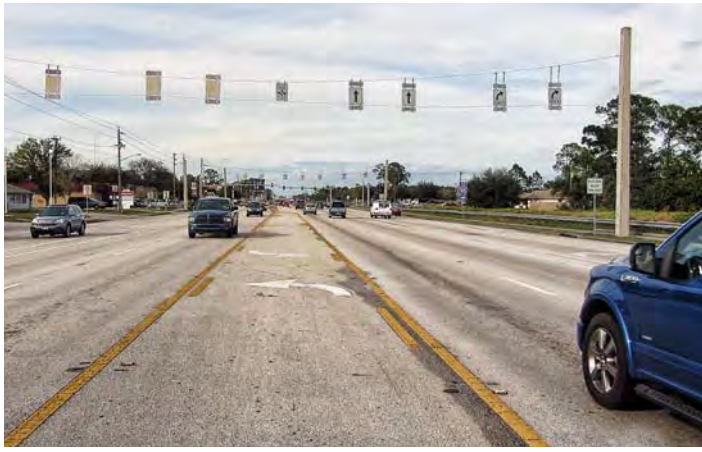
SPACE COAST TPO

ROAD SAFETY AUDIT

Emerson Drive/Minton Road/Palm Bay Road from Jupiter Boulevard to Culver Drive



Prepared for:
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July 2016

High Crash Corridors Analysis

Road Safety Audit Report for

Emerson Drive / Minton Road / Palm Bay Road from Jupiter Boulevard to Culver Drive

Brevard County

Prepared for:

Space Coast Transportation Planning Organization
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July 2016

Project Title: Emerson Drive Road Safety Audit

Field Review Dates: January 26th and 27th, 2016 (AM/PM/afternoon/nighttime reviews and follow-up meeting)

Participants:
Jack Freeman – Kittelson & Associates, Inc. – Team Leader
Laura Carter – Space Coast Transportation Planning Organization
Georganna Gillette – Space Coast Transportation Planning Organization
Steven Bostel – Space Coast Transportation Planning Organization
Gennaro Saliceto – Space Coast Area Transit
Rachel Gerena – Brevard County
Conroy Jacobs – Brevard County
Stuart Hughes – City of Palm Bay
Officer Darin Morgan – Palm Bay Police Department
Travis Hills – Kittelson & Associates, Inc.

Project Characteristics:
Field Review Type:

- All Users (Vehicular, Pedestrian, Bicycle, Transit)

Adjacent Land Use:

- Urban – Commercial, Residential

Posted Speed Limit:

- 40 miles per hour (MPH) along Emerson Drive from Jupiter Boulevard to Minton Road;
- 35 MPH along Minton Road from Emerson Drive to Palm Bay Road; and
- 45 MPH along Palm Bay Road from Minton Road to Culver Drive.

Opposite Flow Separation:

- Raised grass median along Emerson Drive from Jupiter Boulevard to Minton Road;
- Center Two-Way Left-Turn Lane (TWLTL) along Minton Road from Emerson Drive to Palm Bay Road; and
- Raised grass median along Palm Bay Road from Minton Road to Culver Drive.

Service Function:

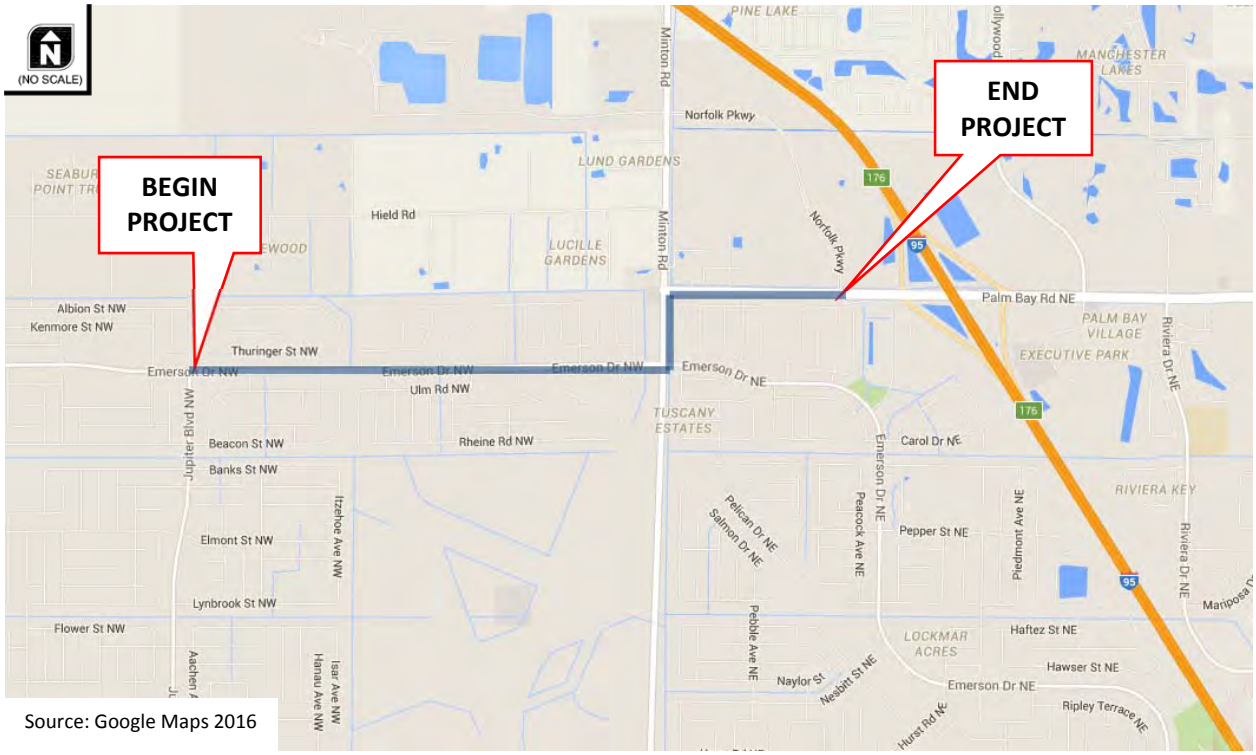
- Urban Minor Arterial along Emerson Drive from Jupiter Boulevard to Minton Road;
- Urban Principal Arterial along Minton Road from Emerson Drive to Palm Bay Road;
- Urban Principal Arterial along Palm Bay Road from Minton Road to Culver Drive.

Terrain:

- Flat

Climatic Conditions:

- Rain before afternoon field review; sunny and hot during the remainder of the review



Source: Google Maps 2016

Figure 1 – Emerson Drive/Minton Road/Palm Bay Road from Jupiter Boulevard to Culver Drive

Background

In December 2014 the SCTPO released the 2014 Annual Countywide Safety Report. Vehicular, pedestrian, and bicycle crash reports filed through the DHSMV in 2009 through 2014 recorded 40,459 total crashes in Brevard County with 238 fatal crashes and 12,531 resulting in injury. The SCTPO initiated the High Crash Corridors Analysis (HCCA) project to help generate a list of suggested improvements addressing the growing need for vehicular safety in Brevard County. As part of this project, five Road Safety Audits were performed along corridors within the County to identify safety improvements relating to vehicular, pedestrian, and bicycle crashes:

- Wickham Road from Sarno Road to Parkway Drive;
- Malabar Road from Jupiter Boulevard to Minton Road and Emerson Drive to San Filippo Drive;
- SR A1A from US 192 to Eau Gallie Boulevard;
- Emerson Drive/Minton Road/Palm Bay Road from Jupiter Boulevard to Culver Drive; and
- Babcock Street from Malabar Road to Palm Bay Road.

The Emerson Drive/Minton Road/Palm Bay Road study area was identified as one of the high crash corridors (**Figure 1**). In order to suggest improvements along this high crash corridor, crash history was evaluated and a Road Safety Audit (RSA) was conducted within the following study limits:

- Emerson Drive, from Jupiter Boulevard to Minton Road;
- Minton Road, from Emerson Drive to Palm Bay Road; and
- Palm Bay Road, from Minton Road to Culver Drive.

This RSA was commissioned by the Space Coast Transportation Planning Organization (SCTPO) to identify potential safety improvements to be considered by SCTPO staff and partner agencies (i.e. Brevard County, Space Coast Area Transit, City of Palm Bay, local law enforcement). This report summarizes the evaluation of the Emerson Drive/Minton Road/Palm Bay Road corridor.

The RSA process involves multi-disciplinary representatives from various stakeholders, including representatives from transportation planning, traffic operations, roadway design, safety, and law enforcement, as needed. RSAs are conducted to identify potential safety issues and provide improvement suggestions in a team collaborative environment. Some improvements presented in this report may be implemented through maintenance-type activities, while other suggested safety improvements may be considered for future study. Each suggestion identified in this study is classified into one of three categories:

- Maintenance – issues identified for maintenance may be addressed by public agency staff on a short timeframe and at a relatively low cost.
- Near-Term Improvement (within 5 years) – activities that may be incorporated into an upcoming construction project in the area, including 3R milling and resurfacing projects.
- Long-Term Improvement (5+ years) – activities that may be incorporated into upcoming construction projects and may need to be programmed for funding as separate projects.

The issues and suggested improvements reflect the consensus of the RSA team and not necessarily that of the SCTPO.

The RSA team met in the morning on Tuesday, January 26, 2016 at the Palm Bay City Hall to discuss the study corridor and crash history. Starting at 1:00 PM, the study team drove the entire corridor, west to east and then east to west, to gain an understanding of the facility characteristics from a driver's perspective. The team was then divided into three groups:

1. Walked south side from Jupiter Boulevard to Culver Drive;
2. Walked north side from Jupiter Boulevard to Culver Drive; and
3. Drove signalized intersections and minor streets along the study corridor.

Once the afternoon observations were completed, the study team observed PM peak hour observations at the signalized intersections. The team reassembled in the evening, after sunset, to make observations in nighttime conditions. The following day (Wednesday January 27th), the study team observed AM peak hour observations at the signalized intersections. A follow-up debrief meeting was held at the Palm Bay City Hall once the AM observations were completed to discuss the corridor's issues and potential improvements.

Study Corridor Characteristics

- Jupiter Boulevard to Culver Drive – 2.25 miles
- Posted speed limits as follows:
    - Emerson Drive = 40 MPH;
    - Minton Road = 35 MPH; and
    - Palm Bay Road = 45 MPH.
- Roadway cross sections as follows:

  - Emerson Drive – four lane divided (two eastbound and two westbound lanes) with raised grass median;
  - Minton Road – Nine lanes: two through northbound and two southbound lanes, dual northbound and southbound right-turn lanes, and a center two-way left-turn lane; and
  - Palm Bay Road – six lane divided (three eastbound and three westbound lanes) with raised grass median.
- Bicycle lanes are present along all three roadways. Along Minton Road, the bicycle lanes are "keyholed" between the dual northbound/southbound right-turn lanes and the northbound/southbound through lanes.
- Sidewalks are present along both sides of all three roadways.
- Overhead street lighting is present along the north and south sides of Emerson Drive, but is not present along Minton Road or Palm Bay Road.
- Type F curb and gutter is present along both sides of all three roadways.
- The land uses along each of the corridors is listed below:
  - Emerson Drive – Residential along the north and south sides
  - Minton Road – Commercial along the west side and residential along the east side
  - Palm Bay Road – Commercial along the north side and residential along the south side
- Space Coast Area Transit (SCAT) bus route 23 serves the Emerson Drive/Minton Road/Palm Bay Road corridor
- Six (6) signalized intersections as listed below:
  - Emerson Drive/Jupiter Boulevard:
    - Old version of special emphasis crosswalk markings on the north, south, and east legs;
    - Special emphasis crosswalk markings on the west leg of the intersection;
    - All crosswalks include pedestrian actuated signals with push buttons; and
    - Continuous sidewalks in the following places:
      - East of the intersection on both sides;
      - South of the intersection on the east side; and
      - West of the intersection on the south side (the north side has sidewalk for approximately 100 feet).
  - Emerson Drive/Park & Ride Lot:
    - Old version of special emphasis crosswalk markings on the north, west, and east legs;
    - All crosswalks include pedestrian actuated signals with push buttons;
    - The southern leg acts as a driveway for the Palm Bay Christian Church;
    - The northern leg serves the park and ride lot and Faith Baptist Church;
    - Bus pullouts with bus shelters are located on the far side of the eastbound and westbound approaches; and
    - Continuous sidewalks in all directions, except for the south leg into the church.
  - Emerson Drive/Minton Road:
    - Dual eastbound left-turn lanes approximately 1,100 feet in length;
    - Dual southbound right-turn lanes approximately 1,000 feet in length;
    - The leftmost eastbound approach lane drops into the dual eastbound left-turn lanes at the intersection.
    - Overhead guide signs on span wire to inform drivers of the lane designations along the following approaches:
      - Two sets on the eastbound approach with signs above all three lanes

        - Three sets on the southbound approach with signs above all four lanes
    - Special emphasis crosswalk markings on all four legs of the intersection;
    - All crosswalks include pedestrian actuated signals with push buttons and countdown timers; and
    - Continuous sidewalks in all directions.
- Minton Road/Palm Bay Road:
    - Dual northbound right-turn lanes approximately 900 feet in length;
    - Triple westbound left-turn lanes approximately 825 feet in length;
    - The leftmost westbound approach lane drops into the triple westbound left-turn lanes at the intersection.
    - Overhead guide signs on span wire to inform drivers of the lane designations along the following approaches:
        - Two sets on the northbound approach with signs above all four lanes
        - One set on the westbound approach with signs above all four lanes
    - Old version of special emphasis crosswalk markings on all four legs of the intersection;
    - All crosswalks include pedestrian actuated signals with push buttons and countdown timers; and
    - Continuous sidewalks in all directions with the exception of the south side of the west leg.
- Palm Bay Road/Athens Drive:
    - The northbound approach is right-turn only;
    - Old version of special emphasis without standard markings on the north, west, and south legs;
    - All crosswalks include pedestrian actuated signals with push buttons and countdown timers; and
    - Continuous sidewalks in all directions with the exception of both sides on the north leg.
- Palm Bay Road/Culver Drive:
    - A 90 degree bend is present just south of the intersection along the Culver Drive approach;
        - An overhead “Be Prepared to Stop” flashing beacon is present on northbound approach.
    - Dual westbound left-turn lanes approximately 800 feet in length;
    - Old version of special emphasis without standard markings on the north, west, and south legs;
    - All crosswalks include pedestrian actuated signals with push buttons and countdown timers; and
    - Continuous sidewalks in all directions with the exception of the east/north sides on the south leg.

Crash History (2009 – 2014)

Six (6) full calendar years (January to December) of available vehicular related crash data, 2009 to 2014, was obtained from the Signal Four Analytics database, maintained by the University of Florida, and utilized for the crash analysis. Because Emerson Drive/Minton Road/Palm Bay Road is a non-state roadway maintained facility, the Signal Four database was the primary source for crash data. Florida Department of Transportation (FDOT) Crash Analysis Reporting System (CARS) data was not utilized for

this study because no state maintained facilities intersect with Emerson Drive/Minton Road/Palm Bay Road within the study limits.

735 vehicular crashes were reported over the six-year study period. A map displaying the locations of crashes along the Emerson Drive corridor is located in **Appendix A** along with a map showing the signal spacing and access management along the corridor. Of the 735 crashes reported during the study period, there were:

- One (1) fatal crash (<1 percent);
- 165 injury crashes (22 percent); and
- 569 property damage only (PDO) crashes (77 percent).

Collision diagrams (located in **Appendix A**) for the corridor include the following crashes:

- At signalized intersections;
- Fatal crash locations;
- Pedestrian crash locations; and
- Bicycle crash locations.

Fatal, Pedestrian, and Bicycle Crash Details

The single fatal crash, along with the two (2) pedestrian and seven (7) bicycle crashes, are summarized below (in order from west to east):

Fatal

- Crash Number 835767540 **(vehicle-motorcycle)**
    - On June 13, 2013 at 11:50 AM a crash involving a motorcycle and a passenger vehicle occurred at the Emerson Drive/Inn Place intersection under daylight and dry roadway surface conditions. The motorcycle was traveling eastbound in the outside through lane. The passenger vehicle was stopped facing northbound along Inn Place and failed to yield the right-of-way to the motorcycle by pulling out in front of the motorcycle. Upon the crash, the driver of the motorcycle was ejected. The driver of the motorcycle was transported to the hospital and was later pronounced deceased.

Pedestrian

- Crash Number 802356730
    - On April 28, 2010 at 4:15 PM a crash involving a pedestrian and a vehicle occurred near the intersection of Emerson Drive and Ulm Road under daylight and dry roadway surface conditions. The pedestrian was attempting to cross Emerson Drive at a mid-block location just east of Ulm Road. The vehicle was traveling eastbound (unknown lane) and struck the pedestrian on his right side. The pedestrian was talking on his cell phone at the time of the crash. The pedestrian suffered some road rash on his right arm.
- Crash Number 802358140
    - On July 13, 2010 at 9:59 PM a crash involving a pedestrian and a vehicle occurred near the intersection of Emerson Drive and Minton Road under dark lighting conditions. The

pedestrian attempted to cross Emerson Drive (heading northbound) at a mid-block location to the west of Minton Road. The pedestrian was struck in the inside westbound through lane as the pedestrian stepped off of the median. The pedestrian was under the influence of alcohol at the time of the crash and the incident resulted in one injury.

Bicycle

- Crash Number 802353550
  - On May 11, 2009 at 8:40 PM a crash involving a bicycle and a vehicle occurred at the intersection of Emerson Drive and Jupiter Boulevard under dark lighting conditions. The bicycle attempted to cross Emerson Drive in the east leg's crosswalk heading northbound. The vehicle was traveling westbound in the outside through lane. The bicyclist failed to yield the right-of-way to the westbound vehicle. No injuries were reported as a result of the incident.
- Crash Number 104187820
  - On June 2, 2009 at 6:50 PM a crash involving two bicycles and a vehicle occurred at the intersection of Emerson Drive and Prum Avenue under dusk lighting conditions. Both bicyclists were traveling eastbound along Emerson Drive against the flow of traffic. As the bicyclists approached Prum Avenue, the first bicycle stopped, but the second vehicle was struck by the vehicle departing Prum Avenue. No injuries were reported as a result of this incident.
- Crash Number 802360360
  - On November 5, 2010 at 6:56 PM a crash involving a bicycle and a vehicle occurred at the intersection of Emerson Drive and Tilberg Avenue under dusk lighting conditions. The bicycle was traveling eastbound on the northern sidewalk against the flow of traffic. The vehicle attempted a southbound right-turn onto Emerson Drive and struck the bicyclist. The bicyclist was transported to the hospital complaining of back pain.
- Crash Number 118423800
  - On June 19, 2012 at 4:04 PM a crash involving a bicycle and a vehicle occurred to the south of the intersection of Palm Bay Road and Minton Road under daylight conditions. The bicyclist was traveling southbound along the western sidewalk in front of the 7-11. The vehicle was also traveling southbound and attempted a right-turn into the 7-11. The bicyclist stated that the driver hit the left side of his bicycle, but there was no damage. The driver states that he heard a loud bang on the back of his car. There are conflicting stories about a potential crash and there was no evidence that a crash occurred. No injuries were reported as a result of this incident.
- Crash Number 842038250
  - On May 8, 2014 at 5:47 AM a crash involving a bicycle and a vehicle occurred at the intersection of Palm Bay Road and Minton Road under dark-lighted conditions. The bicycle was traveling eastbound in the crosswalk along the south leg of the intersection. The vehicle made an eastbound right-turn onto Minton Road and struck the rear tire of the bicycle. The bicycle had the right-of-way in this incident. No injuries were reported as a result of this crash.
- Crash Number 848128910
  - On September 18, 2014 at 3:23 PM a crash involving a bicycle and a vehicle occurred just north of the intersection of Palm Bay Road and Minton Road under daylight conditions. The vehicle was traveling south along Minton Road and was slowing due to

queues at the intersection. The bicycle traveled from the west side of Minton to the east approximately 200 feet north of the marked crosswalk along the north leg. As the driver entered the southbound left-turn lane, the vehicle struck the bicyclist. The bicyclist failed to yield the right-of-way to the vehicle and the incident resulted in one injury.

- Crash Number 848135310
  - On December 19, 2014 at 8:10 PM a crash involving a bicycle and a vehicle occurred at the intersection of Palm Bay Road and Culver Drive under dark lighting conditions. The bicyclist was traveling westbound in the right-turn lane. An unknown vehicle struck the bicyclist and drove off without stopping. The bicyclist was wearing a helmet and reflective clothing at the time of the incident. The bicyclist did not suffer any injuries as a result of the crash.

Corridor Wide Crash Trends

The reported crashes are displayed by different measures of time (year, month, day, and hour) below. Overall, the number of crashes has increased between 2009 and 2014. In 2011 and 2012, the Signal Four dataset displayed approximately 85 percent lower crashes than in the other years due to the availability of city or county crash records. Key crash trends include:

Time (**Figure 2** through **Figure 5**)

- March (72 crashes), December (72 crashes), August (70 crashes), and November (70 crashes) were the highest crash months during the year, while Friday (129 crashes) and Tuesday (123 crashes) were the highest crash days.
- Seventy-six (76) percent of all crashes occurred between 7:00 AM and 7:00 PM with 27 percent occurring between 4:00 PM and 7:00 PM.

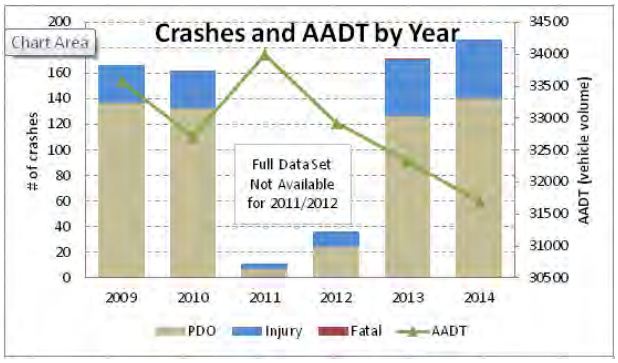
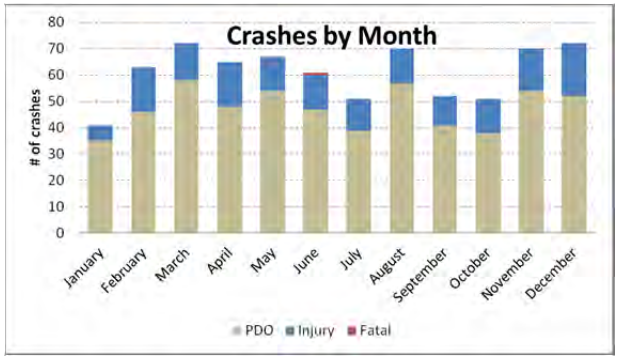


Figure 2



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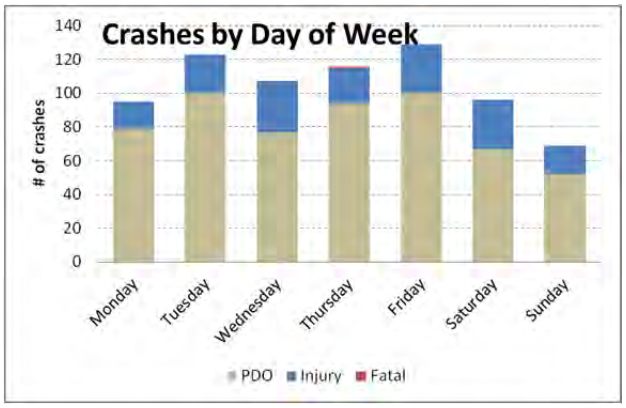

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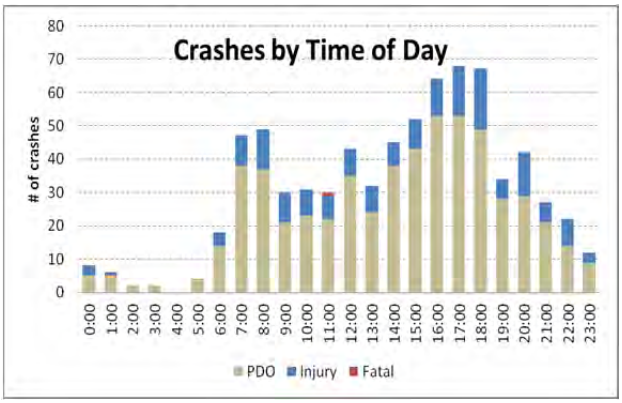


Figure 5

Crash Type and Lighting (**Figure 6** and **Figure 7**)

- Sixty (60) percent (440 crashes) were rear-end;
- 20 percent (144 crashes) sideswipe;
- Five (5) percent (40 crashes) angle; and
- Twenty-nine (29) percent of crashes occurred under dark lighting conditions (dawn, dusk, dark-lighted, and dark-unlighted).

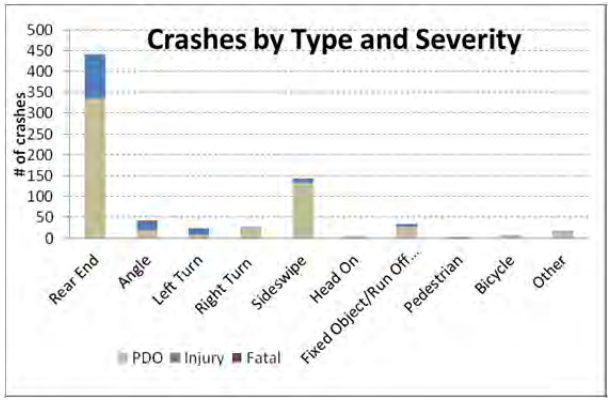


Figure 6

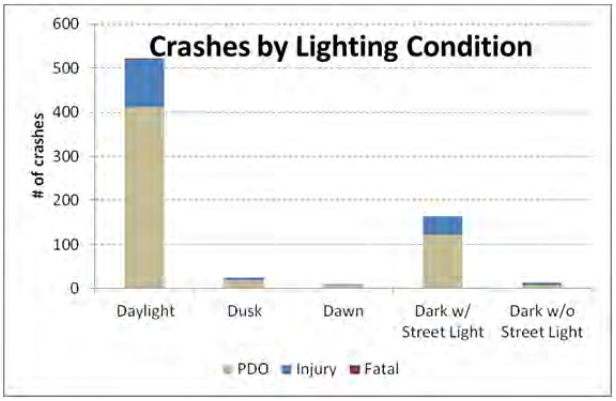


Figure 7

Intersection Crash Statistics

Of the 735 total crashes along the Emerson Drive/Minton Road/Palm Bay Road corridor, 656 occurred at the six (6) signalized intersections. The individual crash statistics for each of those intersections is detailed as follows:

- Emerson Drive at Jupiter Boulevard (42 crashes)
- Emerson Drive at Park & Ride Lot (2 crashes)
- Emerson Drive at Minton Road (257 crashes)
- Minton Road at Palm Bay Road (173 crashes)
- Palm Bay Road at Athens Drive (59 crashes)
- Palm Bay Road at Culver Drive (123 crashes)

Emerson Drive at Jupiter Boulevard (42 crashes)

- 17 percent (7 crashes) were injury-related and 83 percent (35 crashes) were PDO.
- 50 percent (21 crashes) were rear-end, 31 percent (13 crashes) were sideswipe, and 7 percent (3 crashes) were angle (**Figure 8**).
    - 10 of the 21 rear-end crashes occurred in the westbound direction.
    - 6 of the 13 sideswipe crashes occurred in the westbound direction.
- 24 percent (10 crashes) occurred in non-daylight conditions.
- July (7 crashes) and August (6 crashes) were the highest crash months.
- 33 percent (14 crashes) occurred between 3:00 PM and 6:00 PM (**Figure 9**).
- 1 bicycle crash occurred on the east leg crosswalk.

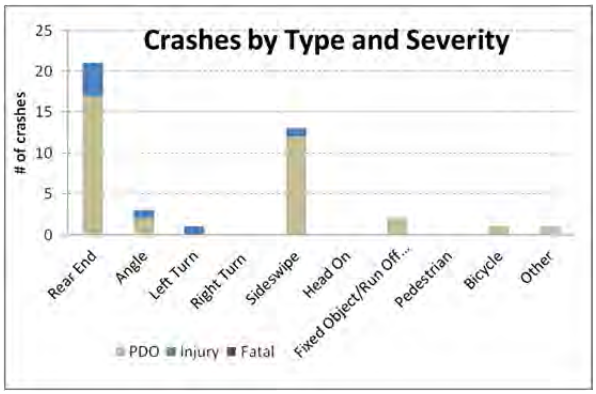


Figure 8

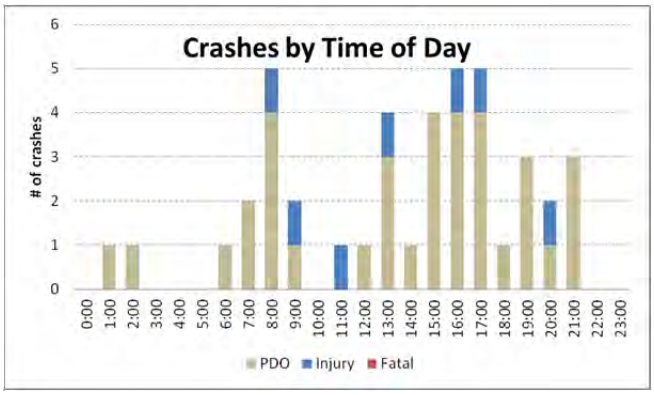


Figure 9

Emerson Drive at Park & Ride Lot (2 crashes)

- Two total crashes occurred at this intersection:
    - One rear-end on the eastbound approach resulting in an injury; and
    - One U-turn related crash on the eastbound approach occurring at night.

Emerson Drive at Minton Road (257 crashes)

- 28 percent (73 crashes) were injury-related and 72 percent (184 crashes) were PDO.
- 58 percent (149 crashes) were rear-end, 23 percent (59 crashes) were sideswipe, and 13 percent (34 crashes) were angle/left-turn/right-turn related (**Figure 10**).
    - 61 of the 149 rear-end crashes occurred on the eastbound approach.
    - 32 of the 149 rear-end crashes occurred on the northbound approach.
    - 30 of the 149 rear-end crashes occurred in the dual southbound right-turn lanes.
    - 38 of the 59 sideswipe crashes occurred in the dual southbound right-turn lanes.
    - 7 crashes occurred between southbound through vehicles and northbound left-turn vehicles.
    - 12 angle crashes occurred between southbound and eastbound through vehicles.
- 1 pedestrian crash occurred approximately 800 feet west of the intersection, within the influence area of the dual eastbound left-turn lanes.
- 28 percent (73 crashes) occurred in non-daylight conditions.
- March and August (26 crashes) were the highest crash months.
- 18 percent (42 crashes) occurred between 5:00 PM and 7:00 PM (**Figure 11**).

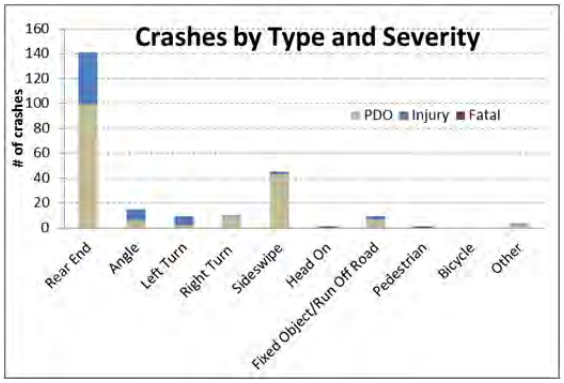


Figure 10

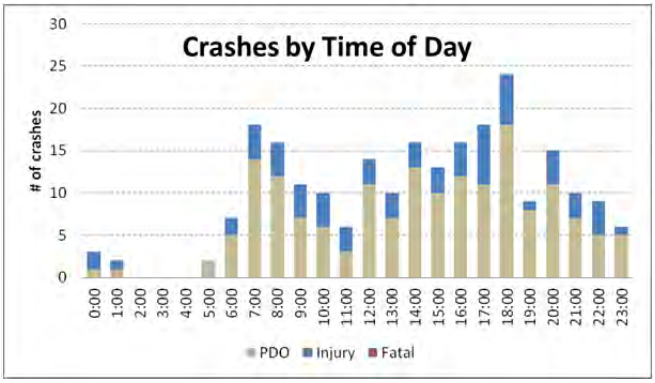


Figure 11

Minton Road at Palm Bay Road (173 crashes)

- 17 percent (29 crashes) were injury-related and 83 percent (144 crashes) were PDO.
- 57 percent (99 crashes) were rear-end, 20 percent (35 crashes) were sideswipe, and 14 percent (24 crashes) were angle/left-turn/right-turn related.
    - 41 of the 99 rear-end crashes occurred in the westbound triple left-turn lanes.
    - 21 of the 99 rear-end crashes occurred on the northbound approach.
    - 19 of the 99 rear-end crashes occurred on the southbound approach.
    - 9 of the 35 sideswipe crashes occurred while drivers were turning in the dual northbound right-turn lanes.
    - 9 of the 35 sideswipe crashes occurred while drivers were turning in the triple westbound left-turn lanes.
    - 6 crashes occurred between westbound right-turning vehicles and northbound through vehicles.
    - 7 rear-end crashes occurred once vehicles had made the westbound left-turn movement.
- 3 bicycle crashes occurred at or near the intersection:
    - One crossing the southern crosswalk struck by an eastbound right-turning vehicle;
    - One crossing mid-block north of the intersection struck by a southbound vehicle; and
    - One crossing the gas station driveway just south of the intersection struck by a southbound right-turning vehicle.
- 30 percent (51 crashes) occurred in non-daylight conditions.
- February (23 crashes) was the highest crash month and Friday (41 crashes) was the highest crash day.
- 36 percent (63 crashes) occurred between 3:00 PM and 6:00 PM (**Figure 12**).

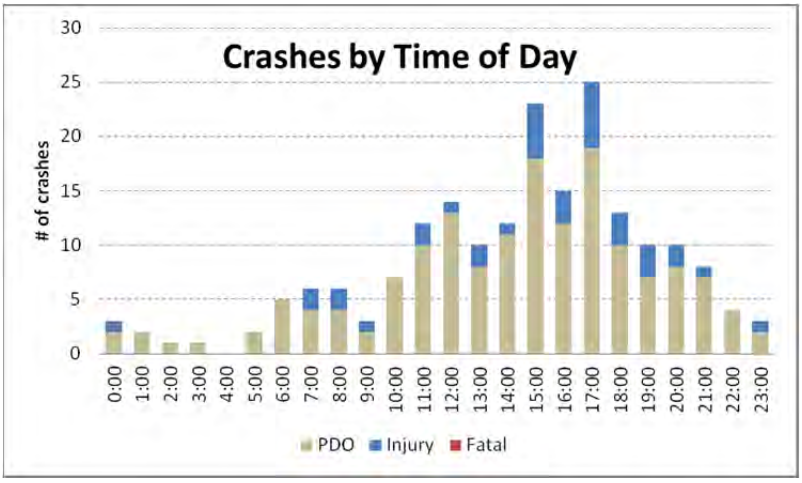


Figure 12

Palm Bay Road at Athens Drive (59 crashes)

- 10 percent (6 crashes) were injury-related and 90 percent (53 crashes) were PDO.
- 66 percent (39 crashes) were rear-end, 19 percent (11 crashes) were sideswipe, and 10 percent (6 crashes) were angle/left-turn/right-turn related (**Figure 13**).
    - 18 of the 39 rear-end crashes occurred before or after the intersection in the westbound direction.
    - 13 of the 39 rear-end crashes occurred on the eastbound approach.
- 34 percent (20 crashes) occurred in non-daylight conditions.
- 25 percent (15 crashes) occurred between 5:00 PM and 7:00 PM and no crashes occurred between 11:00 PM and 6:00 AM (**Figure 14**).

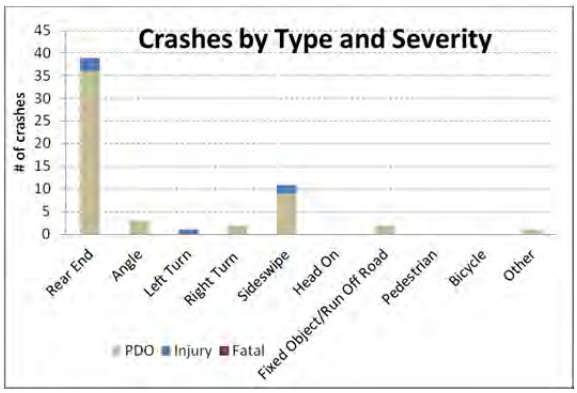


Figure 13

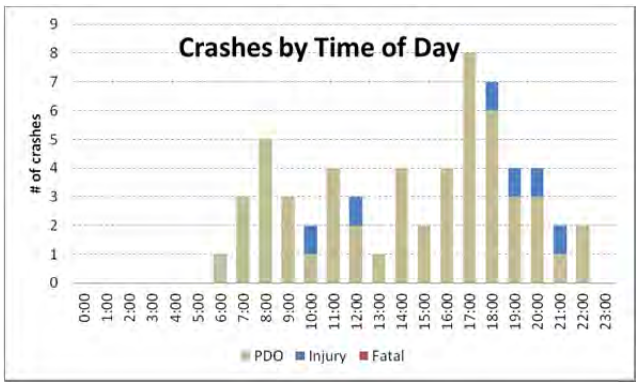


Figure 14

Palm Bay Road at Culver Drive (123 crashes)

- 22 percent (27 crashes) were injury-related and 78 percent (96 crashes) were PDO.
- 73 percent (90 crashes) were rear-end, 12 percent (15 crashes) were sideswipe, and 6 percent (7 crashes) were angle related.
    - 27 of the 90 rear-end crashes occurred on the eastbound approach.
    - 30 of the 90 rear-end crashes occurred on the westbound approach.

  - 23 of the 90 rear-end crashes occurred in the westbound direction east of the intersection.
  - 5 of the 15 sideswipe crashes occurred between vehicles making the northbound right-turn from the dual right-turn lanes.
- 1 bicycle crash occurred along the keyhole in the westbound direction.
- 30 percent (37 crashes) occurred in non-daylight conditions.
- March (16 crashes) was the highest crash month while June (7 crashes) and July (5 crashes) were the lowest months (**Figure 15**).
- 13 percent (16 crashes) occurred between 4:00 PM and 5:00 PM (**Figure 16**).

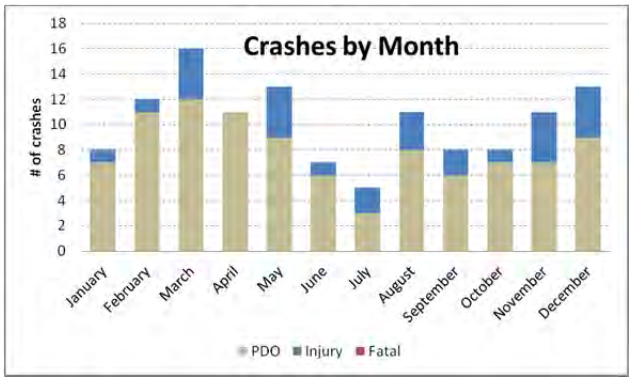


Figure 15

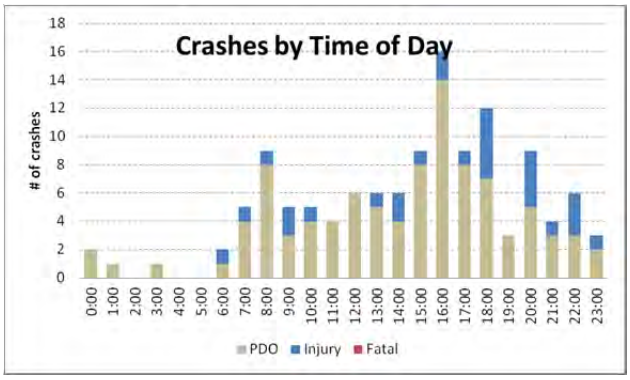


Figure 16

Segment Crash Statistics

There were a total of 79 segment crashes during the analysis period. The following summarizes the total number of crashes for each segment:

- Segment 1 – Jupiter Boulevard to Park and Ride Lot (50 crashes over 0.95 miles)
- Segment 2 – Park and Ride Lot to Minton Road (23 crashes over 0.30 miles)
- Segment 3 – Athens Drive and Culver Drive (6 crashes over 0.15 miles)

The 79 segment crashes were reviewed by locations to identify any additional trends or high crash locations. The individual crash statistics for each of the locations reviewed is detailed as follows:

Stadt Road to Inn Place (26 crashes over 0.20 miles)

- All but 2 of the crashes occurred at full median openings.
- 1 fatal, 6 injury-related, and 19 PDO crashes.
  - The one fatal crash occurred at Inn Place when a vehicle making a northbound left-turning movement pulled out in front of a motorcycle, killing the rider of the motorcycle.
- 46 percent (12 crashes) were rear-end, 34 percent were angle (3 crashes), left-turn (3 crashes), or sideswipe (3 crashes), and 15 percent (4 crashes) were fixed object/run off the road related.
- No pedestrian or bicycle related crashes occurred.
- 23 percent (6 crashes) occurred in non-daylight conditions.
- 46 percent (12 crashes) occurred in wet roadway conditions.
- December (9 crashes) was the highest crash month.

- 7:00 AM to 8:00 AM (6 crashes) and 7:00 PM to 8:00 PM (4 crashes) accounted for 39 percent of the crashes.

Mann Avenue to Ulm Road (16 crashes over 0.10 miles)

- 38 percent (6 crashes) were injury-related and 63 percent (10 crashes) were PDO.
- 50 percent (8 crashes) were rear-end and 19 percent (3 crashes) were sideswipe related.
- 1 pedestrian related crash occurred at Ulm Road between an eastbound traveling vehicle and a pedestrian crossing Emerson Drive (the pedestrian was talking on a cell phone).
- Tuesday (4 crashes) and Wednesday (5 crashes) accounted for 56 percent of the crashes.
- 8:00 AM to 9:00 AM (4 crashes) and 4:00 PM to 5:00 PM (4 crashes) accounted for 50 percent of the crashes.

Olden Avenue to Treu Terrace (12 crashes over 0.10 miles)

- 33 percent (4 crashes) were injury-related and 66 percent (8 crashes) were PDO.
- 58 percent (7 crashes) were rear-end and 17 percent (2 crashes) were left-turn related.
- 1 bicycle related crash occurred at Prum Avenue between bicycles traveling eastbound in the westbound lanes and a vehicle traveling south out of Prum Avenue.
- 25 percent (3 crashes) occurred in non-daylight conditions.
- Tuesday (4 crashes) and Thursday (4 crashes) accounted for 66 percent of the crashes.
- 7:00 AM to 8:00 AM (4 crashes) and 6:00 PM to 7:00 PM (5 crashes) accounted for 75 percent of the crashes.

Olden Avenue to Treu Terrace (12 crashes over 0.10 miles)

- 33 percent (4 crashes) were injury-related and 66 percent (8 crashes) were PDO.
- 58 percent (7 crashes) were rear-end and 17 percent (2 crashes) were left-turn related.
- 1 bicycle related crash occurred at Prum Avenue between bicycles traveling eastbound in the westbound lanes and a vehicle traveling south out of Prum Avenue.
- 25 percent (3 crashes) occurred in non-daylight conditions.
- Tuesday (4 crashes) and Thursday (4 crashes) accounted for 66 percent of the crashes.
- 7:00 AM to 8:00 AM (4 crashes) and 6:00 PM to 7:00 PM (5 crashes) accounted for 75 percent of the crashes.

ROAD SAFETY AUDIT FINDINGS

Transit Related Improvements

SCAT completed the Bus Stop Americans with Disabilities Act (ADA) Assessment Report for every transit stop within their network in early 2015. The Emerson Drive study corridor has 6 transit stops reviewed as part of this assessment. The recommendations from the ADA report are summarized for each stop below:

Jupiter Boulevard Westbound

- Move the stop 60 feet east. Pave a level 5'x3' slab between the curb and sidewalk to create a 5'x8' boarding and alighting (B&A) area.
- Add detectable warnings to the nearby curb ramps.
- Verify that the pole with the bus schedule is located adjacent to the pavement so it is accessible.

Furth Road Westbound

- Pave a level 5’x4’ slab between the curb and sidewalk to complete a 5’x8’ B&A area.
- Verify that the pole with the bus schedule is located adjacent to the pavement so it is accessible.

Mann Avenue Westbound

- Pave a level 5’x4’ slab between the curb and sidewalk to complete a 5’x8’ B&A area.
- Verify that the pole with the bus schedule is located adjacent to the pavement so it is accessible.

NW Olden Avenue Westbound

- Resurface the B&A area to have a cross slope of ≤2%.
- Move the pole with the bus schedule adjacent to the pavement on the far side of the B&A area.

Tilberg Avenue Westbound

- Pave a level 5’x4’ slab between the curb and sidewalk to complete a 5’x8’ B&A area.
- Verify that the pole with the bus schedule is located adjacent to the pavement so it is accessible.

Minton Road Southbound

- Pave a level 5’x4’ slab between the curb and sidewalk to complete a 5’x8’ B&A area.
- Verify that the pole with the bus schedule is located adjacent to the pavement so it is accessible.

The detailed ADA bus stop sheets from the assessment report are located in **Appendix B**.

Summary of Safety Issues

The RSA team identified and categorized corridor-wide and location-specific safety issues based on a qualitative risk scale. For the purposes of this RSA, risk is defined as a function of exposure, probability, and consequence. *Exposure* reflects the number of roadway users that could be influenced by the design feature. *Probability* reflects the likelihood of a crash influenced by the identified design feature. The *consequence* reflects the severity of a crash, if one occurs.

The RSA team assigned the qualitative risk rating of safety issues identified within the Emerson Drive study corridor relative to all other issues observed. ***Category III*** issues have potentially the greatest risk compared to the other observed issues; they are associated with higher exposure, probability, and/or consequence than other issues. ***Category II*** issues indicate higher risk than some issues and lower risk relative to other observed safety issues. ***Category I*** issues indicate the least risk compared to the other observed issues; they are associated with lower exposure, probability, and/or consequence.

Category III issues identified by the RSA Team:

Category II issues identified by the RSA Team:

Category I issues identified by the RSA Team:

- Intersection Street Name Signage: Page 21
- Minor Street Stop Sign Heights: Page 40
- Bus Stop: Page 41
- Emerson Drive/Minton Road Missing Detectable Warning Surfaces: Page 44

Location: Corridor-Wide

Issue #1: Corridor and Intersection Lighting

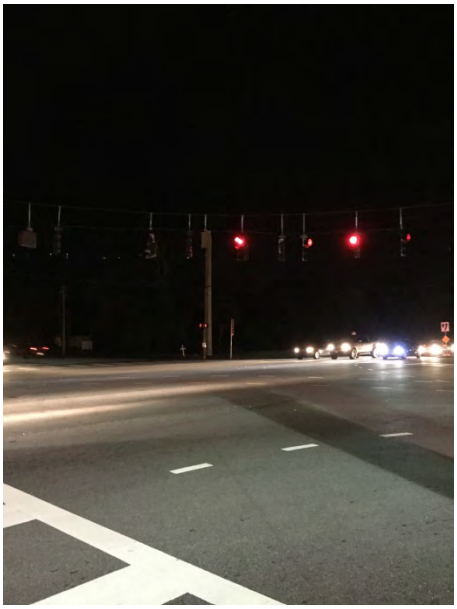


Figure 17

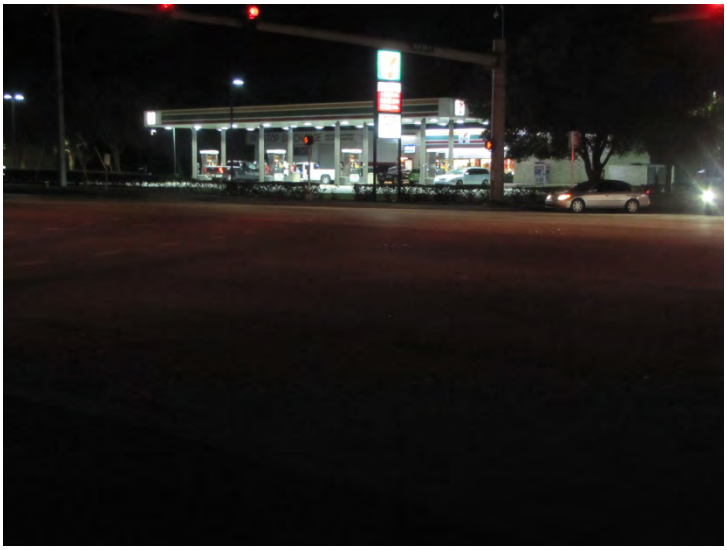


Figure 18

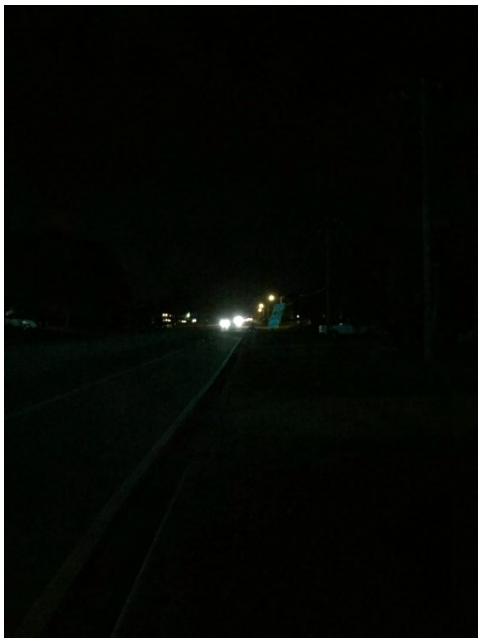


Figure 19

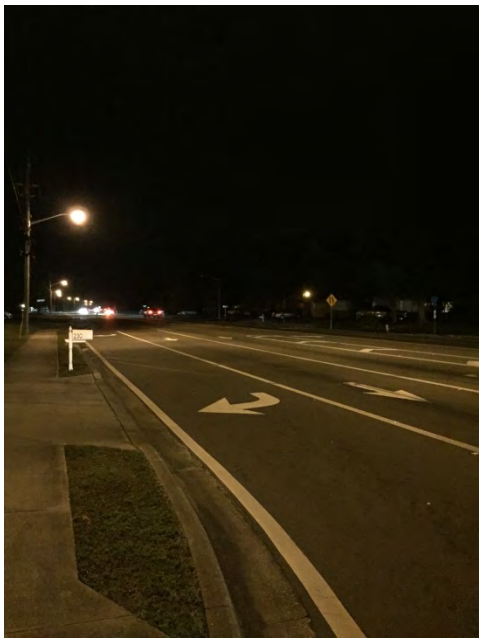


Figure 20

Description of Issue:

The crash statistics showed 29 percent of the total crashes along the corridor and at signalized intersections occurred during non-daylight conditions. No corridor lighting is present along Minton Road and Palm Bay Road. Emerson Drive is dimly lit but some luminaires are burnt out along this segment. Ambient lighting is present from some of the businesses along the Minton Road and Palm Bay Road segments.

Intersection lighting is present at the following locations:

- Emerson Drive/Jupiter Boulevard: Southwest corner
- Emerson Drive/Park and Ride Lot: Southeast corner
- Emerson Drive/Minton Road: Northwest and southwest corners, northwest corner has ambient lighting from CVS (**Figure 17** looking at the southeast corner)
- Minton Road/Palm Bay Road: No intersection lighting (**Figure 18** looking at southwest corner)
- Palm Bay Road/Athens Drive: No intersection lighting
- Palm Bay Road/Culver Drive: No intersection lighting

In addition to the segments and intersections within the study area, the study team also observed a lack of lighting along the south leg of Jupiter Boulevard (**Figure 19**). Luminaires were also burnt out near the merge area just west of the Emerson Drive/Jupiter Boulevard intersection (**Figure 20**).

Table 1. Qualitative Risk Rating for Corridor and Intersection Lighting

Function	Classification	Reasoning
Exposure	Category II	Corridor/intersections under dark lighting conditions for 8-16 hours of the day depending on time of year
Probability	Category II	29 percent of segment and intersection crashes occurred under non-daylight lighting conditions
Consequence	Category II	PDO to injury, depending on crash type
Overall	*Category II*	-

Suggestions for Improvement:
As a maintenance type activity, consider contacting the operator/maintainer of the lighting system to replace the burnt out luminaires along Emerson Drive.

In the near-term, consider upgrading the lighting at the signalized intersections to meet the requirements of Section 7.3.2.2 in Volume 1 of the FDOT Plans Preparation Manual (PPM). This may require the existing lighting to be replaced.

Consider a lighting uniformity study along Emerson Drive to review lighting consistency along this segment. Providing consistent lighting levels along this segment will make vehicles/pedestrians/bicyclists more visible during non-daylight lighting conditions. Also consider a lighting justification study along Minton Road and Palm Bay Road to determine if additional segment lighting is justified.

During implementation of the results of the studies, consider changing from the current high pressure sodium lights to LED (light-emitting diode) lighting to help improve lighting levels along the three corridors.

Location: Corridor-Wide

Issue #2: Intersection Street Name Signage

Figure 21

Figure 22

Figure 23

Figure 24

Figure 25

Figure 26

Description of Issue:
Street name signage types and sizes at signalized intersections are inconsistent along the study corridor. At some intersections such as Emerson Drive/Jupiter Boulevard, overhead street name signage is present on one side (**Figure 21**) but not the other (**Figure 22**). The Emerson Drive/Minton Road intersection does not have any hanging street name signs, only signs mounted on posts at the corners of the intersection as displayed in **Figure 23**. Minton Road/Palm Bay Road has street name signage mounted on the mast arm as displayed in **Figure 24**.

At the unsignalized minor street intersections along the Emerson Drive segment, the study team noted the following observations:

- Street name signage is mounted on stop signs but the stop signs are set back from intersection, making it difficult to see the street signage from Emerson Drive (**Figure 25**)
- At some three leg intersections, street name signage is located on the side of the roadway with no leg in addition to on the stop sign for the minor street leg. Some of the opposite side street name signs are located at three-leg intersections where no median opening is present, rendering the signage ineffective (**Figure 26**).
- The street name signage retro-reflectivity was poor.

Table 2. Qualitative Risk Rating for Intersection Street Name Signage

Function	Classification	Reasoning
Exposure	Category I	Not usually an issue for local drivers
Probability	Category I	No crashes reported due to this issue
Consequence	Category I	Potential for PDO or minor injury rear-end crashes
Overall	*Category I*	-

Suggestions for Improvement:
In the near-term, consider replacing/upgrading signalized intersection street name signage with interior illuminated, overhead LED street name signs, per section 2A.07 and Table 2A-1 of the 2009 Manual on Uniform Traffic Control Devices (MUTCD). By making the signalized intersection street name signage consistent, the distance from which a driver can see the street signs will increase, which may in turn reduce the potential for rear-end crashes associated with sudden deceleration and/or last minute lane changes from turning vehicles.

At minor streets along Emerson Drive, consider replacing street name signage with signage meeting current retro-reflectivity standards as discussed in Sections 2A.07 and 2A.08 in the MUTCD. When these signs are replaced, consider installing a separate post closer to the roadway so the street names are more visible to drivers along Emerson Drive. Also consider removing the street name signage at three-leg intersections on the opposite side of the roadway where there is no median opening. At three-leg intersections where a median opening is present, consider moving the opposite side street name sign to be in the median where it would be more visible for vehicles making a left-turn from Emerson Drive.

Location: Corridor-Wide

Issue #3: Intersection Crosswalk Markings

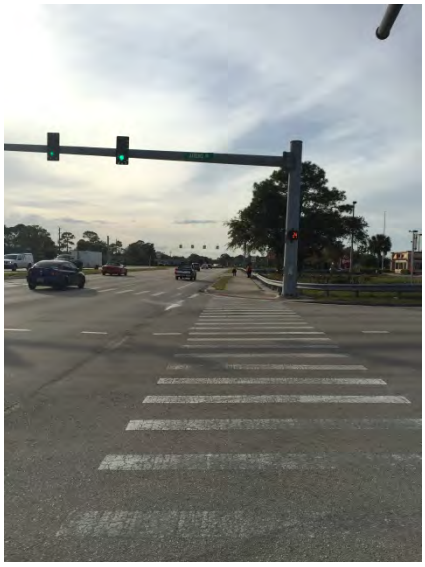


Figure 27

Figure 28

Description of Issue:
Crosswalk markings at signalized intersections, minor street intersections, and driveways along the study corridor are wearing and fading. In most cases, crosswalk markings at these locations are striped with old special emphasis markings, as illustrated in **Figure 27** and **Figure 28**. Five of the nine pedestrian/bicycle crashes along the study corridor occurred within marked crosswalk areas either at signalized intersections or at minor streets/driveways with a marked crosswalk.

Table 3. Qualitative Risk Rating for Intersection Crosswalk Markings

Function	Classification	Reasoning
Exposure	Category III	Present along entire corridor
Probability	Category III	5 of the 9 pedestrian/bicycle crashes occurred within marked crosswalks
Consequence	Category III	Pedestrian/bicycle crash types
Overall	*Category III*	-

Suggestions for Improvement:
Consider upgrading the crosswalk markings along the study corridor to be special emphasis as shown on Sheet 9 of FDOT Design Standard Index 17346. This restriping would take place at every signalized intersection and minor street/driveway with a current marked crosswalk.

Location: Corridor-Wide

Issue #4: Signal Heads at Signalized Intersections

Figure 29

Figure 30

Description of Issue:
The study team observed signals missing signal head backplates at Emerson Drive/Jupiter Boulevard (**Figure 29**), Emerson Drive/Park and Ride Lot, Emerson Drive/Minton Road, and Minton Road/Palm Bay Road (**Figure 30**). Rear-end crashes at the signalized intersections accounted for 399 of the 440 crashes (91 percent) along the entire study corridor.

At Jupiter Boulevard, the lens bulbs for the signal heads appeared to be only 8 inches in diameter and the signal heads were oriented horizontally instead of vertically like the other intersections along the study corridor.

Table 4. Qualitative Risk Rating for Signal Heads at Signalized Intersections

Function	Classification	Reasoning
Exposure	Category III	Present at most intersections, intersections have large volume movements
Probability	Category III	91 percent of rear-end crashes occurred at signalized intersections
Consequence	Category I	PDO to minor injury rear-end crashes
Overall	*Category II*	-

Suggestions for Improvement:
In the near-term, consider installing signal head backplates at the intersections where backplates are missing. Along with the backplate installation, consider adding the 3-inch yellow reflective sheeting (**Figure 31**) to all signal heads along the study corridor to help the signal heads stand out during the day and become more retroreflective at night. According to the FHWA Crash Modification Factor (CMF) Clearinghouse, adding the yellow reflective sheeting can reduce crashes at an intersection by up to 15 percent.

At Jupiter Boulevard, check the size of the lens bulbs. If the bulbs are only 8 inch in diameter, consider replacing the signal heads with 12-inch lens bulbs. Along with this installation, add backplates and the 3-inch yellow reflective sheeting. Also consider installing vertical signal heads for corridor consistency.

Figure 31 – Example of Yellow Reflective Sheeting at the Minton Road/Malabar Road Intersection

Location: Corridor-Wide

Issue #5: Pedestrian Crossing Timings

Description of Issue:
The field review team recorded the following crossing times for the following intersections/crosswalks:

- Emerson Drive/Jupiter Boulevard – 15 second pedestrian clearance interval on the east and west legs of the intersection. Using the recommended walking speed of 3.5 feet per second as included in Paragraph 7 of Section 4E.06 of the MUTCD, a pedestrian clearance interval of 26 seconds is needed on the east leg and 25 seconds is needed on the west leg to accommodate a pedestrian.
- Emerson Drive/Park and Ride Lot – 13 second pedestrian clearance interval on the east and west legs of the intersection. Using the recommended walking speed of 3.5 feet per second, a pedestrian clearance interval of 25 seconds is needed for both legs to accommodate a pedestrian.

Table 5. Qualitative Risk Rating for Pedestrian Crossing Timings

Function	Classification	Reasoning
Exposure	Category I	Only when pedestrians are present
Probability	Category I	No crashes reported due to this issue
Consequence	Category III	Potential for pedestrian/bicycle crash types
Overall	*Category II*	-

Suggestions for Improvement:
Consider extending the following pedestrian clearance intervals to meet the 3.5 feet per second walking speed:

- Emerson Drive/Jupiter Boulevard – extend to 26 seconds on the east leg and 25 seconds on the west leg.
- Emerson Drive/Park and Ride Lot – extend to 25 seconds for both the east and west legs.

Location: Corridor-Wide

Issue #6: Corridor Signage

Figure 32

Figure 33

Figure 34

Figure 35

Description of Issue:
During the field review, the study team observed the following issues related to signage along the study corridor:

- "One Way" signage is not present in medians at three-leg intersections and commercial driveways with no left-turn access.
- During the night review, the study team noted poor signage retro-reflectivity along the entire corridor.
- Emerson Drive/Minton Road intersection
    - Advanced overhead lane designation signage for the eastbound left-turn lanes are spanned 20 to 30 feet above the road surface due to proximity to utility lines crossing roadway.
        - Street name signs have been added to the lane designation signs informing

drivers what lane they need to be in depending on where they need to travel. For example, the rightmost eastbound left-turn lane sign says "Palm Bay Road East" informing drivers they need to pre-position themselves in that lane if they want to go east on Palm Bay Road. The wording on these signs is small and the driver cannot read the roadway names until they are practically under the sign (**Figure 32**).

- The leftmost approaching eastbound through lane becomes the rightmost left-turn lane at the intersection. There is no advanced warning informing drivers that the through lane becomes a left-turn trap lane.

- A "No U-Turn" sign is present in the median approximately 400 feet west of the intersection, but there is no "No U-Turn" sign present at the intersection itself.
- The median nose on the west leg between the eastbound left-turn and westbound through lanes has been damaged (**Figure 33**). There is no "Keep Right" signage for the median nose to alert drivers of the raised separation.

- Along Minton Road between Emerson Drive and Palm Bay Road, sign pollution is present on the east side of roadway making it difficult to discern which signs are important (**Figure 34**). There are numerous ground mounted signs and three sets of overhead signs within the 1,200 feet between signals.
- The overhead lane designation signage westbound along Palm Bay Road does not have street name signage similar to what is being provided along Emerson Drive. Also, only one set of overhead signs are present approximately 800 feet east of the Minton Road/Palm Bay Road intersection (**Figure 35**).

Table 6. Qualitative Risk Rating for Corridor Signage

Function	Classification	Reasoning
Exposure	Category III	High traffic volume corridor with numerous signs along corridor
Probability	Category I	No crashes reported due to this issue
Consequence	Category II	Potential for PDO to moderate injury depending on the crash type
Overall	*Category II*	-

Suggestions for Improvement:
Consider a corridor signage re-evaluation, focusing on the following suggestions targeting the above issues:

- Install ONE WAY (R6-1) signage in medians at three-leg intersections and commercial driveways with no left-turn access.
- Upgrade signage along the corridor to current retro-reflectivity standards as discussed in Sections 2A.07 and 2A.08 in the MUTCD.
- Emerson Drive/Minton Road intersection
  - Lower the overhead signage along the eastbound approach. If the signage cannot be lowered due to proximity of the utility lines, consider moving the signage to a location where it can be installed at an appropriate height.

  - Install street name signage on the lane designation signage with larger lettering that can be seen from farther away.
  - Add LEFT LANE MUST TURN LEFT (R3-7) signage in advance of the eastbound left-turn lanes to warn drivers the inside through lane becomes a left-turn lane at the intersection.
  - Add a "No U-Turn" (R3-4) sign for the eastbound left-turn lanes on the span wire because this sign may be too wide to be installed in the median.
  - For the median nose between the eastbound left-turn lanes and westbound through lanes, add a flex post bright stick and repaint the nose to make it stand out to left and right-turning vehicles.
- Along Minton Road between Emerson Drive and Palm Bay Road remove unnecessary signs.
- Add an extra set of overhead lane designation signage along Palm Bay Road east of the Minton Road intersection. Add street name signage on the lane designation signage with larger lettering that can be seen from farther away, similar to what is being suggested along Emerson Drive eastbound.

Location: Emerson Drive/Jupiter Boulevard Intersection

Issue #7: Jupiter Boulevard Pavement Condition

Figure 36

Figure 37

Description of Issue:
Emerson Drive has been recently resurfaced, as displayed in **Figure 36**, but the Jupiter Boulevard legs of the intersection were not resurfaced during this project. A rain storm passed through the study area before the afternoon field review. During the field review, the study team observed vehicles losing traction and sometimes skidding on the wet pavement along Jupiter Boulevard. The study team also observed a vehicle making a westbound left-turn to go south on Jupiter Boulevard lose control and crash into the speed limit sign (**Figure 37**). On the south leg, three (3) of the seven (7) crashes occurred under wet pavement conditions. Worn pavement can be a contributing factor in crashes during wet conditions.

Table 7. Qualitative Risk Rating for Jupiter Boulevard Pavement Condition

Function	Classification	Reasoning
Exposure	Category III	Present when vehicles drive on north or south legs of intersection
Probability	Category II	3 of 7 crashes on south leg occurred under wet conditions
Consequence	Category I	PDO to minor injury, depending on crash type
Overall	*Category II*	-

Suggestions for Improvement:
Consider a resurfacing project along the north and south legs of Jupiter Boulevard to increase the skid resistance and traction for vehicles.

Location: Emerson Drive/Jupiter Boulevard Intersection

Issue #8: Right-Turn on Red

Figure 38

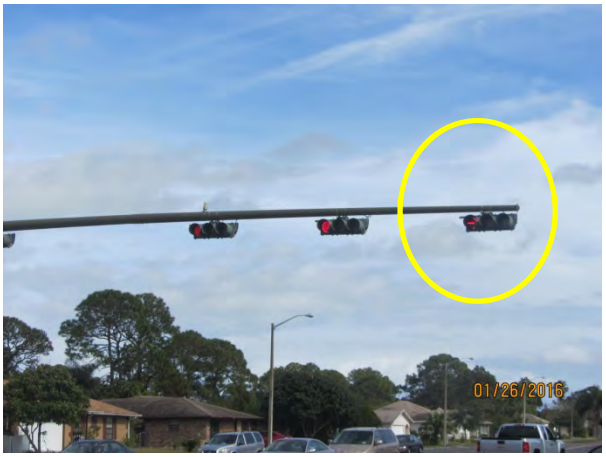


Figure 39

Description of Issue:
The eastbound and northbound approaches of the intersection have exclusive right-turn lanes with right-turn arrow signal heads (**Figure 38** and **Figure 39**). Right-turns on red are permitted on these legs of the intersection after a complete stop. The study team observed multiple vehicles on the eastbound and northbound legs making right-turns on red without coming to a complete stop. This can lead to conflicts between pedestrians/bicyclists utilizing the marked crosswalks or other through vehicles approaching from the left.

Table 8. Qualitative Risk Rating for Right-Turn on Red

Function	Classification	Reasoning
Exposure	Category II	Moderate eastbound and northbound right-turn volumes observed during AM and PM peak hours
Probability	Category I	No crashes reported due to this issue
Consequence	Category III	Potential for pedestrian/bicycle crashes or right-turn crashes with approaching through vehicles
Overall	*Category II*	-

Suggestions for Improvement:
Consider adding RIGHT ON RED ARROW AFTER STOP (R10-17a) signs to the eastbound and northbound legs. Also consider additional right-turn on red enforcement on these two legs.

R10-17a

Location: Emerson Drive/Jupiter Boulevard Intersection

Issue #9: Westbound Left-Turn Lanes

Figure 40

Description of Issue:
The current westbound left-turn lanes (displayed in **Figure 40**) are approximately 125 feet long, not including the taper. A westbound U-turn is located just east of the start of the westbound left-turn lanes. During the PM peak hour field review, the study team observed queueing from the left-turn movement extending into the westbound through lanes along Emerson Drive.

Table 9. Qualitative Risk Rating for Westbound Left-Turn Lanes

Function	Classification	Reasoning
Exposure	Category III	High westbound left-turn volume observed during PM peak hour
Probability	Category I	No crashes reported due to this issue
Consequence	Category II	Potential for PDO to minor injury rear-end and sideswipe crash types
Overall	*Category II*	-

Suggestions for Improvement:
Based on FDOT Design Index Standard 301, the minimum deceleration distance for left-turn lanes along a 40 MPH roadway is 155 feet, including a 100-foot taper. The 155-foot dimension does not include storage for queued vehicles. Consider a turn lane study to assess extending the length of the westbound turn lanes. The length of the turn lanes should meet minimum deceleration standards and also accommodate queued vehicles. This may require extending the turn lanes further east into the median and westbound U-turn area, thus the westbound U-turn should be considered for removal.

Location: Emerson Drive between Jupiter Boulevard and Minton Road

Issue #10: Vehicular Speeding

Description of Issue:
The current posted speed along the Emerson Drive portion of the study corridor is 40 MPH and during the field review, the study team observed most vehicles traveling at or above the posted speed. Local residents have complained about the excessive speeds along Emerson Drive and the law enforcement representative noted vehicles are consistently driving 50 to 55 MPH. Even though the roadway lanes are 10-10.5 feet wide, the roadway feels wider due to the 5-6 feet bicycle lane, which encourages faster vehicle speeds. Even though the Park and Ride Lot signal is located halfway between Jupiter Boulevard and Minton Road, it primarily gives green time to east-west through movements along Emerson Drive due to the low minor street volume. This allows drivers to maintain a consistently high speed from Jupiter Boulevard to Minton Road, a distance of approximately 1.50 miles. The high speeds create potential conflicts with queued vehicles in the eastbound direction approaching Minton Road in the AM peak hour and in the westbound direction approaching Jupiter Boulevard in the PM peak hour.

Table 10. Qualitative Risk Rating for Vehicular Speeding

Function	Classification	Reasoning
Exposure	Category III	Speeding vehicles were observed frequently during the field review; study team members familiar with area discussed frequency of speeding vehicles
Probability	Category I	No crashes reported due to this issue
Consequence	Category II	Potential for PDO to minor injury rear-end and sideswipe crash types
Overall	*Category II*	-

Suggestions for Improvement:
In order to help with posted speed compliance along Emerson Drive, a few treatments could be considered:

- Enforcement Related –
  - Install a set of speed feedback signs that display how fast the vehicle is traveling in both the eastbound and westbound direction. This may help deter speeding along the corridor.
    - Perform two speed studies: 1.) Before the signs are installed, and 2.) When the signs are implemented. These studies will help determine if the signs are making a positive impact in slowing vehicles down.
  - Increase speed enforcement to encourage vehicles to drive closer to the posted speed limit.
  - Perform a speed study just west of the Emerson Drive/Minton Road intersection to review reducing the posted speed to 35 MPH in the eastbound direction. The change in posted speed may need to be done in coordination with increased enforcement because just changing the sign will not change driver behavior.

- Geometric Related –
    - As noted above, the travel lanes are only 10-10.5 feet wide but the roadway feels wider due to the bicycle lane. One way to reduce speeds is to change the physical layout of the roadway. The study team discussed adding some type of vertical features between the outside travel lane and the bicycle lane. This physical separation could come in the form of Qwick Kurb (www.qwickkurb.com), a temporary raised traffic separator with flexible delineators, as illustrated in **Figure 41** and **Figure 42**.

Figure 41

Figure 42

Location: Emerson Drive between Jupiter Boulevard and Minton Road

Issue #11: Emerson Drive Access Management

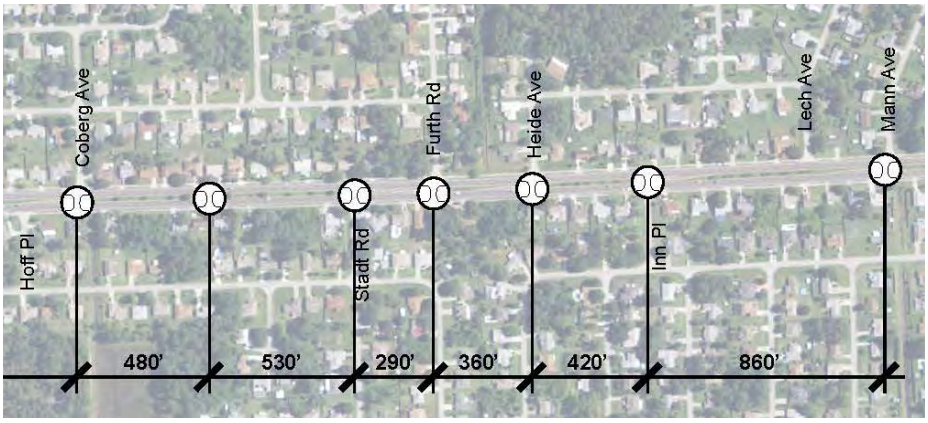


Figure 43

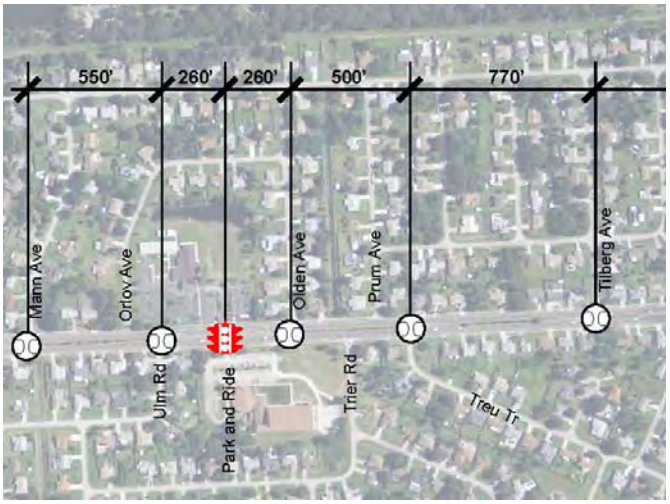


Figure 44

Description of Issue:

Along Emerson Drive between Coberg Avenue (east of Jupiter Boulevard) and Tilberg Avenue (west of Minton Road), 11 full median openings are present. This stretch of roadway is approximately one mile, which means one full median opening is present approximately every 480 feet with some full medians spaced less than 300 feet apart as displayed in **Figure 43** and **Figure 44**. For this type of roadway, full median openings should be spaced between 1,300 feet and 2,650 feet apart based on FDOT Access Management Rule 14-97. Most of the left-turn lane lengths at these full median openings are shorter than the standard 155 feet needed for proper deceleration along a 40 MPH roadway. Of the 83 crashes that occurred between signalized intersections along Emerson Drive, 64 (77 percent) occurred at or near the 11 full median openings.

Table 11. Qualitative Risk Rating for Emerson Drive Access Management

Function	Classification	Reasoning
Exposure	Category III	11 median openings present along Emerson Drive between Jupiter Boulevard and Minton Road
Probability	Category III	77 percent of segment crashes occurred at the 11 full median openings
Consequence	Category III	Moderate to severe rear-end, angle, and left-turn crash types
Overall	*Category III*	-

Suggestions for Improvement:
Consider an access management study along Emerson Drive between Jupiter Boulevard and Minton Road. As part of this study, the total number and placement of the full median openings should be assessed. The study should also review converting some medians from full access to directional left-turn access from Emerson Drive to the minor street. The following considerations were discussed amongst the study team and should be reviewed during the study:

- Lengthen the turn lanes for the median openings to meet the standard deceleration distance based on FDOT Design Standard Index 301.
- At U-turn only median openings that do not have left-turn lanes, install a left-turn lane or close the opening.
- Due to their close proximity to the Park and Ride Lot signalized intersection, remove the left-turn lanes at Ulm Road and Olden Avenue. This would allow the left-turn lanes at the Park and Ride Lot intersection to be extended to meet deceleration guidance. Displaced left-turns that would now be U-turns would need to be accounted for at either the signalized intersection or downstream median openings.

Location: Emerson Drive between Jupiter Boulevard and Minton Road

Issue #12: Emerson Drive Bicycle Lane Striping

Figure 45

Figure 46

Description of Issue:
The intent of the RSA is to consider safety for all user groups based on both crash data and risk factors. There may not be crash data supporting the noted design deficiencies, but the RSA team conducted a risk-based assessment and identified locations to address potential safety issues based on risk. During the most recent resurfacing project, a diamond icon instead of a bicycle lane marking icon was painted within the shoulder area of Emerson Drive (**Figure 45**). Also at the intersection of the Park and Ride Lot, the bicycle lane merges with the right turn lane, not giving any dedicated area for a bicyclist traveling along Emerson Drive (**Figure 46**). The eastbound and westbound intersection approaches consist of four 11-foot wide lanes.

Table 12. Qualitative Risk Rating for Bicycle Lane Striping

Function	Classification	Reasoning
Exposure	Category I	Low number of bicyclists observed during field review
Probability	Category I	No crashes reported due to this issue
Consequence	Category III	Potential for bicycle crash types
Overall	*Category II*	-

Suggestions for Improvement:
To increase driver awareness of a possible bicyclist in the bicycle lane, consider removing the diamond striping and installing bicycle lane striping per FDOT Design Index Standard 17347 Page 3. Also consider restriping the Park and Ride Lot intersection eastbound and westbound approaches to provide for a minimum 5 feet wide keyhole between the outside through and right-turn lanes per FDOT Design Index Standard 17347 Page 5.

Location: Emerson Drive between Jupiter Boulevard and Minton Road

Issue #13: Minor Street Sight Distance

Figure 47

Figure 48

Description of Issue:
The study team observed sight distance issues at the following minor streets along Emerson Drive:

- Hoff Place northbound looking westbound.
- Coberg Avenue southbound looking westbound.
- Stadt Road northbound looking westbound.
- Heide Avenue southbound looking westbound (**Figure 47**).
- Ulm Road northbound looking westbound.
- Olden Avenue southbound looking westbound (**Figure 48**).

The limited sight distance causes potential issues with minor street turning vehicles and pedestrians/bicyclists utilizing the crosswalk or Emerson Drive through vehicles.

Table 13. Qualitative Risk Rating for Minor Street Sight Distance

Function	Classification	Reasoning
Exposure	Category II	Low to moderate minor street volumes, high Emerson Drive through volumes
Probability	Category I	No crashes reported due to this issue
Consequence	Category III	Potential for right-turn crashes with high speed through vehicles
Overall	*Category II*	-

Suggestions for Improvement:
Consider trimming the shrubbery so minor street turning vehicles can better see vehicles traveling along Emerson Drive. If the shrubbery is on private property, consider coordinating with the property owner to trim.

Location: Emerson Drive between Jupiter Boulevard and Minton Road

Issue #14: Minor Street Stop Sign Heights

Figure 49

Figure 50

Description of Issue:
The intent of the RSA is to consider safety for all user groups based on both crash data and risk factors. There may not be crash data supporting the noted design deficiencies, but the RSA team conducted a risk-based assessment and identified locations to address potential safety issues based on risk. At minor streets along Emerson Drive, the study team observed stop signs mounted less than 7 feet and secondary signs underneath the stop sign mounted less than 6 feet above the edge of the travel way (**Figure 49** and **Figure 50**). Section 2A.18 of the MUTCD states that the minimum height of the primary sign should be 7 feet above the travel way and the secondary sign should be mounted one foot less than the 7 feet height.

Table 14. Qualitative Risk Rating for Minor Street Stop Sign Heights

Function	Classification	Reasoning
Exposure	Category II	Stop signs mounted less than 7 feet above travel way present at multiple minor street intersections
Probability	Category I	No crashes reported due to this issue
Consequence	Category I	No injury to minor injury for a pedestrian or bicyclist walking near the sign
Overall	*Category I*	-

Suggestions for Improvement:
Consider reinstalling the stop sign so that it is 7 feet above the travel way. Consider reinstalling the secondary sign so that it is 6 feet above the travel way, where applicable. Refer to **Issue #2: Intersection Street Name Signage** regarding street names to coordinate sign installation art unsignalized intersections.

Location: Emerson Drive/Park and Ride Lot Intersection

Issue #15: Bus Stop

Figure 51

Figure 52

Description of Issue:
The intent of the RSA is to consider safety for all user groups based on both crash data and risk factors. There may not be crash data supporting the noted design deficiencies, but the RSA team conducted a risk-based assessment and identified locations to address potential safety issues based on risk. SCAT Route 23 serves Emerson Drive with bus stops in the westbound direction only. At the Park and Ride Lot intersection, the study team observed issues with the SCAT westbound bus stop:

- The intersection was designed for far side bus pullouts (**Figure 51** displays the westbound stop) but only the westbound bus pullout is being utilized. This leaves extra pavement on the far side of the intersection in the eastbound direction.
    - The bus pullout for the westbound bus is not long enough, causing the bus to stop on the west leg crosswalk.
- The guide signs along the corridor point to the south side parking lot as the official park and ride lot but the bus stop is located on the north side of the roadway in the westbound direction (**Figure 52**).

Table 15. Qualitative Risk Rating for Bus Stop

Function	Classification	Reasoning
Exposure	Category I	Route 23 serves corridor with one hour headways
Probability	Category I	No crashes reported due to this issue
Consequence	Category II	Potential for moderate to severe injury high speed sideswipe crashes between bus and vehicle in outside travel lane
Overall	*Category I*	-

Suggestions for Improvement:
Consider the following suggestions for the bus stop at the Park and Ride Lot:

- Stripe out the bus pullout merge area eastbound.
- Extend the bus pullout area in the westbound direction to accommodate one full bus length beyond the crosswalk based on local transit agency.
- Change the guide signs to direct drivers to the north side parking lot.

Location: Emerson Drive/Minton Road Intersection

Issue #16: Southbound Right-Turn Movement

Source: Google Earth 2016

Figure 53

Figure 54

Description of Issue:
The northwest corner of the intersection has a small radius due to a small tangent section leading to a bulb out for the bicycle lane addition (**Figure 53**). The study team observed multiple vehicles in the inside right-turn lane crossing over the guide striping into the area designated for the outside right-turn lane as displayed in **Figure 54**. Twenty-five (25) sideswipe crashes occurred between southbound right-turning vehicles around this curve.

Table 16. Qualitative Risk Rating for Southbound Right-Turn Movement

Function	Classification	Reasoning
Exposure	Category III	High volume of southbound right-turning vehicles
Probability	Category III	25 sideswipe crashes occurred between southbound right-turning vehicles
Consequence	Category I	PDO to minor injury sideswipe crashes
Overall	*Category II*	-

Suggestions for Improvement:
Consider reconstructing the northwest corner of the intersection to remove the bulb out area and tangent section of the curve. Once the curb is reconstructed, consider restriping the guide stripe between the dual southbound right-turn lanes so there is a wider radius turn for the outside right-turner.

Location: Emerson Drive/Minton Road Intersection

Issue #17: Missing Detectable Warning Surfaces

Figure 55

Figure 56

Description of Issue:
The intent of the RSA is to consider safety for all user groups based on both crash data and risk factors. There may not be crash data supporting the noted design deficiencies, but the RSA team conducted a risk-based assessment and identified locations to address potential safety issues based on risk. The study team observed missing detectable warning surfaces on the northeast (**Figure 55**) and southeast (**Figure 56**) corners of the intersection.

Table 17. Qualitative Risk Rating for Missing Detectable Warning Surfaces

Function	Classification	Reasoning
Exposure	Category I	Low pedestrian volumes observed at the intersection
Probability	Category I	No crashes reported due to this issue
Consequence	Category III	Potential for pedestrian/bicycle crash types
Overall	*Category I*	-

Suggestions for Improvement:
Consider installing detectable warning surfaces on the northeast and southeast corner curb ramps of the intersection per FDOT Standard Index 304.

Location: Emerson Drive/Minton Road Intersection

Issue #18: Northbound Left-Turn Signal Phasing

Figure 57

Figure 58

Description of Issue:
The northbound left-turn movement has protected/permissive signal phasing (i.e., 5-section doghouse signal head) as displayed in **Figure 57**. The permissive phase of the movement is allowed during the protected southbound right-turn phase, leading to possible turning vehicle conflicts as observed in **Figure 58**. During the permissive phase, the northbound left-turn driver is having to process information regarding the southbound through vehicles and their speed along with if there are one or more right-turning vehicles. There have been seven crashes involving northbound left-turning vehicles and southbound through/right-turning vehicles.

Table 18. Qualitative Risk Rating for Northbound Left-Turn Signal Phasing

Function	Classification	Reasoning
Exposure	Category III	High volume of southbound through/right-turning vehicles and moderate volume of northbound left-turning vehicles
Probability	Category II	Seven left-turn crashes involving the northbound left-turn movement
Consequence	Category III	Moderate to severe injury left-turn crashes
Overall	*Category III*	-

Suggestions for Improvement:
Consider an operational study to review changing the northbound left-turn movement from protected/permissive phasing to protected only signal phasing. Based on the results of the study, the protected only signal phasing could just be implemented during the peak hour time periods when right-turn volume is the highest.

Location: Minton Road between Emerson Drive and Palm Bay Road

Issue #19: Northbound Merging Maneuver

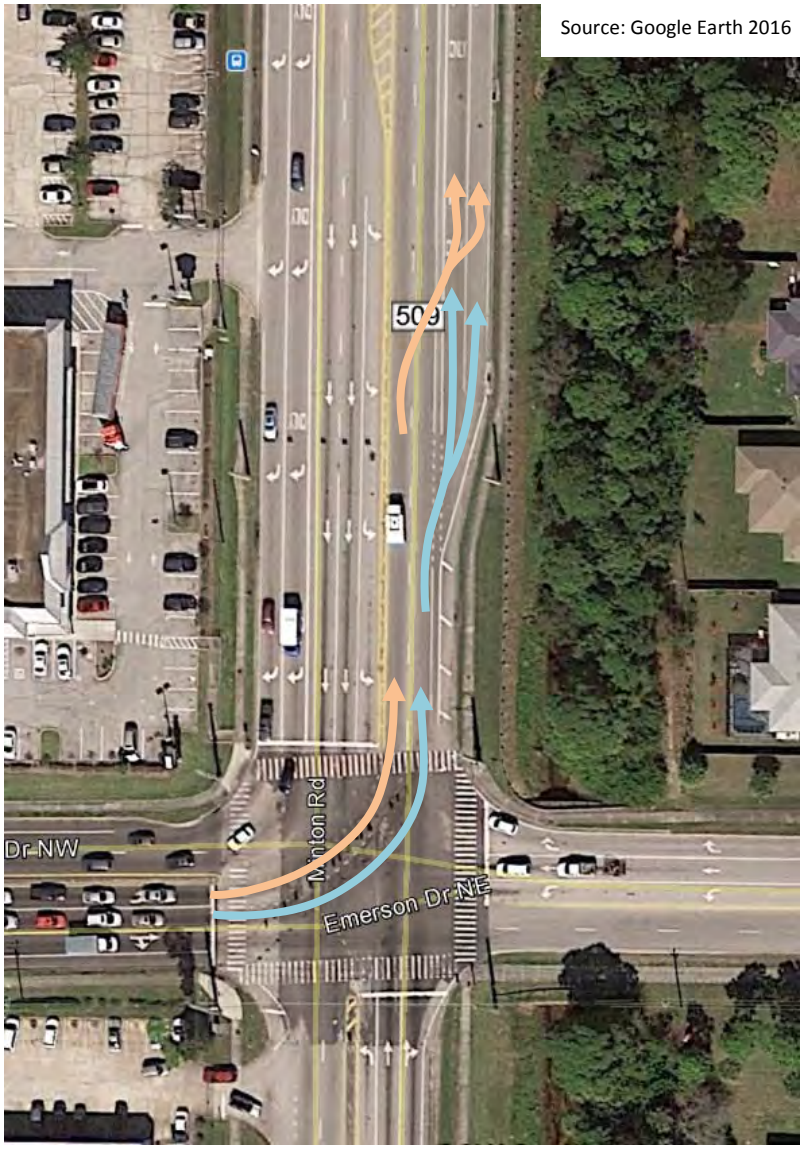


Figure 59

Description of Issue:

The dual eastbound left-turns at the Emerson Drive/Minton Road intersection are guided into the two northbound through lanes along Minton Road, as illustrated in **Figure 59**. From field observations, most of the vehicles in the outside left-turn lane (blue line) merge into the two northbound right-turn lanes that develop just north of the intersection. The study team observed vehicles from the inside left-turn lane (orange line) attempt to also merge across into the northbound right-turn lanes. If a vehicle is already positioned in the inside right-turn lane (blue line), it becomes difficult for someone in the inside through lane to merge into the right-turn lanes (orange line). Representatives from Palm Bay also noted an imbalance in lane utilization for the eastbound left-turn lanes due to this merge situation. By observation, 60 to 75 percent of left-turning vehicles utilized the outside left-turn lane in order to pre-

position themselves for the northbound right-turn movement. In addition during the peak hours, the study team observed northbound traffic queueing approximately ½ to ¾ of a mile south of the intersection. Eight sideswipe crashes occurred within the northbound dual right-turn lane area between Emerson Drive and Palm Bay Road.

Table 19. Qualitative Risk Rating for Northbound Merging Maneuver

Function	Classification	Reasoning
Exposure	Category III	High volume of eastbound left-turns from Emerson Drive, high number of those making right-turn onto Palm Bay Road
Probability	Category III	8 sideswipe crashes in this area
Consequence	Category I	PDO to minor injury sideswipe crashes
Overall	*Category III*	-

Suggestions for Improvement:
Consider a study to assess the feasibility of providing improved lane balancing by introducing appropriate channelization. Consider the following:

- Extend the outside northbound right-turn lane south to the Emerson Drive/Minton Road intersection as indicated in **Figure 60**.
- The outside eastbound left-turn lane could be restriped, leading vehicles to the new outside lane (blue line).
- The vehicles from the inside left-turn lane would now be led into the outside northbound through lane and be able to merge into the inside right-turn lane without conflict (orange line).
- The signing on the eastbound approach would need to be revised, stating the outside left-turn lane is exclusively for right-turn traffic at Palm Bay Road and that the inside lane is for Minton Road northbound through or right-turn traffic at Palm Bay Road.
- A third northbound lane could be added at the Emerson Drive/Minton Road intersection. This third lane would exclusively serve northbound right-turn traffic at the Minton Road/Palm Bay Road intersection, as well as right-turns onto eastbound Emerson Drive. By adding the third lane, vehicles will be distributed across three lanes thus reducing queueing along the northbound intersection approach.
    - The existing outside northbound lane would become a northbound through only.
- Special attention should be given for accommodating bicycles and pedestrians with the suggestion configuration.

This suggested configuration would improve lane utilization and balance the volumes along the approaches. In addition, some type of vertical treatment (e.g., such as Qwick Kurb [www.qwickkurb.com] as discussed in **Issue #10: Vehicular Speeding**) could be installed in key locations to discourage undesirable maneuvers between lanes.

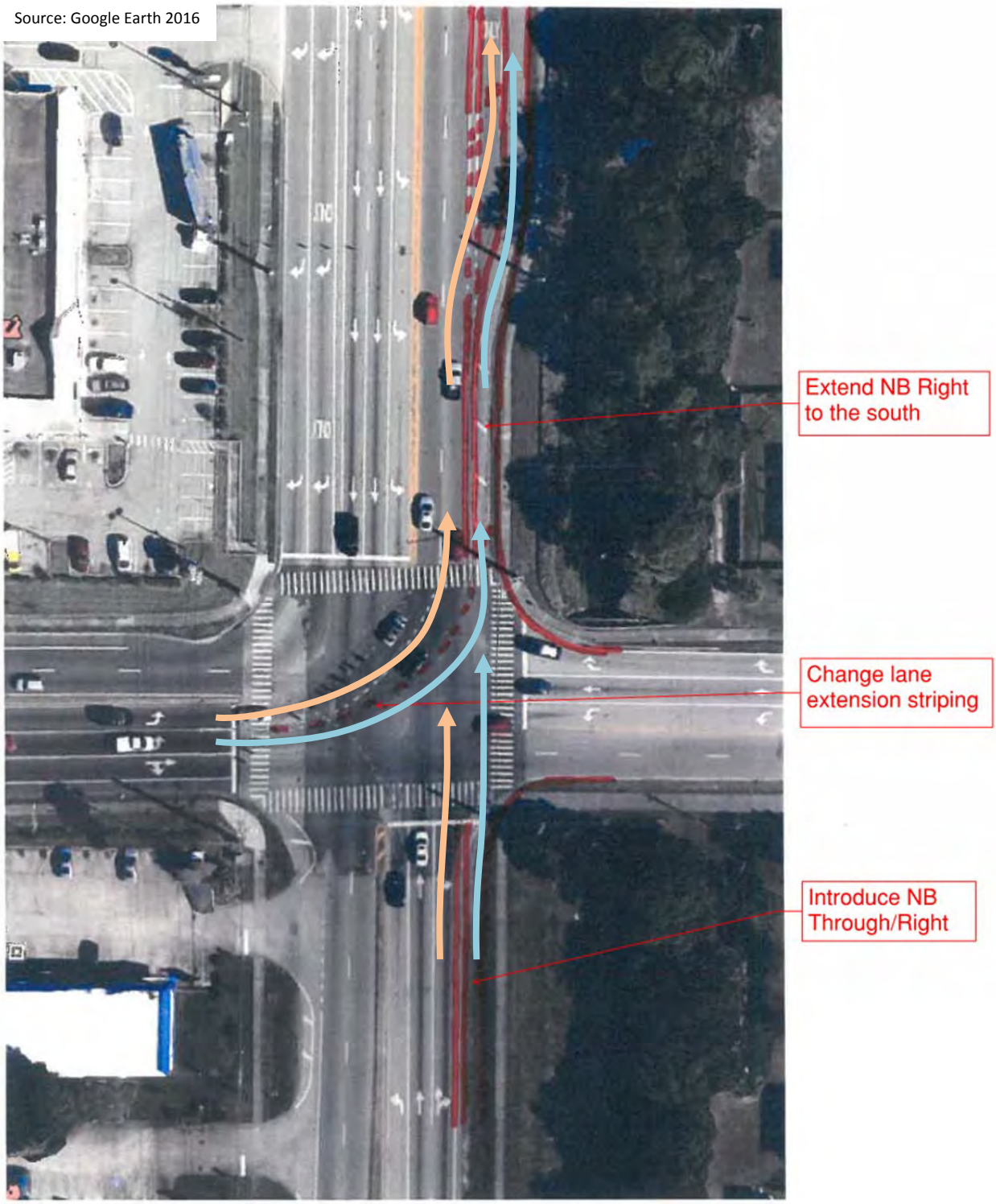

Source: Google Earth 2016
Extend NB Right to the south
Change lane extension striping
Introduce NB Through/Right

Figure 60

Location: Minton Road between Emerson Drive and Palm Bay Road

Issue #20: Southbound Merging Maneuver

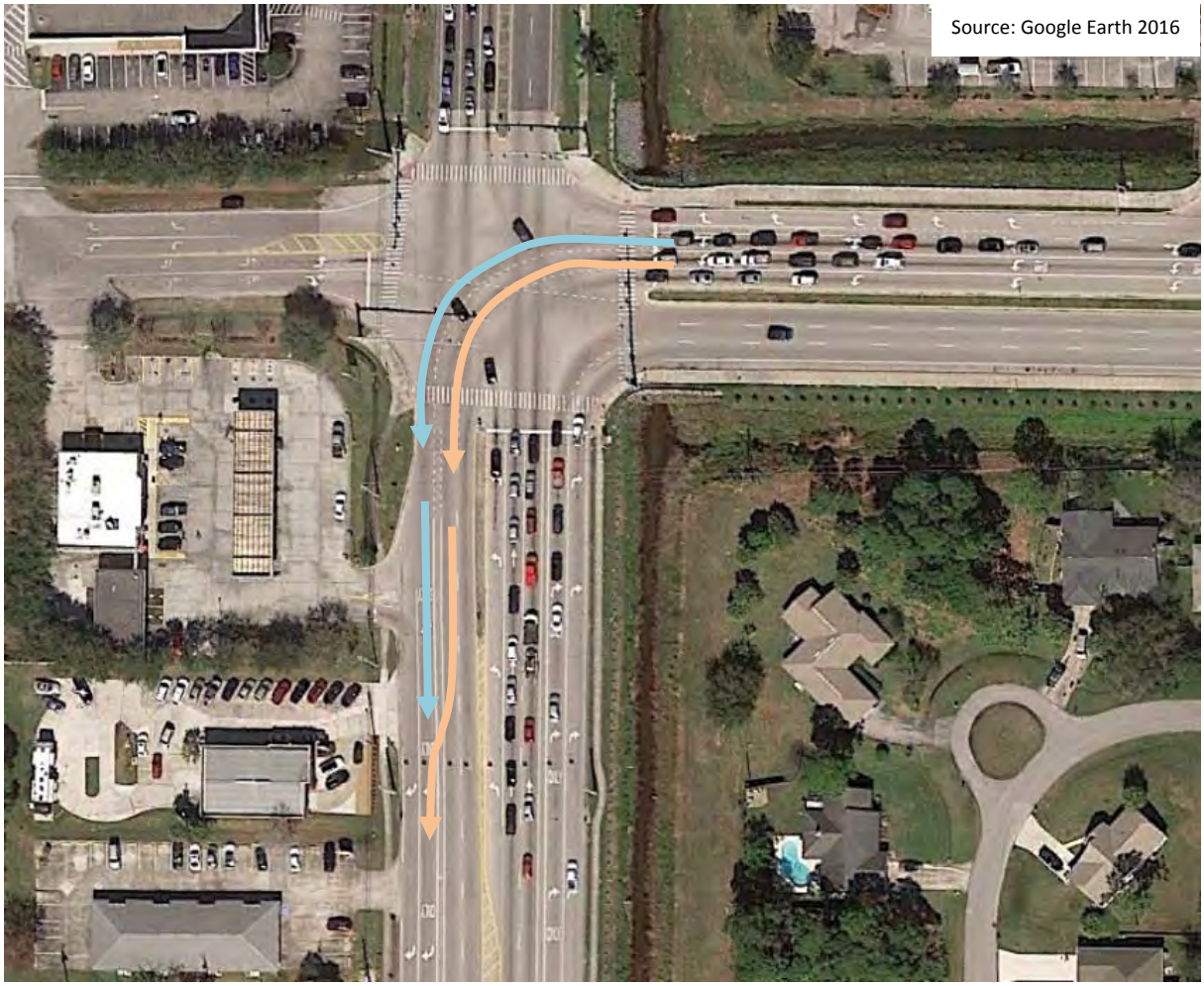


Figure 61

Description of Issue:

The triple westbound left-turns at the Minton Road/Palm Bay Road intersection are guided into two southbound through lanes and the inside southbound right-turn lane along Minton Road, as illustrated in **Figure 61**. The study team observed vehicles from the middle left-turn lane (orange line) attempt to merge across one or two lanes to get into the southbound right-turn lanes. If a vehicle is already positioned in the inside southbound right-turn lane (blue line), it becomes difficult for someone in the southbound through lane to merge into the right-turn lanes (orange line). The study team observed an imbalance in lane utilization for the westbound left-turn lanes due to this merge situation. By observation, 50 to 60 percent of left-turning vehicles utilized the rightmost left-turn lane and 20 to 30 percent utilized the middle left-turn lane in order to pre-position themselves for the southbound right-turn movement at Emerson Drive. Fourteen (14) sideswipe crashes occurred within the southbound dual right-turn lane area between Palm Bay Road and Emerson Drive.

Table 20. Qualitative Risk Rating for Southbound Merging Maneuver

Function	Classification	Reasoning
Exposure	Category III	High volume of westbound left-turns from Palm Bay Road, high number of those making right-turn onto Emerson Drive
Probability	Category III	14 sideswipe crashes in this area
Consequence	Category I	PDO to minor injury sideswipe crashes
Overall	*Category III*	-

Suggestions for Improvement:
Consider a study to assess the feasibility of providing improved lane balancing by introducing appropriate channelization. Consider the following:

- Extend the rightmost southbound right-turn lane north to the Minton Road/Palm Bay Road intersection as displayed by the red line in **Figure 62**.
- The outside through/left-turn lane could be restriped, leading vehicles to the new rightmost lane (blue line).
    - As part of this suggestion, the study should review changing the outside left-turn lane from a shared through/left lane to a left-turn only lane. The through movement could be joined with the right-turn movement creating a shared through/right lane. From field observations, the through volume was the smallest of the westbound movements.
- The middle left-turn lane could be restriped, giving vehicles the option to enter the leftmost right-turn lane (orange line) or the rightmost southbound through lane. The striping for the leftmost westbound left-turn lane would remain the same, leading vehicles into the leftmost southbound through lane (green line).
- The signing on the westbound Palm Bay Road approach would need to be revised, stating the rightmost and middle left-turn lanes are exclusively for southbound right-turn traffic at Emerson Drive and that the leftmost lane is for southbound through traffic at Emerson Drive.
- Evaluate the location of the right-in/right-out driveway immediately south of the Minton Road/Palm Bay Road intersection, especial the safety and operational aspects related to the new configuration.
- Special attention should be given for accommodating bicycles and pedestrians with the suggestion configuration.

This configuration would allow that the two lanes would be utilized for the westbound left to southbound right turning movement instead of one lane, thus possibly reducing conflict between vehicles trying to merge into the right-turn lanes. In addition, this new lane configuration would help lane utilization and balance the volumes between the rightmost and middle left-turn lanes. The leftmost left-turn lane would experience less volume, because less drivers are making the westbound left to southbound through movement in this area. In addition, some type of vertical treatment (e.g., such as Qwick Kurb [www.qwickkurb.com] as discussed in **Issue #10: Vehicular Speeding**) could be installed in key locations to discourage undesirable maneuvers between lanes.

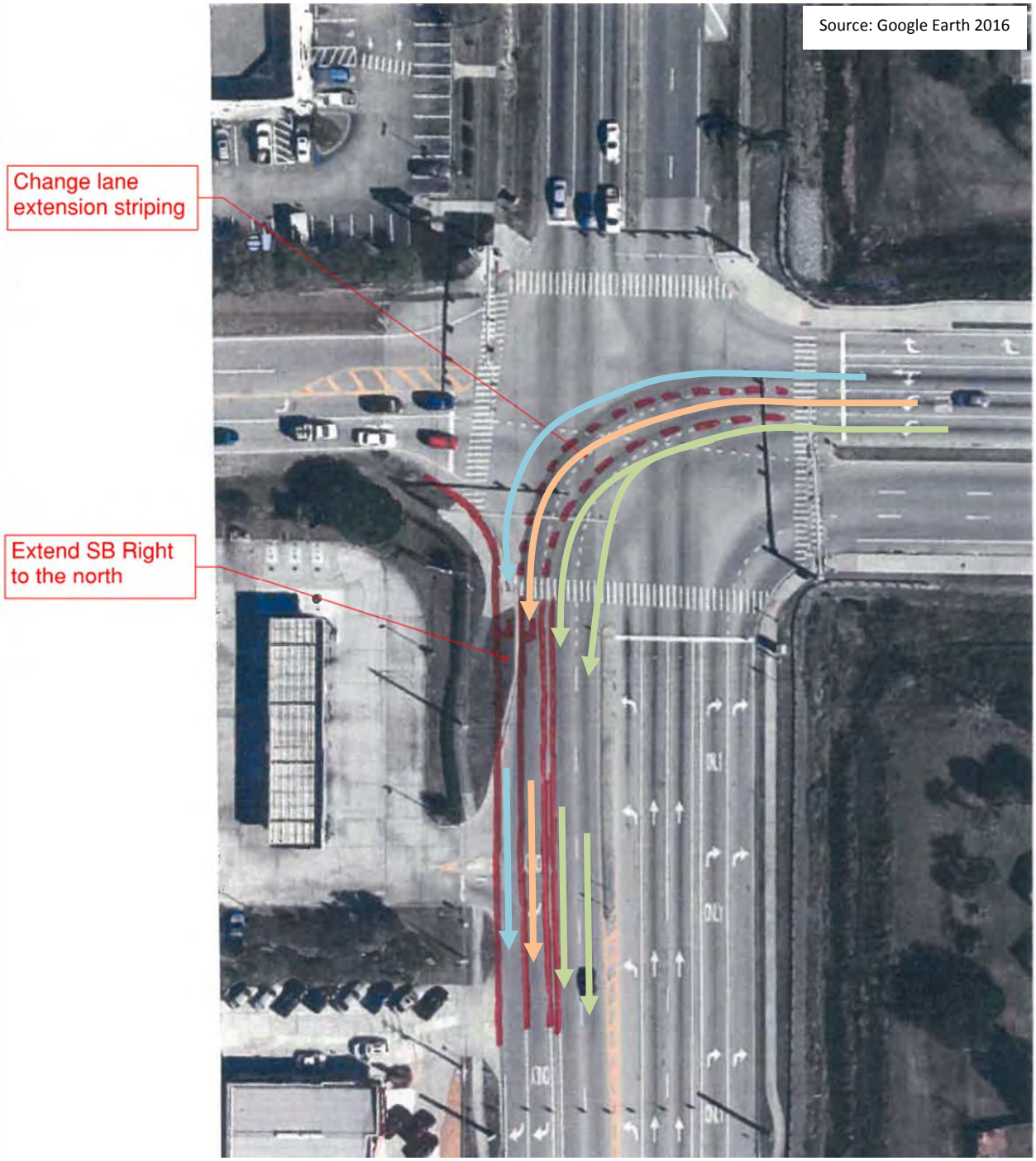

Source: Google Earth 2016
Change lane extension striping
Extend SB Right to the north

Figure 62

Location: Minton Road between Emerson Drive and Palm Bay Road

Issue #21: Minton Road Bicycle Lanes

Figure 63

Description of Issue:

Five-foot "keyhole" bicycle lanes are present between the dual right-turn lanes and outside through lanes along Minton Road from Emerson Drive to Palm Bay Road in both directions (**Figure 63**). With the nearly 1,200-foot long turn lanes and the high volume of merging/weaving vehicles, a bicycle rider in the "keyhole" bicycle lane is placed in an undesirable position. While there were no crashes between bicyclists in the "keyhole" and vehicles traveling along Minton Road, this may have more to do with a low number of riders in the roadway as opposed to the roadway being safe and comfortable for bicyclists.

Table 21. Qualitative Risk Rating for Minton Road Bicycle Lanes

Function	Classification	Reasoning
Exposure	Category I	No bicyclists observed utilized bicycle lanes during field review
Probability	Category I	No crashes reported due to this issue
Consequence	Category III	Potential for bicycle crash types
Overall	*Category II*	-

Suggestions for Improvement:
Consider a study to assess removing bicycle lanes from within the roadway and creating multi-use paths on both sides of Minton Road between Emerson Drive and Palm Bay Road.

- A multi-use path could be incorporated on the east side and the bicyclists could be transitioned to this path at the Emerson Drive/Minton Road intersection.
- Along the west side, there appears to be less right-of-way thus the curb may need to be moved east to provide for a multi-use path. The 5 feet from the southbound bicycle lane could be utilized so the entire roadway does not have to be shifted. The bicyclists could be transitioned to this path at the Minton Road/Palm Bay Road intersection.

Removing the bicycle lanes will also help reduce the crossing distance. In addition, this will also allow drivers to focus on vehicles without having to consider and negotiate the potential for bicycles within this congested segment.

Location: Minton Road between Emerson Drive and Palm Bay Road

Issue #22: Minton Road Access Management

Figure 64

Description of Issue:
The roadway segment along Minton Road between Emerson Drive and Palm Bay Road is nine lanes wide with two 5-foot wide bicycle lanes between the through lanes and the right turn lanes (**Figure 64**). Two northbound/southbound through lanes, two northbound/southbound right-turn lanes, along with a TWLTL make up the cross section of this segment. With the open access, vehicles are allowed to turn left to/from the properties along the west side of the corridor across four or more lanes of travel. Nine crashes occurred between left turning vehicles to/from the properties and southbound traveling vehicles.

Table 22. Qualitative Risk Rating for Minton Road Access Management

Function	Classification	Reasoning
Exposure	Category III	High volume of vehicles traveling along Minton Road
Probability	Category II	9 left-turn crashes along segment
Consequence	Category II	Moderate to severe injury left-turn crashes
Overall	*Category II*	-

Suggestions for Improvement:
Consider an access management study to assess restricting access along this portion of Minton Road. With the number of lanes and access points, the number of conflict points increases the possibility of a crash. The following should be considered as part of the study:

- Construct a raised median along the entire length between Emerson Drive and Palm Bay Road.
    - Add a raised traffic separator between the southbound left and northbound through lanes at the Emerson Drive/Minton Road intersection.

  - Extend the raised traffic separator between the northbound left and southbound through lanes at the Minton Road/Palm Bay Road intersection.
- Construct a directional northbound left-turn lane into the northern driveway at the Shell station. This will help reduce U-turns at the Minton Road/Palm Bay Road intersection.
- If the bicycle lanes are removed as suggested in **Issue #21: Minton Road Bicycle Lanes**, the extra 5-10 feet of pavement could be utilized for the raised median. This extra space would help provide a buffer between the suggested northbound directional left-turn and the southbound through vehicles.

Location: Minton Road between Emerson Drive and Palm Bay Road

Issue #23: Minton Road Faded Pavement Markings

Figure 65

Figure 66

Figure 67

Figure 68

Description of Issue:

Pavement markings along the Minton Road section from Emerson Drive to Palm Bay Road are wearing and fading (**Figure 65** and **Figure 66**). This may possibly contribute to rear-end and sideswipe crashes both along this segment and at the signalized intersections of Emerson Drive/Minton Road and Minton Road/Palm Bay Road. Crosswalk markings at the Minton Road/Palm Bay Road signalized intersection are striped with old special emphasis markings and are beginning to wear (**Figure 67**). In the case of the west leg of the Minton Road/Palm Bay Road intersection, the lane markings are faded to a point the driver cannot tell which lane corresponds to which movement (**Figure 68**).

Table 23. Qualitative Risk Rating for Minton Road Faded Pavement Markings

Function	Classification	Reasoning
Exposure	Category III	Present along entire segment
Probability	Category I	Could be a contributing factor to rear-end or sideswipe crashes depending on situation
Consequence	Category II	Potential for PDO to injury, depending on crash type
Overall	*Category II*	-

Suggestions for Improvement:
Consider the following suggestions to improve faded pavement markings along Minton Road:

- Check with Brevard County on when the next resurfacing project will occur along Minton Road. During the resurfacing project, the entire corridor will be restriped.
- If no resurfacing project is planned within the next 5 years, perform a restriping project to enhance the crosswalk markings at the Minton Road/Palm Bay Road intersection, the roadway lane markings, and the west leg intersection approach lane markings at Minton Road/Palm Bay Road.
    - Upgrade the crosswalk markings to be special emphasis as shown on Sheet 9 of FDOT Design Standard Index 17346.

Location: Minton Road between Emerson Drive and Palm Bay Road

Issue #24: Peak Hour Intersection Queuing

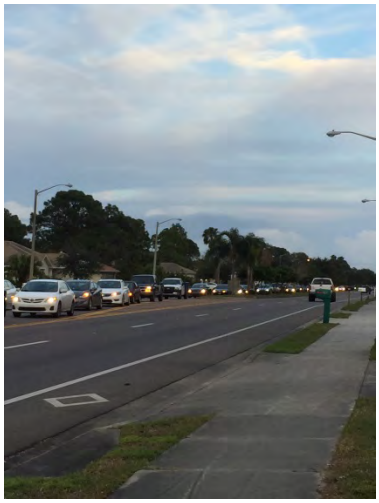


Figure 69

Figure 70

Description of Issue:
The Emerson Drive/Minton Road/Palm Bay Road study corridor has distinct peak direction travel patterns due to commuter traffic. In the AM, a majority of the traffic is coming eastbound along Emerson Drive from the single family homes, turning north onto Minton Road, then turning east along Palm Bay Road to access I-95. In the PM, a majority of traffic is coming westbound along Palm Bay Road from I-95, turning south onto Minton Road, then turning west along Emerson Drive to head home. Due to these distinct travel patterns, the study team observed long queues during the AM and PM peak hours at the following locations:

- AM Peak Hour –
  - Northbound and eastbound (**Figure 69**) at the Emerson Drive/Minton Road intersection.
- PM Peak Hour –
  - Southbound at Minton Road/Palm Bay Road intersection (**Figure 70**).
  - Westbound along Palm Bay Road.

40 percent of crashes occurred from 7 AM to 9 AM and from 4 PM to 7 PM.

Table 24. Qualitative Risk Rating for Peak Hour Intersection Queuing

Function	Classification	Reasoning
Exposure	Category III	Peak hour traffic occurs every day
Probability	Category III	40 percent of crashes occurred during the peak hours of the day
Consequence	Category II	PDO to injury, depending on crash type
Overall	*Category III*	-

Suggestions for Improvement:

Consider a signal retiming study along Minton Road. Due to the peak direction occurring eastbound/westbound, vehicles traveling along Minton Road northbound/southbound experience significant observed delays. The study should explore giving more north/south green time so the queues along Minton Road do not reach ½ to ¾ of a mile. If the turn lane/merging improvements as discussed in **Issue #19: Northbound Merging Maneuver** and **Issue #20: Southbound Merging Maneuver** are incorporated, the eastbound/westbound movements may operate at a higher capacity thus allowing for more north/south green time.

Location: Palm Bay Road between Minton Road and Athens Drive

Issue #25: Dynamic Message Sign

Figure 71

Description of Issue:
The intent of the RSA is to consider safety for all user groups based on both crash data and risk factors. There may not be crash data supporting the noted design deficiencies, but the RSA team conducted a risk-based assessment and identified locations to address potential safety issues based on risk. While out on the RSA, the study team noted a dynamic message sign (DMS) facing the westbound direction of travel along Palm Bay Road approximately 350 feet east of the Minton Road/Palm Bay Road intersection that was not working (**Figure 71**). This DMS is in a great position to display some type of warning/public service announcement about crash statistics before turning onto Minton Road, where a combined 430 of the 735 crashes occurred during the study period.

Table 25. Qualitative Risk Rating for Dynamic Message Sign

Function	Classification	Reasoning
Exposure	Category III	High volume of traffic passing through area
Probability	Category III	59 percent of study corridor crashes occurred in this area
Consequence	Category II	PDO to injury, depending on crash type
Overall	*Category III*	-

Suggestions for Improvement:
Consider fixing the DMS and displaying some type of public service announcement that could show the number of crashes that have occurred at the Emerson Drive/Minton Road and/or Minton Road/Palm Bay Road intersection during the year. This may remind drivers about how safely they are driving while passing through this area.

Location: Palm Bay Road/Athens Drive Intersection

Issue #26: Pedestrian Features

Figure 72

Figure 73

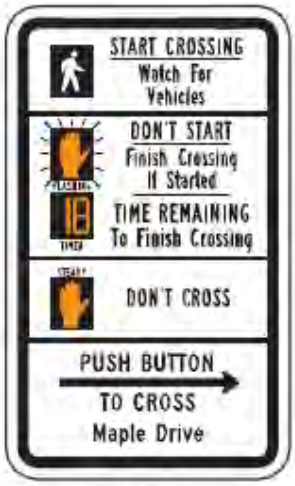
Description of Issue:
The intent of the RSA is to consider safety for all user groups based on both crash data and risk factors. There may not be crash data supporting the noted design deficiencies, but the RSA team conducted a risk-based assessment and identified locations to address potential safety issues based on risk. The pedestrian push button signage at the intersection does not have street names to identify which pedestrian detectors pertain to which crossing (**Figure 72**). The pedestrian detectors on the south side of the roadway are mounted to the traffic signal poles which are placed greater than 10 feet from the curb ramp for the crosswalk, the maximum distance as defined in Section 4E.08 of the MUTCD. Also, no sidewalk is present on the north leg into the development on the north side of Palm Bay Road (**Figure 73**).

Table 26. Qualitative Risk Rating for Pedestrian Features

Function	Classification	Reasoning
Exposure	Category I	Utilized when pedestrians are present
Probability	Category I	No crashes reported due to this issue
Consequence	Category III	Potential for pedestrian/bicycle crash types
Overall	*Category II*	-

Suggestions for Improvement:
Consider installing R10-3i pedestrian plaques at all push button locations indicating which pedestrian detectors pertain to which crossing. Also consider installing separate push button poles that are less than ten feet from the pedestrian curb ramp on the southwest and southeast corners of the

intersection. Consider working with the County and the property owner to review the feasibility of a sidewalk along one side of Athens Drive north of the intersection. Providing an accessible pedestrian route to/from the property is important in keeping pedestrians/bicyclists safe when they leave the Palm Bay Road right-of-way.



R10-3i

Location: Palm Bay Road/Culver Drive Intersection

Issue #27: Slope behind Sidewalk

Figure 74

Description of Issue:
The intent of the RSA is to consider safety for all user groups based on both crash data and risk factors. There may not be crash data supporting the noted design deficiencies, but the RSA team conducted a risk-based assessment and identified locations to address potential safety issues based on risk. Immediately west (**Figure 74**) of the Palm Bay Road/Culver Drive intersection on the south side of the road, steep side slopes were observed off the edge of the sidewalk. If a pedestrian/bicyclist is utilizing the sidewalk in this location, they may accidentally step/ride off the sidewalk onto the sloped grass and into the roadside ditch.

Table 27. Qualitative Risk Rating for Slope behind Sidewalk

Function	Classification	Reasoning
Exposure	Category I	Low pedestrian/bicycle volumes observed
Probability	Category I	No crashes reported due to this issue
Consequence	Category III	Potential for pedestrian/bicyclist injury from falling into ditch area
Overall	*Category II*	-

Suggestions for Improvement:
Due to the steep slope off the back of sidewalk, consider reviewing this location based on FDOT Plans Preparation Manual (PPM) Figure 8.8.1. If railing is needed, install the railing just off the south edge of the sidewalk to prevent pedestrians/bicyclists from stepping/riding off the sidewalk into the ditch area.

Location: Palm Bay Road/Culver Drive Intersection

Issue #28: Northbound Approach

Figure 75

Figure 76

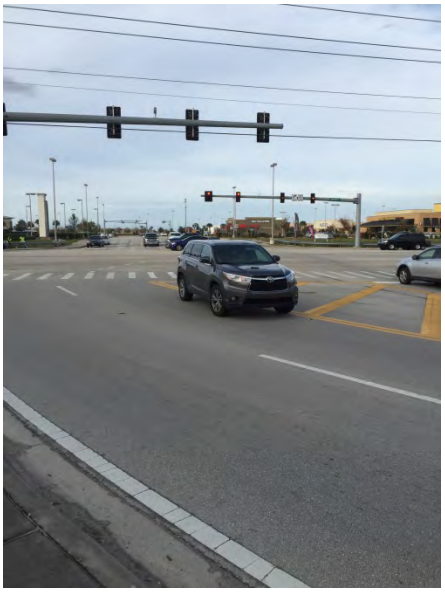


Figure 77

Description of Issue:
The northbound approach at the intersection has a tight 90-degree turn, as displayed in **Figure 75**. The tight turning radius and approximately 13.5-foot lanes may have contributed to 6 sideswipe crashes and 5 rear-end crashes within the dual right-turn lanes.

An overhead "Be Prepared to Stop" sign with two flashing indicators is located just east of the intersection along Culver Drive. This flashing sign was not operating during the field review (**Figure 76**).

The study team also observed vehicles making a westbound left-turn at the intersection encroaching on the yellow painted area between the northbound left-turn lane and the leftmost southbound receiving lane (**Figure 77**).

Table 28. Qualitative Risk Rating for Northbound Approach

Function	Classification	Reasoning
Exposure	Category II	Moderate volume northbound approach and westbound left-turn volume
Probability	Category II	6 sideswipe and 5 rear-end crashes occurred on the northbound approach in the right-turn lanes
Consequence	Category I	PDO to minor injury sideswipe and rear-end crashes
Overall	*Category II*	-

Suggestions for Improvement:
To help mitigate sideswipe crashes along the northbound approach, consider increasing the dual right-turn lane widths to between 16 feet and 20 feet where the striped out gore area begins approximately 75' south of the intersection. This will create a larger radius right-turn movement while also allowing an easier right-turn for bigger trucks.

Consider sending a technician to fix the "Be Prepared to Stop" just east of the intersection along Culver Drive.

If the lanes are widened, the yellow striped gore area between the northbound left-turn lane and southbound through lane may be reduced. Based on field observations of westbound left-turning vehicles encroaching on this gore area, a potential conflict may be introduced between those westbound left-turning vehicles and northbound vehicles waiting to make a left turn. Consider adding a small raised median in the yellow gore area and installing a KEEP RIGHT (R4-7 or R4-7a) sign in the median facing the westbound left-turning vehicles. The median could be placed closer to the northbound left-turn lane in order to leave some striped out area for westbound left-turning vehicles.

R4-7

R4-7a

Location: Palm Bay Road/Culver Drive Intersection

Issue #29: Pedestrian Push Button Poles

Description of Issue:
The intent of the RSA is to consider safety for all user groups based on both crash data and risk factors. There may not be crash data supporting the noted design deficiencies, but the RSA team conducted a risk-based assessment and identified locations to address potential safety issues based on risk. The pedestrian detectors on the southwest, northwest, and northeast corners of the intersection are mounted to the traffic signal poles which are placed greater than 10 feet from the curb ramp for the crosswalk, the maximum distance as defined in Section 4E.08 of the MUTCD.

Table 29. Qualitative Risk Rating for Pedestrian Push Button Poles

Function	Classification	Reasoning
Exposure	Category I	Utilized when pedestrians are present
Probability	Category I	No crashes reported due to this issue
Consequence	Category III	Potential for pedestrian/bicycle crash types
Overall	*Category II*	-

Suggestions for Improvement:
Consider installing separate push button poles that are less than ten feet from the pedestrian curb ramps on the southwest, northwest, and northeast corners of the intersection.

Summary of Recommendations

This RSA considers operational and safety related issues for vehicles, pedestrians, and bicyclists on Emerson Drive/Minton Road/Palm Bay Road from Jupiter Boulevard to Culver Drive. This study was commissioned by the SCTPO to develop recommendations to improve the safety of motorists and non-motorists within the study limits. Each recommendation identified in this study is classified into one of three categories:

- Maintenance – issues identified for maintenance may be addressed by public agency staff on a short timeframe and at a relatively low cost.
- Near-Term Improvement (within 5 years) – activities that may be incorporated into an upcoming construction project in the area, including 3R milling and resurfacing projects.
- Long-Term Improvement (5+ years) – activities that may be incorporated into upcoming construction projects and may need to be programmed for funding as separate projects.

Tables listing the priority of the corridor-wide improvements are provided on the next page. The pages following summarize the recommendations by priority (transit, maintenance, near-term, or long-term) for the study corridor.

Location	Issue Number	Issue	Suggestion
TRANSIT RELATED			
Jupiter Blvd Westbound	N/A	Bus Stop	Move the stop 60' east. Pave a level 5'x3' slab between the curb and sidewalk to create a 5'x8' B&A area. Add detectable warnings to the nearby curb ramps. Verify the pole with the bus schedule is located adjacent to the pavement so it is accessible.
Furth Rd Westbound	N/A	Bus Stop	Pave a level 5'x4' slab between the curb and sidewalk to complete a 5'x8' B&A area. Verify the pole with the bus schedule is located adjacent to the pavement so it is accessible.
Mann Ave Westbound	N/A	Bus Stop	Pave a level 5'x4' slab between the curb and sidewalk to complete a 5'x8' B&A area. Verify the pole with the bus schedule is located adjacent to the pavement so it is accessible.
NW Olden Ave Westbound	N/A	Bus Stop	Resurface the B&A area to have a cross slope of <=2%. Move the pole with the bus schedule adjacent to the pavement on the far side of the B&A area.
Tilberg Ave Westbound	N/A	Bus Stop	Pave a level 5'x4' slab between the curb and sidewalk to complete a 5'x8' B&A area. Verify the pole with the bus schedule is located adjacent to the pavement so it is accessible.
Minton Rd Southbound	N/A	Bus Stop	Pave a level 5'x4' slab between the curb and sidewalk to complete a 5'x8' B&A area. Verify the pole with the bus schedule is located adjacent to the pavement so it is accessible.

Location	Issue Number	Issue	Suggestion
MAINTENANCE			
Corridor Wide	1	Corridor and Intersection Lighting	Consider contacting the operator/maintainer of the lighting system to replace the burnt out luminaires along Emerson Drive.
Corridor Wide	3	Intersection Crosswalk Markings	Consider upgrading the crosswalk markings along the study corridor to be special emphasis as shown on Sheet 9 of FDOT Design Standard Index 17346. This restriping would take place at every signalized intersection and minor street/driveway with a current marked crosswalk.
Corridor Wide	5	Pedestrian Crossing Timings	Consider extending the following pedestrian clearance intervals to meet the 3.5 feet per second walking speed: • Emerson Drive/Jupiter Boulevard – extend to 26 seconds on the east leg and 25 seconds on the west leg. • Emerson Drive/Park and Ride Lot – extend to 25 seconds for both the east and west legs.
Emerson Drive/Jupiter Boulevard Intersection	8	Right-Turn on Red	Consider adding RIGHT ON RED ARROW AFTER STOP (R10-17a) signs to the eastbound and northbound legs. Also consider additional right-turn on red enforcement on these two legs.
Emerson Drive between Jupiter Boulevard and Minton Road	12	Emerson Drive Bicycle Lane Striping	Consider removing the diamond striping and installing bicycle lane striping per FDOT Design Index Standard 17347 Page 3. Also consider restriping the Park and Ride Lot intersection eastbound and westbound approaches to provide for a minimum 5 feet wide keyhole between the outside through and right-turn lanes per FDOT Design Index Standard 17347 Page 5.
Emerson Drive between Jupiter Boulevard and Minton Road	13	Minor Street Sight Distance	Consider trimming the shrubbery so minor street turning vehicles can better see vehicles traveling along Emerson Drive. If the shrubbery is on private property, consider coordinating with the property owner to trim.
Emerson Drive between Jupiter Boulevard and Minton Road	14	Minor Street Stop Sign Heights	Consider reinstalling the stop sign so that it is 7 feet above the travel way. Consider reinstalling the secondary sign so that it is 6 feet above the travel way, where applicable. Refer to **Issue #2: Intersection Street Name Signage** regarding street names to coordinate sign installation art unsignalized intersections.

Location	Issue Number	Issue	Suggestion
MAINTENANCE			
Emerson Drive/Minton Road Intersection	17	Missing Detectable Warning Surfaces	Consider installing detectable warning surfaces on the northeast and southeast corner curb ramps of the intersection per FDOT Standard Index 304.
Palm Bay Road between Minton Road and Athens Drive	25	Dynamic Message Sign	Consider fixing the DMS and displaying some type of public service announcement that could show the number of crashes that have occurred at the Emerson Drive/Minton Road and/or Minton Road/Palm Bay Road intersection during the year.
Palm Bay Road/Culver Drive Intersection	27	Slope behind Sidewalk	Consider reviewing this location based on FDOT Plans Preparation Manual (PPM) Figure 8.8.1. If railing is needed, install the railing just off the south edge of the sidewalk to prevent pedestrians/bicyclists from stepping/riding off the sidewalk into the ditch area.
Palm Bay Road/Culver Drive Intersection	28	Northbound Approach	Consider sending a technician to fix the "Be Prepared to Stop" just east of the intersection along Culver Drive.

Location	Issue Number	Issue	Suggestion
NEAR-TERM PRIORITY			
Corridor Wide	1	Corridor and Intersection Lighting	Consider upgrading the lighting at the signalized intersections to meet the requirements of Section 7.3.2.2 in Volume 1 of the FDOT Plans Preparation Manual (PPM). This may require the existing lighting to be replaced. Consider a lighting uniformity study along Emerson Drive to review lighting consistency along this segment. Providing consistent lighting levels along this segment will make vehicles/pedestrians/bicyclists more visible during non-daylight lighting conditions. Also consider a lighting justification study along Minton Road and Palm Bay Road to determine if additional segment lighting is justified.
Corridor Wide	2	Intersection Street Name Signage	Consider replacing/upgrading signalized intersection street name signage with interior illuminated, overhead LED street name signs, per section 2A.07 and Table 2A-1 of the 2009 Manual on Uniform Traffic Control Devices (MUTCD). At minor streets along Emerson Drive, consider replacing street name signage with signage meeting current retro-reflectivity standards as discussed in Sections 2A.07 and 2A.08 in the MUTCD. When these signs are replaced, consider installing a separate post closer to the roadway so the street names are more visible to drivers along Emerson Drive. Also consider removing the street name signage at three-leg intersections on the opposite side of the roadway where there is no median opening. At three-leg intersections where a median opening is present, consider moving the opposite side street name sign to be in the median where it would be more visible for vehicles making a left-turn from Emerson Drive.
Corridor Wide	4	Signal Heads at Signalized Intersections	Consider installing signal head backplates at the intersections where backplates are missing. Along with the backplate installation, consider adding the 3-inch yellow reflective sheeting to all signal heads along the study corridor to help the signal heads stand out during the day and become more retroreflective at night. At Jupiter Boulevard, check the size of the lens bulbs. If the bulbs are only 8 inch in diameter, consider replacing the signal heads with 12-inch lens bulbs. Along with this installation, add backplates and the 3-inch yellow reflective sheeting. Also consider installing vertical signal heads for corridor consistency.

Location	Issue Number	Issue	Suggestion
NEAR-TERM PRIORITY			
Corridor Wide	6	Corridor Signage	Consider a corridor signage re-evaluation, focusing on the following suggestions targeting the above issues: • Install ONE WAY (R6-1) signage in medians at three-leg intersections and commercial driveways with no left-turn access. • Upgrade signage along the corridor to current retro-reflectivity standards as discussed in Sections 2A.07 and 2A.08 in the MUTCD. • Emerson Drive/Minton Road intersection o Lower the overhead signage along the eastbound approach. If the signage cannot be lowered due to proximity of the utility lines, consider moving the signage to a location where it can be installed at an appropriate height. o Install street name signage on the lane designation signage with larger lettering that can be seen from farther away. o Add LEFT LANE MUST TURN LEFT (R3-7) signage in advance of the eastbound left-turn lanes to warn drivers the inside through lane becomes a left-turn lane at the intersection. o Add a "No U-Turn" (R3-4) sign for the eastbound left-turn lanes on the span wire because this sign may be too wide to be installed in the median. o For the median nose between the eastbound left-turn lanes and westbound through lanes, add a flex post bright stick and repaint the nose to make it stand out to left and right-turning vehicles. • Along Minton Road between Emerson Drive and Palm Bay Road remove unnecessary signs. • Add an extra set of overhead lane designation signage along Palm Bay Road east of the Minton Road intersection. Add street name signage on the lane designation signage with larger lettering that can be seen from farther away, similar to what is being suggested along Emerson Drive eastbound.
Emerson Drive/Jupiter Boulevard Intersection	7	Jupiter Boulevard Pavement Condition	Consider a resurfacing project along the north and south legs of Jupiter Boulevard to increase the skid resistance and traction for vehicles.
Emerson Drive/Jupiter Boulevard Intersection	9	Westbound Left-Turn Lanes	Consider a turn lane study to assess extending the length of the westbound turn lanes. The length of the turn lanes should meet minimum deceleration standards and also accommodate queued vehicles. This may require extending the turn lanes further east into the median and westbound U-turn area, thus the westbound U-turn should be considered for removal .
Emerson Drive between Jupiter Boulevard and Minton Road	10	Vehicular Speeding	In order to help with posted speed compliance along Emerson Drive, a few treatments could be considered: • Enforcement Related – o Install a set of speed feedback signs that display how fast the vehicle is traveling in both the eastbound and westbound direction. • Perform two speed studies: 1.) Before the signs are installed, and 2.) When the signs are implemented. These studies will help determine if the signs are making a positive impact in slowing vehicles down. o Increase speed enforcement to encourage vehicles to drive closer to the posted speed limit. o Perform a speed study just west of the Emerson Drive/Minton Road intersection to review reducing the posted speed to 35 MPH in the eastbound direction. The change in posted speed may need to be done in coordination with increased enforcement because just changing the sign will not change driver behavior. • Geometric Related – o The study team discussed adding some type of vertical features between the outside travel lane and the bicycle lane. This physical separation could come in the form of Qwick Kurb (www.qwickkurb.com), a temporary raised traffic separator with flexible delineators.

Location	Issue Number	Issue	Suggestion
NEAR-TERM PRIORITY			
Emerson Drive between Jupiter Boulevard and Minton Road	11	Emerson Drive Access Management	Consider an access management study along Emerson Drive between Jupiter Boulevard and Minton Road. As part of this study, the total number and placement of the full median openings should be assessed. The study should also review converting some medians from full access to directional left-turn access from Emerson Drive to the minor street. The following considerations should be reviewed during the study: • Lengthen the turn lanes for the median openings to meet the standard deceleration distance based on FDOT Design Standard Index 301. • At U-turn only median openings that do not have left-turn lanes, install a left-turn lane or close the opening. • Due to their close proximity to the Park and Ride Lot signalized intersection, remove the left-turn lanes at Ulm Road and Olden Avenue. This would allow the left-turn lanes at the Park and Ride Lot intersection to be extended to meet deceleration guidance. Displaced left-turns that would now be U-turns would need to be accounted for at either the signalized intersection or downstream median openings.
Emerson Drive/Park and Ride Lot Intersection	15	Bus Stop	Consider the following suggestions for the bus stop at the Park and Ride Lot: • Stripe out the bus pullout merge area eastbound. • Extend the bus pullout area in the westbound direction to accommodate one full bus length beyond the crosswalk based on local transit agency. • Change the guide signs to direct drivers to the north side parking lot.
Emerson Drive/Minton Road Intersection	16	Southbound Right-Turn Movement	Consider reconstructing the northwest corner of the intersection to remove the bulb out area and tangent section of the curve. Once the curb is reconstructed, consider restriping the guide stripe between the dual southbound right-turn lanes so there is a wider radius turn for the outside right-turner.
Emerson Drive/Minton Road Intersection	18	Northbound Left-Turn Signal Phasing	Consider an operational study to review changing the northbound left-turn movement from protected/permissive phasing to protected only signal phasing. Based on the results of the study, the protected only signal phasing could just be implemented during the peak hour time periods when right-turn volume is the highest.
Minton Road between Emerson Drive and Palm Bay Road	19	Northbound Merging Maneuver	Consider a study to assess the feasibility of providing improved lane balancing by introducing appropriate channelization. • Extend the outside northbound right-turn lane south to the Emerson Drive/Minton Road intersection. See **Figure 60** on page 48 for further clarification. • The outside eastbound left-turn lane could be restriped, leading vehicles to the new outside lane. • The vehicles from the inside left-turn lane would now be led into the outside northbound through lane and be able to merge into the inside right turn lane without conflict. • The signing on the eastbound approach would need to be revised, stating the outside left-turn lane is exclusively for right-turn traffic at Palm Bay Road and that the inside lane is for Minton Road northbound through or right-turn traffic at Palm Bay Road. • A third northbound lane could be added at the Emerson Drive/Minton Road intersection. This third lane would exclusively serve northbound right-turn traffic at the Minton Road/Palm Bay Road intersection, as well as right-turns onto eastbound Emerson Drive. By adding the third lane, vehicles will be distributed across three lanes thus reducing queueing along the northbound intersection approach. o The existing outside northbound lane would become a northbound through only. • Special attention should be given for accommodating bicycles and pedestrians with the suggestion configuration. This suggested configuration would improve lane utilization and balance the volumes along the approaches. In addition, some type of vertical treatment (e.g., such as Qwick Kurb [www.qwickkurb.com] as discussed in **Issue #10: Vehicular Speeding**) could be installed in key locations to discourage undesirable maneuvers between lanes.

Location	Issue Number	Issue	Suggestion
NEAR-TERM PRIORITY			
Minton Road between Emerson Drive and Palm Bay Road	20	Southbound Merging Maneuver	Consider a study to assess the feasibility of providing improved lane balancing by introducing appropriate channelization. • Extend the rightmost southbound right-turn lane north to the Minton Road/Palm Bay Road intersection. See **Figure 62** on page 51 for further clarification. • The outside through/left-turn lane could be restriped, leading vehicles to the new rightmost lane. o As part of this suggestion, the study should review changing the outside left-turn lane from a shared through/left lane to a left-turn only lane. The through movement could be joined with the right-turn movement creating a shared through/right lane. From field observations, the through volume was the smallest of the westbound movements. • The middle left-turn lane could be restriped, giving vehicles the option to enter the leftmost right-turn lane or the rightmost southbound through lane. The striping for the leftmost westbound left-turn lane would remain the same, leading vehicles into the leftmost southbound through lane. • The signing on the westbound Palm Bay Road approach would need to be revised, stating the rightmost and middle left-turn lanes are exclusively for southbound right-turn traffic at Emerson Drive and that the leftmost lane is for southbound through traffic at Emerson Drive. • Evaluate the location of the right-in/right-out driveway immediately south of the Minton Road/Palm Bay Road intersection, especial the safety and operational aspects related to the new configuration. • Special attention should be given for accommodating bicycles and pedestrians with the suggestion configuration. This configuration would allow that the two lanes would be utilized for the westbound left to southbound right turning movement instead of one lane, thus possibly reducing conflict between vehicles trying to merge into the right-turn lanes. In addition, this new lane configuration would help lane utilization and balance the volumes between the rightmost and middle left-turn lanes. The leftmost left-turn lane would experience less volume, because less drivers are making the westbound left to southbound through movement in this area. In addition, some type of vertical treatment (e.g., such as Qwick Kurb [www.qwickkurb.com] as discussed in **Issue #10: Vehicular Speeding**) could be installed in key locations to discourage undesirable maneuvers between lanes.
Minton Road between Emerson Drive and Palm Bay Road	21	Minton Road Bicycle Lanes	Consider a study to assess removing bicycle lanes from within the roadway and creating multi-use paths on both sides of Minton Road between Emerson Drive and Palm Bay Road. • A multi-use path could be incorporated on the east side and the bicyclists could be transitioned to this path at the Emerson Drive/Minton Road intersection. • Along the west side, there appears to be less right-of-way thus the curb may need to be moved east to provide for a multi-use path. The 5 feet from the southbound bicycle lane could be utilized so the entire roadway does not have to be shifted. The bicyclists could be transitioned to this path at the Minton Road/Palm Bay Road intersection.
Minton Road between Emerson Drive and Palm Bay Road	22	Minton Road Access Management	Consider an access management study to assess restricting access along this portion of Minton Road. The following should be considered as part of the study: • Construct a raised median along the entire length between Emerson Drive and Palm Bay Road. o Add a raised traffic separator between the southbound left and northbound through lanes at the Emerson Drive/Minton Road intersection. o Extend the raised traffic separator between the northbound left and southbound through lanes at the Minton Road/Palm Bay Road intersection. • Construct a directional northbound left-turn lane into the northern driveway at the Shell station. • If the bicycle lanes are removed as suggested in **Issue #21: Minton Road Bicycle Lanes**, the extra 5-10 feet of pavement could be utilized for the raised median. This extra space would help provide a buffer between the suggested northbound directional left-turn and the southbound through vehicles.

Location	Issue Number	Issue	Suggestion
NEAR-TERM PRIORITY			
Minton Road between Emerson Drive and Palm Bay Road	23	Minton Road Faded Pavement Markings	Consider the following suggestions to improve faded pavement markings along Minton Road: • Check with Brevard County on when the next resurfacing project will occur along Minton Road. During the resurfacing project, the entire corridor will be restriped. • If no resurfacing project is planned within the next 5 years, perform a restriping project to enhance the crosswalk markings at the Minton Road/Palm Bay Road intersection, the roadway lane markings, and the west leg intersection approach lane markings at Minton Road/Palm Bay Road. o Upgrade the crosswalk markings to be special emphasis as shown on Sheet 9 of FDOT Design Standard Index 17346.
Minton Road between Emerson Drive and Palm Bay Road	24	Peak Hour Intersection Queuing	Consider a signal retiming study along Minton Road. The study should explore giving more north/south green time so the queues along Minton Road do not reach ½ to ¾ of a mile. If the turn lane/merging improvements as discussed in **Issue #19: Northbound Merging Maneuver** and **Issue #20: Southbound Merging Maneuver** are incorporated, the eastbound/westbound movements may operate at a higher capacity thus allowing for more north/south green time.
Palm Bay Road/Athens Drive Intersection	26	Pedestrian Features	Consider installing R10-3i pedestrian plaques at all push button locations indicating which pedestrian detectors pertain to which crossing. Also consider installing separate push button poles that are less than ten feet from the pedestrian curb ramp on the southwest and southeast corners of the intersection. Consider working with the County and the property owner to review the feasibility of a sidewalk along one side of Athens Drive north of the intersection.
Palm Bay Road/Culver Drive Intersection	28	Northbound Approach	To help mitigate sideswipe crashes along the northbound approach, consider increasing the dual right-turn lane widths to between 16 feet and 20 feet where the striped out gore area begins approximately 75' south of the intersection. If the lanes are widened, the yellow striped gore area between the northbound left-turn lane and southbound through lane may be reduced. Based on field observations of westbound left-turning vehicles encroaching on this gore area, a potential conflict may be introduced between those westbound left-turning vehicles and northbound vehicles waiting to make a left turn. Consider adding a small raised median in the yellow gore area and installing a KEEP RIGHT (R4-7 or R4-7a) sign in the median facing the westbound left-turning vehicles. The median could be placed closer to the northbound left-turn lane in order to leave some striped out area for westbound left-turning vehicles.
Palm Bay Road/Culver Drive Intersection	29	Pedestrian Push Button Poles	Consider installing separate push button poles that are less than ten feet from the pedestrian curb ramps on the southwest, northwest, and northeast corners of the intersection.

Location	Issue Number	Issue	Suggestion
LONG-TERM PRIORITY			
Corridor Wide	1	Corridor and Intersection Lighting	During implementation of the results of the studies, consider changing from the current high pressure sodium lights to LED (light-emitting diode) lighting to help improve lighting levels along the three corridors.

Appendix A – Crash Analysis Reference Materials

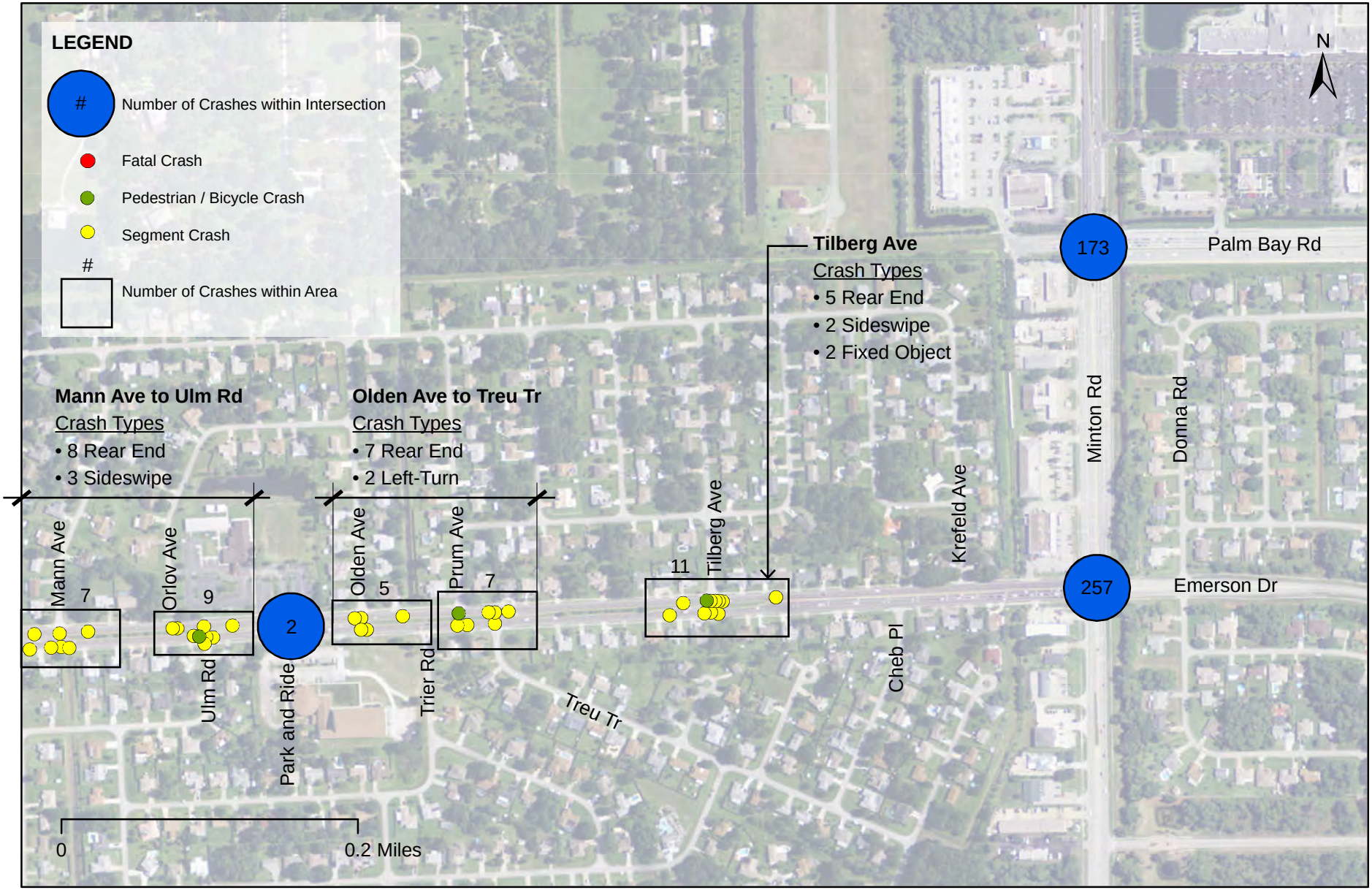
Emerson Dr / Minton Rd / Palm Bay Rd (Jupiter Blvd to Culver Dr/Norfolk Pkwy)

2009 - 2014 Crash Map

Brevard County, Florida

Figure **1**

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING



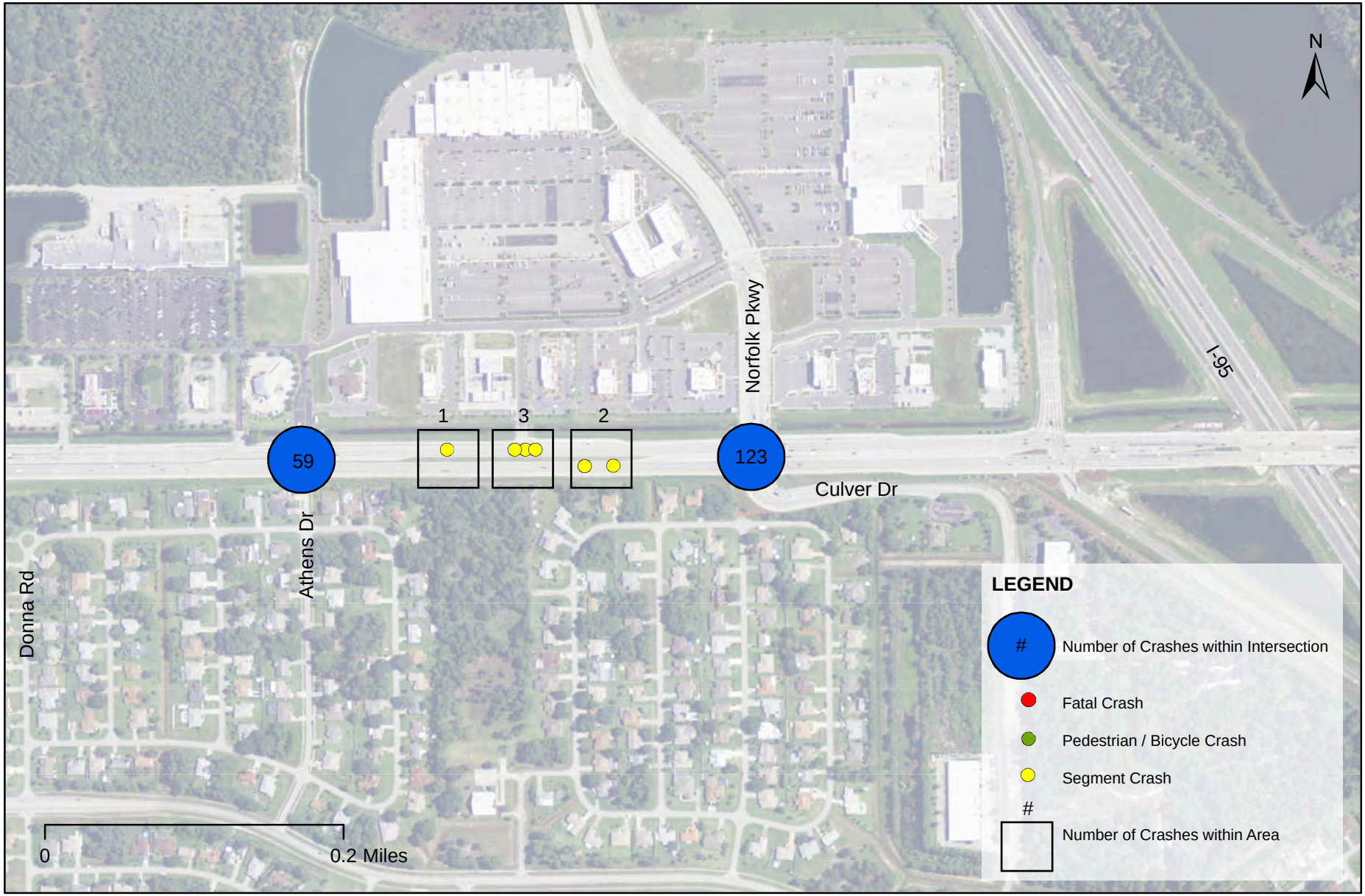
Emerson Dr / Minton Rd / Palm Bay Rd (Jupiter Blvd to Culver Dr/Norfolk Pkwy)

2009 - 2014 Crash Map

Brevard County, Florida

Figure **2**

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING



Emerson Dr / Minton Rd / Palm Bay Rd (Jupiter Blvd to Culver Dr/Norfolk Pkwy)

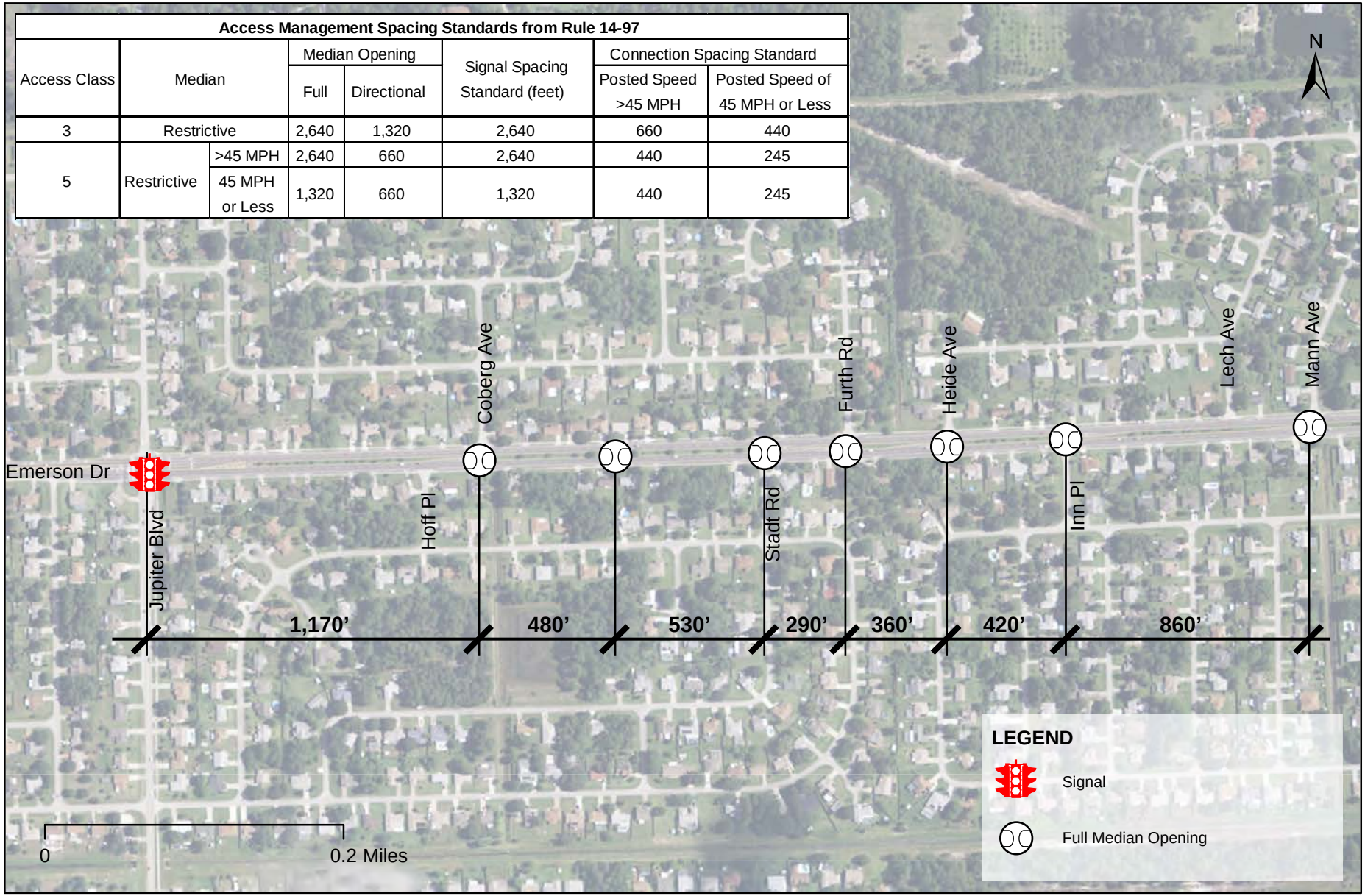
2009 - 2014 Crash Map

Brevard County, Florida

Figure **3**

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING

Access Management Spacing Standards from Rule 14-97							
Access Class	Median		Median Opening		Signal Spacing Standard (feet)	Connection Spacing Standard	
			Full	Directional		Posted Speed >45 MPH	Posted Speed of 45 MPH or Less
3	Restrictive		2,640	1,320	2,640	660	440
5	Restrictive	>45 MPH	2,640	660	2,640	440	245
		45 MPH or Less	1,320	660	1,320	440	245



Emerson Dr / Minton Rd / Palm Bay Rd (Jupiter Blvd to Culver Dr/Norfolk Pkwy)

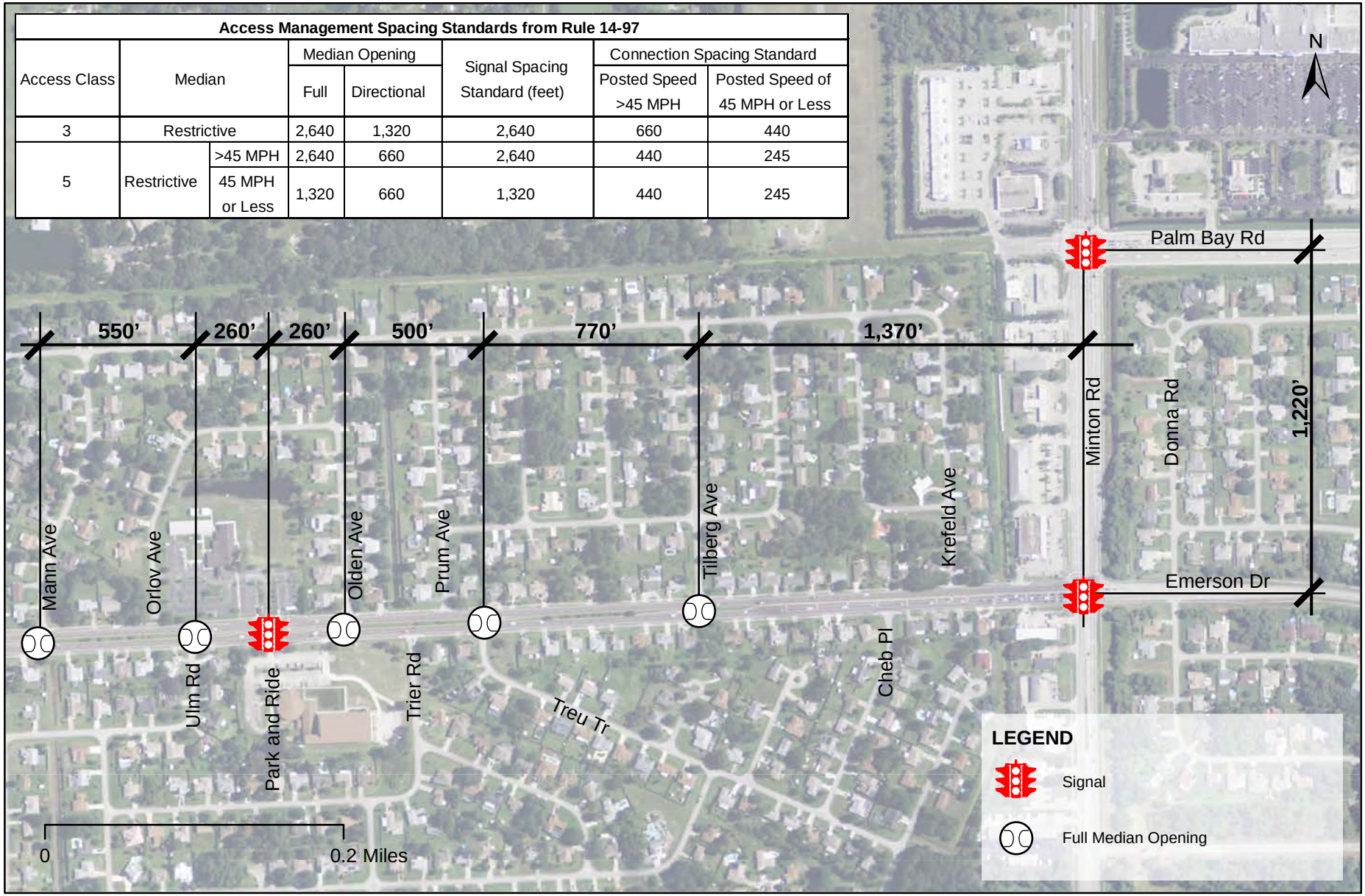
Access Management Map

Brevard County, Florida

Figure **4**

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING

Access Management Spacing Standards from Rule 14-97							
Access Class	Median		Median Opening		Signal Spacing Standard (feet)	Connection Spacing Standard	
			Full	Directional		Posted Speed >45 MPH	Posted Speed of 45 MPH or Less
3	Restrictive		2,640	1,320	2,640	660	440
5	Restrictive	>45 MPH	2,640	660	2,640	440	245
		45 MPH or Less	1,320	660	1,320	440	245



Emerson Dr / Minton Rd / Palm Bay Rd (Jupiter Blvd to Culver Dr/Norfolk Pkwy)

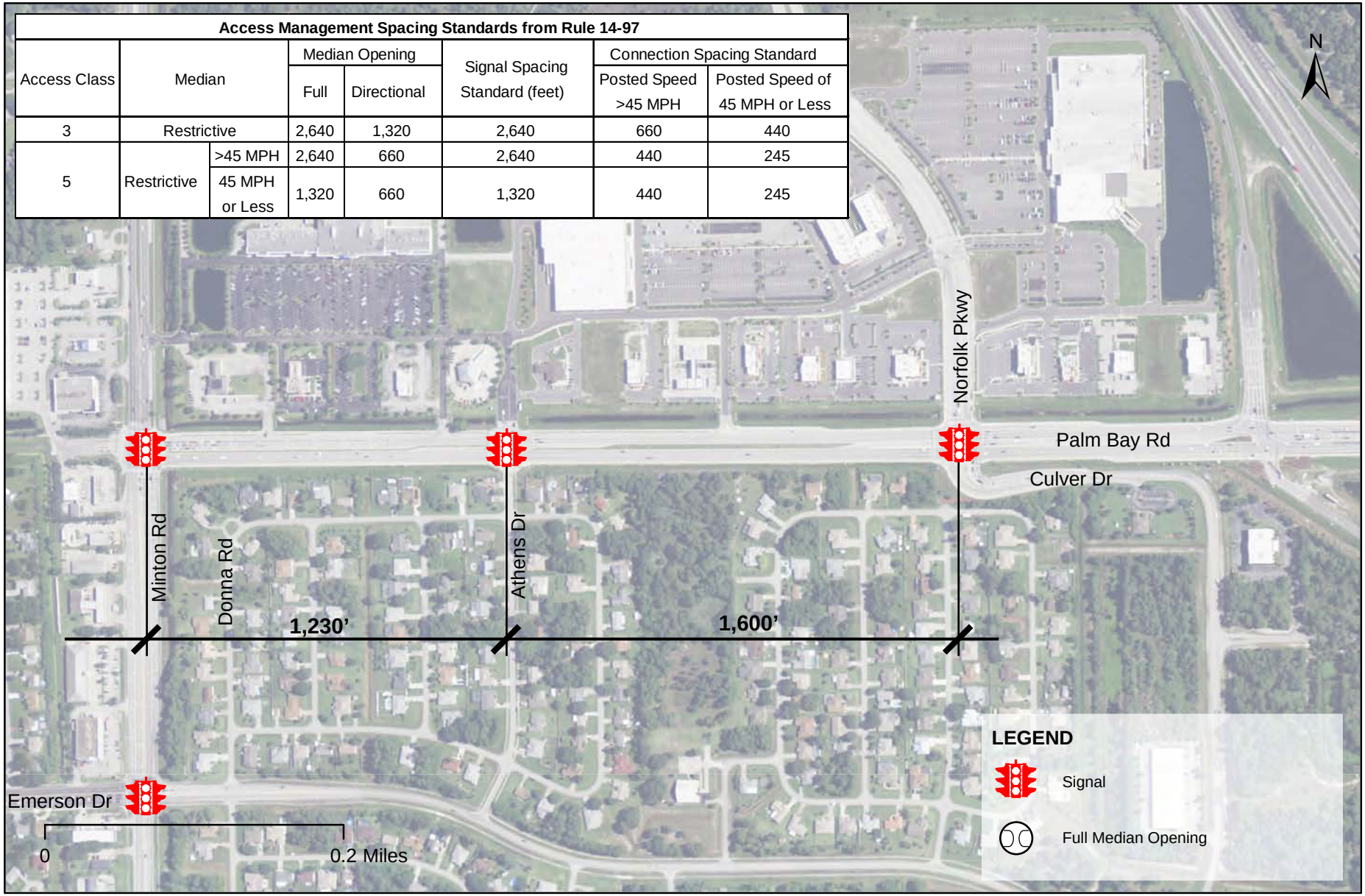
Access Management Map

Brevard County, Florida

Figure **5**

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING

Access Management Spacing Standards from Rule 14-97							
Access Class	Median		Median Opening		Signal Spacing Standard (feet)	Connection Spacing Standard	
			Full	Directional		Posted Speed >45 MPH	Posted Speed of 45 MPH or Less
3	Restrictive		2,640	1,320	2,640	660	440
5	Restrictive	>45 MPH	2,640	660	2,640	440	245
		45 MPH or Less	1,320	660	1,320	440	245



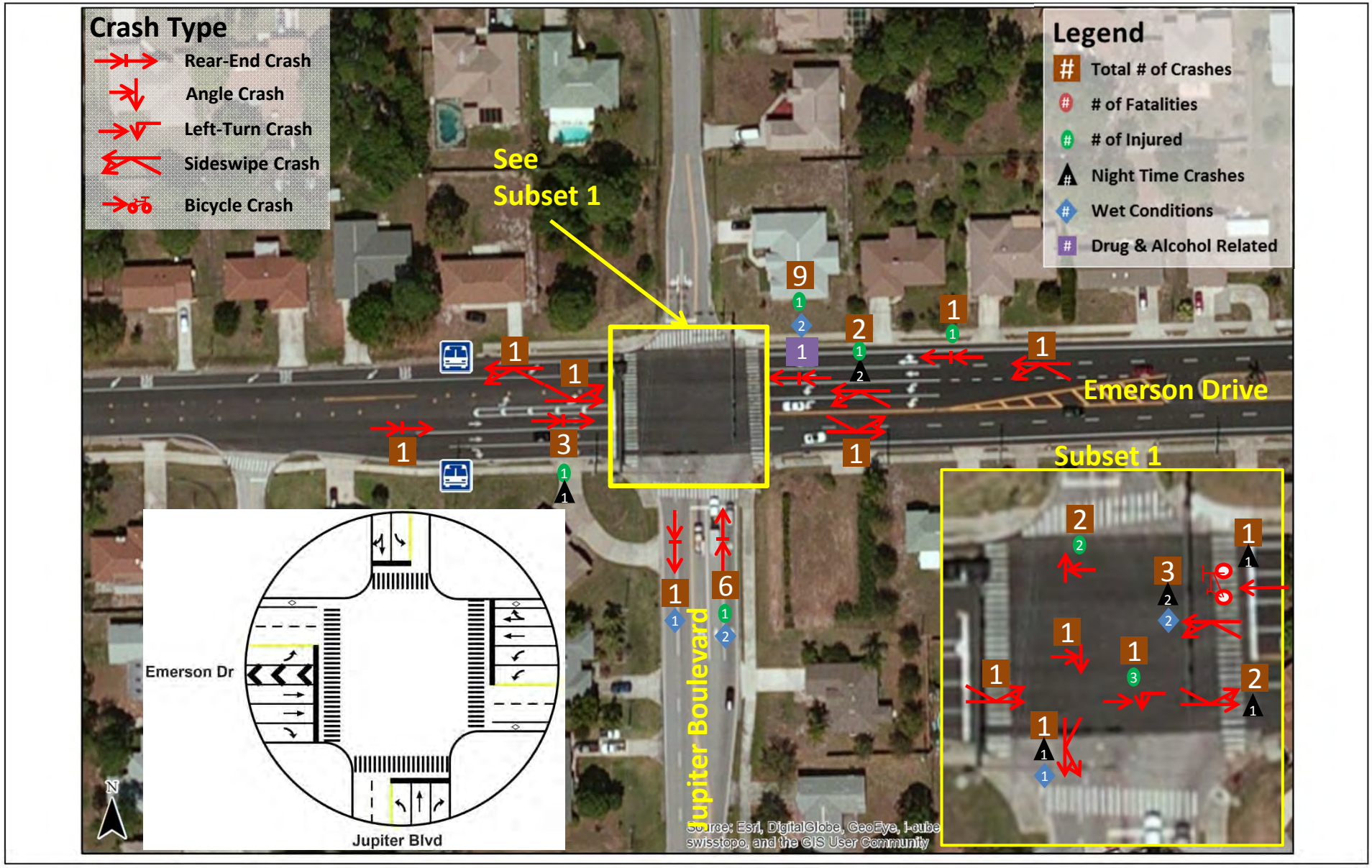
Emerson Dr / Minton Rd / Palm Bay Rd (Jupiter Blvd to Culver Dr/Norfolk Pkwy)

Access Management Map

Brevard County, Florida

Figure **6**

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING

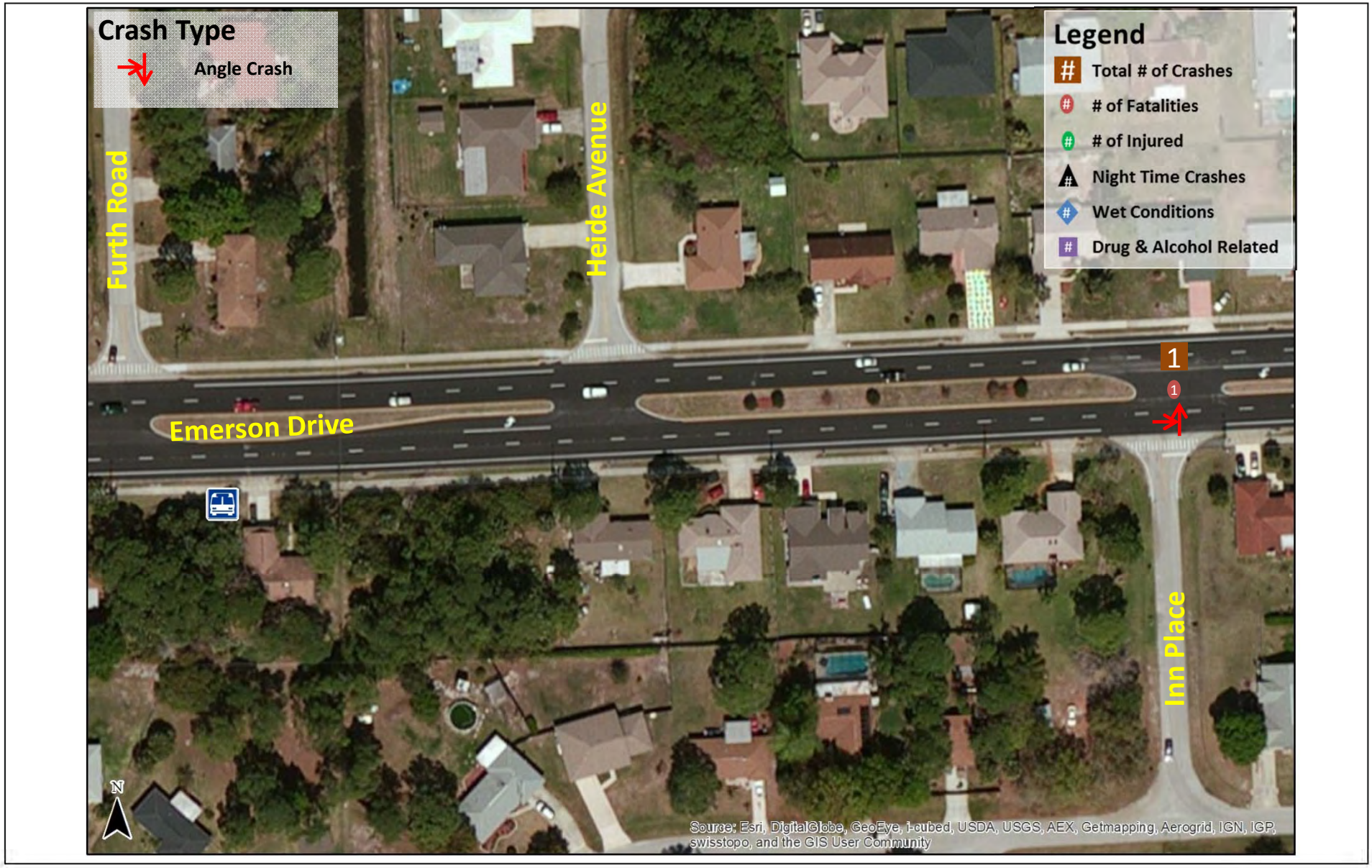


Emerson Drive (Jupiter Boulevard to Culver Drive) RSA
Collision Diagram (2009 – 2014)
Intersection 1: Emerson @ Jupiter

Figure **7**

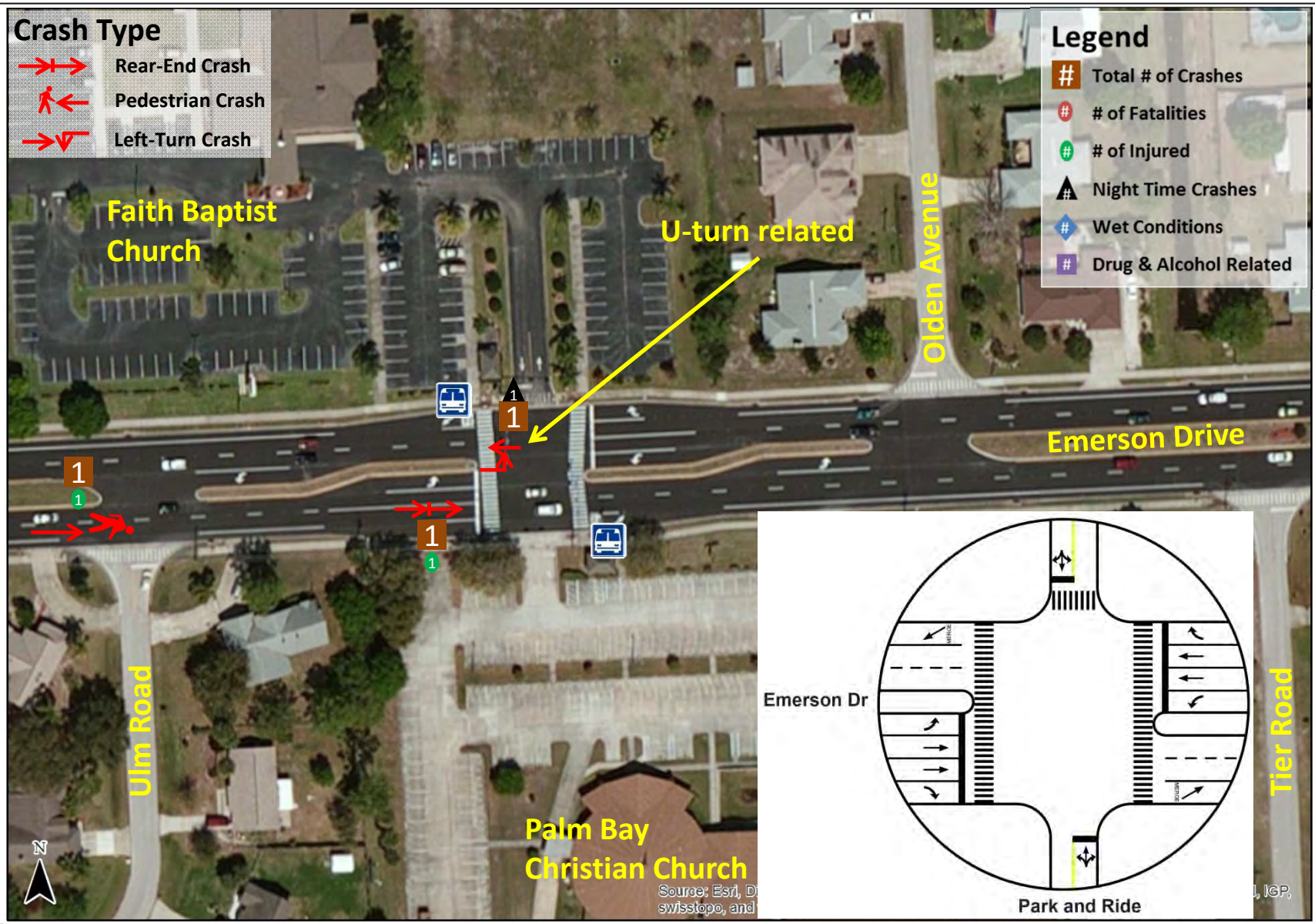
Emerson Drive (Jupiter Boulevard to Culver Drive) RSA
Collision Diagram (2009 – 2014)
Segment 1: Jupiter to Park & Ride

Figure
8



Emerson Drive (Jupiter Boulevard to Culver Drive) RSA
Collision Diagram (2009 – 2014)
Segment 1: Jupiter to Park & Ride

Figure **9**



Emerson Drive (Jupiter Boulevard to Culver Drive) RSA
Collision Diagram (2009 – 2014)
Intersection 2: Emerson @ Park & Ride

Figure **10**

Emerson Drive (Jupiter Boulevard to Culver Drive) RSA
Collision Diagram (2009 – 2014)
Segment 2: Park & Ride to Minton

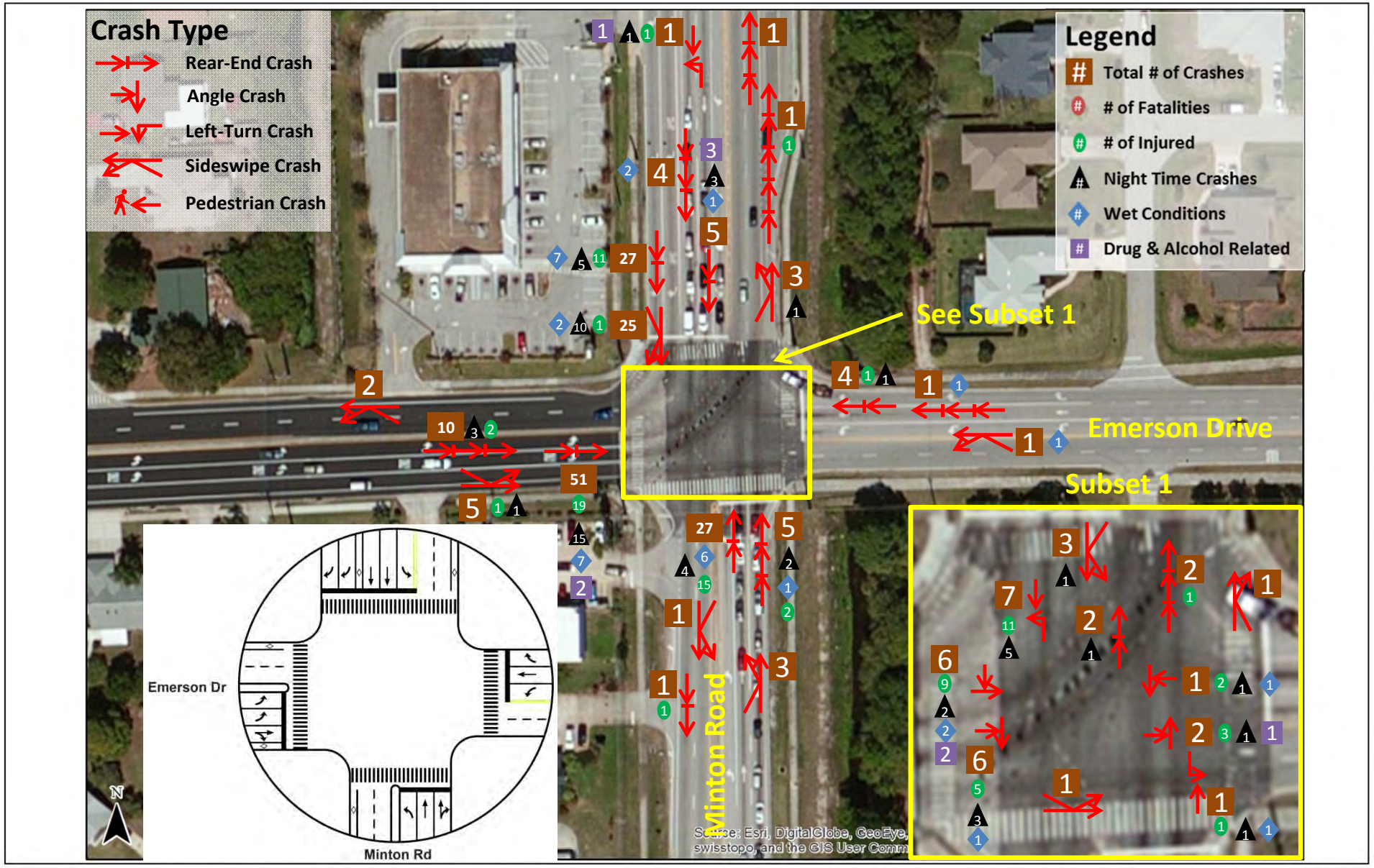
Figure **11**

Emerson Drive (Jupiter Boulevard to Culver Drive) RSA
Collision Diagram (2009 – 2014)
Segment 2: Park & Ride to Minton

Figure **12**

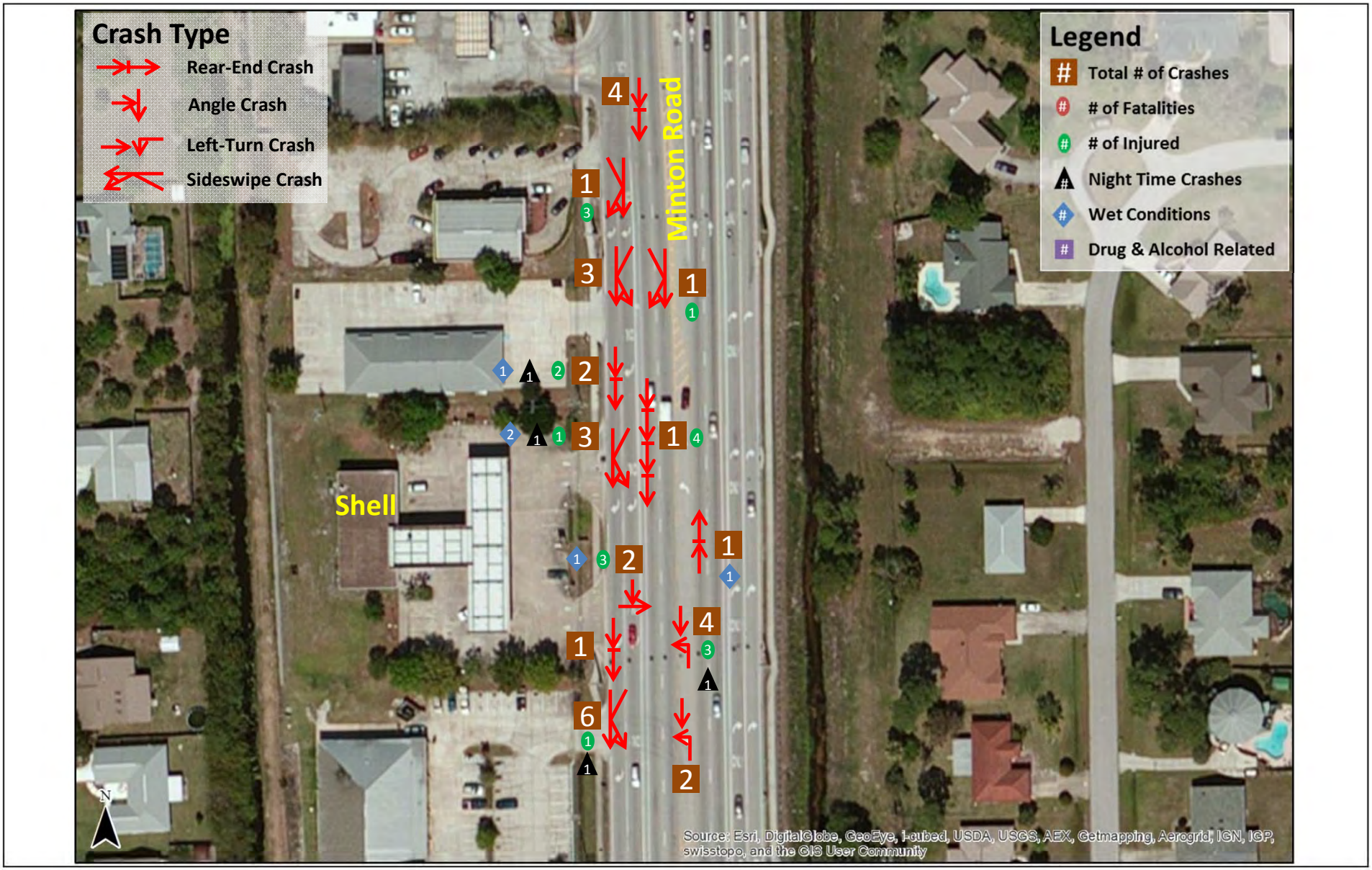
Emerson Drive (Jupiter Boulevard to Culver Drive) RSA
Collision Diagram (2009 – 2014)
Intersection 3: Emerson @ Minton

Figure **13**



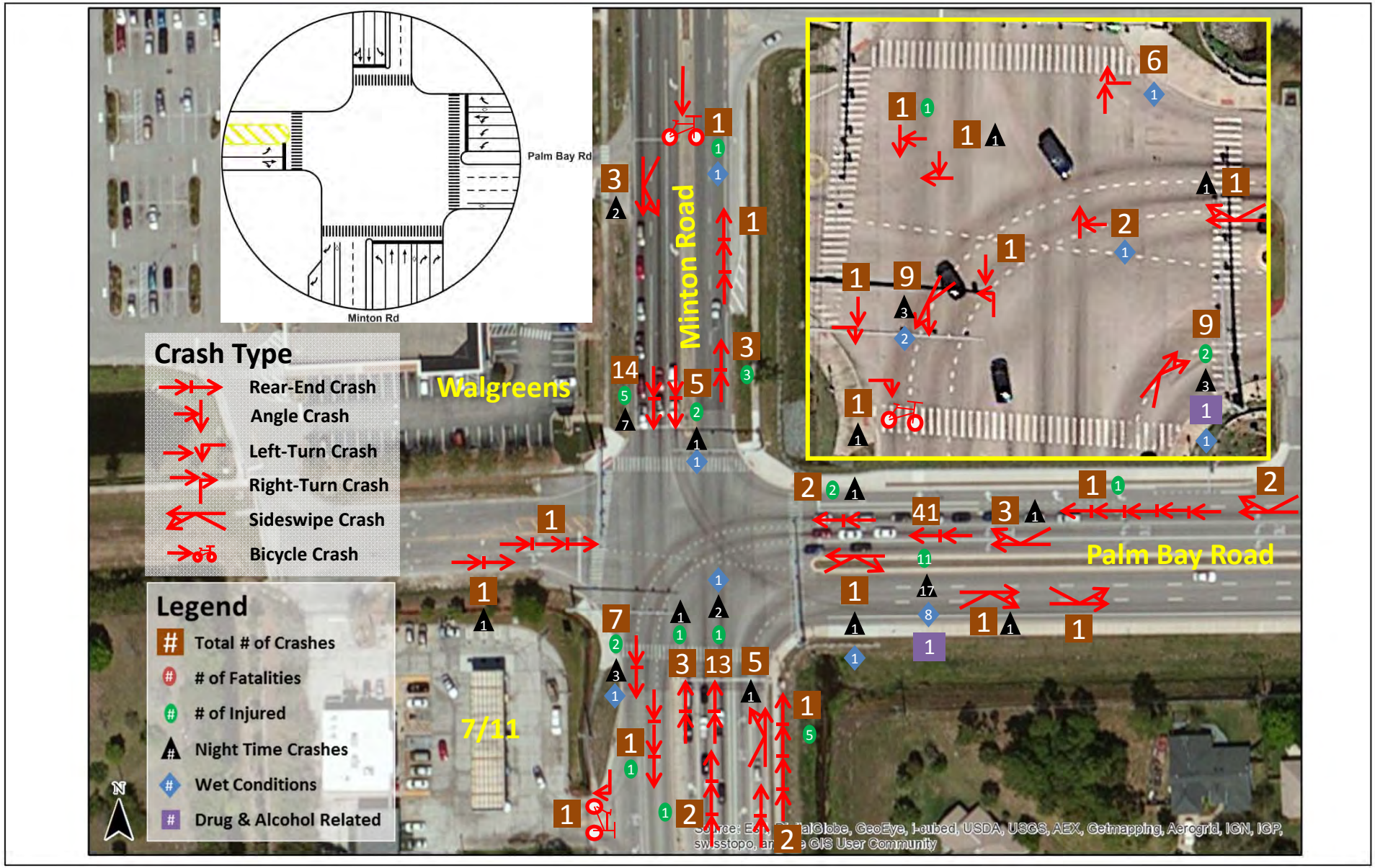
Emerson Drive (Jupiter Boulevard to Culver Drive) RSA
Collision Diagram (2009 – 2014)
Intersection 3: Emerson @ Minton

Figure **14**



Emerson Drive (Jupiter Boulevard to Culver Drive) RSA
Collision Diagram (2009 – 2014)
Intersection 3/4: Minton between Emerson and Palm Bay

Figure **15**

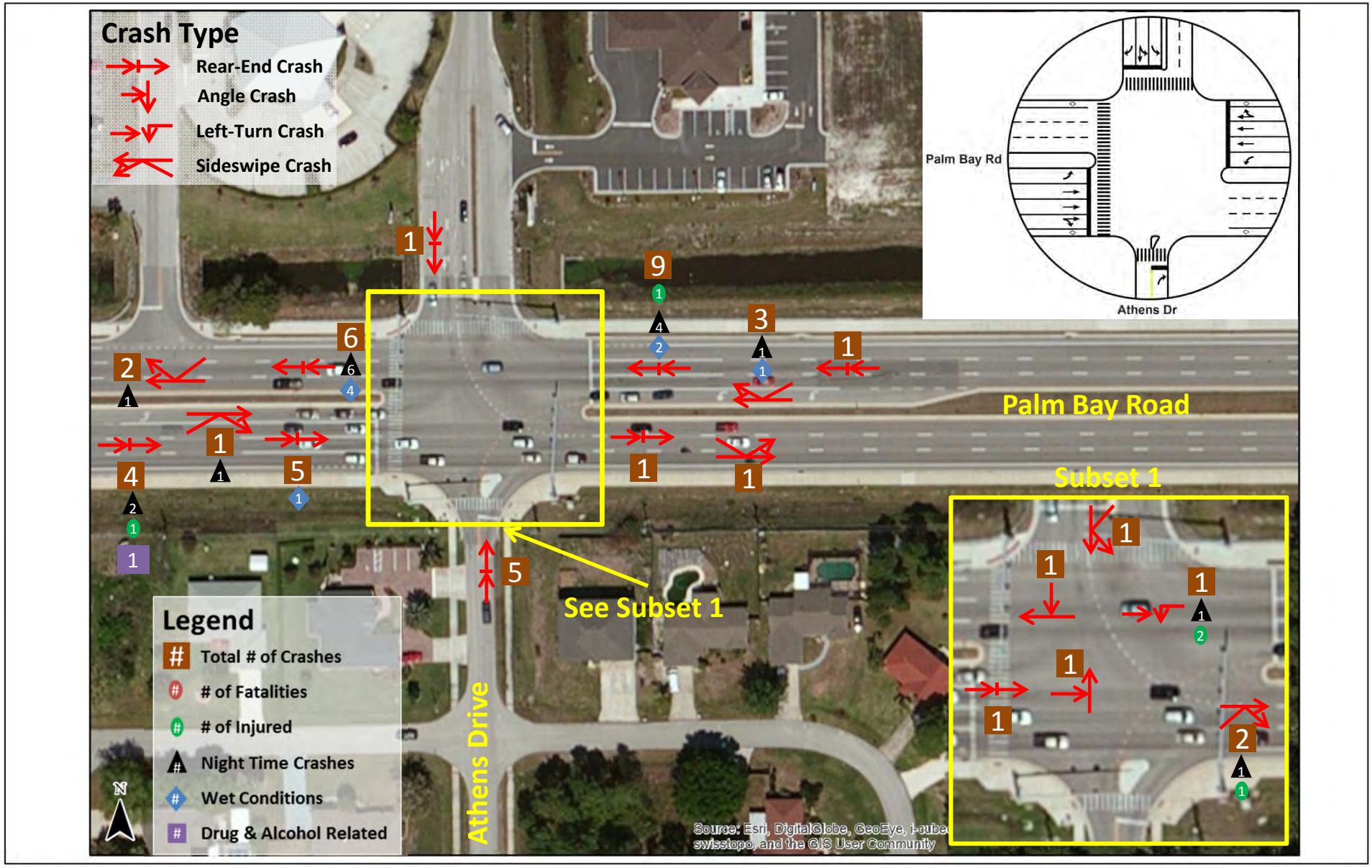


Emerson Drive (Jupiter Boulevard to Culver Drive) RSA
Collision Diagram (2009 – 2014)
Intersection 4: Minton @ Palm Bay

Figure **16**

Emerson Drive (Jupiter Boulevard to Culver Drive) RSA
Collision Diagram (2009 – 2014)
Intersection 4/5: Palm Bay between Minton and Athens

Figure **17**

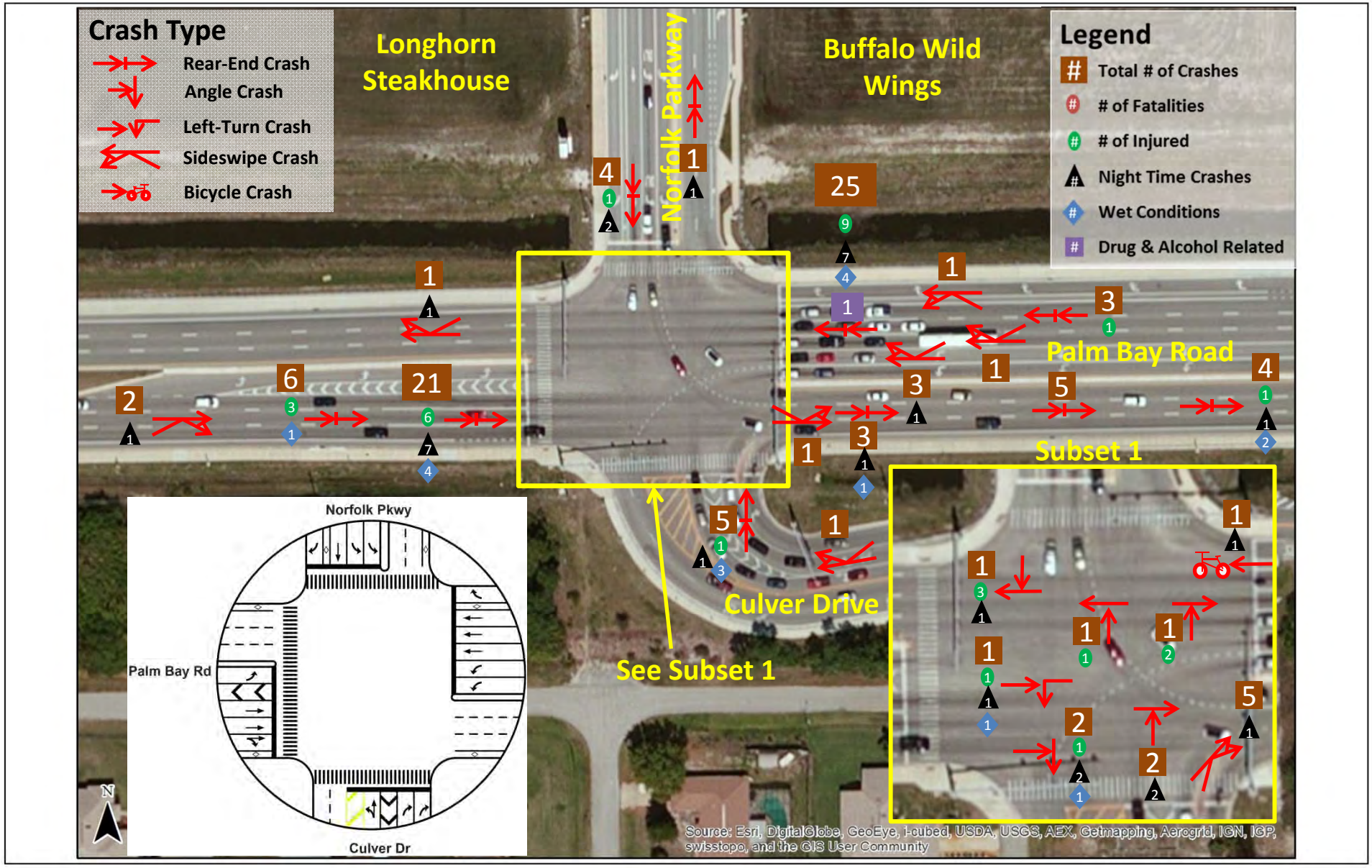


Emerson Drive (Jupiter Boulevard to Culver Drive) RSA
Collision Diagram (2009 – 2014)
Intersection 5: Palm Bay @ Athens

Figure **18**

Emerson Drive (Jupiter Boulevard to Culver Drive) RSA
Collision Diagram (2009 – 2014)
Segment 3: Athens to Culver

Figure **19**



Emerson Drive (Jupiter Boulevard to Culver Drive) RSA
Collision Diagram (2009 – 2014)
Intersection 6: Palm Bay @ Culver

Figure **20**

Emerson Drive (Jupiter Boulevard to Culver Drive) RSA
Collision Diagram (2009 – 2014)
Intersection 6: Palm Bay @ Culver

Figure **21**

Appendix B – SCAT ADA Assessment Bus Stop Sheets

Location: NW EMERSON DR & JUPITER BLVD **ID:** 374

Quick Fix: No **ADA Compliant:** No **Direction:** Westbound

Quick Fix Items:

Non-Compliant Features: Boarding and alighting area not compliant, Schedule not accessible, Detectable Warnings

Average Ridership per Run: 2

Scoring: Accessibility: 5 **Safety** 8 **Operational:** 5 **Cost:** 0 **Rideship:** 4 **Total:** 22

Rank: 200 **Total Cost: $3,600**

Northbound

Southbound

Supplemental Photo

Eastbound

Westbound

Stop Location: On a raised curb (away from the sidewalk)
Bus Location: In a travel-thru lane
Releation to Intersection: At street, on far side of intersection
Hazards None

Curb Type/Height: None
Signage: Standard bus stop sign post
Sign Mounted Correctly: Yes
Amenities: Bus Schedule
Bench Accessible: N/A
Bench Obstruction: N/A
Trashcan Accessible:
Trashcan Obstruction:
Schedule Accessible: No

Is there a B&A area: Yes
Max Clear Space:
What prevents a B&A area:
Is the B&A 5'x8':
B&A Materials: Dirt/Grass
Is the B&A Safe: Yes
B&A Condition: Surface not firm, stable, or slip r
Running Slope (%): 0.2
Cross Slope (%): 0.9
B&A Obstructions: No obstruction
B&A Barriers: No barriers
Sidewalk Connection: No
1/4" Change in Elevation: No
Sidewalk Width (feet): 5

Marked Crosswalk: Yes
Protected Crosswalk: Yes
Detectable Warning: No
Detectable Warning Condition:
Detectable Full Width:
24" Detectable Warning:
Curb Ramp: Yes
Smooth Transition at Curb Ramp: Yes
Curb Ramp Slope: Yes
Curb Ramp Surface: Yes

Shelter: No **Shelter Condition:** **Wheelchair Into:**
Distance from Curb (inches): **Accessible Connection:**

Trip Generators: Residential

Recommendations: Move the stop 60' east. Pave a level 5'x3' slab between the curb and sidewalk to create a 5'x8' B&A area. Add detectable warnings to the nearby curb ramps. Make sure the pole with the bus schedule is located adjacent to the pavement so it is accessible.

Location: EMERSON DR & FURTH RD **ID:** 857

Quick Fix: No **ADA Compliant:** No **Direction:** Westbound

Quick Fix Items:

Non-Compliant Features: Boarding and alighting area not compliant, Schedule not accessible

Average Ridership per Run: 2

Scoring: Accessibility: 7 **Safety** 6 **Operational:** 5 **Cost:** 5 **Rideship:** 4 **Total:** 27

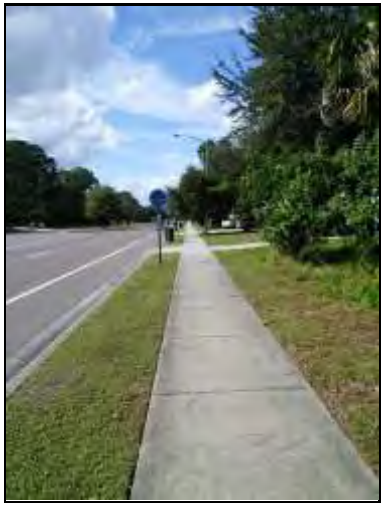
Rank: 115 **Total Cost: $2,800**

Northbound

Southbound

Supplemental Photo

Eastbound



Westbound

Stop Location: On the sidewalk (adjacent to the street with a raised curb)
Bus Location: In a travel-thru lane
Releation to Intersection: At street, on far side of intersection
Hazards None

Curb Type/Height: Type F-6 **Signage:** Standard bus stop sign post
Sign Mounted Correctly: Yes
Amenities: Bus Schedule
Bench Accessible: N/A **Bench Obstruction:** N/A
Trashcan Accessible: **Trashcan Obstruction:**
Schedule Accessible: **No**

Is there a B&A area: Yes **Max Clear Space:**
What prevents a B&A area:
Is the B&A 5'x8': **B&A Materials:** Partially Paved
Is the B&A Safe: Yes **B&A Condition:** Surface not firm, stable, or slip r
Running Slope (%): 0.3 **Cross Slope (%):** **2.1**
B&A Obstructions: No obstruction
B&A Barriers: No barriers
Sidewalk Connection: Yes **1/4" Change in Elevation:** No
Sidewalk Width (feet): 5

Marked Crosswalk: Yes **Protected Crosswalk:** No
Detectable Warning: Yes **Detectable Warning Condition:** Good
Detectable Full Width: Yes **24" Detectable Warning:** Yes
Curb Ramp: Yes **Smooth Transition at Curb Ramp:** Yes
Curb Ramp Slope: Yes **Curb Ramp Surface:** Yes

Shelter: No **Shelter Condition:** **Wheelchair Into:**
Distance from Curb (inches): **Accessible Connection:**

Trip Generators: Residential

Recommendations: Pave a level 5'x4' slab between the curb and sidewalk to complete a 5'x8' B&A area. Make sure the pole with the bus schedule is located adjacent to the pavement so it is accessible.

Location: EMERSON DR & MANN AVE **ID:** 405

Quick Fix: No **ADA Compliant:** No **Direction:** Westbound
Quick Fix Items:
Non-Compliant Features: Boarding and alighting area not compliant, Schedule not accessible

Average Ridership per Run: 0
Scoring: Accessibility: 7 **Safety** 6 **Operational:** 5 **Cost:** 0 **Rideship:** 0 **Total:** 18
Rank: 285 **Total Cost: $3,200**


Northbound


Southbound


Supplemental Photo


Eastbound


Westbound

Stop Location: On the sidewalk (adjacent to the street with a raised curb)
Bus Location: In a travel-thru lane
Releation to Intersection: At street, on far side of intersection
Hazards None

Curb Type/Height: Type F-6
Signage: Standard bus stop sign post
Sign Mounted Correctly: Yes
Amenities: Bus Schedule
Bench Accessible: N/A
Bench Obstruction: N/A
Trashcan Accessible:
Trashcan Obstruction:
Schedule Accessible: No

Is there a B&A area: Yes
Max Clear Space:
What prevents a B&A area:
Is the B&A 5'x8':
B&A Materials: Partially Paved
Is the B&A Safe: Yes
B&A Condition: Surface not firm, stable, or slip r
Running Slope (%): 0.3
Cross Slope (%): 2.1
B&A Obstructions: No obstruction
B&A Barriers: No barriers
Sidewalk Connection: Yes
1/4" Change in Elevation: No
Sidewalk Width (feet): 5

Marked Crosswalk: Yes
Protected Crosswalk: No
Detectable Warning: Yes
Detectable Warning Condition: Good
Detectable Full Width: Yes
24" Detectable Warning: Yes
Curb Ramp: Yes
Smooth Transition at Curb Ramp: Yes
Curb Ramp Slope: Yes
Curb Ramp Surface: Yes

Shelter: No **Shelter Condition:** **Wheelchair Into:**
Distance from Curb (inches): **Accessible Connection:**

Trip Generators: Residential

Recommendations: Pave a level 5'x4' slab between the curb and sidewalk to complete a 5'x8' B&A area. Make sure the pole with the bus schedule is located adjacent to the pavement so it is accessible.

Location: EMERSON DR & NW OLDEN AVE **ID:** 321

Quick Fix: No **ADA Compliant:** No **Direction:** Westbound

Quick Fix Items:

Non-Compliant Features: Boarding and alighting area not compliant, Schedule not accessible

Average Ridership per Run: 0

Scoring: Accessibility: 7 **Safety** 9 **Operational:** 4 **Cost:** 10 **Rideship:** 0 **Total:** 30

Rank: 88 **Total Cost: $1,200**

Northbound

Southbound

Supplemental Photo

Eastbound

Westbound

Stop Location: On the sidewalk (adjacent to the street with a raised curb)
Bus Location: In a pull-in lane to walkway curb (bus bay/pull-out)
Releation to Intersection: At street, on far side of intersection
Hazards None

Curb Type/Height: Type F-6 **Signage:** Standard bus stop sign post
Sign Mounted Correctly: Yes
Amenities: Bus Schedule
Bench Accessible: N/A **Bench Obstruction:** N/A
Trashcan Accessible: **Trashcan Obstruction:**
Schedule Accessible: **No**

Is there a B&A area: Yes **Max Clear Space:**
What prevents a B&A area:
Is the B&A 5'x8': **B&A Materials:** Concrete
Is the B&A Safe: Yes **B&A Condition:** No defects
Running Slope (%): 0.3 **Cross Slope (%):** **3.1**
B&A Obstructions: No obstruction
B&A Barriers: No barriers
Sidewalk Connection: Yes **1/4" Change in Elevation:** No
Sidewalk Width (feet): 5

Marked Crosswalk: Yes **Protected Crosswalk:** Yes
Detectable Warning: Yes **Detectable Warning Condition:** Good
Detectable Full Width: Yes **24" Detectable Warning:** Yes
Curb Ramp: Yes **Smooth Transition at Curb Ramp:** Yes
Curb Ramp Slope: Yes **Curb Ramp Surface:** Yes

Shelter: No **Shelter Condition:** **Wheelchair Into:**
Distance from Curb (inches): **Accessible Connection:**

Trip Generators: Medical/Rehab, Office/Commercial, Residential

Recommendations: Resurface the B&A area to have a cross slope of <=2%. Move the pole with the bus schedule adjacent to the pavement on the far side of the B&A area.

Location: NE EMERSON DR & TILBERG AVE **ID:** 364

Quick Fix: No **ADA Compliant:** No **Direction:** Westbound

Quick Fix Items:

Non-Compliant Features: Boarding and alighting area not compliant, Schedule not accessible

Average Ridership per Run: 0

Scoring: Accessibility: 7 **Safety** 9 **Operational:** 3 **Cost:** 5 **Rideship:** 0 **Total:** 24

Rank: 145 **Total Cost: $2,600**

Northbound

Southbound

Supplemental Photo

Eastbound

Westbound

Stop Location: On the sidewalk (adjacent to the street with a raised curb)
Bus Location: In a travel-thru lane
Releation to Intersection: At street, on nearside of intersection
Hazards None

Curb Type/Height: Type F-6 **Signage:** Standard bus stop sign post
Sign Mounted Correctly: Yes
Amenities: Bus Schedule
Bench Accessible: N/A **Bench Obstruction:** N/A
Trashcan Accessible: **Trashcan Obstruction:**
Schedule Accessible: **No**

Is there a B&A area: Yes **Max Clear Space:**
What prevents a B&A area:
Is the B&A 5'x8': **B&A Materials:** Partially Paved
Is the B&A Safe: Yes **B&A Condition:** Surface not firm, stable, or slip r
Running Slope (%): 0.3 **Cross Slope (%):** 0.6
B&A Obstructions: No obstruction
B&A Barriers: No barriers
Sidewalk Connection: Yes **1/4" Change in Elevation:** No
Sidewalk Width (feet): 5

Marked Crosswalk: Yes **Protected Crosswalk:** Yes
Detectable Warning: Yes **Detectable Warning Condition:** Good
Detectable Full Width: Yes **24" Detectable Warning:** Yes
Curb Ramp: Yes **Smooth Transition at Curb Ramp:** Yes
Curb Ramp Slope: Yes **Curb Ramp Surface:** Yes

Shelter: No **Shelter Condition:** **Wheelchair Into:**
Distance from Curb (inches): **Accessible Connection:**

Trip Generators: Church, Office/Commercial, Residential, Retail

Recommendations: Pave a level 5'x4' slab between the curb and sidewalk to complete a 5'x8' B&A area. Make sure the pole with the bus schedule is located adjacent to the pavement so it is accessible.

Location: NW MINTON RD & EMERSON DR **ID:** 403

Quick Fix: No **ADA Compliant:** No **Direction:** Southbound

Quick Fix Items:

Non-Compliant Features: Boarding and alighting area not compliant, Schedule not accessible

Average Ridership per Run: 1

Scoring: Accessibility: 7 **Safety** 9 **Operational:** 2 **Cost:** 5 **Rideship:** 0 **Total:** 23

Rank: 165 **Total Cost: $2,600**

Northbound

Southbound

Supplemental Photo

Eastbound

Westbound

Stop Location: On the sidewalk (adjacent to the street with a raised curb)
Bus Location: In a right turn only lane
Releation to Intersection: At street, on nearside of intersection
Hazards None

Curb Type/Height: Type F-6 **Signage:** Standard bus stop sign post
Sign Mounted Correctly: Yes
Amenities: Bus Schedule
Bench Accessible: N/A **Bench Obstruction:** N/A
Trashcan Accessible: **Trashcan Obstruction:**
Schedule Accessible: No

Is there a B&A area: Yes **Max Clear Space:**
What prevents a B&A area:
Is the B&A 5'x8': **B&A Materials:** Partially Paved
Is the B&A Safe: Yes **B&A Condition:** Surface not firm, stable, or slip r
Running Slope (%): 0.6 **Cross Slope (%):** 0.3
B&A Obstructions: No obstruction
B&A Barriers: No barriers
Sidewalk Connection: Yes **1/4" Change in Elevation:** No
Sidewalk Width (feet): 5

Marked Crosswalk: Yes **Protected Crosswalk:** Yes
Detectable Warning: Yes **Detectable Warning Condition:** Good
Detectable Full Width: Yes **24" Detectable Warning:** Yes
Curb Ramp: Yes **Smooth Transition at Curb Ramp:** Yes
Curb Ramp Slope: Yes **Curb Ramp Surface:** Yes

Shelter: No **Shelter Condition:** **Wheelchair Into:**
Distance from Curb (inches): **Accessible Connection:**

Trip Generators: Office/Commercial, Retail

Recommendations: Pave a level 5'x4' slab between the curb and sidewalk to complete a 5'x8' B&A area. Make sure the pole with the bus schedule is located adjacent to the pavement so it is accessible.