

STUDY OVERVIEW

WHY IS RIVERSIDE DRIVE BEING STUDIED?

Safety and access issues exist along Riverside Drive. Riverside Drive has a high density of signalized intersections, unsignalized median openings, and driveways that do not meet VDOT access spacing standards. Many intersections and segments have high crash rates and potential for safety improvements. Multiple fatalities have occurred between 2013 and 2018, including two pedestrians and a bicyclist. Multiple crashes resulting in pedestrian injuries have also occurred.

WHAT ARE THE ISSUES?

There are no sidewalks or crosswalks along most of Riverside Drive. Pedestrian fatalities and injuries have occurred throughout the corridor.

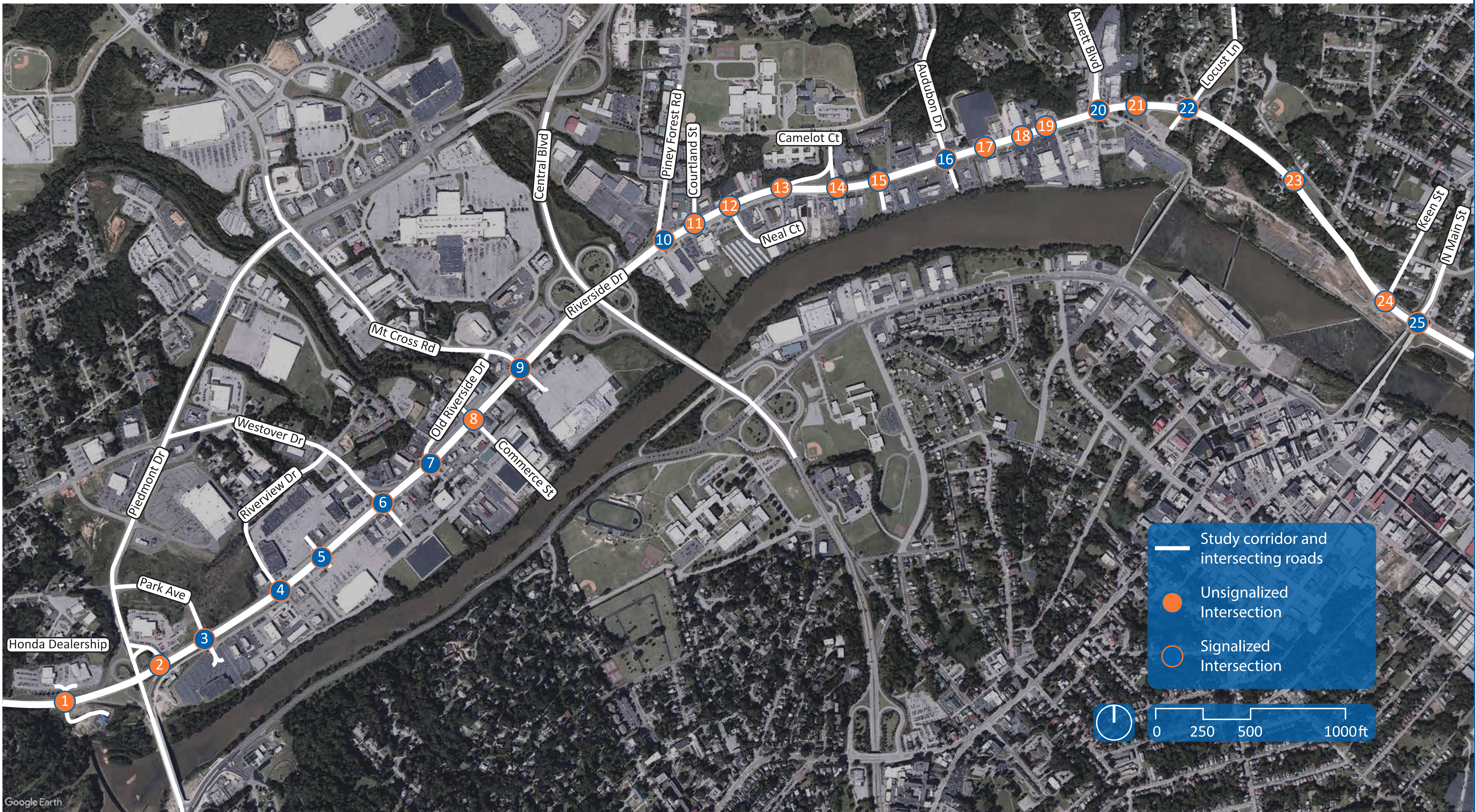
Clusters of angle and rear-end crashes occur at several intersections. Locations with the highest potential for safety improvement include:

- Old Riverside Drive at Riverside Drive
- Riverside Drive between Piedmont Drive and Westover Drive
- Riverside Drive between Piney Forest Road and Audubon Drive

Median openings and driveways are spaced closely together, creating multiple conflicts.

WHAT WILL THIS STUDY DO?

This study will identify improvements to improve safety, better manage access, and address operational issues.



SAFETY DEFICIENCIES

Many of the intersections and road segments have potential for safety improvement, which means the crash rate is higher than expected for a road of its size, volume, and speed.

Crash clusters occur at intersections. Possible contributing factors include:

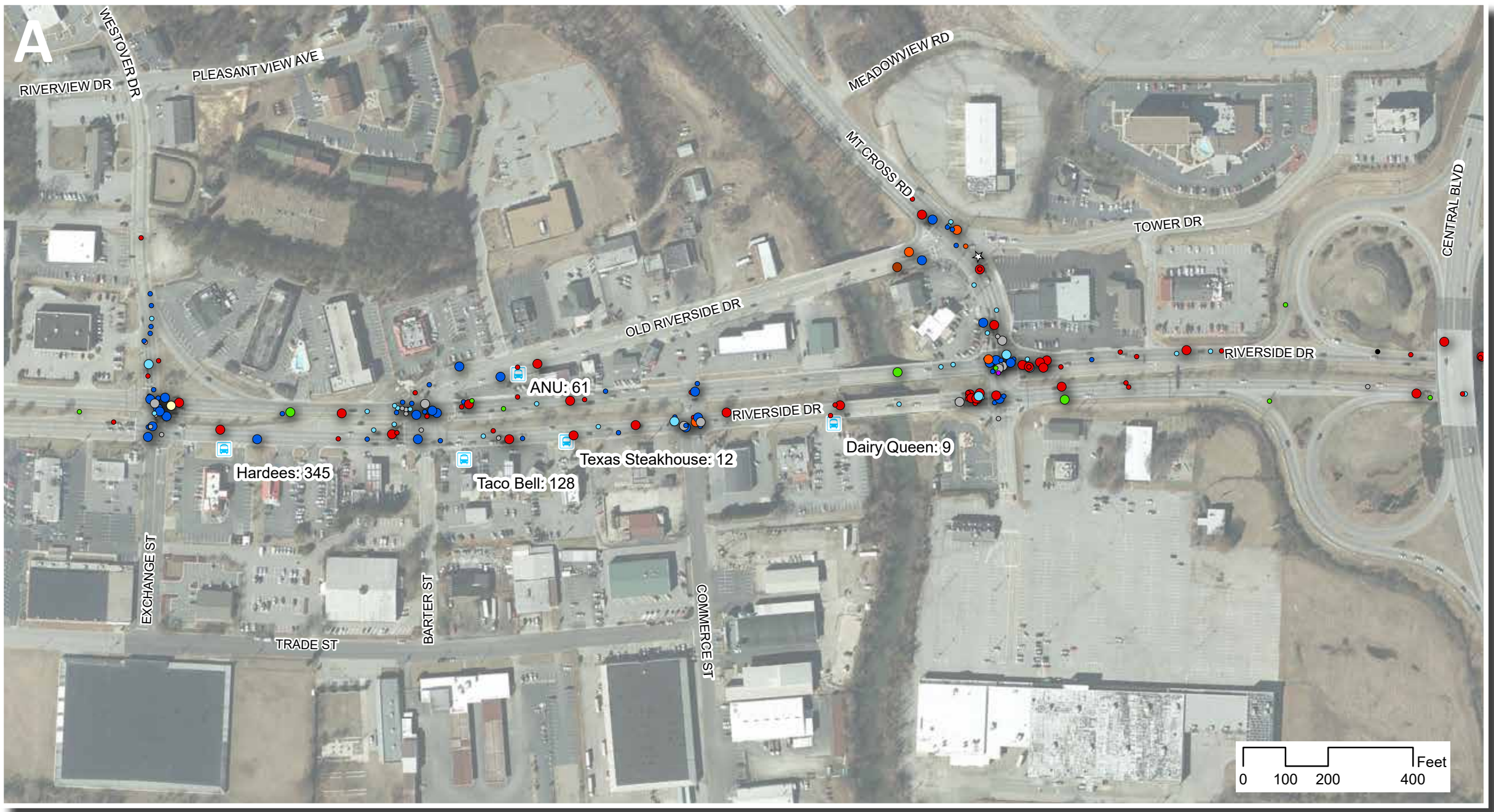
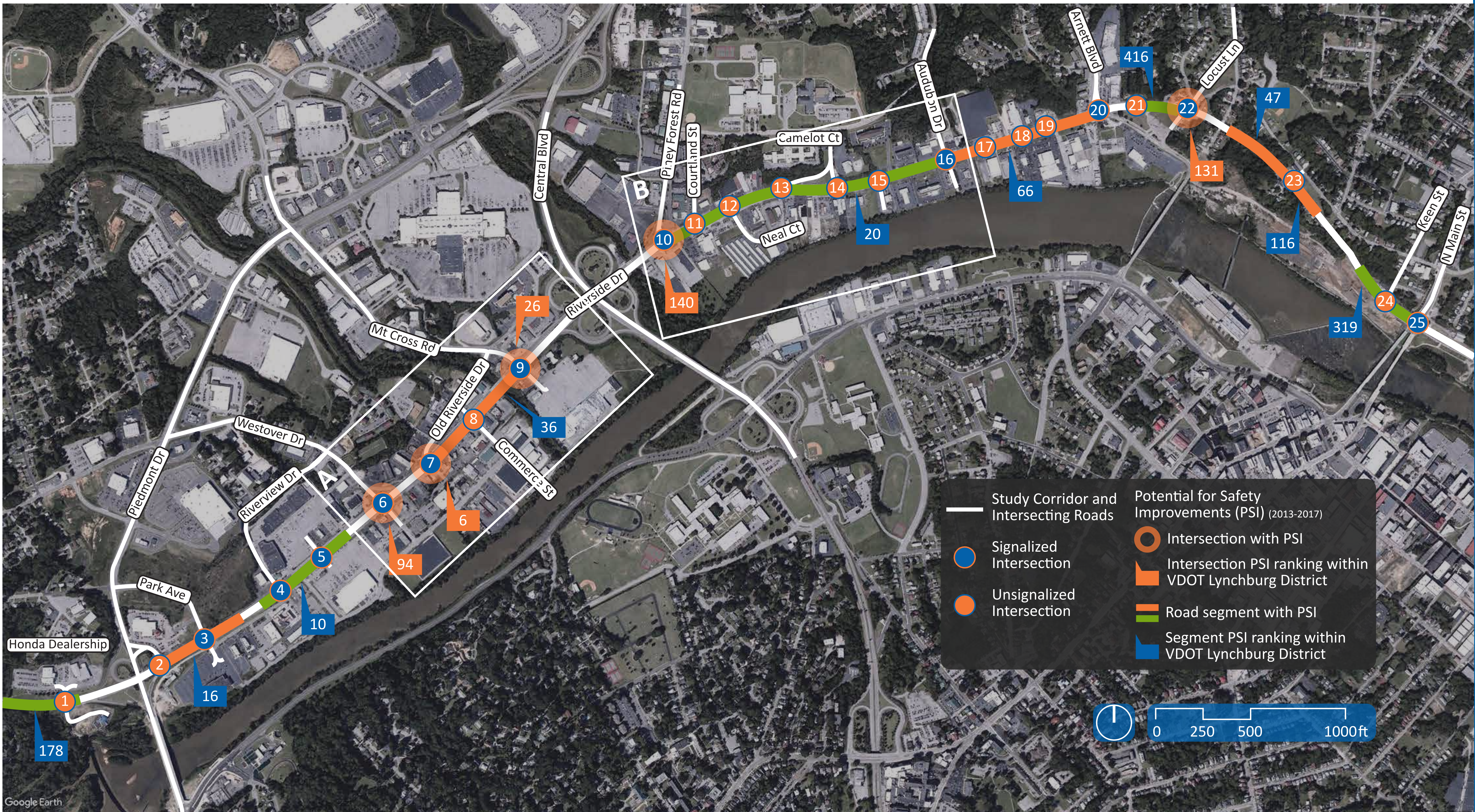
- Failure to obey red lights
- Skewed angles
- Access spacing issues, including entrances located too close to intersections
- Lack of pedestrian crossing facilities
- Insufficient turn lane lengths
- Ramp spacing issues
- Back-out parking maneuvers into travel lanes
- Left turns from side-streets at unsignalized median openings

Pedestrians frequently walk along and cross Riverside Drive, including to and from bus stops, but there are no sidewalks or crosswalks.

VDOT’s statewide Pedestrian Safety Action Plan (PSAP) identifies Riverside Drive as a Pedestrian Safety Priority Corridor. In the past six years, four pedestrians were struck trying to cross Riverside Drive between Central Blvd and Audubon Dr. Two pedestrians were killed, and the other two were injured.

The PSAP recommends installing pedestrian signal heads and countdown signals, high visibility crosswalk materials and patterns, modification of medians to median islands, and Pedestrian Hybrid Beacons at midblock crossings.

The Riverwalk Trail runs parallel to Riverside Drive. Visibility and access to the Riverwalk Trail could be improved.

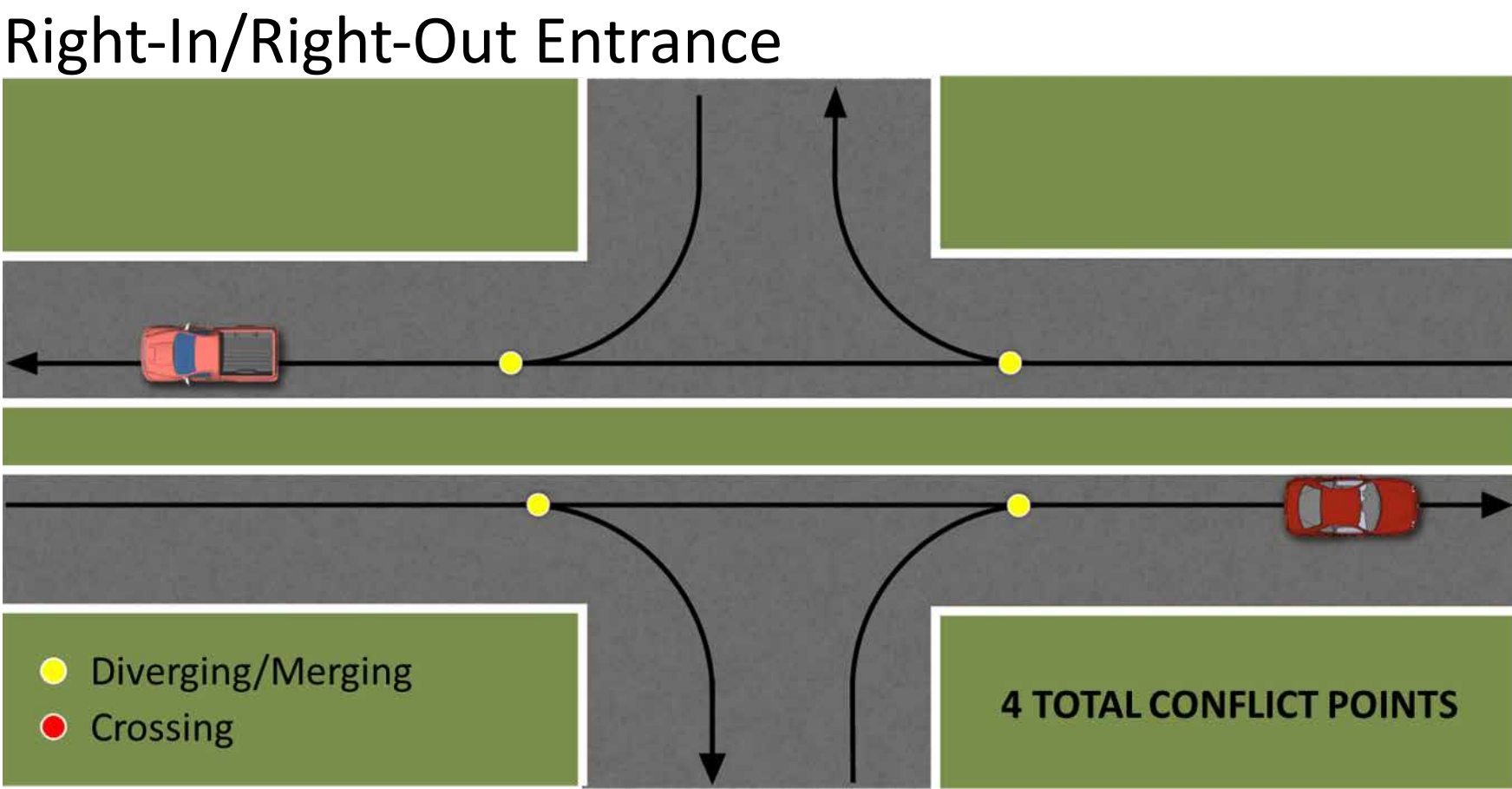
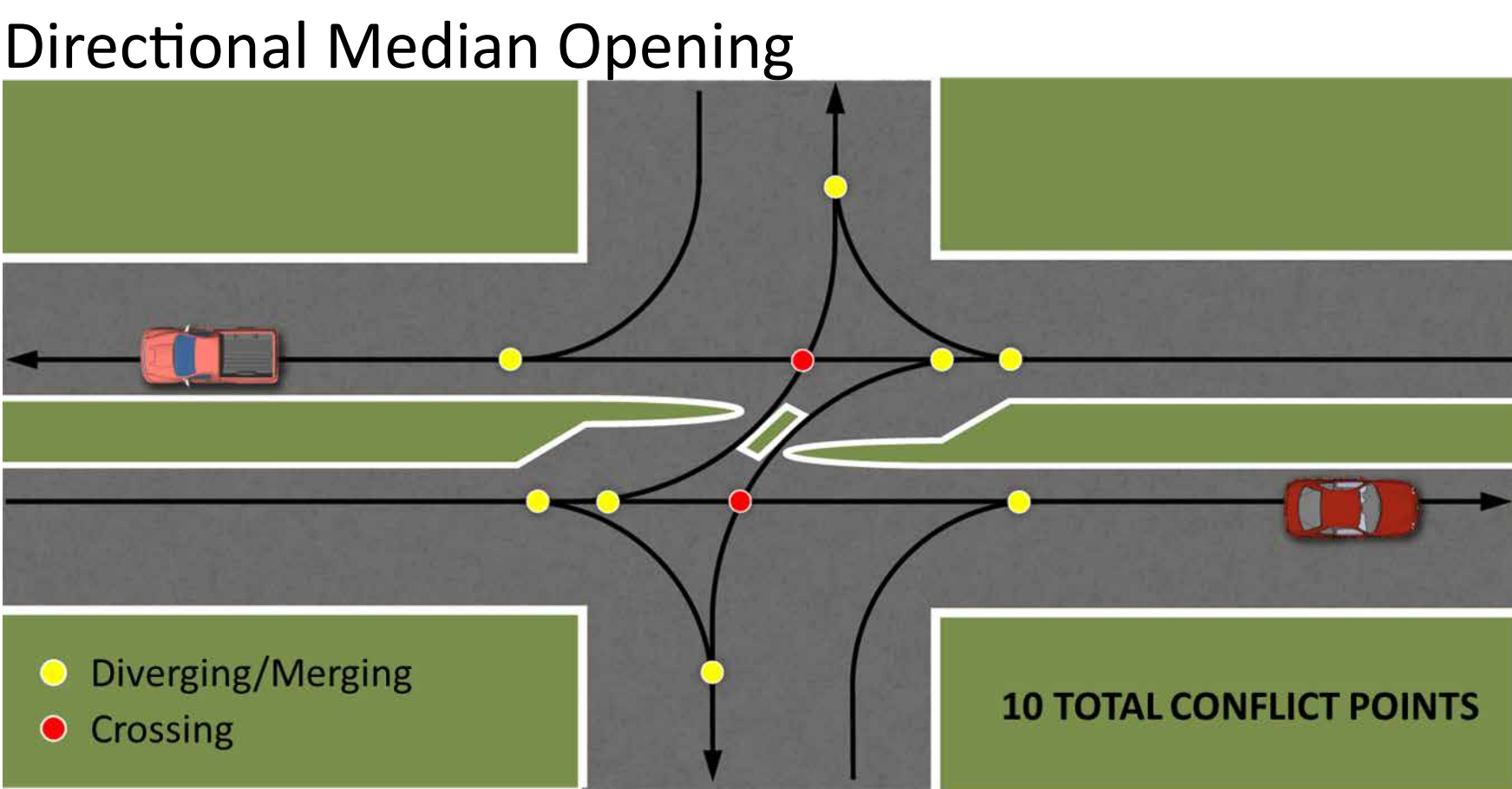
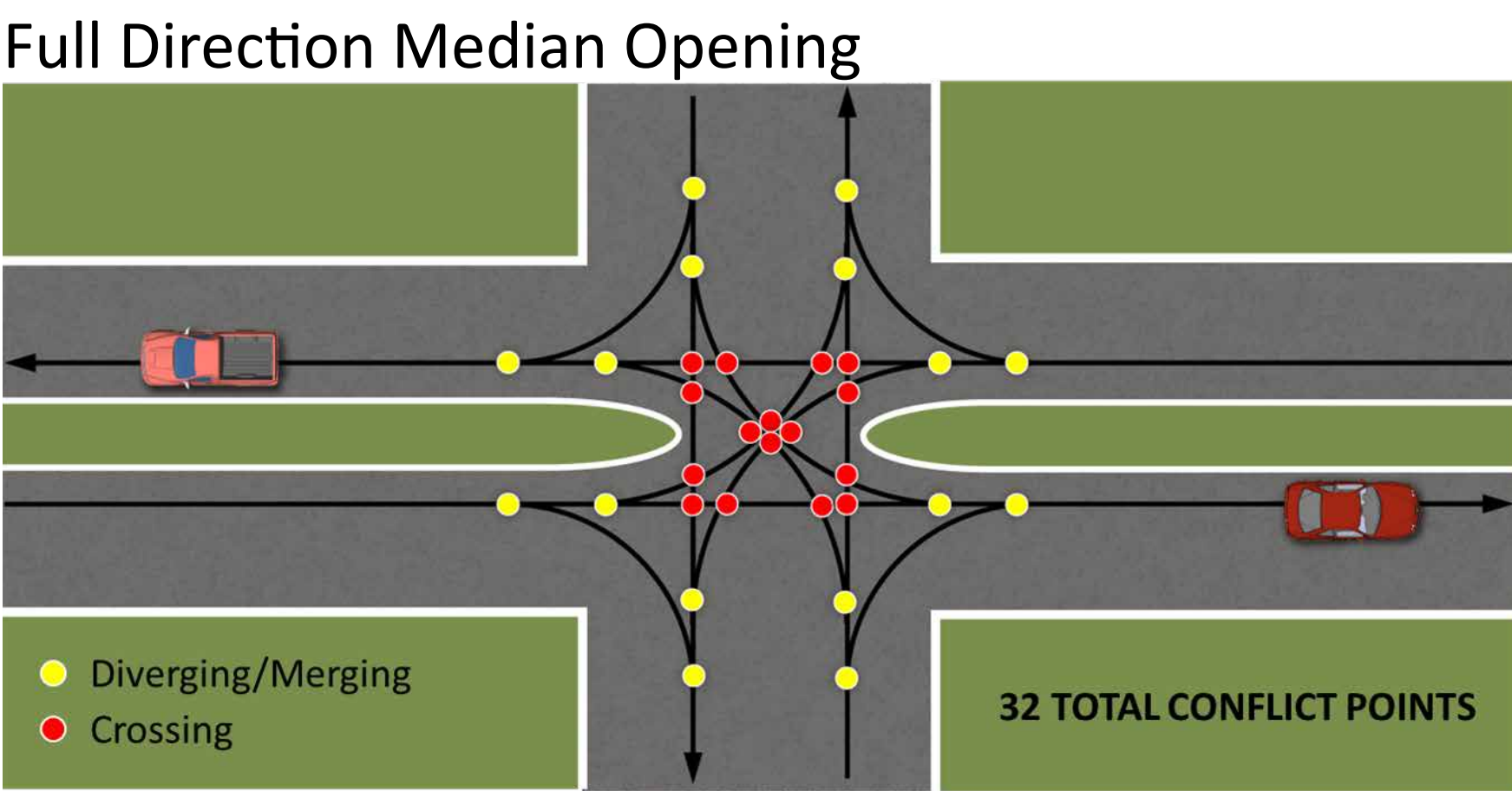


ACCESS SPACING & ACCESS MANAGEMENT

WHAT IS ACCESS MANAGEMENT?

Roads with frequent median openings and entrances have higher crash rates compared to similar roads with fewer access points.¹

Access management is a set of techniques that state and local governments use to control access to highways and major arterials. Controlling access points makes roads safer by reducing the potential for crashes. It also manages congestion and improves capacity.



TYPES OF ACCESS POINTS

- There are different types of access points. The number of conflict points represents the different ways in which crashes could occur.
- **Full direction median openings** have no turn restrictions. This type of access point has 32 conflict points.
 - **Directional median openings** have turn restrictions. A Restricted Crossing U-Turn (RCUT) is one type of directional median opening that requires side-street traffic to turn right. This type of access point has 10 conflict points.
 - **Right-in/right-out entrances** have a median separator that only allow right turns into and out of the side-street or entrance. This type of access point has 4 conflict points.

Fewer conflict points means there is less potential for crashes to occur. Converting a full direction median opening to a directional median opening reduces the number of conflict points by 69 percent, minimizing the potential for crashes.

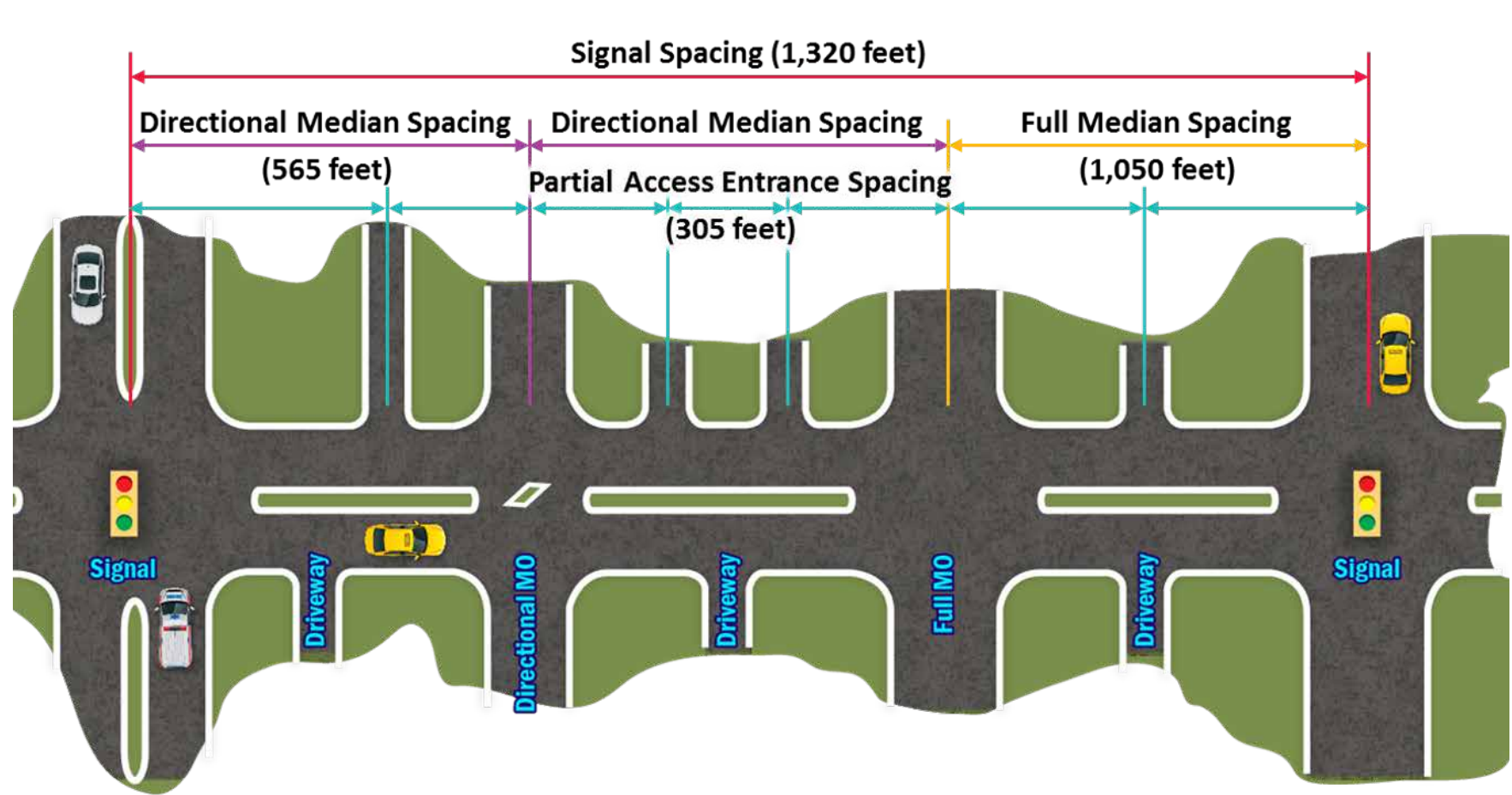
Consolidating or closing entrances that are close together also reduces the number of conflict points, and is another way to minimize crash potential.

ACCESS SPACING REQUIREMENTS

VDOT requires minimum spacing between access points to safely balance providing access and maintaining traffic flow based on a roadway's functional classification and posted speed limit. On arterial roadways like Riverside Drive, VDOT requires 305 feet between entrances and 1,050 feet between full direction median openings.

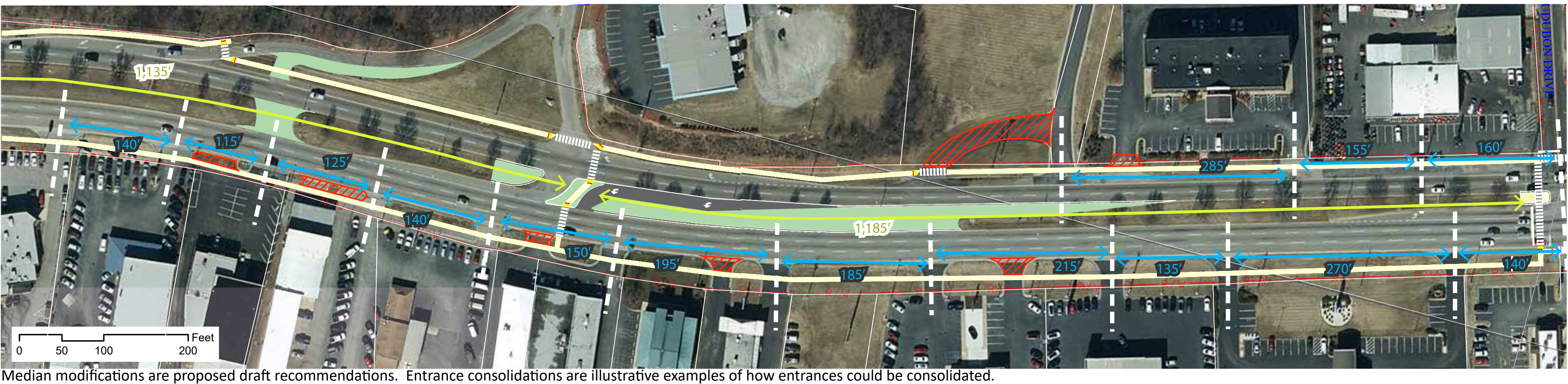
Most median openings and entrances along Riverside Drive do not meet VDOT's spacing requirements, as illustrated below.

The draft recommendations include consolidating median openings to reduce crashes and more closely conform to VDOT's spacing requirements. These recommendations are illustrated in the Draft Recommendations boards.

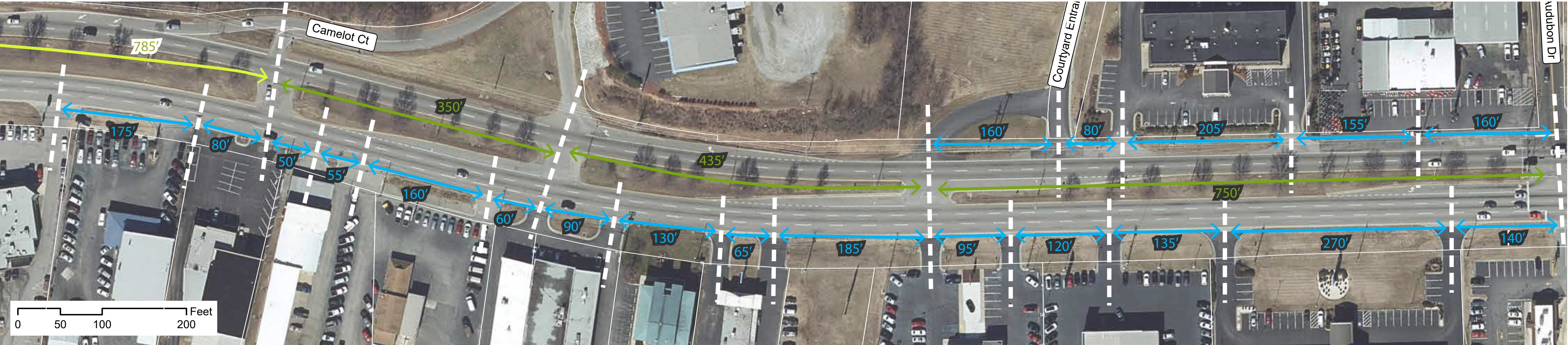


The images below show an example of how entrances could be consolidated to more closely conform to the requirements while still maintaining one access point per parcel. The median spacing deficiencies (green) are eliminated, and spacing between entrances (blue) is closer to the required 305 feet.

EXAMPLE OF MEDIAN MODIFICATIONS AND POTENTIAL ENTRANCE CONSOLIDATIONS TO IMPROVE ACCESS SPACING



EXISTING SPACING DEFICIENCIES



- ### Deficient Length
- ➡ Spacing between Unsignalized Intersection/Full Median Crossover and Signalized Intersection/Unsignalized Intersection/Full Median Crossover (1050' required)
 - ➡ Spacing between Full Access Entrance or Directional Median and Any Intersection, Full Access Entrance or Median Crossover (565' required)
 - ➡ Spacing between Partial Access Entrance and Any Entrance, Intersection or Median Crossover (305' required)

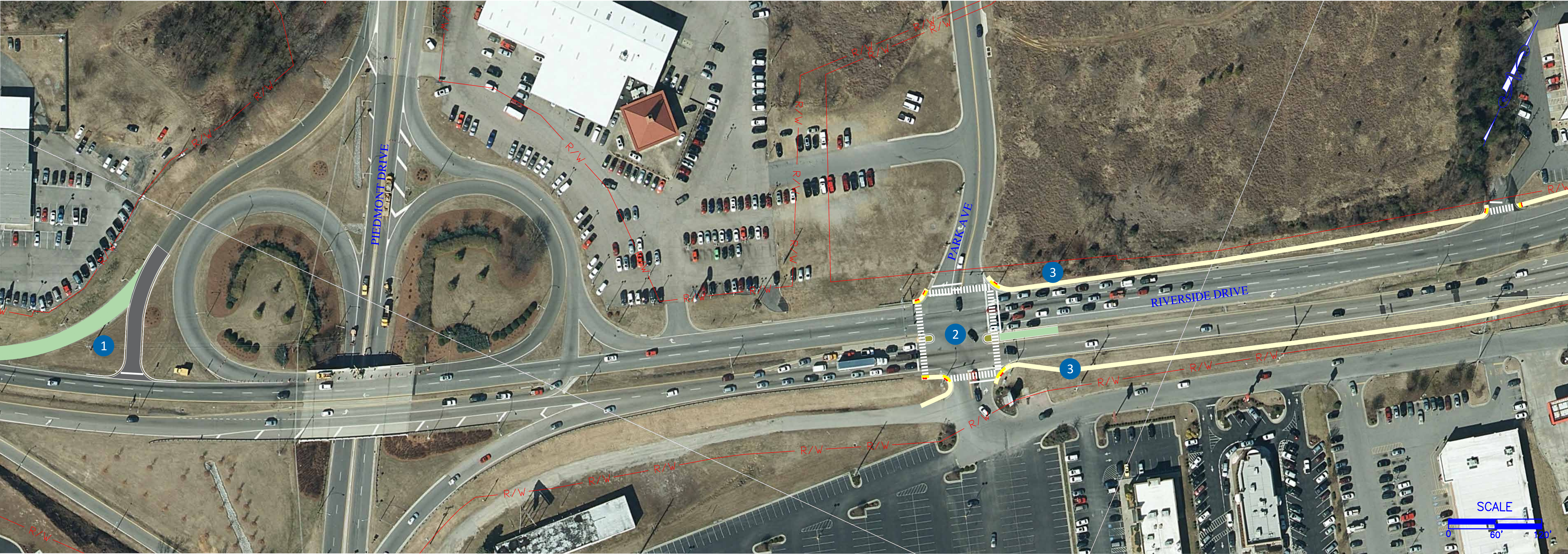
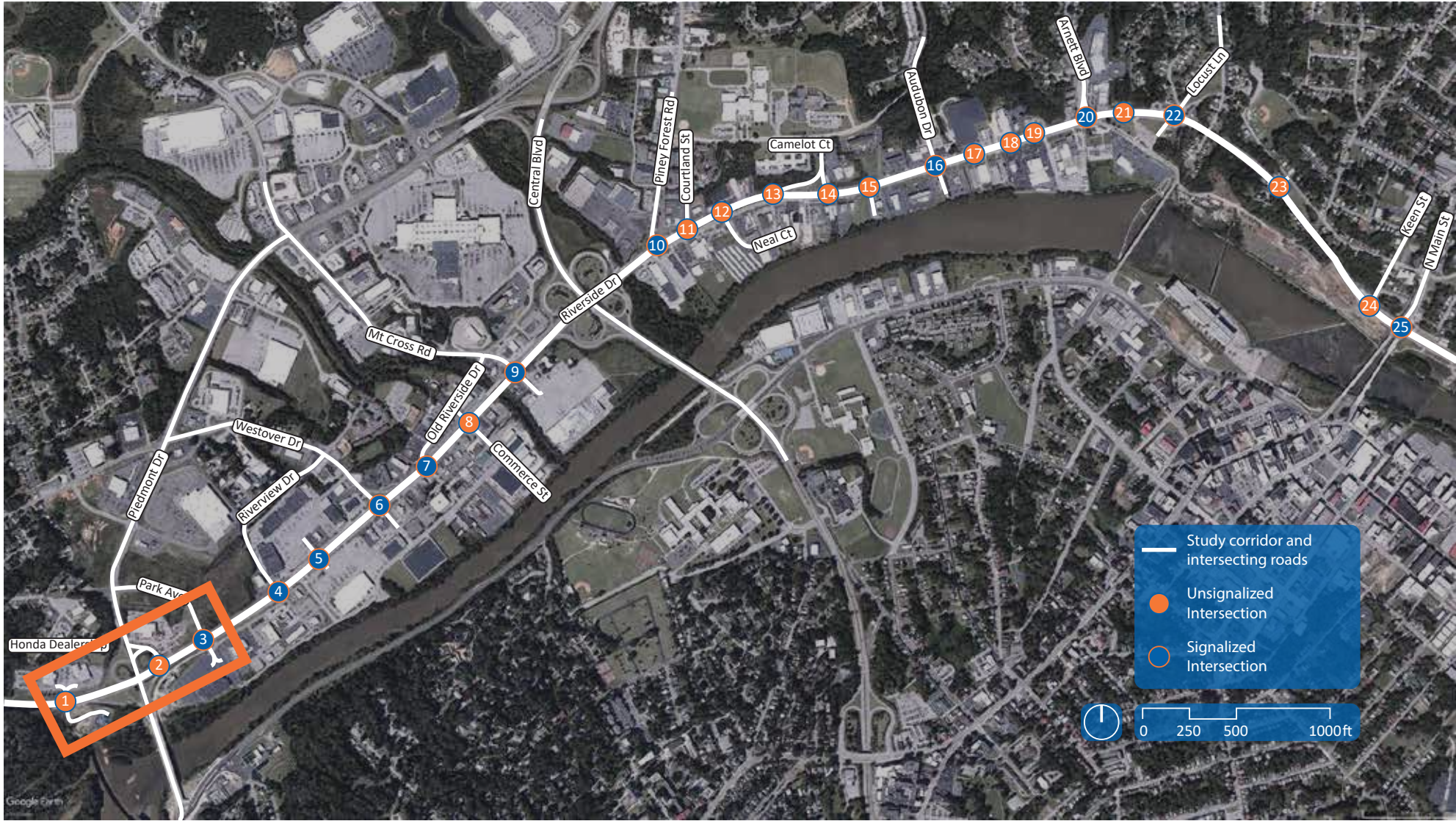
DRAFT RECOMMENDATIONS

Segment 1 of 9:

- 1 Realigned ramp from southbound Piedmont Drive to westbound Riverside Drive improves spacing to the car dealership entrance and separates conflicting movements. A new stop sign will require drivers to stop before turning right onto Riverside Drive. The old ramp will be demolished and replaced with grass.
- 2 Crosswalks and pedestrian countdown signals at Park Avenue provide dedicated space for pedestrians to safely cross the road with median refuges. Stop bars will be adjusted back to accommodate the crosswalks.
- 3 New sidewalks will be provided on both sides of Riverside Drive east of Park Avenue.

LEGEND

New Sidewalk

Existing Sidewalk

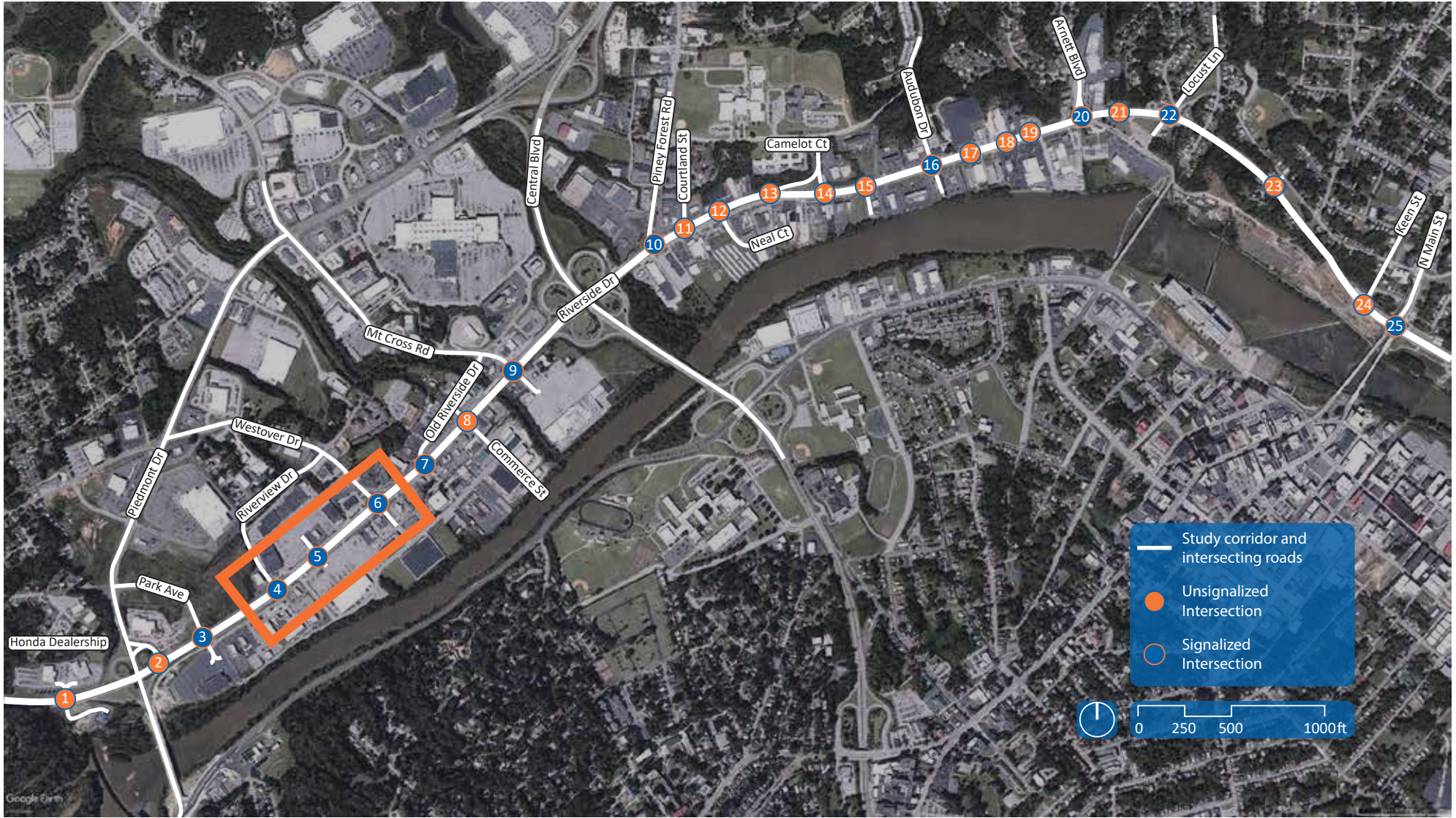
DRAFT RECOMMENDATIONS

Segment 2 of 9:

- 1 The intersections at Riverview Drive/Wild Wings Lane and the Riverside Center entrance will be converted to a signalized Restricted Crossing U-Turn. Side-street traffic must turn right onto Riverside Drive and can U-turn at the next intersection. Crosswalks and pedestrian countdown signals will allow pedestrians to cross Riverside Drive through the directional median.
- 2 At Westover Drive, the existing westbound right turn ramp will be demolished and replaced with a new right turn lane closer to the intersection. The southbound approach lanes will be widened to 12-feet wide. Crosswalks and pedestrian countdown signals will be provided across all four legs, with median refuges on Riverside Drive.
- 3 A bus bay and shelter will be provided at the Hardee's bus stop. It is recommended to close the Hardee's entrance closest to the intersection to eliminate the conflict points at this location, and enhance the easterly entrance with a median separator for site ingress and egress.
- 4 New sidewalks will be provided along both sides of Riverside Drive. Sidewalks will be installed across entrances at grade to provide a designated path for pedestrians.

LEGEND

- New Sidewalk
- Existing Sidewalk
- New Crosswalk
- New Pavement
- Grassy Raised Median or Grass Replacing Existing Ramp/Entrance
- Edge of Right-of-Way



1 What is a Restricted Crossing U-Turn?

A Restricted Crossing U-Turn (RCUT) is an intersection design where all side-street movements begin with a right turn. Side-street left-turn and through vehicles turn right and make a U-turn at a downstream median opening to complete the desired movement.

What are the benefits of an RCUT?

- Improved safety: Reduces the number of points where vehicles cross paths and eliminates the potential for head-on crashes.
- Increased efficiency: Each direction of the major street can operate independently creating two one-way streets and increasing the overall intersection capacity.
- Shorter wait times: Fewer traffic signal phases means less stopping for mainline vehicles. Right turns only from the side-street vehicles means less time waiting.
- Cost-effective: A RCUT can be more cost-effective than adding lanes to improve capacity.

INNOVATIVE INTERSECTIONS

Navigating a Restricted Crossing U-Turn (RCUT)

NOT TO SCALE

Visit www.virginiadot.org/innovativeintersections to learn more.

VDOT

4 Maintaining a Continuous Sidewalk

Sidewalks will continue across driveway entrances at grade to provide a continuous path for pedestrians. The change in pavement color provides a visual cue to drivers to be aware of the possible presence of pedestrians.

DRAFT RECOMMENDATIONS

Segment 3 of 9:

- 1 The intersection at Old Riverside Drive/Barrett Street will be converted to a signalized Restricted Crossing U-Turn. Crosswalks and pedestrian countdown signals will allow pedestrians to cross Riverside Drive through the directional median.
- 2 The intersection at Commerce Street will be converted to an unsignalized Restricted Crossing U-Turn.
- 3 Sidewalks across the Sandy River will require constructing new pedestrian bridges. In the short term, sidewalks will be provided on the north side of Riverside Drive between Old Riverside Drive and Mount Cross Road. In the longer term, sidewalks along the south side will be added.
- 4 The westbound approach at Mount Cross Road will be reconfigured. The second left turn lane will be converted to a through lane, providing a full-length westbound right turn lane that extends back to Central Blvd off-ramp. Crosswalks and pedestrian countdown signals will be provided across all four legs.

LEGEND

New Sidewalk

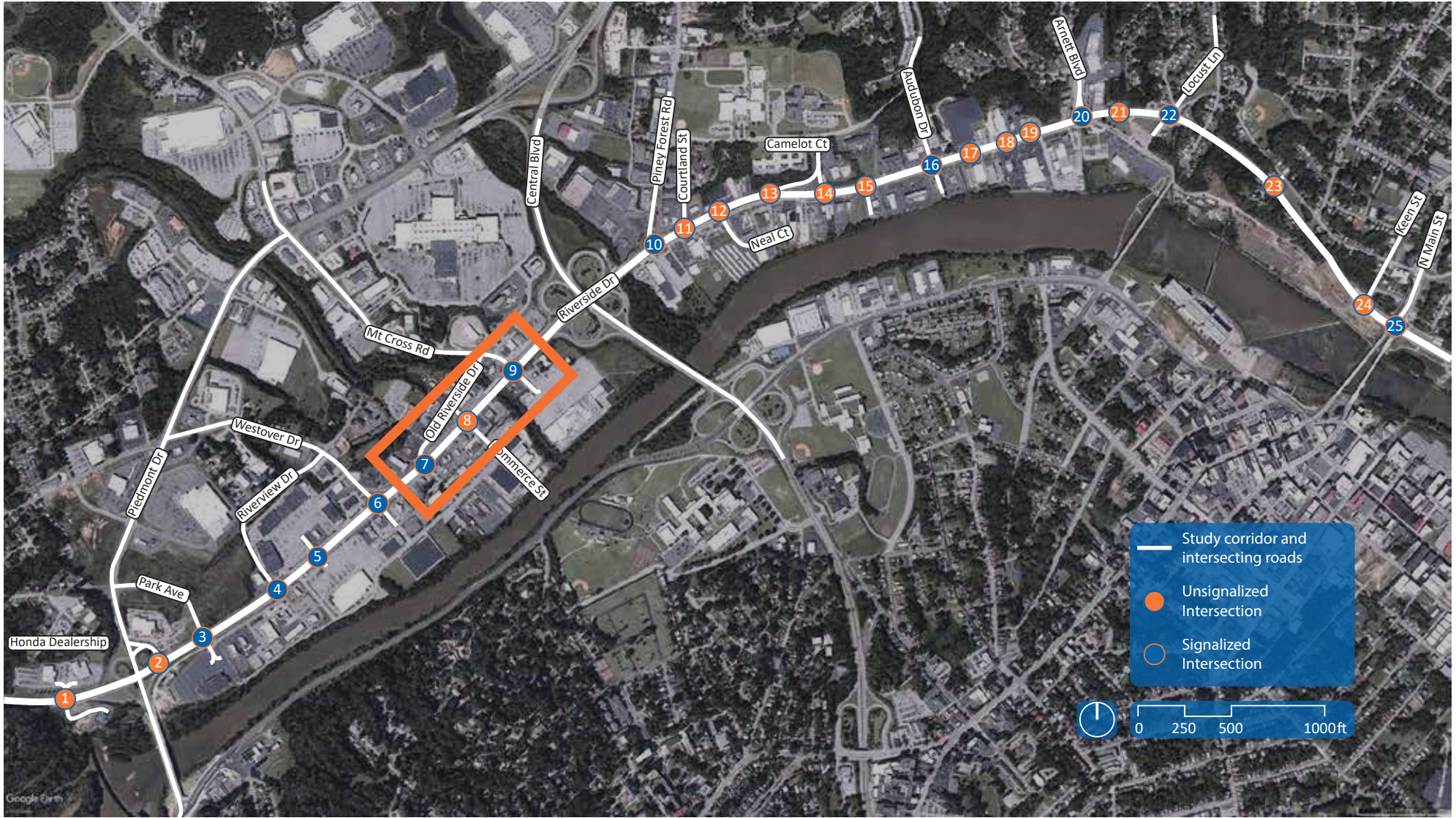
Existing Sidewalk

New Crosswalk

New Pavement

Grassy Raised Median or Grass Replacing Existing Ramp/Entrance

Edge of Right-of-Way



DRAFT RECOMMENDATIONS

Segment 4 of 9:

- 1 Close the entrance to the connector road to Tower Drive to address spacing deficiency.
- 2 Realign southbound Central Blvd ramp to intersect with westbound Riverside Drive at a new signal. This configuration will eliminate the weaving conflict in advance of the Mount Cross Road intersection. Eastbound traffic will remain unsignalized.
- 3 Sidewalks along the north side of Riverside Drive will be provided through the Central Blvd interchange area to Piney Forest Road. Rectangular rapid flashing beacons should be installed with the crosswalks across the on- and off ramps.
- 4 New railings will be installed between the sidewalk and the vehicle travel lanes on the bridge across Sandy Creek. The exterior railings will be replaced to meet height requirements.
- 5 Crosswalks and pedestrian countdown signals will be provided across all four legs at the Piney Forest Road intersection, with median refuges on Riverside Drive.
- 6 Advance pedestrian warning signs should be provided to warn drivers on the off-ramp when pedestrians are crossing the ramp.

LEGEND

New Sidewalk

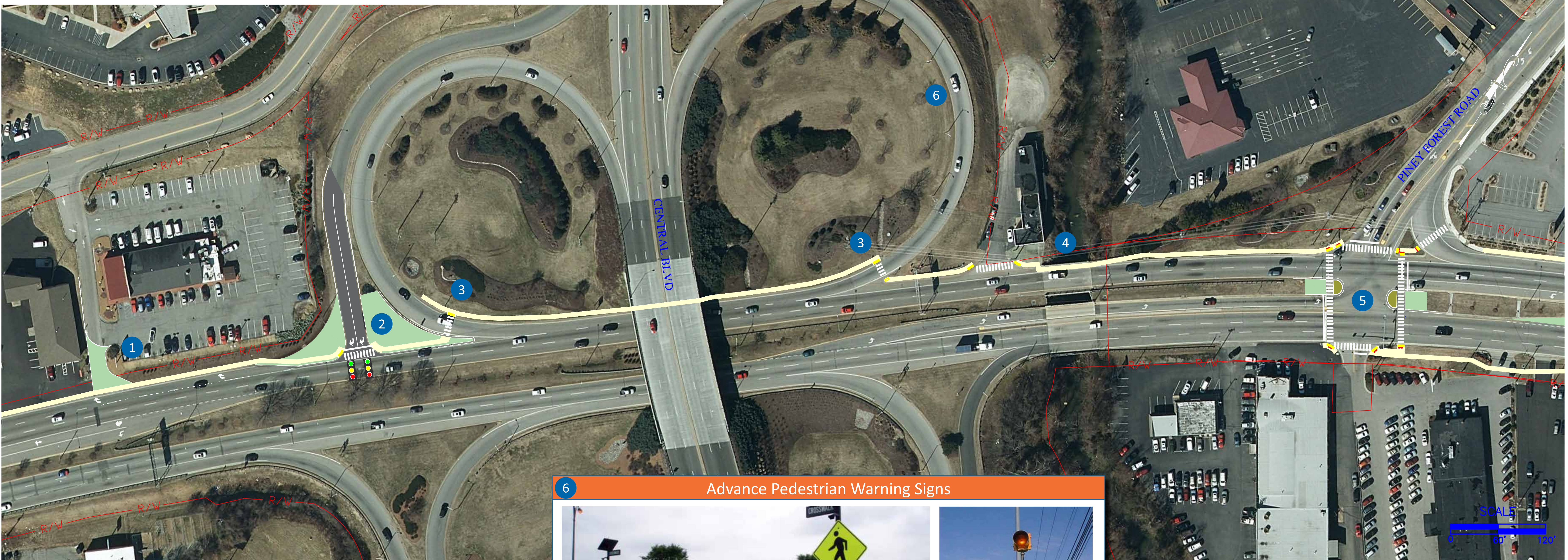
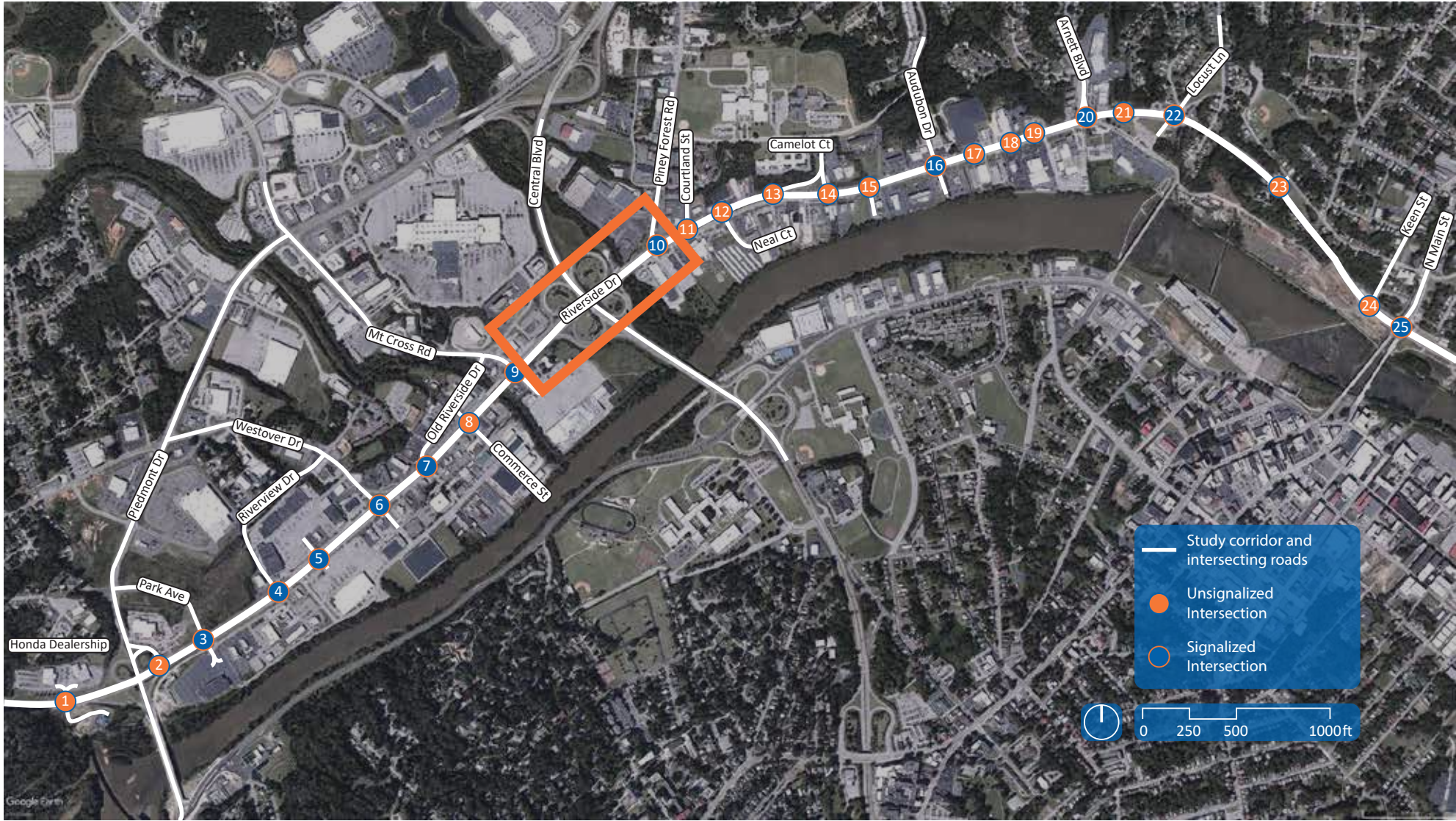
Existing Sidewalk

New Crosswalk

New Pavement

Grassy Raised Median or Grass Replacing Existing Ramp/Entrance

Edge of Right-of-Way



6 Advance Pedestrian Warning Signs



Rectangular Rapid Flashing Beacon at Crosswalk

Alexandria, VA



Advance Pedestrian Warning Sign in Austin, NC

Credit: Dan Burden, pedbikeimages.org

Vehicles coming around the curve of the off-ramp will need advance warning if a pedestrian is crossing the ramp. Rectangular rapid flashing beacons are recommended at the crosswalk location. Pedestrians push a button to activate the flashing beacon. In addition, advance pedestrian warning signs with beacons are recommended for placement 200 feet in advance of the crosswalk to ensure adequate stopping sight distance. These advance warning signs should have either a flashing beacon on in-sign flashing lights that also flash when a pedestrian has pushed the button.

DRAFT RECOMMENDATIONS

Segment 5 of 9:

- 1 Install unsignalized Restricted Crossing U-Turns at Neal Court and at the Camelot Court entrance. Crosswalks and pedestrian hybrid beacons will be installed to stop vehicles and allow pedestrians to cross Riverside Drive.
- 2 Close the median openings at Courtland Street and at the Camelot Court exit to address access spacing deficiency and eliminate conflict points. Vehicles exiting Camelot Court must turn right.
- 3 New sidewalks will be provided along both sides of Riverside Drive. Sidewalks will be installed across entrances at grade to provide a designated path for pedestrians.

LEGEND

New Sidewalk

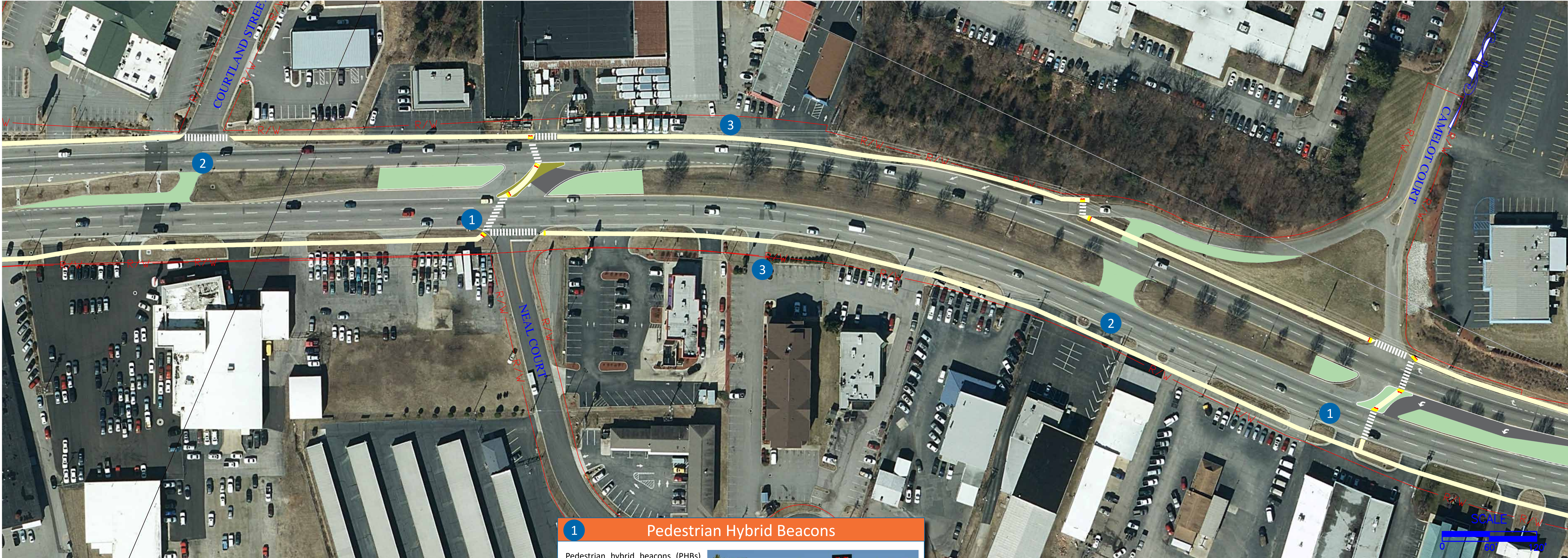
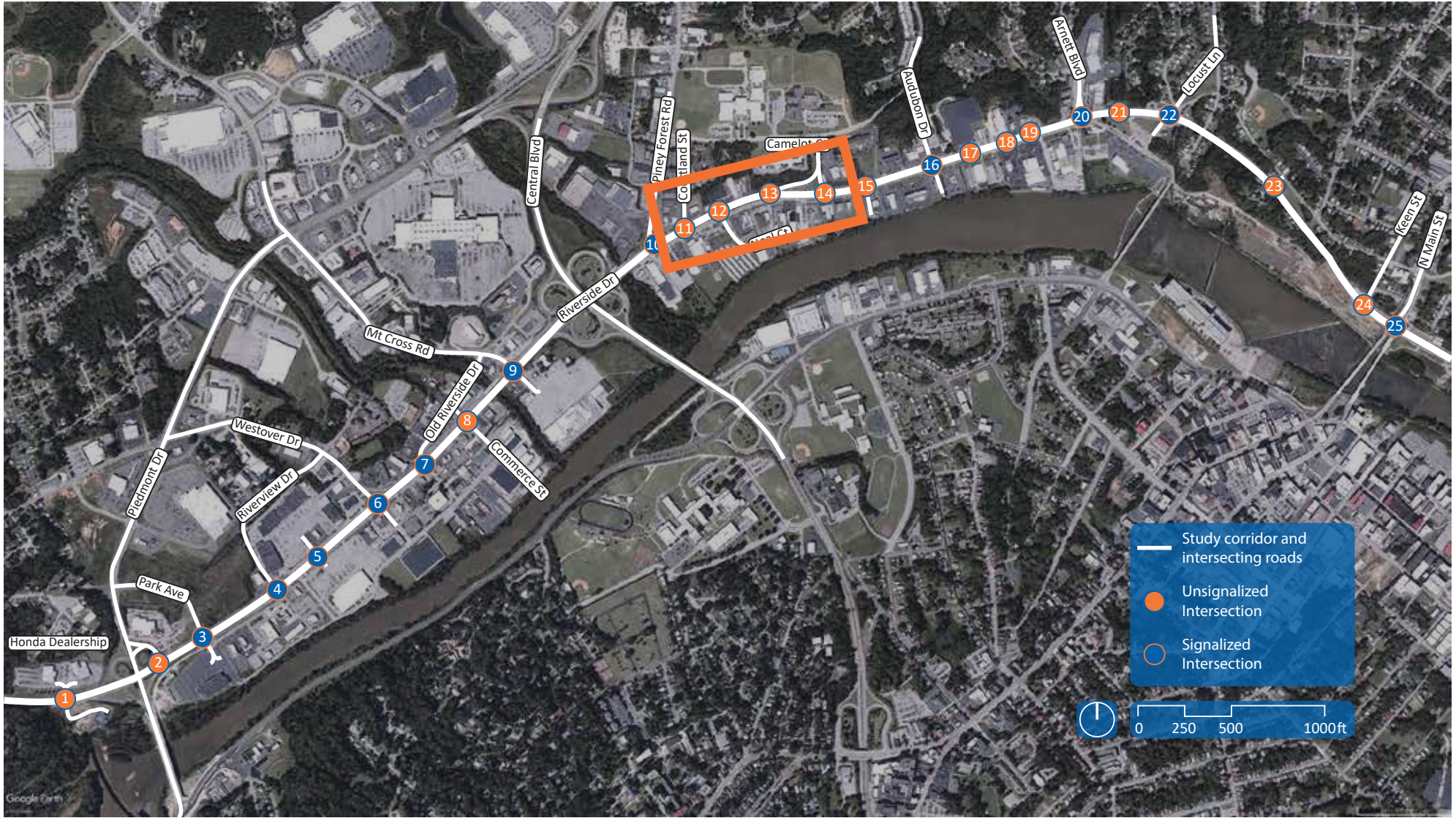
Existing Sidewalk

New Crosswalk

New Pavement

Grassy Raised Median or Grass Replacing Existing Ramp/Entrance

Edge of Right-of-Way



1 Pedestrian Hybrid Beacons

Pedestrian hybrid beacons (PHBs) warn and control traffic at unsignalized locations and assist pedestrians in crossing a street or highway at a marked crosswalk.

Unlike a traffic signal, the PHB rests in dark until a pedestrian activates it via pushbutton or other form of detection. When activated, the beacon displays a sequence of flashing and solid lights that indicate the pedestrian walk interval and when it is safe for drivers to proceed.

Safety Benefits:

- 69% reduction in pedestrian crashes
- 29% reduction in total crashes
- 15% reduction in serious injury and fatal crashes

Pedestrian Hybrid Beacon in Phoenix, AZ
Credit: Mike Cynski, pedbikeinfo.org

DRAFT RECOMMENDATIONS

Segment 6 of 9:

- 1 New sidewalks will be provided along both sides of Riverside Drive. Sidewalks will be installed across entrances at grade to provide a designated path for pedestrians.
- 2 Close the median opening at the Courtyard entrance to address access spacing deficiency and eliminate conflict points.
- 3 Passenger cars can make U-turns at Audubon Drive and at Camelot Court. Truck U-turns will be prohibited.
- 4 Bus bay and shelter will be provided at the Biscuitville transit stop. A sidewalk connection to the Riverwalk trail is recommended.
- 5 To address safety issues, a new westbound right turn lane is recommended at Audubon Drive. This configuration would eliminate parking in front of the businesses, eliminating the conflicts from vehicles backing out of parking spaces.
- 6 Close the median opening at NAPA Auto Parts to address access spacing deficiency and eliminate conflict points.

LEGEND

New Sidewalk

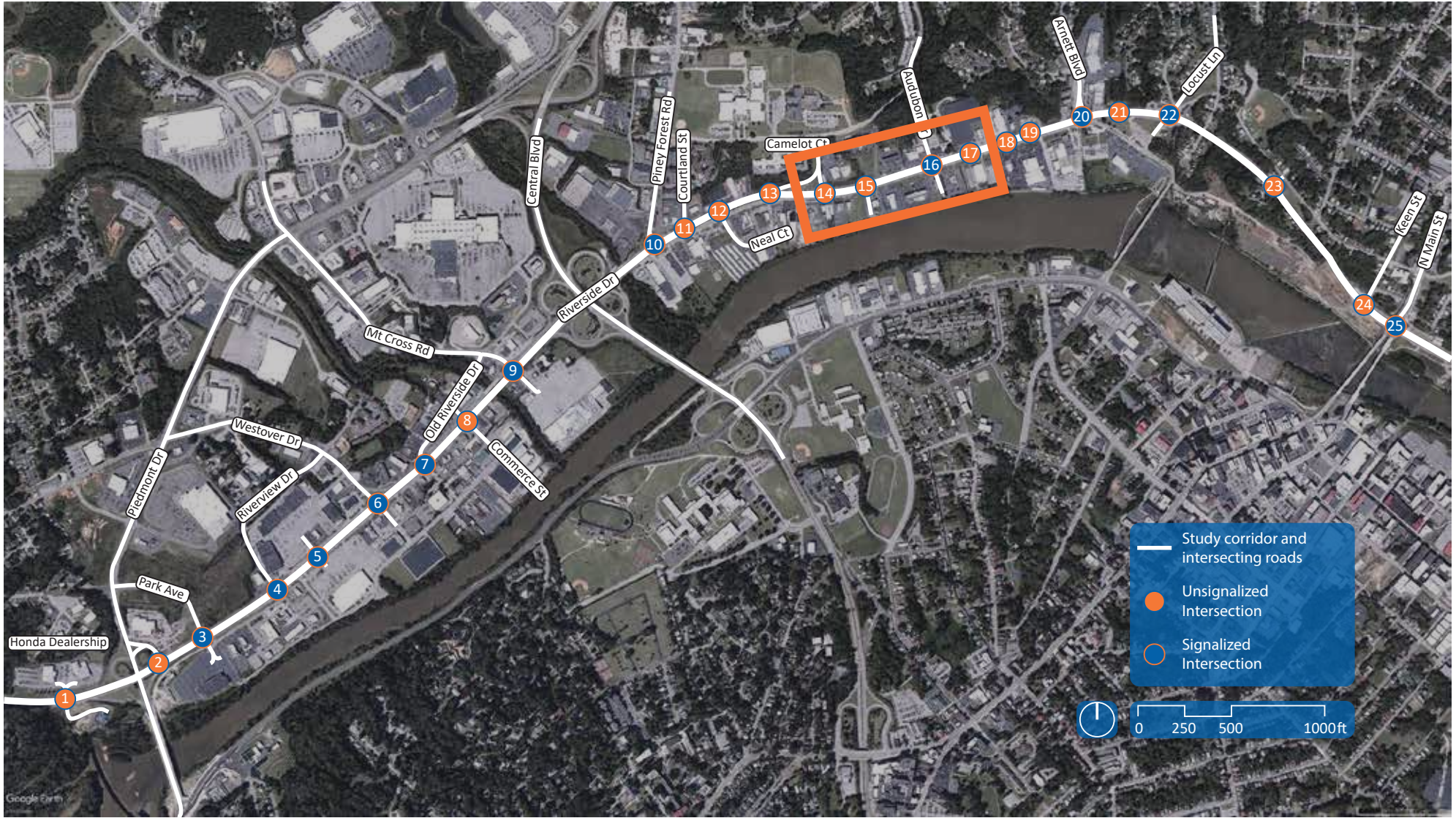
Existing Sidewalk

New Crosswalk

New Pavement

Grassy Raised Median or Grass Replacing Existing Ramp/Entrance

Edge of Right-of-Way



DRAFT RECOMMENDATIONS

Segment 7 of 9:

- 1 New sidewalks will be provided along both sides of Riverside Drive west of Arnett Boulevard. Sidewalks will be installed across entrances at grade to provide a designated path for pedestrians.
- 2 Install an unsignalized Restricted Crossing U-Turn at the median opening in front of Los Mariachi's.
- 3 Close the median opening in front of Riverside Produce to address access spacing deficiency and eliminate conflict points.
- 4 Install crosswalks and pedestrian countdown signals at Arnett Boulevard. Eastbound-to-westbound U-turns will be permitted for passenger cars. Truck U-turns will be prohibited.
- 5 New sidewalks will be provided along the north side of Riverside Drive east of Arnett Boulevard.
- 6 Close the existing median opening east of Arnett Boulevard to address access spacing deficiency and eliminate conflict points.
- 7 Close the entrance to the former Heartline Restaurant to address access spacing deficiency.

LEGEND

New Sidewalk

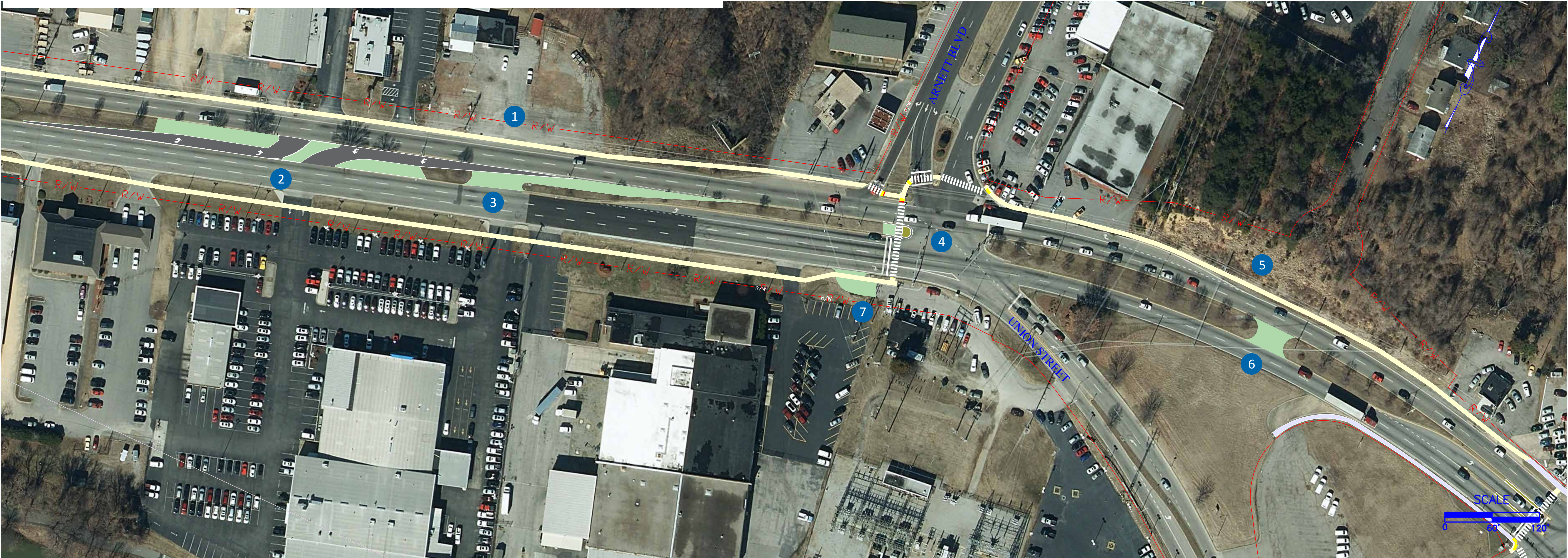
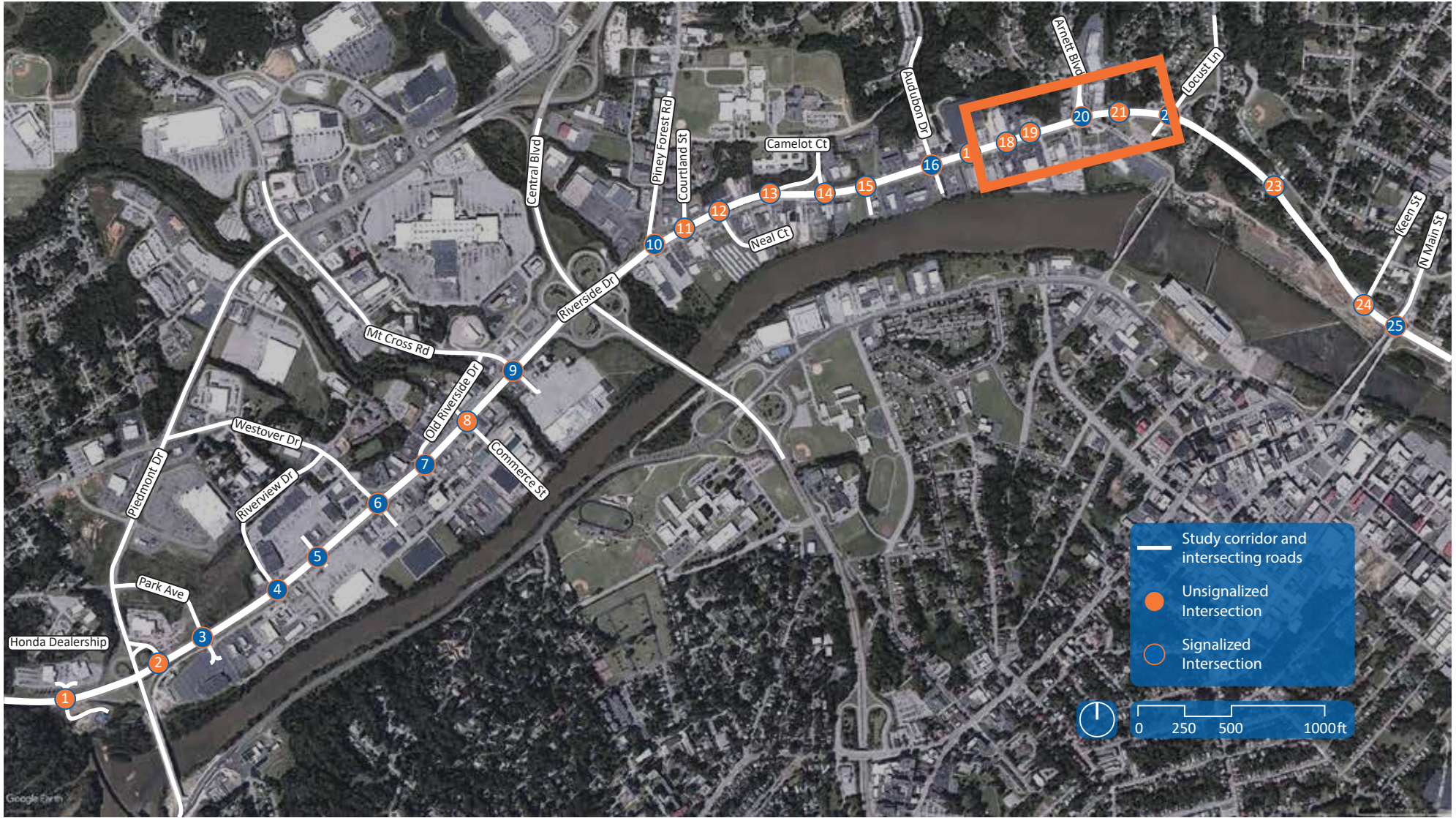
Existing Sidewalk

New Crosswalk

New Pavement

Grassy Raised Median or Grass Replacing Existing Ramp/Entrance

Edge of Right-of-Way



DRAFT RECOMMENDATIONS

Segment 8 of 9:

- 1 New sidewalks will be provided along the north side of Riverside Drive. Sidewalks currently exist on the south side.
- 2 Crosswalks and pedestrian countdown signals will be provided across all four legs at Locust Lane. Stop bars will be adjusted to accommodate the crosswalks and improve sight distance on the southbound approach.
- 3 Left turns from Riverside Drive onto Highland Court will be prohibited to address the safety issue of eastbound rear-end crashes. Flexible delineators will be installed as a temporary solution. A longer term solution would involve widening the road to install a concrete median separator.

LEGEND

New Sidewalk

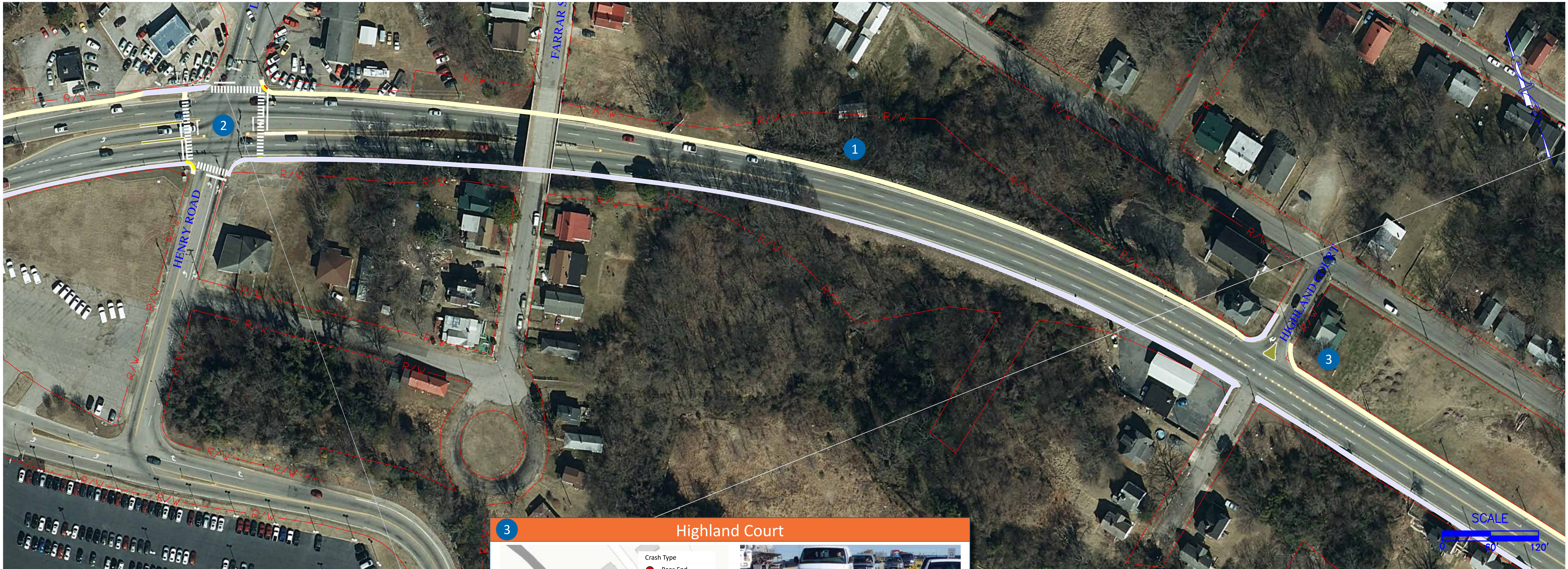
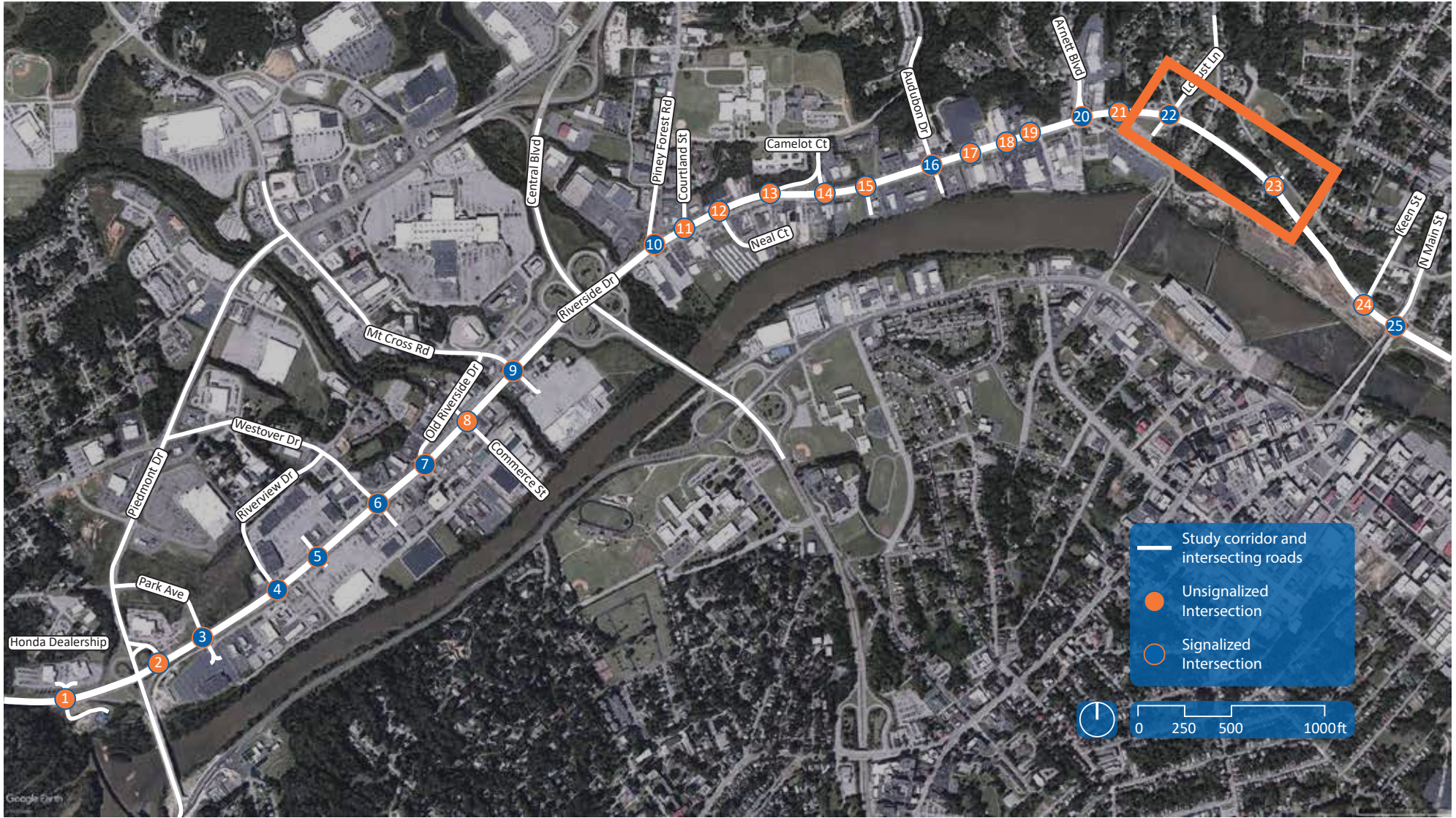
Existing Sidewalk

New Crosswalk

New Pavement

Grassy Raised Median or Grass Replacing Existing Ramp/Entrance

Edge of Right-of-Way



3 Highland Court

Crash Type

● Rear-End

● Angle

● Fixed Object

☆ Pedestrian

2013-2018 VDOT Crash Data

There is a cluster of eastbound rear-end crashes that resulted in injuries involving left turns onto Highland Court. Flexible delineators are recommended as a temporary solution. A longer term solution would involve widening the road to provide a concrete median barrier. A porkchop island on the northbound approach is also recommended, and can be installed in the short term.

DRAFT RECOMMENDATIONS

Segment 9 of 9:

- 1 New sidewalks will be provided along the north side of Riverside Drive will tie into the existing sidewalks at Keen Street.
- 2 It is recommended that the existing crosswalks across Riverside Drive at Keen Street be removed. Install signage encouraging pedestrians to cross Riverside Drive at the Main Street intersection 300 feet away. An alternative solution is to enhance the existing crosswalks with a rectangular rapid flashing beacon, although those beacons are usually not applied on six-lane facilities.

LEGEND

New Sidewalk

Existing Sidewalk