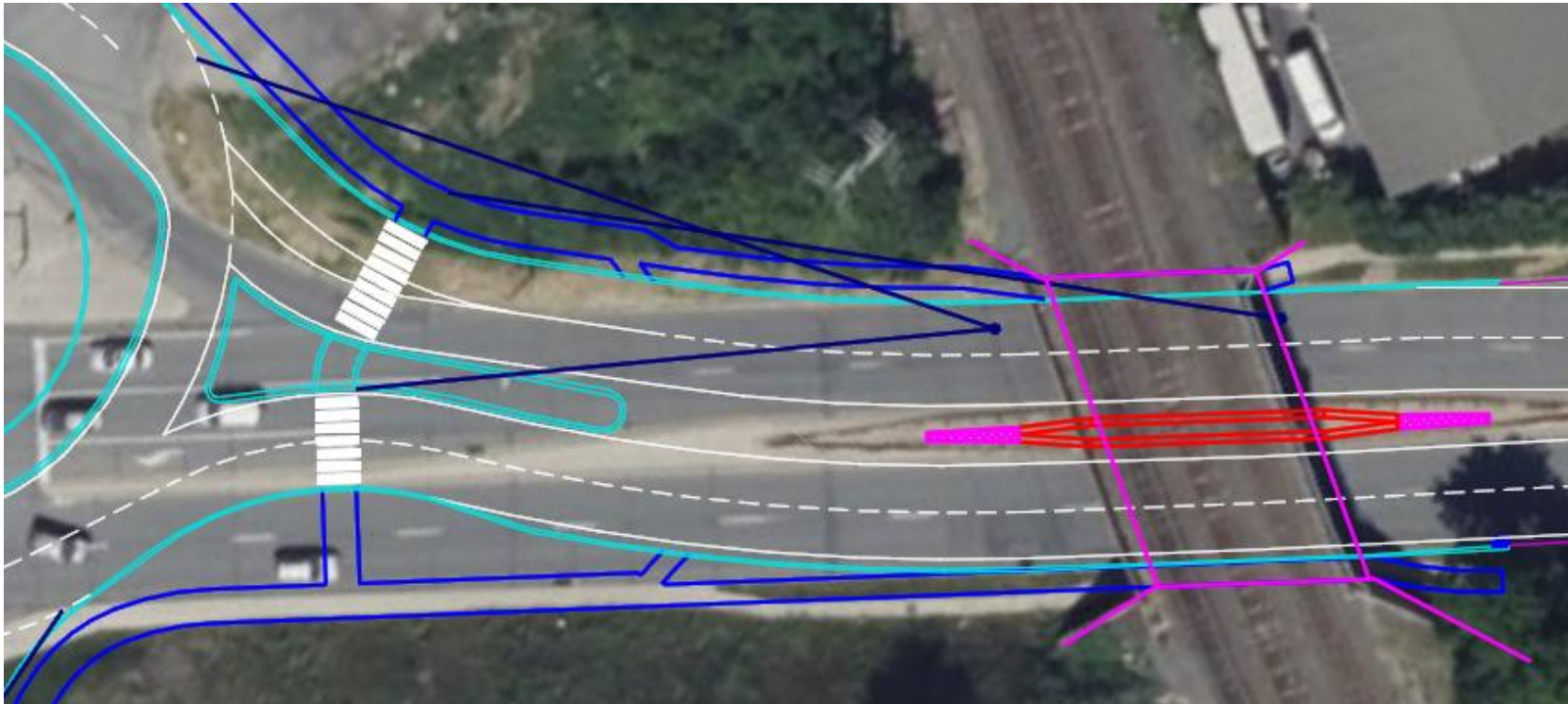


Sight Distance Checks



Sight Distance Check Conflicts

- Railroad Bridge Abutment – Northbound Approach at Spring Street Roundabout



Sight Distance Checks



Sight Distance Check Conflicts

- NCHRP 672

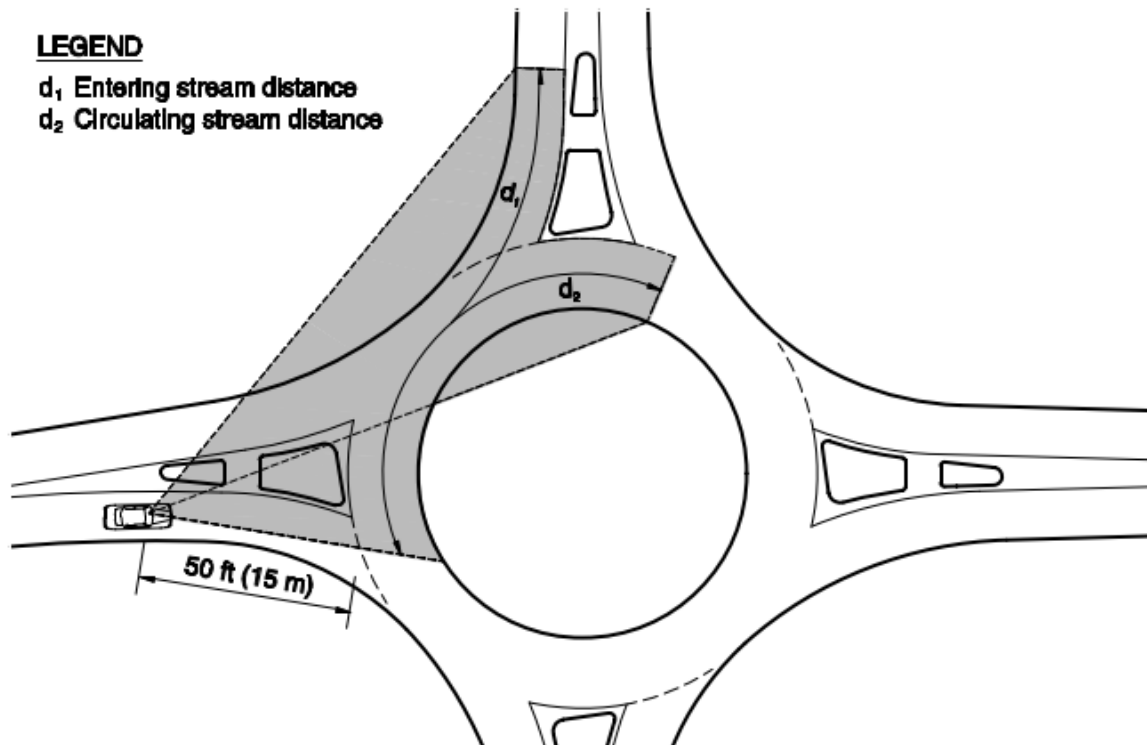


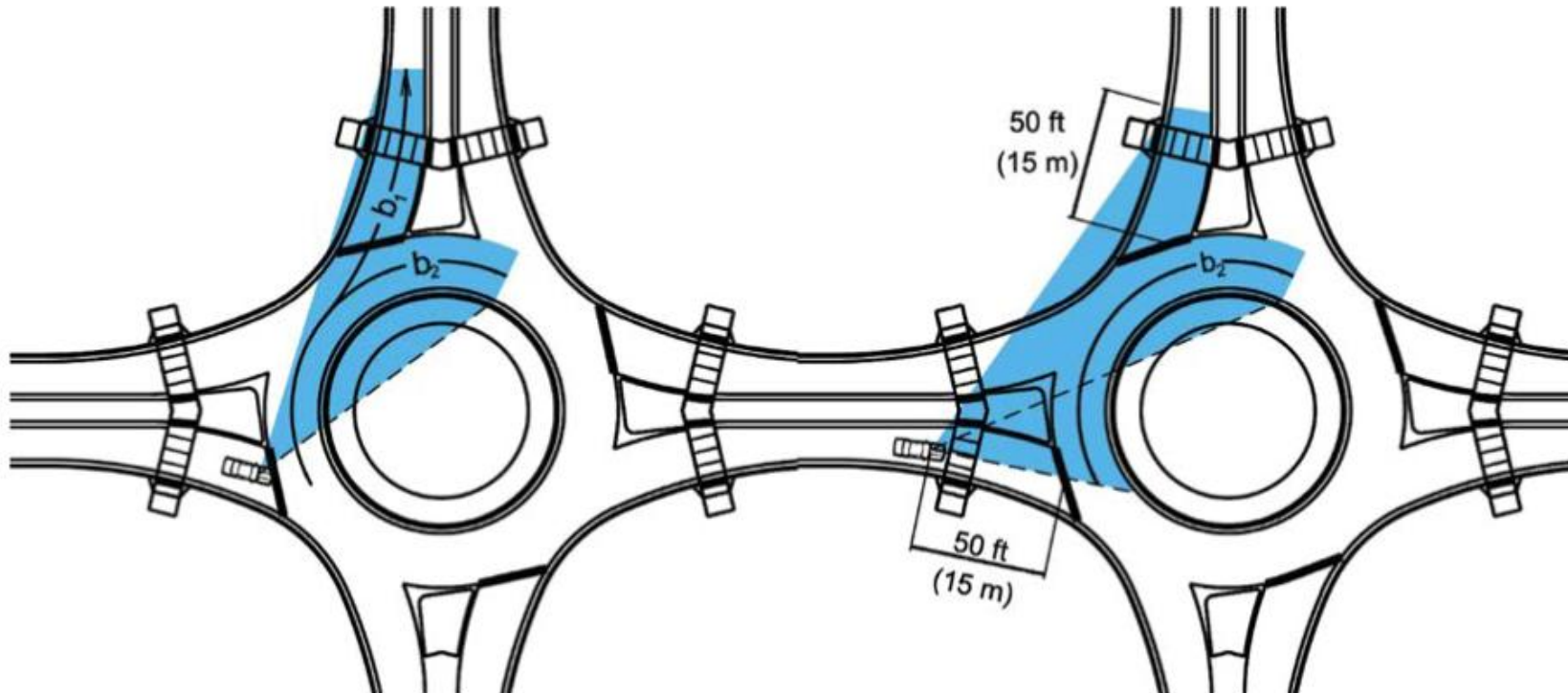
Exhibit 6-58
Intersection Sight Distance

Sight Distance Checks



Sight Distance Check Conflicts

- NCHRP 1043



Sight Distance Checks



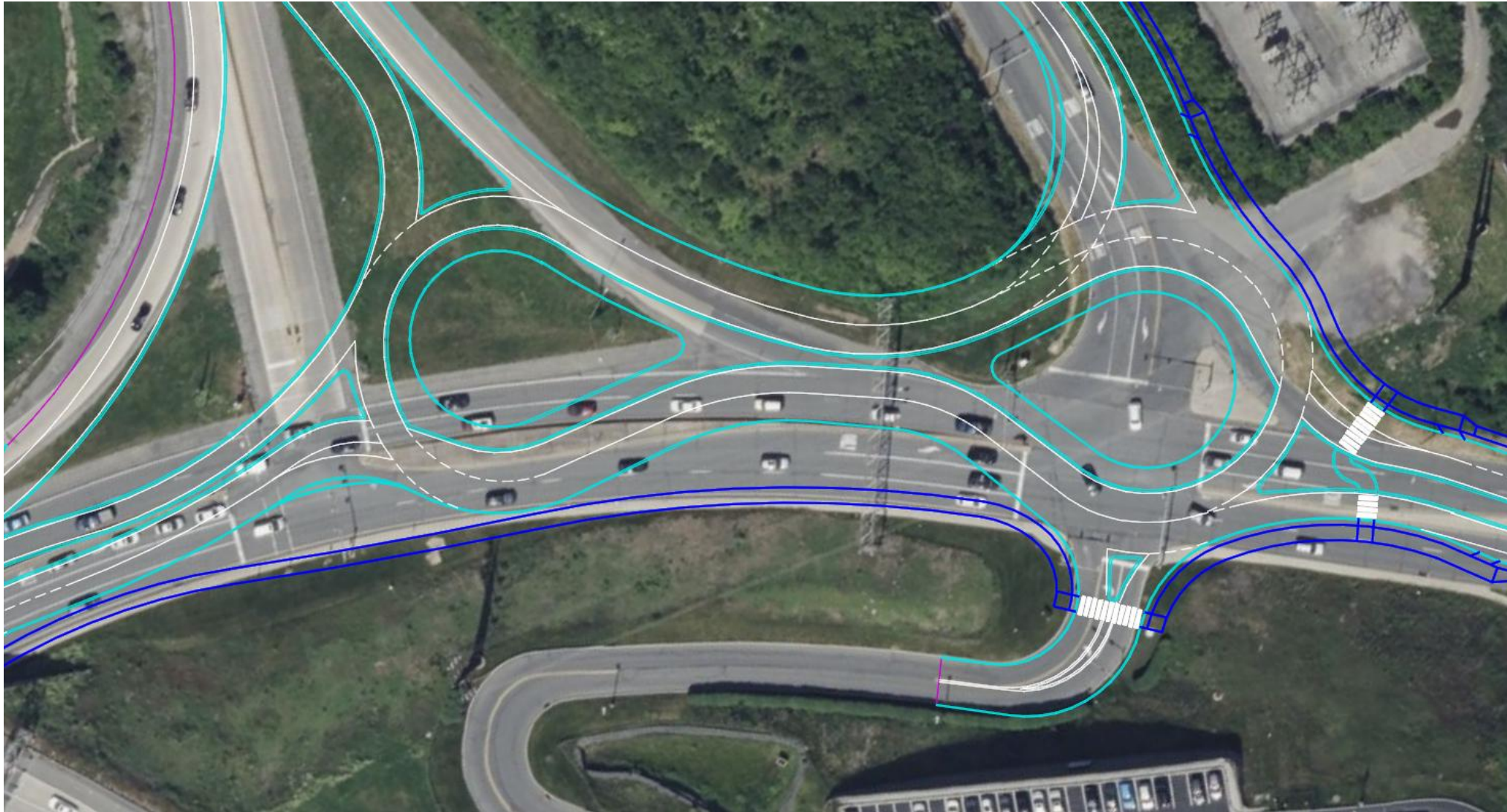
Sight Distance Check Conflicts

- Parking Lot – Northbound Approach at Woodland Roundabout

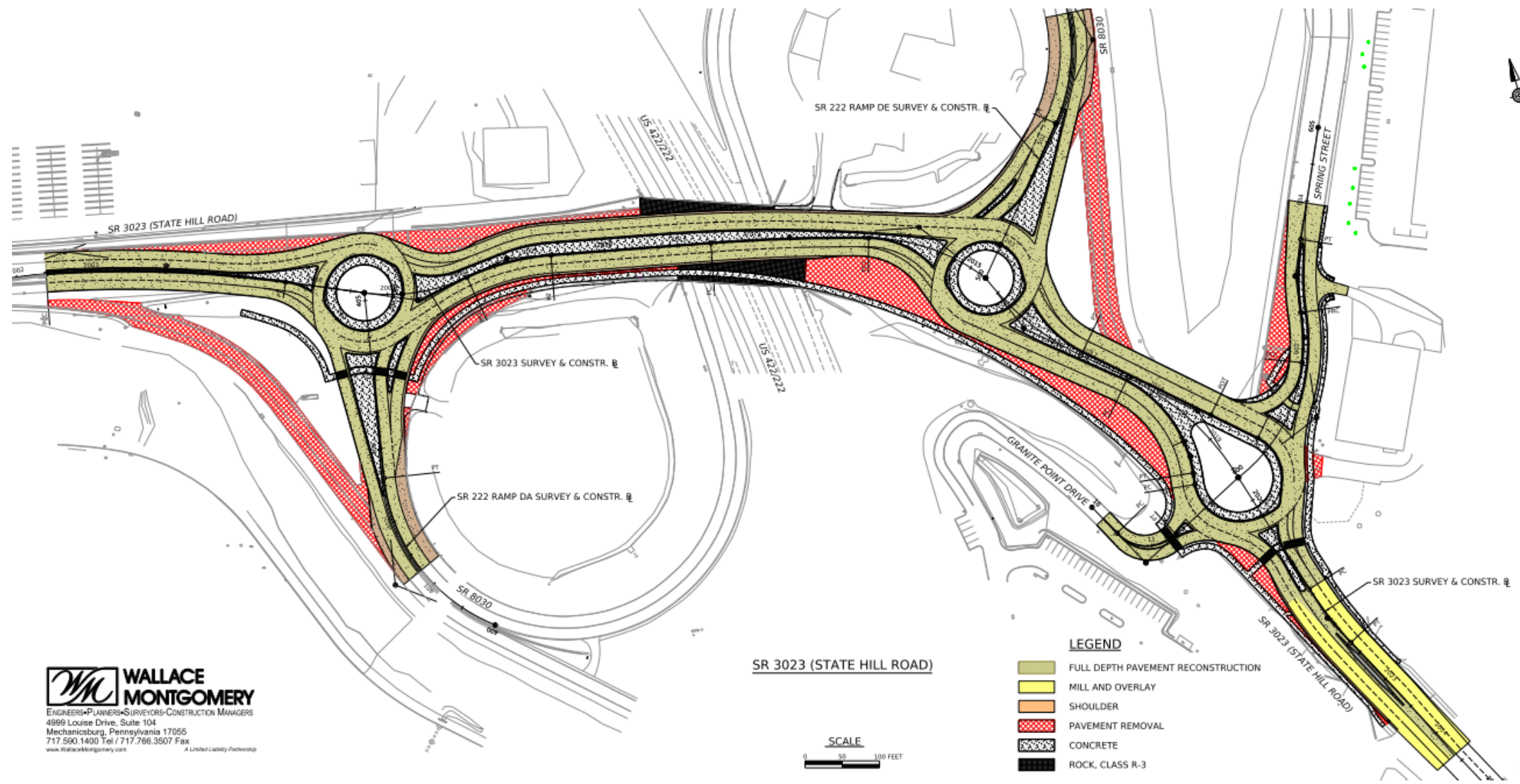


Queuing Analysis

Geometry Layout for 05S



Geometry Layout for 05S



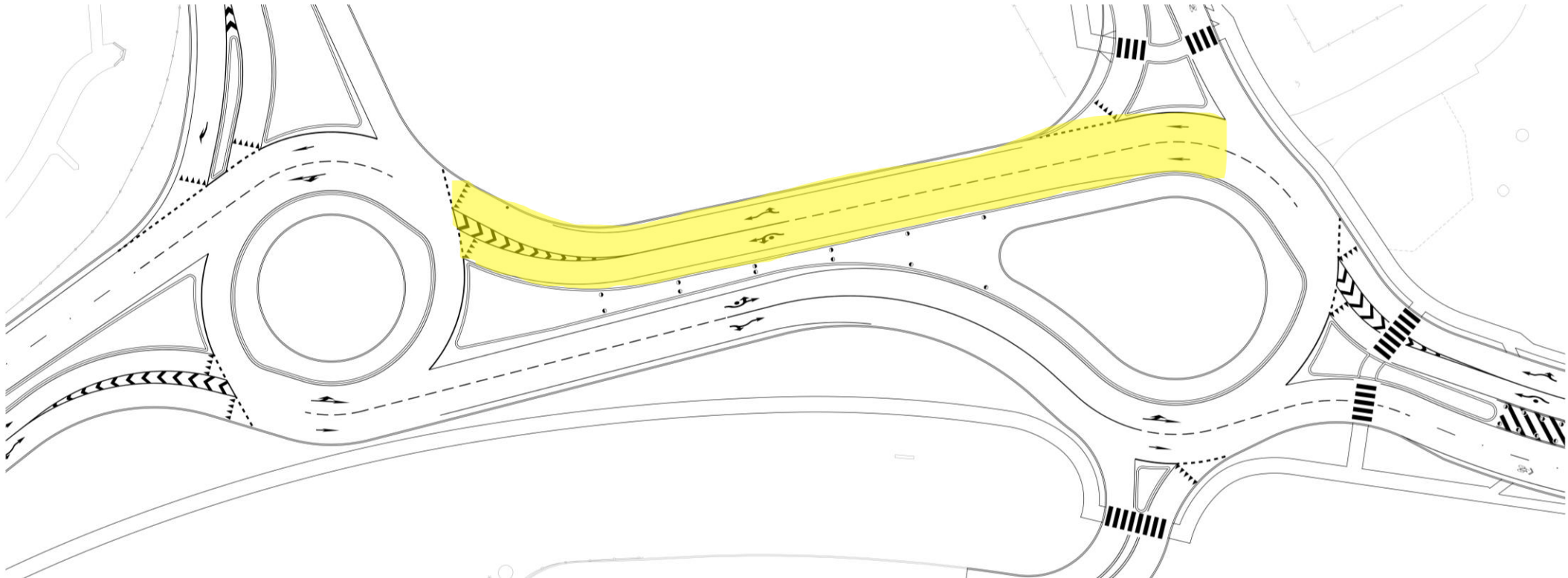
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Roundabout 95th Percentile Queuing Analyses



Convert Roundabout at US 222 NB/US 422 EB Ramp Roundabout to be Full-Access

- Evaluate WBT State Hill Road Queues Lengths (Yield to EBL)

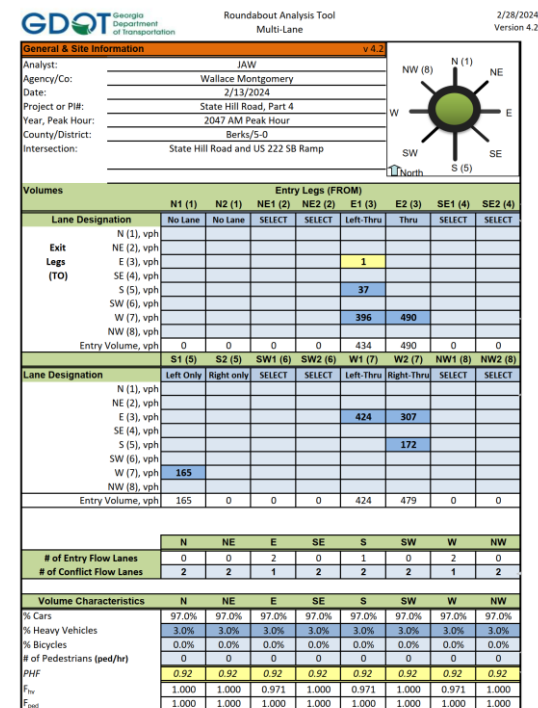
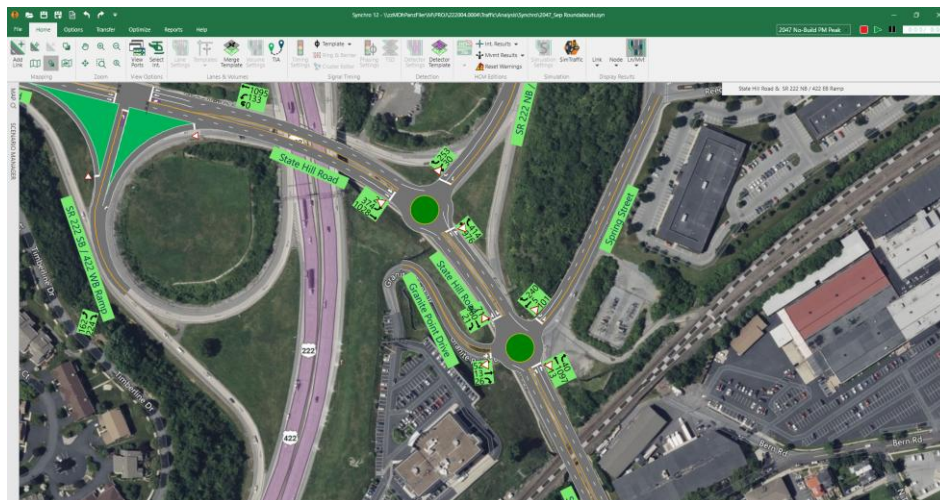
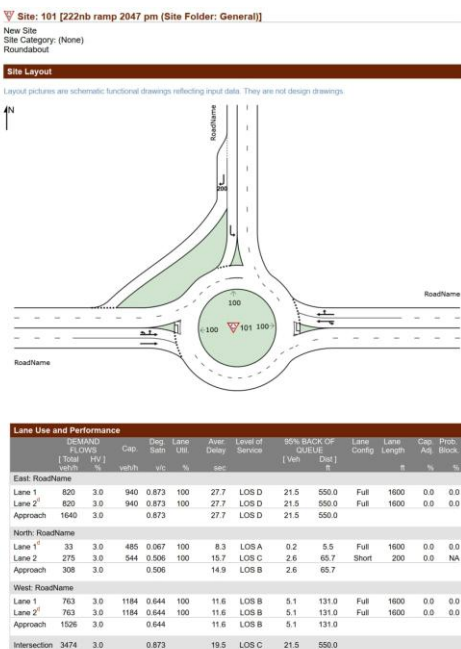


Roundabout 95th Percentile Queuing Analyses



Software

- SIDRA Intersection (Sidra Solutions)
- Synchro/SimTraffic (Cubic Corporation)
- GDOT Roundabout Analysis Tool (GDOT, link in PennDOT Signal Portal)



Roundabout 95th Percentile Queuing Analyses

Spacing between Roundabouts (405' of Available Storage)

- SIDRA Intersection – **587'**
- Synchro – **350'**
- SimTraffic – **384'**
- GDOT Roundabout Analysis Tool – **385'**

Thank You



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