

# PEDESTRIAN SAFETY STUDY

For  
State Road 423 from Wymore Road to U.S. 17/92  
Section 75190  
M.P. 8.655 to M.P. 9.864  
Orange County

Prepared for:

**FLORIDA DEPARTMENT OF TRANSPORTATION**  
**DISTRICT 5 TRAFFIC OPERATIONS**  
719 South Woodland Boulevard, MS 3-562  
DeLand, Florida 32720



Districtwide Community Traffic Safety Program (CTSP)  
Financial Project ID: 237995-1-32-16  
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Consultant No.: 11128  
Task Work Order: 15

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## **EXECUTIVE SUMMARY**

Stanley Consultants, Inc. was retained on behalf of the Florida Department of Transportation (FDOT) to conduct a Pedestrian Safety Study on State Road (S.R.) 423 from Wymore Road to U.S. 17/92 in Orange County, Florida. The original study was previously completed in February 2020 with a second draft in August 2021. The purpose of this study update is to provide a supplemental collision analysis, review the previously provided recommendations, and update the cost estimate and benefit-cost analysis.

Based on engineering judgement, a review of crash history, the location of pedestrian generators and attractors, the proximity to bus stops, adjacent signals, and field observations, the following improvements are recommended:

### Short term improvements:

- Refresh the southbound stop bar on Wymore Road approaching S.R. 423.
- Install retroreflective backplates on all signal heads at the intersection of S.R. 423 and Wymore Road.
- Install Pedestrian Warning signs, with supplemental distance plaques noting NEXT 1 MILE, west of U.S. 17/92 (westbound travel direction) and east of Fremont Avenue (eastbound travel direction).
- Replace the yellow Pedestrian Warning sign located east of Aldrich Avenue with a fluorescent yellow-green Pedestrian Warning sign and a supplemental distance plaque noting NEXT 0.5 MILE
- Expand the existing 35 mph speed zone west of U.S. 17/92 by relocating the existing 45 mph (westbound travel direction) and 35 mph (eastbound travel direction) approximately 170 feet west.
- Reinstall the KEEP RIGHT SIGN on the eastbound approach to U.S. 17/92.

### Long term improvements:

- Upgrade the lighting system throughout the corridor. Lighting is being provided at the Wymore Road intersection under FPID 442390-1, Lighting Bundle D.
- Reconstruct the intersection of S.R. 423 at Country Club Drive to convert the existing full median opening to a restricted crossing U-turn (RCUT) and install a Pedestrian Hybrid Beacon (PHB). To avoid right-of-way impacts, consider placing a dual mast arm in the 30-foot median and reconstructing the sidewalk for the signal cabinet.
- Install STOP FOR PEDS blank out signs on all approaches at the U.S. 17/92 intersection.

### Improvements for future Work Program project consideration:

- Remove the SCHOOL pavement messages on the westbound approach to Wymore Road during a future resurfacing project.
- Rebuild the traffic signal at Wymore Road, to include STOP FOR PEDS blank out signs, one (1) signal head per lane, 4-section flashing yellow arrow signal heads for the northbound/southbound approaches, pedestrian lighting, and upgrade pedestrian detector stations. Significant right-of-way impacts are expected with this improvement that would not result in an acceptable benefit-cost; therefore, this improvement is not included in the cost estimate of benefit-cost analysis.

The total cost for the recommended improvements is estimated at approximately \$1,543,435. The Benefit/Cost ratio of the proposed improvements is 2.59, with a net present value (NPV) estimated at approximately \$2,913,691.



## **EXISTING CONDITIONS**

S.R. 423 is a north/south arterial roadway that extends north from S.R. 408 before transitioning into an east/west arterial from approximately U.S. 441 to U.S. 17-92 in Winter Park. Within the study limits, S.R. 423 is an east/west four-lane divided arterial with curb and gutter, bicycle lanes, and an inside median (grass and concrete) of various widths throughout the study corridor.

The majority of land uses along the study corridor are comprised of commercial interests, including traditional offices and commercial plazas as well as medical and law practices. The highest density of development is largely confined to the area adjacent to U.S. 17/92. Residential housing (multi-family and single-family) are in the surrounding areas behind the commercial interests on S.R. 423 throughout the study corridor. Three (3) schools are within 1-mile of the study corridor: Killarney Elementary School, Park Maitland School, and Hungerford Elementary School. Lynx, Orange County's public transit provider, has numerous bus stops along both sides of the S.R. 423 corridor (Route 443). Route 443 provides service from the Park Promenade superstop near the intersection of Silver Star Road at Hiawasse Road in Pine Hills, through the study corridor, to the Advent Health of Winter Park hospital near the intersection of Lakemont Avenue at Aloma Avenue.

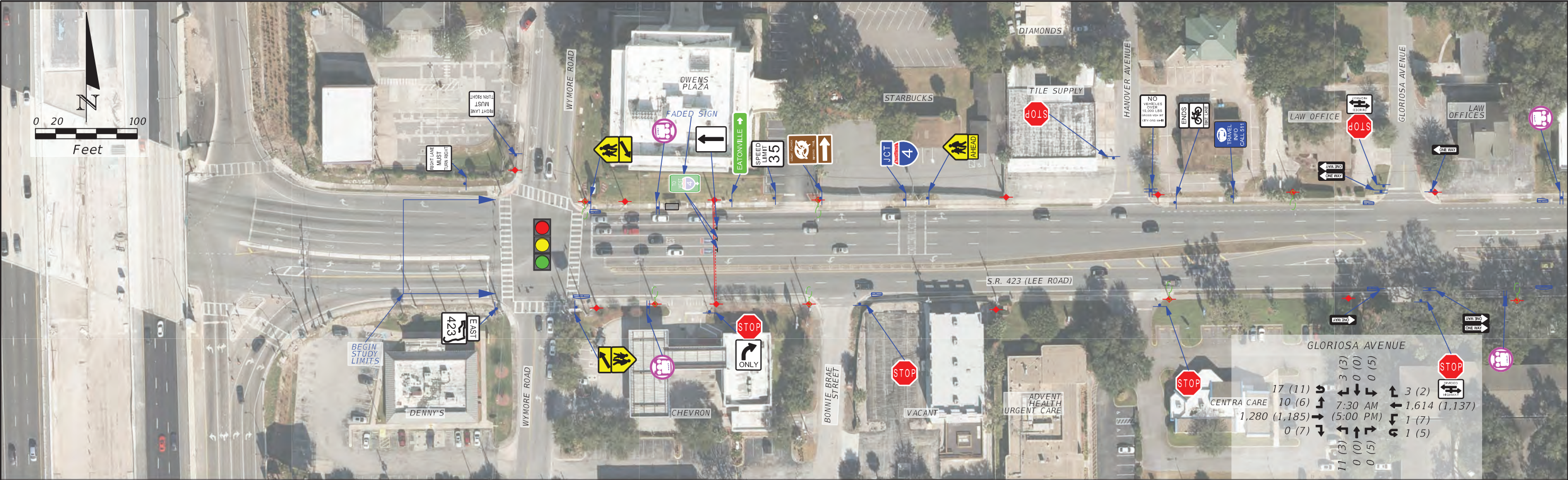
An aerial photograph showing the existing conditions of the study corridor and the surrounding area is depicted in **Figure 2**. The morning and afternoon peak-hour turning movement counts are also included in **Figure 2**. Existing conditions for S.R. 423 are shown in **Table 1**. A straight-line diagram is attached in the **Appendix A**.



**Table 1**  
**Summary of Existing Conditions**

<b>Feature</b>	<b>Description</b>
<b>Main Line</b>	<ul style="list-style-type: none"> <li>State Road 423</li> </ul>
<b>Area Location</b>	<ul style="list-style-type: none"> <li>Winter Park (Orange County), Florida</li> </ul>
<b>Cross Section</b>	<ul style="list-style-type: none"> <li><u>Cross Section</u>: Four-lane divided arterial with curb and gutter and raised grassed median of varied widths. Bikes lanes are provided from east of Gloriosa Avenue to Executive Drive.</li> <li><u>Context Classification</u>: Commercial (C4)</li> <li><u>Access</u>: Access Class 5</li> <li><u>Posted Speed Limit</u>: <ul style="list-style-type: none"> <li>35 mph from Wymore Road (M.P. 8.655) to M.P. 8.685</li> <li>45 mph from M.P. 8.685 to M.P. 9.741</li> <li>35 mph from M.P. 9.741 to U.S. 17/92 (M.P. 9.864)</li> </ul> </li> <li><u>2019 AADT</u>: 39,500 vehicles per day (vpd)</li> <li><u>Alignment</u>: Straight</li> <li><u>Sidewalks</u>: Five (5) foot wide sidewalks along both sides of the roadway throughout the corridor</li> <li><u>Street Lighting</u>: Luminaires on utility poles along both sides of the roadway</li> <li><u>Utilities</u>: Overhead utilities along both sides of the roadway</li> <li><u>Bus stops</u>: Multiple bus stops on both sides of the roadway throughout the study corridor (Lynx Transportation Services Routes 443)</li> </ul>
<b>Adjacent Land Uses</b>	<ul style="list-style-type: none"> <li>Primarily commercial interests (professional offices and retail) with single family unit houses and condominiums in the surrounding areas</li> </ul>
<b>Signalized Intersections</b>	<ul style="list-style-type: none"> <li>Wymore Road – M.P. 8.655</li> <li>U.S. 17/92 – M.P. 9.864</li> </ul>
<b>Median Openings</b>	<ul style="list-style-type: none"> <li>Gloriosa Avenue – M.P. 8.816 (Full-Median Opening)</li> <li>Dupont Avenue – M.P. 8.956 (Full-Median Opening)</li> <li>Clayton Office Building - M.P. 9.046 (Full-Median Opening)</li> <li>Turner Road – M.P. 9.119 (Full-Median Opening)</li> <li>Beard Avenue – M.P. 9.223 (Full-Median Opening)</li> <li>Aldrich Avenue – M.P. 9.330 (Full-Median Opening)</li> <li>Lexington Apartment Complex ~ M.P. 9.440 (Full-Median Opening)</li> <li>Country Club Drive – M.P. 9.490 (Full-Median Opening)</li> <li>Bennett Avenue – M.P. 9.630 (Full-Median Opening)</li> <li>Lewis Drive – M.P. 9.751 (Eastbound Directional)</li> </ul>





- Symbols:
- Utility Pole
  - Traffic Sign
  - Luminaire
  - Traffic Controller Cabinet
  - Existing Inlet
  - Existing Manhole
  - Pedestrian Signal Pole
  - Mitered End Section

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FIGURE 2  
EXISTING CONDITIONS DIAGRAM  
SHEET 1/3



MATCHLINE B



MATCHLINE C

MATCHLINE C



MATCHLINE D

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- Utility Pole
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FIGURE 2  
EXISTING CONDITIONS DIAGRAM  
SHEET 2/3







## **TRAFFIC VOLUMES**

Five (5) eight-hour turning movement counts (TMC) were conducted on a weekday (August 18 and 19, 2019) from 7:00 to 9:00 a.m., 11:00 a.m. to 1:00 p.m., and 2:00 to 6:00 p.m. on S.R. 423 at the following intersections along the study corridor:

- Gloriosa Avenue (M.P. 8.816)
- DuPont Avenue (M.P. 8.956)
- Turner Road (M.P. 9.119)
- Killarney Townhomes (formerly The Mondrian Condos)/Waterfall Cove (M.P. 9.400)
- Bennett Avenue (M.P. 9.630)

Additionally, four (4) eight-hour pedestrian movement counts were conducted during the same timeframe at the following locations along the study corridor:

- East of Wymore Road (M.P. 8.655)
- Between Turner Road (M.P. 9.119) and Killarney Townhomes (M.P. 9.400)
- Between Killarney Townhomes (M.P. 9.400) and Bennett Avenue (M.P. 9.630)
- West of U.S. 17/92 (M.P. 9.864)

The peak-hour volumes at the intersections listed above are shown on the Existing Conditions Diagrams in **Figure 2**. Based on the eight-hour TMCs, the a.m. peak hour ranged from 7:30 to 8:30 a.m. and 7:45 to 8:45 a.m., and the p.m. peak hour ranged from 4:45 to 5:45 p.m. and 5:00 to 6:00 p.m.

Eight-hour bicycle and pedestrian counts were obtained for each of the counted intersections during the weekday count. Additionally, pedestrian/bicycle counts were conducted throughout the corridor to assist in determining the locations people are crossing. The pedestrian/bicycle crossings are summarized on an aerial in **Appendix B**. Throughout the corridor, pedestrian and bicycle activity was moderate to high with many crossings at the un-signalized intersections as well as mid-block. Mid-block crossings occurred throughout the corridor and locations were dependent on approaching traffic. Several pedestrians and bicyclists were observed crossing in two steps, staging on the raised separator while waiting for a gap in traffic to complete their crossing. Details of pedestrian activities are summarized in the Qualitative Assessment section.

## **SUPPLEMENTAL PEDESTRIAN VOLUMES**

Updated pedestrian crossing data was collected on January 25, 2024, from 7:00 a.m. to 7:00 p.m. in the vicinity of Country Club Drive (where a pedestrian crossing was previously recommended). A total of 53 pedestrians and nine bicycles were observed crossing during the 12-hour count period. The supplemental pedestrian/bicycle crossings are summarized on an aerial in **Appendix B**.



## **COLLISION ANALYSIS**

Vehicle, pedestrian, and bicycle safety was assessed along the S.R. 423 corridor through a review of crash reports and field observations. Crash data for the 90-month period between January 1, 2012 and June 30, 2019 was obtained from the FDOT's CAR database and the University of Florida's *Signal Four Analytics*. Based on a review of the data, there were 736 crashes reported along the study corridor as summarized below:

- 371 rear-end;
  - 163 side-swipe;
  - 68 angle;
  - 39 left-turn;
  - 33 right-turn;
  - 17 backed-into;
  - 16 bicycle;
  - 12 fixed-object;
  - Eight (8) pedestrian;
  - Three (3) head-on;
  - Two (2) animal;
  - One (1) object-in-road;
  - One (1) off-road;
  - One (1) other; and,
  - One (1) rollover
- The crashes resulted in one (1) fatality, 301 injuries, and \$2,819,443 in estimated property damage.
- 625 of the crashes occurred during the day while 111 crashes occurred at night.
- 667 crashes occurred under dry pavement conditions and 67 crashes occurred under wet pavement conditions.
- One (1) fatal crash occurred during the day and under dry pavement conditions, approximately 200 feet east of Aldrich Avenue. A westbound motorcycle rear-ended a box truck. The at-fault driver suffered fatal injuries as a result of the collision. A witness in the crash report stated the at-fault driver was speeding prior to the collision.
- Sixteen (16) bicycle crashes occurred as follows:
  - Eleven (11) of the crashes occurred when right-turning drivers failed to yield to the bicyclists:
    - At Wymore Road, two (2) southbound right-turning drivers struck eastbound bicyclists in the north leg crosswalk.
    - At Dupont Avenue, a southbound right-turning driver struck an eastbound bicyclist on the north side of the road.
    - East of Aldrich Avenue, two (2) northbound right-turning drivers (exiting Lee World Center) struck westbound bicyclists traveling on the south sidewalk.
    - East of Aldrich Avenue, two (2) southbound right-turning drivers struck eastbound/westbound bicyclists on the north sidewalk.
    - At the Lexington at Winter Park driveway, a westbound right-turning vehicle struck an eastbound bicyclist crossing the driveway.
    - At Bennett Avenue, a southbound right-turning driver struck an eastbound bicyclist in the north leg crosswalk.
    - At Executive Drive, a northbound right-turning driver struck a westbound bicyclist in the south crosswalk.
    - At U.S. 17/92, an eastbound right-turning driver struck a bicyclist (unknown direction) in the south leg crosswalk. The bicyclist left the scene before the arrival of police.
  - Five (5) occurred when bicyclists failed to yield to vehicles:
    - At Wymore Road, a northbound bicyclist, inside the east marked crosswalk, was struck by a northbound right-turning driver.

- East of Wymore Road, a westbound bicyclist (traveling in the roadway) struck the side mirror of a vehicle stopped in traffic.
- East of Aldrich Avenue, a southbound bicyclist failed to yield to an eastbound vehicle.
- A northbound bicyclist at Lewis Drive failed to yield to an eastbound vehicle.
- At U.S. 17/92, a southbound bicyclist, traveling in the west crosswalk, entered the eastbound lanes while eastbound traffic had a green signal.
- Eight (8) pedestrian crashes occurred as described below:
  - Three (3) occurred when drivers failed to yield to pedestrians:
    - At Wymore Road, a northbound right-turning driver struck a westbound pedestrian in the south leg crosswalk.
    - At Loren Avenue, a southbound right-turning driver vehicle struck an eastbound pedestrian in the north crosswalk.
    - At Country Club Road, a northbound driver entered the marked crosswalk and struck a westbound pedestrian.
  - Five (5) occurred when pedestrians failed to follow traffic control devices or crossed outside of a marked crosswalk:
    - At Wymore Road, a northbound pedestrian in the east crosswalk failed to yield to a traffic control device and was struck by a westbound vehicle. The pedestrian was noted to be under the influence at the time of the collision.
    - At Executive Drive, a northbound pedestrian (outside of a marked crosswalk) was struck by a northbound right-turning vehicle.
    - Three (3) occurred at U.S. 17/92:
      - An eastbound pedestrian (in the north crosswalk) was struck by an eastbound left-turning vehicle.
      - A northbound pedestrian (outside the marked crosswalk) was struck by an eastbound vehicle.
      - An eastbound pedestrian (in the south crosswalk) was struck by a northbound right-turning vehicle.
- Sixty-eight (68) angle crashes occurred as described below:
  - Twenty-seven (27) occurred at the intersection S.R. 423 and Wymore Road:
    - Twenty-six of the angle crashes occurred due to drivers disregarding the red traffic signal:
      - Twenty-one (21) westbound through drivers failed to yield to northbound/southbound through and left-turn vehicles.
      - Three (3) southbound through drivers failed to yield to eastbound/westbound through vehicles.
      - Two (2) eastbound through drivers failed to yield to northbound/southbound through vehicles.
    - A westbound driver slid into the intersection on wet pavement while attempting to stop and struck a southbound vehicle.
  - Seven (7) occurred at the intersection of S.R. 423 and Country Club Drive:
    - Six (6) occurred when northbound drivers struck eastbound vehicles.
    - A northbound left-turning driver failed to yield to a westbound vehicle.
  - Two (2) occurred at the intersection of S.R. 423 and Bennett Avenue when southbound drivers failed to yield to a westbound vehicle.
  - Seven (7) occurred at the intersection of S.R. 423 and Lewis Drive when northbound drivers (exiting the shopping center on the south side of S.R. 423)

- failed to yield to eastbound vehicles.
  - Four (4) occurred at the intersection of S.R. 423 and U.S. 17/92 due to drivers disregarding the red traffic signal:
    - Three (3) southbound drivers struck eastbound left-turning vehicles.
    - An eastbound driver struck a northbound vehicle.
  - Four (4) occurred at the intersection of S.R. 423 and Webster Avenue where northbound drivers failed to yield to eastbound/westbound vehicles.
  - Seventeen (17) other angle crashes occurred at various other side streets and driveways throughout the study corridor.
- Thirty-nine (39) left-turn crashes occurred as described below:
  - Ten (10) occurred at the intersection of S.R. 423 and Wymore Road:
    - Three (3) occurred when westbound drivers disregarded the red traffic signal and struck eastbound left-turning vehicles.
    - Two (2) occurred when eastbound drivers disregarded the red traffic signal and struck westbound left-turning vehicles.
    - Two (2) occurred when westbound left-turning drivers failed to yield to eastbound vehicles.
    - A southbound left-turning driver failed to yield to a northbound vehicle.
    - A northbound left-turning driver failed to yield to a southbound vehicle.
    - A westbound left-turning driver disregarded the red traffic signal and struck an eastbound vehicle.
  - Eight (8) occurred at the intersection of S.R. 423 and Gloriosa Avenue when eastbound left-turning drivers failed to yield to westbound vehicles, resulting in seven (7) non-incapacitating and one (1) possible injuries.
  - Twelve (12) occurred at the intersection of S.R. 423 and Bennett Avenue when eastbound left-turning drivers failed to yield to westbound vehicles.
  - At the intersection of S.R. 423 and U.S. 17/92, a northbound left-turning driver disregarded the signal and struck a southbound vehicle.
  - Eight (8) other left-turn crashes occurred at various other side streets and driveways throughout the study corridor.
- Thirty-three (33) right-turn crashes occurred as described below:
  - Four (4) occurred at the intersection of S.R. 423 and Wymore Road involving southbound right-turning drivers failing to yield to eastbound (U-turn), westbound and northbound (left-turn) vehicles.
  - Seven (7) occurred at the intersection of S.R. 423 and Lewis Drive
    - Six (6) northbound right-turning drivers failed to yield to eastbound vehicles.
    - A southbound right-turning driver failed to yield to a westbound vehicle.
  - Six (6) occurred at the intersection of S.R. 423 and Webster Avenue when northbound right-turning drivers failed to yield to eastbound vehicles
  - Three (3) occurred at the intersection of S.R. 423 and U.S. 17/92:
    - A southbound right-turning driver struck a northbound left-turning vehicle.
    - Two (2) eastbound right-turning drivers failed to yield to a southbound (through) and westbound (left-turning) vehicles
  - Thirteen (13) right-turn crashes occurred at various other side streets and driveways throughout the study corridor.

Detailed collision summaries specifying all of the crashes and crash types within the study corridor with their corresponding collision diagrams are provided in **Appendix C**.

## **SUPPLEMENTAL COLLISION ANALYSIS**

A supplemental collision analysis was performed for the 54-month period between July 1, 2019 and December 31, 2023 that focused on locations where improvement recommendations were previously provided. Crash data was obtained from the University of Florida's *Signal Four Analytics*. Based on a review of the supplemental data, there were 167 crashes reported at the study locations as summarized below:

### **S.R. 423 at Wymore Road:**

- 56 rear-end;
  - 43 angle;
  - 23 side-swipe;
  - Eight (8) left-turn;
  - Three (3) right-turn;
  - Two (2) backed-into;
  - One (1) bicycle;
  - One (1) pedestrian; and,
  - One (1) other.
- 138 total crashes occurred at Wymore Road, resulting in no fatalities, 52 injuries, and \$717,550 in estimated property damage.
- 107 of the crashes occurred during the day while 31 crashes occurred at night.
- 120 crashes occurred under dry pavement conditions and 18 crashes occurred under wet pavement conditions.
- 42 angle crashes occurred when drivers failed to stop for a red signal:
  - 14 westbound versus northbound; 25 westbound versus southbound;
  - One (1) northbound versus westbound;
  - One (1) southbound versus eastbound; and,
  - One (1) eastbound versus northbound.
- One (1) angle crash (southbound versus eastbound) occurred when a southbound right-turning driver struck an eastbound vehicle queued in the left-turn lane. The crash occurred at night and the at-fault driver was charged with driving under the influence.
- One (1) pedestrian crash occurred when a southbound pedestrian, crossing during the westbound green phase, was struck by a westbound vehicle. The crash occurred at night and under wet pavement conditions. The crash resulted in a non-incapacitating injury.
- One bicycle crash occurred when a westbound left-turning driver failed to yield to a westbound bicycle in the south crosswalk. The crash occurred at night and resulted in a non-incapacitating injury.

### **S.R. 423 at Country Club Drive:**

- 11 rear-end, eight (8) angle, and one pedestrian crash were reported at the intersection.
- 20 total crashes occurred at Country Club Drive, resulting in no fatalities, nine (9) injuries, and \$132,000 in estimated property damage.
- All 20 of the crashes occurred during the day.
- 18 crashes occurred under dry pavement conditions and two (2) crashes occurred under wet pavement conditions.
- Eight (8) angle crashes occurred when northbound left-turning drivers from Country Club Drive failed to yield to vehicles on S.R. 423, six (6) were northbound versus eastbound, and two (2) were northbound versus westbound.
- One (1) pedestrian crash occurred when a northbound pedestrian crossing just east of the intersection was struck by multiple eastbound vehicles. The crash occurred during the day under dry pavement conditions and resulted in a non-incapacitating injury.

Corridor wide pedestrian/bicycle crashes:

- Five (5) pedestrian and four (4) bicycle crashes were reported along the study corridor (not including the Wymore Road and Country Club Drive intersections), resulting in no fatalities, seven (7) injuries, and \$1,700 in estimated property damage.
- Seven (7) of the crashes occurred during the day while one (1) crash occurred at night.
- All eight (8) crashes occurred under dry pavement conditions.
- One (1) pedestrian crash occurred just east of Wymore Road when a northbound right-turning vehicle departing the Chevron gas station struck a westbound pedestrian in the marked crosswalk. The crash resulted in a non-incapacitating injury.
- One (1) pedestrian crash occurred at Aldrich Avenue when a westbound left-turning driver struck a westbound pedestrian in the marked crosswalk. The crash resulted in an incapacitating injury.
- One (1) pedestrian crash occurred at Aldrich Avenue when a southbound driver struck an eastbound pedestrian in the marked crosswalk. The crash resulted in a possible injury.
- One (1) bicycle crash occurred at the driveway for the Westmount apartment complex east of Aldrich Avenue when a southbound driver struck a westbound bicyclist in the marked crosswalk. The crash resulted in a possible injury.
- One (1) bicycle crash occurred at the driveway for the Westmount apartment complex east of Aldrich Avenue when a southbound driver struck an eastbound bicyclist in the marked crosswalk. The crash resulted in a non-incapacitating injury.
- One (1) pedestrian crash occurred at Bennett Avenue when a southbound driver struck an eastbound pedestrian in the marked crosswalk. The crash resulted in a possible injury.
- One (1) bicycle crash occurred just east of Executive Drive when an eastbound bicyclist, riding in the travel lane, lost control and overturned. The crash resulted in a non-incapacitating injury.
- One (1) bicycle crash occurred at Webster Avenue when a northbound driver struck a westbound bicyclist in the marked crosswalk. The crash resulted in a non-incapacitating injury.
- One (1) pedestrian crash occurred at U.S. 17-92 when a southbound driver struck a pedestrian crossing during the southbound green phase. The crash occurred at night and no injuries were reported.

Detailed collision summaries specifying all of the crashes and crash types within the study corridor with their corresponding collision diagrams are provided in **Appendix C**.



## **QUALITATIVE ASSESSMENT**

**Operations:** Operations include the efficiency of operation and interaction of motor vehicles, pedestrians, and bicycles along the corridor. The study corridor of S.R. 423 was observed by a registered professional engineer to evaluate pedestrian/bicyclist activity along the corridor. The goal of the observations was to determine the need for any improvements to enhance the safety and efficiency of the corridor.

- S.R. 423 is a four-lane divided roadway within the study section, with sidewalks, bike lanes and sporadic roadway lighting provided along both sides of the roadway.
- Spot speed data was collected at two locations along the corridor; west of Turner Road and west of Bennett Avenue. The resultant 85<sup>th</sup> percentile speeds were 51 mph at Turner Road and 50 mph at Bennett Avenue with the upper limit of the 10-mph pace being 53 for both locations. Based on the spot speed data, no modification to the posted speed limit is recommended at this time. Spot speed tables are provided in **Appendix D**.
- There are two signalized intersections within the study corridor: Wymore Avenue and U.S. 17/92. Special emphasis crosswalks and push button pedestrian signal detection with countdown type pedestrian signal heads are provided on all approaches of both intersections.
- The intersection of S.R. 423 at U.S. 17/92 was reconstructed to convert the T-intersection to a four-legged intersection, extending Lee Road eastward. As part of this reconstruction, the traffic signal was rebuilt and includes retroreflective backplates on all signal heads. Based on available dated photographs, the new signal was functional in December 2016.
- There are 10 unsignalized median opening intersections within the study corridor (one (1) eastbound directional and nine (9) full openings). Median opening spacing ranges from 400 to 750 feet. Based on FDOT's Access Management Guidelines, the suggested spacing is 1,320 feet between full/signalized median openings and 660 feet between directional median openings.
- Multiple Lynx bus stops are provided along both sides of the road throughout the study corridor (Lynx Route 443). The bus stop locations appeared appropriate based on the surrounding land uses (apartments, restaurants, and businesses).
- Several schools are within one mile north or south of the study corridor: Killarney Elementary School (south of S.R. 423), Park Maitland School (north of S.R. 423), and Hungerford Elementary School (north along U.S. 17/92).
- The current pedestrian WALK and DON'T WALK intervals were evaluated at the signalized intersections and determined to be adequate based on MUTCD guidelines and the existing crosswalk lengths.
- Throughout the study corridor, pedestrians were observed crossing midblock (outside of marked crosswalks), using both one-stage and two-stage crossings. A pedestrian conducts a two-stage crossing by first crossing one direction of traffic, and then waiting within the median for a gap in the other direction of traffic before crossing the remaining lanes of the roadway.
- The highest concentration of pedestrian/bicycle activity was observed between Bennett Avenue and U.S. 17/92, which coincides with the highest mix of residential and commercial land uses. During the 8-hour count period, 61 pedestrians and 10 bicyclists were observed crossing S.R. 423, from west of Bennett Avenue to west of U.S. 17/92.
- Significant redevelopment has occurred in the vicinity of the S.R. 423 at U.S. 17/92 intersection. Shopping centers and restaurants are located on all four corners with multi-family residential units also provided in the northwest quadrant. Development is still in

progress, with hotels and other residential buildings under construction. Based on historical aerial images, the redevelopment of this area appears to have begun in 2012.

- The Watercrest Assisted Living and Memory Care Center is located at the intersection of Bennett Avenue and Glendon Parkway, approximately 1,100 feet north of S.R. 423.
- Vehicular traffic was moderate with platoons of cars created by the signalized intersections. Turning movements were generally efficient at the unsignalized median openings along the corridor. Left-turning conflicts were noted specifically at the following locations:
  - The eastbound directional median opening at Lewis Drive is located approximately 600 feet west of U.S. 17/92. Lewis Drive is the north leg of the intersection and provides access to the redeveloped area north of S.R. 423. There is a shopping center located on the south side of S.R. 423, with the driveway located approximately 115 feet west of Lewis Drive. Numerous conflicts were observed with northbound drivers from the shopping center attempting to access the eastbound left-turn lane at Lewis Drive. Approaching eastbound drivers appeared to be slowing as they approached this area: eastbound traffic queues from the U.S. 17/92 intersection frequently queued up to and beyond the driveway and gaps were not sufficient to accommodate the movement from the driveway to the eastbound left-turn lane at Lewis Drive. Northbound drivers were often observed “creeping” between queued vehicles to access the left-turn lane. While a turning movement count was not collected at this location as part of the study efforts, a count was performed for the eastbound left and U-turn movements from 12:00 to 1:00 p.m. Sixty-two (62) eastbound left turns and 120 eastbound U-turns were counted during this one-hour period.
  - The full median opening at Bennett Avenue is located approximately 1,240 feet west of U.S. 17/92. Bennett Avenue is the north leg of the intersection and also provides access to the redeveloped area north of S.R. 423. Executive Drive extends south from S.R. 423, approximately 110 feet east of Bennett Avenue and provides access to industrial businesses and the rear access to the shopping center. Eastbound left-turn volumes averaged 73 vph (ranging from 41 to 159 vph) and westbound U-turn volumes average 50 vph (ranging from 15 to 83 vph). Conflicts were observed when eastbound left-turning and westbound U-turning vehicles were simultaneously waiting for gaps to complete their turns. Drivers’ ability to see approaching through vehicles and take advantage of gaps was significantly hindered while opposing left-turn/U-turn vehicles were stopped across from them. While southbound left-turn volumes are low (average of 10 vph), conflicts were compounded when southbound vehicles staged within the median opening and restricted sight distance for all other drivers.

**Safety:** Vehicle, pedestrian, and bicycle safety along the study corridor was assessed through review of crash reports, identification of significant crash trends, and correlation to field conditions. The following are observations related to the safety of the corridor based on the various field reviews:

- Based on a review of the previous crash data analysis (90-month period between January 1, 2012 and June 30, 2019), 736 crashes occurred, resulting in one (1) fatality, 301 injuries, and \$2,819,443 in estimated property damage.
- A supplemental crash data analysis (54-month period between July 1, 2019 and December 31, 2023), 167 crashes occurred, resulting in no fatalities, 69 injuries, and \$851,250 in estimated property damage.
- Twenty-one (21) bicycle and 15 pedestrian crashes occurred within the study limits. Four (4) of the pedestrian crashes and one (1) of the bicycle crashes occurred at night. 13 bicycle and five (5) pedestrian crashes involved right-turning drivers, with 12 occurring at unsignalized intersections/driveways (nine (9) bicycle and three (3) pedestrian). Eight (8) of the bicycle crashes involved a cyclist travelling in the opposite direction of vehicular traffic when they were struck by drivers exiting driveways/sidestreets. Three (3) pedestrian crashes occurred when the pedestrian was crossing outside of a marked crosswalk (midblock).
- Four (4) bicycle and two (2) pedestrian and crashes occurred at the Wymore Road intersection. Three (3) bike and one (1) pedestrian crashes involved northbound or southbound right-turning vehicles while one (1) bike crash involved a westbound left-turning vehicle and one (1) pedestrian crash involved a pedestrian crossing during the green phase. It is recommended STOP FOR PEDS blank out signs be installed on all approaches to the intersection. It is assumed the existing box span is not structurally sufficient to accommodate the additional loading of the blank out signs; **therefore, it is recommended the existing traffic signal at Wymore be rebuilt to include:**
  - One signal head per lane;
  - Retroreflective backplates on all signal heads;
  - 4-section flashing yellow arrow signal heads for northbound/southbound left-turn movements;
  - STOP FOR PEDS blank out signs on all approaches;
  - Updated pedestrian detectors on all corners; and,
  - Pedestrian lighting (lighting is being added to the intersection under FPID 442390-1, Lighting Bundle D).

It should be noted the right-of-way appears restrictive on all four quadrants of the intersection and right-of-way impacts/costs would be significant to replace the signal poles. For the purposes of this study, only the installation of the retroreflective backplates will be included in the cost estimate and cost-benefit analysis.

- While conflicts were not typically observed between vehicles and pedestrians at the U.S. 17/92 intersection, the increased redevelopment in the surrounding area has the potential to increase pedestrian activity and potential conflicts. **It is recommended STOP FOR PED blank out signs be installed on all approaches to the intersection.** Based on this signal being rebuilt in 2016, it is assumed the addition of the blank out signs on all approaches will not have a significant impact to the loading of the mast arm.
- Consideration was given to mid-block crosswalks throughout the study segment. Based on the locations and volumes of pedestrian/bicycle crossings, bus stop locations, surrounding developments, signal spacing within the corridor and existing median opening placement, mid-block crosswalks are recommended for consideration west of

Country Club Drive and at Bennett Avenue. Given the higher 85<sup>th</sup> percentile speeds along the roadway, Pedestrian Hybrid Beacons (PHB's) would be recommended.

- West of Country Club Drive – **It is recommended the full median opening at Country Club Drive be reconstructed to a westbound restricted crossing U-turn (RCUT) and a PHB be installed.** This location will provide a pedestrian crossing opportunity between the generators (neighborhoods, apartments, and bus stops) and attractors (restaurants, businesses, and bus stops) and accommodates the concentration of existing pedestrian crossings within 300 feet of Country Club Drive. The supplemental pedestrian crossing volumes collected continue to show a pedestrian crossing pattern at or near the Country Club Drive intersection, with 47 pedestrians and seven bicyclists crossing in the vicinity. To avoid right-of-way needs, consideration should be given to installing a dual mast arm for the PHB in the 30-foot median and the sidewalk be reconstructed as necessary to position the signal cabinet within the right-of-way.
- Seven (7) angle and seven (7) right-turn crashes have been reported at the shopping center driveway opposite from Lewis Drive. As previously mentioned, conflicts were observed at this location and gaps are not sufficient to accommodate the movement. Consideration was given to closing the eastbound directional median opening at Lewis Drive. The eastbound left-turn and U-turn volumes were observed to be high and redirecting these turns would result in increased U-turn movements at the signalized intersection of U.S. 17/92 (and a potential increase in eastbound U-turn versus southbound right-turn conflicts). Eastbound drivers who arrived at this intersection from the west (not by exiting the shopping center driveway) were able to complete their left and U-turn movements without conflict. With the recommended signalization of Bennett Avenue, larger and more frequent gaps in eastbound approaching traffic should be created. These gaps could reduce the conflicts created by northbound drivers exiting the shopping center to access the eastbound left-turn lane. **It is recommended this location be monitored after the implementation of the signal at Bennett Avenue. Should conflicts continue, more restrictive measures should be implemented to restrict access to the eastbound left-turn lane, from the shopping center driveway.**
- In an effort to alert drivers to mid-block pedestrian activities along this section of S.R. 423, **it is recommended fluorescent yellow green Pedestrian Warning signs with a supplemental distance plaque, noting NEXT 1 MILE, be installed east of Fremont Avenue (eastbound travel direction) and west of U.S. 17/92 (westbound travel direction).** It is also recommended the existing yellow Pedestrian Warning sign that is posted east of Aldrich Avenue (eastbound travel direction) be replaced with a fluorescent yellow green Pedestrian Warning sign with a supplemental distance plaque, noting NEXT 0.5 MILE.
- A Lighting Justification Report (LJR) was conducted on S.R. 423, from U.S. 441 to U.S. 17/92 under a separate study effort. The results of the study indicate the existing lighting should be upgraded. Lighting will be provided at the Wymore Road intersection under FPID 442390-1, Lighting Bundle D. **It is recommended the lighting system be upgraded along the study corridor.**
- The existing 45-mph speed limit (from west to east) along S.R. 423 transitions to 35 mph approximately 650 feet west of U.S. 17/92. Given the increase in development and pedestrian/bicycle activity between Bennett Drive and U.S. 17/92, **it is recommended the 35-mph speed zone be expanded to include Bennett Drive, relocating the 35 mph (eastbound travel direction) and 45 mph (westbound travel direction) speed**

**limit signs to be 170 feet west of Bennett Drive (M.P. 9.598).** A speed limit of 35 mph is consistent with the existing commercial (C4) context classification.

Maintenance: During the various field reviews the condition of the study corridor's asphalt, striping, signing, and lighting were observed. The following are observations related to the maintenance of the study corridor based on the various field reviews:

- The signs, pavement markings, and pavement conditions along S.R. 423 generally appear to be in good condition.
- There are SCHOOL pavement messages on the westbound approach to Wymore Road. This area is not a designated reduced speed school zone and the pavement message is not applicable (per the FDOT Speed Zoning Manual 2018). **Consideration should be given to removing the SCHOOL pavement messages during a future resurfacing project.**
- The KEEP RIGHT sign mounted on the separator for the eastbound approach to U.S. 17/92 is knocked down. **It is recommended the KEEP RIGHT SIGN be reinstalled.**



## **SUMMARY OF RECOMMENDATIONS**

Stanley Consultants, Inc. was retained on behalf of the Florida Department of Transportation (FDOT) to conduct a Pedestrian Safety Study on S.R. 423 from Wymore Road to U.S. 17/92 in Winter Park (Orange County), Florida. The original study was previously completed in February 2020 with a second draft in August 2021. The purpose of this study update is to provide a supplemental collision analysis, review the previously provided recommendations, and update the cost estimate and benefit-cost analysis.

Based on engineering judgement, a review of crash history, the location of pedestrian generators and attractors, the proximity to bus stops, adjacent signals, and field observations, the following improvements are recommended:

### Short term improvements:

- Refresh the southbound stop bar on Wymore Road approaching S.R. 423.
- Install retroreflective backplates on all signal heads at the intersection of S.R. 423 and Wymore Road.
- Install Pedestrian Warning signs, with supplemental distance plaques noting NEXT 1 MILE, west of U.S. 17/92 (westbound travel direction) and east of Fremont Avenue (eastbound travel direction).
- Replace the yellow Pedestrian Warning sign located east of Aldrich Avenue with a fluorescent yellow-green Pedestrian Warning sign and a supplemental distance plaque noting NEXT 0.5 MILE
- Expand the existing 35 mph speed zone west of U.S. 17/92 by relocating the existing 45 mph (westbound travel direction) and 35 mph (eastbound travel direction) approximately 170 feet west.
- Reinstall the KEEP RIGHT SIGN on the eastbound approach to U.S. 17/92.

### Long term improvements:

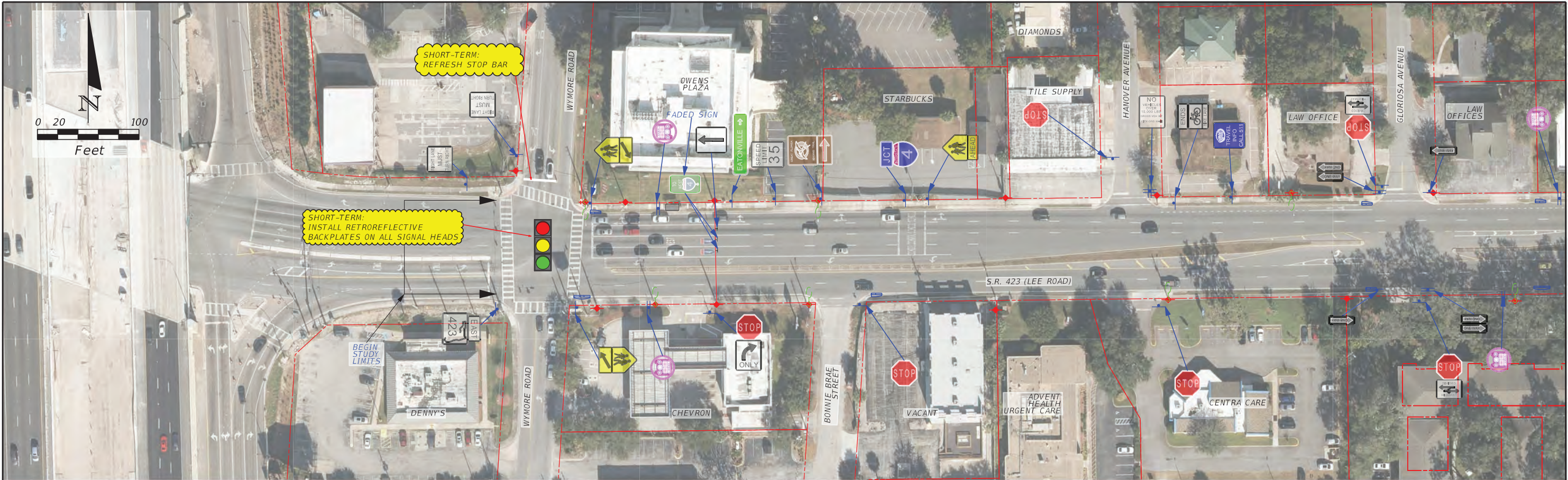
- Upgrade the lighting system throughout the corridor. Lighting is being provided at the Wymore Road intersection under FPID 442390-1, Lighting Bundle D.
- Reconstruct the intersection of S.R. 423 at Country Club Drive to convert the existing full median opening to a restricted crossing U-turn (RCUT) and install a Pedestrian Hybrid Beacon (PHB). To avoid right-of-way impacts, consider placing a dual mast arm in the 30-foot median and reconstructing the sidewalk for the signal cabinet.
- Install STOP FOR PEDS blank out signs on all approaches at the U.S. 17/92 intersection.

### Improvements for future Work Program project consideration:

- Remove the SCHOOL pavement messages on the westbound approach to Wymore Road during a future resurfacing project.
- Rebuild the traffic signal at Wymore Road, to include STOP FOR PEDS blank out signs, one (1) signal head per lane, 4-section flashing yellow arrow signal heads for the northbound/southbound approaches, pedestrian lighting, and upgrade pedestrian detector stations. Significant right-of-way impacts are expected with this improvement that would not result in an acceptable benefit-cost; therefore, this improvement is not included in the cost estimate of benefit-cost analysis.



MATCHLINE A



MATCHLINE A



MATCHLINE B

- Utility Pole
- Traffic Sign
- Luminaire

Symbols:

- Traffic Controller Cabinet
- Existing Inlet

- Proposed Elements
- Short Term Improvements

Stanley Consultants, Inc.  
80 Spring Vista Drive  
DeBary, FL 32713

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DEPARTMENT OF TRANSPORTATION

FIGURE 3  
SHORT-TERM IMPROVEMENTS DIAGRAM  
(PAGE 1 OF 3)

PAGE  
NO.

20



MATCHLINE B



MATCHLINE C

MATCHLINE C



MATCHLINE D

- Utility Pole
- Traffic Sign
- Luminaire

Symbols:

- Traffic Controller Cabinet
- Existing Inlet
- Proposed Elements
- Short Term Improvements

Stanley Consultants, Inc.  
80 Spring Vista Drive  
DeBary, FL 32713

STATE OF FLORIDA  
DEPARTMENT OF TRANSPORTATION

FIGURE 3  
SHORT-TERM IMPROVEMENTS DIAGRAM  
(PAGE 2 OF 3)

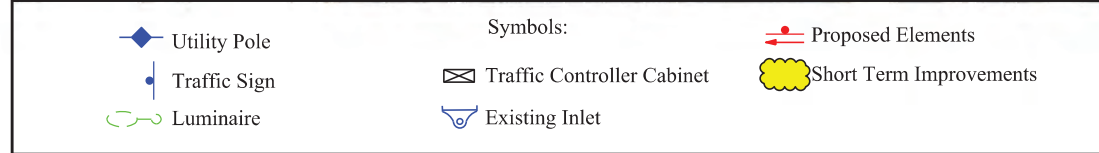
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NO.

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FDOT MAINTENANCE ITEMS:

0650 2102 -- SIGNAL AUX. RETROFIT BACKPLATE W/ REFLECT BORDER -- 10 EA  
0700 1 11 -- SINGLE POST SIGN, F&I, GM, <12 SF -- 4 AS  
0700 1 50 -- SINGLE POST SIGN, RELOCATE -- 2 AS  
0700 1 60 -- SINGLE POST SIGN, REMOVE -- 2 AS  
0711 11125 -- THERMOPLASTIC, STARDARD, WHITE, 24" FOR STOP LINE -- 35 LF



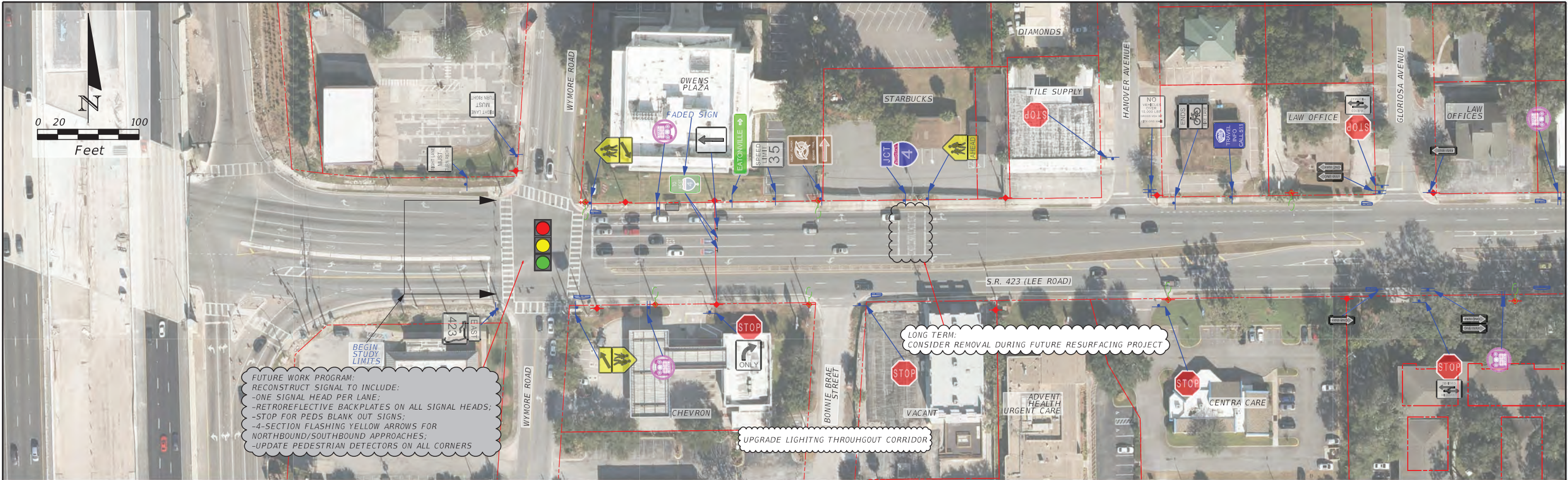
*Stanley Consultants, Inc.*  
80 Spring Vista Drive  
DeBary, FL 32713

STATE OF FLORIDA  
DEPARTMENT OF TRANSPORTATION

FIGURE 3  
SHORT-TERM IMPROVEMENTS DIAGRAM  
(PAGE 3 OF 3)



MATCHLINE A



MATCHLINE A



MATCHLINE B

- |                |                              |                          |
|----------------|------------------------------|--------------------------|
| ◆ Utility Pole | Symbols:                     | — Proposed Elements      |
| • Traffic Sign | ⊠ Traffic Controller Cabinet | ☁ Long Term Improvements |
| — Luminaire    | ⚡ Existing Inlet             | ☁ Future Work Program    |

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FIGURE 3  
LONG-TERM IMPROVEMENTS DIAGRAM  
(PAGE 1 OF 3)



MATCHLINE B



MATCHLINE C

MATCHLINE C



MATCHLINE D

- Symbols:
- Utility Pole
  - Traffic Sign
  - Luminaire
  - Traffic Controller Cabinet
  - Existing Inlet
  - Proposed Elements
  - Long Term Improvements
  - Future Work Program

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FIGURE 3  
LONG-TERM IMPROVEMENTS DIAGRAM  
(PAGE 2 OF 3)







## **COST ESTIMATE**

With the updated recommended improvements and using the FDOT's 12-Month moving average prices from January 1, 2023 to December 31, 2023, the updated estimated cost for the short and long-term improvements shown in **Figure 3** is \$1,543,435 as shown in the "Engineer's Opinion of Probable Costs" table in **Appendix E**.

## **BENEFIT/COST ANALYSIS**

A benefit-cost analysis was conducted for the proposed short and long-term improvements to determine if the project is justified based on criteria outlined in the Highway Safety Improvement Program Manual. The benefit of the improvement is determined as the cost associated with any crash susceptible to correction by the improvements.

A crash modification factor (CMF) of 0.679 was identified for improvements to the uniformity and luminance of existing street lighting (see **Appendix F**). This CMF was applied to all nighttime crashes between Wymore Road and US 17/92, including nighttime crashes around Country Club Drive. From January 1, 2019 to December 31, 2023 there were 34 applicable collisions, and upon applying the CMF to the crashes, it was determined that 2.18 crashes per year would be reduced by the improvement to uniformity and luminance of existing street lighting.

A crash modification factor (CMF) of 0.95 was identified for conversion of full median opening to a directional median opening (see **Appendix F**). This CMF was applied to all daytime crashes interacting with the median opening at Country Club Drive, including angle crashes involving northbound left-turning vehicles. From January 1, 2019 to December 31, 2023 there were 14 applicable collisions and upon applying the CMF to the crashes, it was determined that 0.14 crashes per year would be reduced by the conversion of the open median at Country Club Drive to a westbound directional median.

Based on FDOT's Crash Analysis Reporting System, S.R. 423 falls under crash category 20, urban 4-5 lane two-way divided roadways with raised medians with an average cost-per-crash of \$141,193. As summarized in **Table 2**, the resulting benefit-cost ratio of 2.59 was calculated. The net present value (NPV) for the improvement, including engineering and CEI, is estimated at approximately \$2,913,691. The NPV calculations are provided in **Appendix G**.

The total cost for the recommended improvements is estimated at approximately \$1,543,435.

**Table 2**  
**Benefit/Cost Analysis**

1. SUBMITTED BY	Stanley Consultants, Inc.	FM #		5. SAFETY PRIORITY																																																																											
2. DATE SUBMITTED	3/28/2024			ENV. STUDY																																																																											
3. PROJECT NO.				SKID (ID)																																																																											
4. ALTERNATIVE NO.	1			SPEED	45																																																																										
6. DISTRICT	5	COUNTY	Orange	SECTION	75250																																																																										
7. BEGIN MILE POST	8.655	END MILE POST	9.864	SR	423																																																																										
				U.S. ROAD	N/A																																																																										
				LENGTH	1.209																																																																										
				NODE	N/A																																																																										
10. PROPOSED IMPROVEMENTS (LIST AND DISCUSS): Improve street lighting throughout the corridor, and convert Country Club Drive to a westbound directional median with a pedestrian hybrid beacon.																																																																															
11.	12.	14. CRASH INFORMATION FOR FACILITY																																																																													
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		DATE:																																																																													

• Cost per crash based on Category 20- Statewide Urban 4-5 Lane 2 Way Divided Raised Median (\$141,193) as obtained from the Segment Based crash Rate Statistics for FDOT.  
 • Improvement of street lighting illuminance and uniformity has a CMF of 0.679 pertaining to all crash types and all crash which occurred at night throughout the corridor.  
 • Conversion of an unsignalized median opening to a left-in only directional median has a CMF of 0.95 and was applied to all crashes and all severities at the intersection of S.R. 423 and Country Club Drive.

# APPENDIX



## **APPENDIX A**

# **STRAIGHT LINE DIAGRAM**