



SR/CR A1A PEDESTRIAN SAFETY & MOBILITY STUDY

PEDESTRIAN / BICYCLE SAFETY REVIEW

Focus Area A / Peninsula Avenue to E 3rd Avenue (New Smyrna Beach)



Prepared for:
**River to Sea Transportation
Planning Organization**
2570 West International
Speedway Boulevard, Suite 100
Daytona Beach, FL 32114

Prepared by:
Kittelsohn & Associates, Inc.
225 E. Robinson Street, Suite 450
Orlando, FL 32801
407.540.0555
kittelsohn.com

October 2016

SR/CR A1A Pedestrian Safety & Mobility Study

Pedestrian/Bicycle Safety Review Report for Focus Area A: SR A1A from Peninsula Avenue to E 3rd Avenue (New Smyrna Beach)

Section Number: 79070000

Mile Post: 30.448 – 31.043

Volusia County

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Project Title: Focus Area A Pedestrian/Bicycle Safety Field Review

Field Review Dates: February 11th and 12th, 2016 (daytime/nighttime reviews and follow up meeting)

Participants:

Adam Burghdoff – Kittelson & Associates, Inc. – Team Leader
Stephan Harris – River to Sea Transportation Planning Organization
Chad Lingenfelter – Florida Department of Transportation, District 5 (February 11th only)
Joan Carter – Florida Department of Transportation, District 5
Jon Cheney – Volusia County (February 11th only)
Carole Thomas – Volusia County
Kyle Fegley – City of New Smyrna Beach
Michelle Updike – City of New Smyrna Beach
Steven Bapp – City of New Smyrna Beach
Jesse Meyers – City of New Smyrna Beach
Jake Sachs – City of New Smyrna Beach
Rick and Donna Ames – Seawoods (February 11th only)
Dennis Anderson – Seawoods (February 11th only)
Sergeant Mark Severance – New Smyrna Beach PD
Travis Hills – Kittelson & Associates, Inc.

Project Characteristics:

Field Review Type: Pedestrian, Bicycle, Existing Road
Adjacent Land Use: Urban, Commercial
Posted Speed Limit: 40 miles per hour (mph) along the length of the study corridor
Opposite Flow Separation: Raised median from Peninsula Avenue to 800' east of Peninsula Avenue, center two-way left-turn lane (TWLTL) from 800' east of Peninsula Avenue to E 3rd Avenue
Service Function: Urban Principal Arterial
Terrain: Flat
Climatic Conditions: Sunny

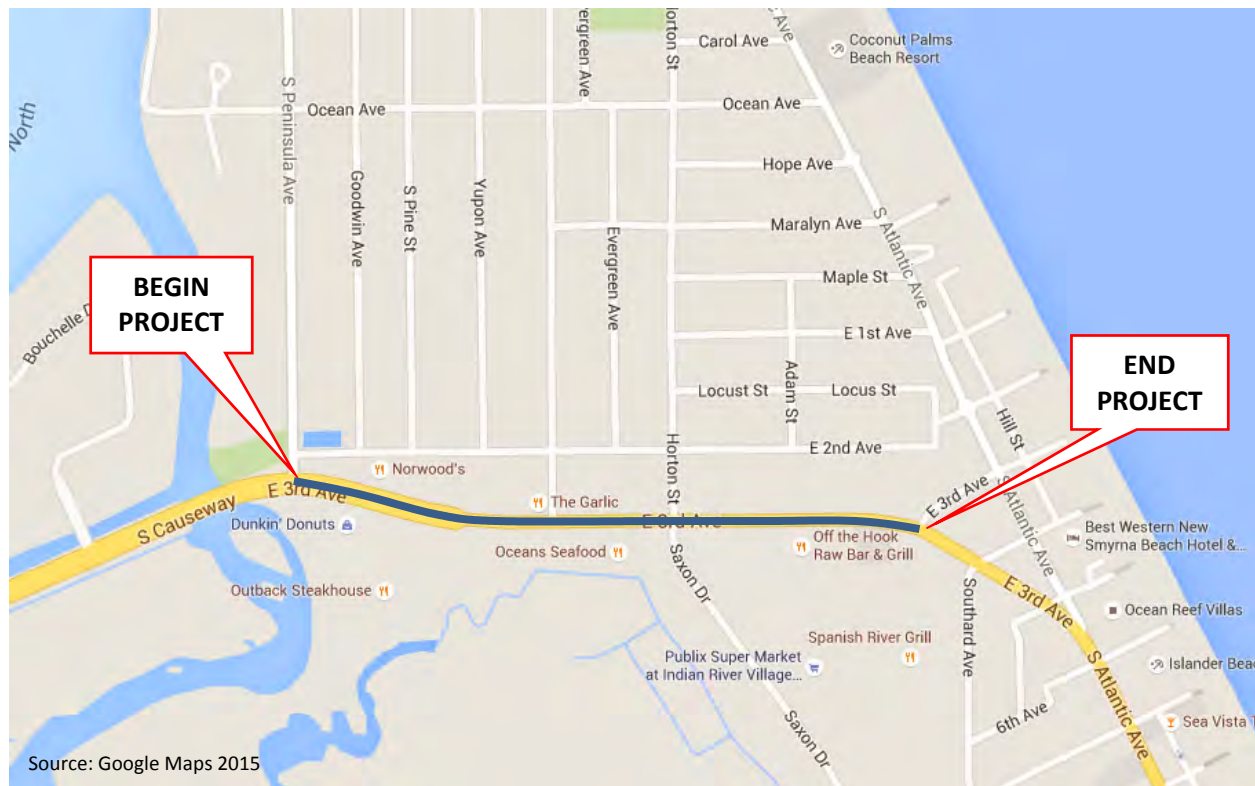


Figure 1 – Focus Area A Study Corridor

Background

Volusia County is ranked in Florida's top 10 counties for pedestrian injuries and fatalities. Pedestrians and bicyclists are identified as Vulnerable Road Users in the Florida Strategic Highway Safety Plan (SHSP). The goal of the SR/CR A1A Pedestrian Safety & Mobility Study is to generate a list of suggested improvements at high pedestrian/bicycle crash locations to address the growing need for pedestrian/bicycle safety along SR A1A in Volusia and Flagler Counties. SR A1A from Peninsula Drive to E 3rd Avenue (**Figure 1**), a 0.60 mile corridor in New Smyrna Beach, was identified as one of these high crash locations. In order to suggest improvements along this high crash corridor, the crash history was evaluated and a field review was conducted. The methodology for selecting high crash corridors is explained in the SR A1A Pedestrian Safety and Mobility Study Final Report. This report will be available on the River to Sea TPO's website upon the completion of the study: <http://www.r2ctpo.org/bicycle-pedestrian-program/overview/>.

The pedestrian/bicycle safety review process involves multi-disciplinary representatives from various stakeholders, potentially including representatives from transportation planning, traffic operations, roadway design, safety, and law enforcement. Pedestrian/bicycle safety reviews are conducted to identify potential safety issues and provide improvement suggestions in a team collaborative environment. This pedestrian/bicycle safety review was commissioned by the River to Sea Transportation Planning Organization (R2CTPO) to develop short-term, near-term, and long-term suggestions to improve pedestrian and bicyclist safety within the study limits. This safety review is limited in scope and should not be construed as a comprehensive safety study; nor is it a formal Road Safety Audit. It is intended to identify potential operational and safety related improvements related to pedestrians and bicyclists to be considered by R2CTPO staff and partner agencies (i.e. FDOT District Five

(D5), Volusia County, New Smyrna Beach, local law enforcement). Some improvements presented in this report may be implemented in the short-term while other suggested safety improvements may be considered for future study. Each suggestion identified in this study is classified into one of three categories:

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

The field review was conducted on Thursday February 11th, 2016. The team met in the morning at the Connor Library across from the New Smyrna Beach City Hall to discuss the study corridor and crash history. After lunch, the study team drove the entire corridor, south to north then north to south, to gain an understanding of the facility characteristics from a driver's perspective. The team then walked the length of sidewalk along the north and south sides of the roadway. The team reassembled in the evening, after sunset, to make observations in nighttime conditions. A follow-up debrief meeting was held at New Smyrna Beach City Hall Commission Chamber the following morning (February 12th) to discuss the corridor's issues and potential improvements identified by the team. Study corridor characteristics are reviewed below:

- Peninsula Avenue to 3rd Avenue – 0.60 miles
- Typical cross section as follows:
 - Four-lane, divided roadway from Peninsula Avenue to the Outback Steakhouse driveway (0.15 miles).
 - Five-lane roadway with a center two-way left-turn lane (TWLTL) from the Outback Steakhouse driveway to 3rd Avenue (0.35 miles).
- The posted speed along the study corridor limits is 40 mph;
- Three (3) signalized intersections at Peninsula Avenue, Saxon Drive/Horton Street, and 3rd Avenue:
 - Peninsula Avenue
 - Three-leg intersection with old special emphasis crosswalk markings on all three legs.
 - Saxon Drive/Horton Street
 - Old special emphasis crosswalk markings along all four legs.
 - 3rd Avenue
 - Three-leg intersection with old special emphasis crosswalk markings along the north and east legs.
 - No marked crosswalk on the west leg.
- There are two (2) marked unsignalized mid-block crossings:
 - Approximately 0.75 miles east of Peninsula Avenue
 - Provides crossing to the Outback Steakhouse shopping center;
 - The crosswalk is marked with old special emphasis markings;
 - This crossing is located within the four lane divided roadway section, thus the median island provides refuge and allows for a two-stage crossing;

- A Pedestrian Warning sign (W11-2) and downward arrow plaque (W16-7P) are present on the right side of each roadway approach; and
- There is overhead lighting on both sides of the roadway, but there is no additional pedestrian-scale lighting at the crosswalk.
- Approximately 0.10 miles west of 3rd Avenue
 - Provides crossing to the Publix shopping center;
 - The crosswalk is marked with old special emphasis markings;
 - A refuge island allows for a two-stage crossing;
 - A Pedestrian Warning sign (W11-2) and downward arrow plaque (W16-7P) are present on the right side of each roadway approach; and
 - There is overhead lighting on both sides of the roadway, but there is no additional pedestrian-scale lighting at the crosswalk.
- Continuous sidewalks along both sides of the roadway for the length of the study corridor;
- No marked bicycle lanes are provided, but there is a four-foot paved shoulder on both sides of the roadway along the length of the study corridor;
- Type F curb and gutter along the length of the study corridor;
- Votran, Volusia County's public transit system, does not serve SR A1A with fixed-route transit within the study limits;
- Overhead street lighting is present along both sides of the study corridor; and
- The study corridor has experienced an average AADT of 23,250 vehicles/day over the last six years (2009-2014).

Crash History (2009 – 2014)

Six (6) years of available pedestrian and bicycle related crash data, 2009 to 2014, were utilized for the SR A1A crash analysis. Crash data was obtained from two sources: 1. The FDOT Crash Analysis Reporting System (CARS) database from 2009 to 2013 and 2. The Signal Four Analytics database, maintained by University of Florida from 2009 to 2014. The 2014 CARS data was not yet FDOT certified at the time this study was initiated, thus the reason for six years of crash data instead of the traditional five. The additional crashes from the Signal Four database supplemented the CARS data along SR A1A.

Nine (9) pedestrian or bicycle-related crashes were reported over the six-year study period, two (2) involved pedestrians and seven (7) involved bicyclists. All nine crashes resulted in injury. No fatal pedestrian or bicycle crashes were reported during the analysis period.

Crash diagrams were created along the corridor to summarize the pedestrian/bicycle-related crash history. The crash diagrams are included in **Appendix A**. The pedestrian/bicycle crash data was also summarized by the crash metrics displayed in the charts in **Appendix A**. A summary of these metrics, signalized intersection crashes, and locations with more than one crash, are provided below:

- One (1) crash occurred in dark lighting conditions. The remaining (8) crashes occurred in daylight;
- The majority (89 percent) of crashes occurred under dry roadway conditions;
- Five (5) of the nine (9) reported crashes occurred in 2010. There were no reported crashes in 2011 or 2012.
- The corridor has experienced an average AADT of 23,250 vehicles/day over the six year analysis period. The highest volumes along the corridor were experience in 2009 and 2010;

- There were two (2) reported crashes in March and November. There was one (1) reported crash in January, February, September, October, and December.
- Two (2) crashes occurred on Thursday, Friday, and Sunday. One (1) crash occurred on Monday, Tuesday, and Wednesday;
- Sixty-seven (67) percent of the crashes (6 crashes) occurred between 11:00 AM and 4:00 PM;
- Only two (2) of the pedestrians/bicyclists lived outside of the City based upon their provided zip codes. A zip code was not reported for one of the bicyclists;
- None of the reported crashes involved alcohol or drugs;
- The vehicle had the right-of-way in one (1) of the two (2) pedestrian crashes;
- The vehicle had the right-of-way in two (2) of the seven (7) bicycle crashes;
- In one (1) of the crashes, the pedestrian was attempting to cross SR A1A at a mid-block location. In the other pedestrian crash, the pedestrian was crossing at a signalized intersection in the crosswalk;
- Two (2) of the seven (7) bicyclists were struck while riding on the sidewalk, with one of those bicyclists being struck a driveway crossing riding against the flow of traffic;
- Three (3) of the seven (7) bicyclists were struck at a signalized intersection in the crosswalk;
- One (1) bicycle crash occurred at the signalized intersection at Peninsula Avenue;
- Two (2) crashes occurred at the signalized intersection at Saxon Drive/Horton Street:
 - One (1) pedestrian crash.
 - One (1) bicycle crash, struck on west leg crosswalk by northbound left turner.
- Two (2) crashes occurred at the signalized intersection of 3rd Avenue:
 - One (1) bicycle crash, struck on the north leg crosswalk by southbound right turner.
 - One (1) bicycle crash on the south leg sidewalk.

FIELD REVIEW FINDINGS

Location: Corridor-Wide

Issue #1: Vehicular Speed

Figure 2



Figure 3

Description of Issue:

Vehicular speeds appeared to be in excess of the posted speeds along the entire length of the study corridor. The posted speed limits are 40 mph within the study corridor, but 50 mph just west of the study limits (**Figure 2**). The causeway portion of SR A1A, just west of the study limits, has limited driveway access and traffic regularly exceeds the posted 50 mph speed limit, especially in the eastbound direction where there are no driveways accessing the south side of the roadway. Along the corridor, the center two-way left-turn lane (TWLTL) ranges between 15' and 22' wide (**Figure 3**), contributing to high

vehicular speeds. With two striped mid-block crossings located along the study corridor and two of the nine corridor crashes occurring when a pedestrian/bicyclist was crossing at a mid-block location, keeping vehicular speeds at or below the 40 mph posted speed is a need along the corridor.

Suggestions for Improvement:

In order to emphasize the reduction in speed once the causeway is crossed, a few treatments could be considered to help reduced vehicular speeds along the corridor:

- Near Term –
 - Reduce amount of cross sectional width for the travel lanes:
 - Currently 5' unmarked bicycle lanes are present along with four 12' lanes.
 - Restripe the pavement to have 11' lanes and a 7' buffered bike lane during the next resurfacing project.
 - Increase speed enforcement to encourage vehicles to drive closer to the posted speed limit based on the results of the speed study. Speed feedback signs that display how fast the vehicle is traveling may help deter speeding along the corridor.
- Long Term –
 - Perform an access management study to review the feasibility of:
 - A raised median between Peninsula Avenue and Horton Street/Saxon Drive.
 - Spot median installations between Horton Street/Saxon Drive and 3rd Avenue.

The City of New Smyrna Beach recently completed a gateway treatment at the intersection of Peninsula Avenue and SR A1A. The suggestions above coupled with the recently constructed gateway treatment may encourage vehicular speeds closer to the posted speed limit.

Location: Corridor-Wide

Issue #2: Detectable Warning Surfaces**Figure 4****Figure 5****Description of Issue:**

Along the south side of the study corridor, the study team observed the detectable warning surfaces to be broken or missing at multiple driveways to major commercial developments, as displayed in **Figure 4** and **Figure 5**.

Suggestions for Improvement:

Consider replacing/installing detectable warning surfaces at major driveways on the south side of the corridor per FDOT Design Standard Index 304.

Location: Corridor-Wide

Issue #3: Driveway Aprons

Figure 6



Figure 7

Description of Issue:

At most of the driveways/driveway aprons throughout the corridor, the sidewalk merges into the existing driveway, as displayed in **Figure 6** and **Figure 7**, providing no level path for pedestrians (maximum two (2) percent cross slope per section R302.6 in the ADA PROWAG guidance).

Along the study corridor, properties were observed as having multiple driveways/driveway aprons onto SR A1A, with most of those driveway aprons not currently being utilized by vehicular traffic as displayed in **Figure 6** and **Figure 7**. A number of driveways/driveway aprons were also noted to be longer than the 36' maximum driveway width as specified per FDOT Standard Index 515. While there was not a high amount of pedestrian/bicycle crashes at driveways (1 out of the 9 crashes), these areas are conflict points between pedestrians/bicyclists utilizing the sidewalk and vehicles exiting properties or turning from SR A1A.

Suggestions for Improvement:

Consider driveway reconstruction during the roadway's next 3R project to provide a level path for the sidewalk and meet ADA guidance. As part of this construction, consider reducing the driveway widths down to the 36' maximum per FDOT Standard Index 515. Also as part of this future 3R project, consider eliminating unused driveways, like those shown in **Figure 6** and **Figure 7**.

The above suggestions could also be performed as properties redevelop along the corridor and it appears these improvements can be done without negatively impacting parking or site circulation on the subject parcels. Consolidating driveways/access management during development will reduce the amount of conflict areas between pedestrians/bicyclists and vehicles. Some local government agencies around Central Florida have incorporated land use policies encouraging pedestrian cross access between adjacent commercial and office properties. Cross-access between adjacent parcels within a block should be a focus on the SR A1A corridor as properties redevelop which would help eliminate unused or underutilized driveways.

Location: Corridor-Wide

Issue #4: Landscape Buffer Strips**Figure 8****Figure 9****Description of Issue:**

Along the corridor, multiple sidewalk locations were observed as having walkability issues due to sand partially covering the sidewalk (**Figure 8** and **Figure 9**). At these locations, the landscape buffer strip was sand with very little grass which does not allow for water to properly drain, thus creating the ponding/sand on the sidewalk. This reduces the effective width of the sidewalk while also creating potential trip hazards.

Suggestions for Improvement:

Consider removing small landscape buffer strips at locations where water ponding/sand collection is occurring and replace with concrete to create a wider sidewalk area.

Location: Corridor-Wide

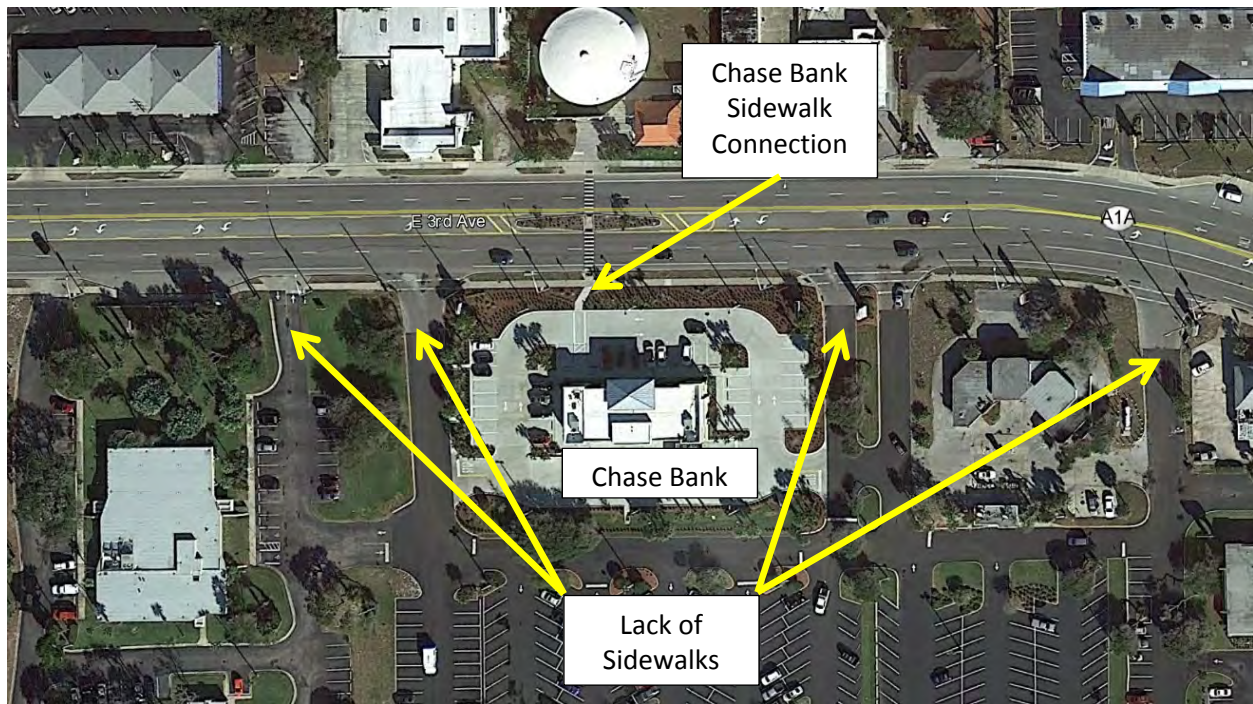
Issue #5: Push Button Placement**Figure 10****Figure 11****Description of Issue:**

At the three signalized intersections throughout the corridor, the faces of the pedestrian push button detectors are perpendicular to the crosswalk, as displayed in **Figure 10**. Only the accessible pedestrian signal (APS) push buttons on the northeast (**Figure 11**) and southeast corners of the Horton Street/Saxon Drive intersection are properly oriented to be parallel to their corresponding crosswalk.

Suggestions for Improvement:

Consider rotating the pedestrian push button detectors at each of the signalized intersections so the face of the pedestrian detectors is parallel to the crosswalk to be used, as discussed in section 4E.08 of the *2009 Manual of Uniform Traffic Control Devices (MUTCD)*.

Location: Corridor-Wide

Issue #6: Sidewalk Connectivity to Property

Source: Google Earth

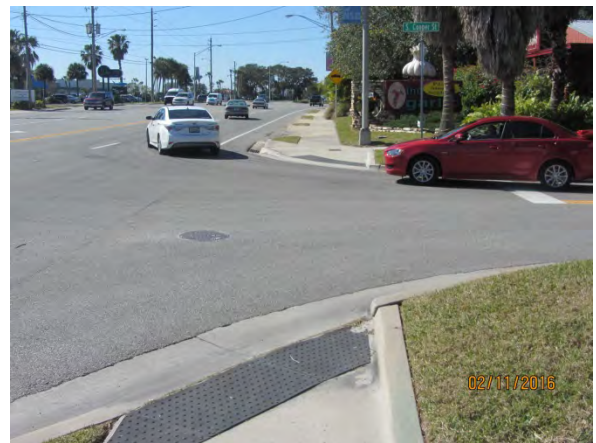
Figure 12**Description of Issue:**

Sidewalks are provided along both sides of SR A1A for the entire limits of the study corridor, but there is limited sidewalk access to the commercial properties on the north and south sides of the roadway. The limited sidewalk connectivity creates situations where pedestrians must use the entrance/exit roadway for a hard surface to get to/from SR A1A leading to potential pedestrian/vehicle conflicts. Examples of some commercial properties that lack sidewalks are presented in **Figure 12**.

Suggestions for Improvement:

As properties redevelop along the corridor, consider requiring the property owner to construct sidewalks that connect to SR A1A. When the Chase Bank was constructed, the property provided a connection to the SR A1A south side sidewalk as displayed in **Figure 12**.

Location: Corridor-Wide

Issue #7: Crosswalk Markings**Figure 13****Figure 14****Figure 15****Figure 16****Description of Issue:**

Overall, the existing crosswalk markings along the corridor were faded, as displayed in **Figure 13**, **Figure 14**, and **Figure 15**. At the signalized intersections, the crosswalk markings are the old special emphasis style. Cooper Street is missing crosswalk markings, as shown in **Figure 16**. The study team observed limited retro reflectivity of the crosswalk markings during nighttime conditions. Six of the nine corridor crashes occurred within marked crosswalk areas either at signalized intersections or at minor streets/driveways.

Suggestions for Improvement:

At signalized intersections, consider restriping the crosswalks with special emphasis marked crosswalks as shown on sheet 9 of the FDOT Design Standard Index 17346 during the next resurfacing project. At Cooper Street, consider striping a crosswalk across the stop controlled approach with standard markings as shown on sheet 9 of the FDOT Design Standard Index 17346. Also consider restriping the driveway crosswalks with standard crosswalk markings. Striping/restriping the crosswalks will improve retro reflectivity at night.

Location: Peninsula Avenue Intersection**Issue #8: Landscape/Tree Maintenance****Figure 17****Description of Issue:**

To the west of Peninsula Avenue, the study team observed landscaping/trees in the right of way obstructing the sight distance for vehicles coming eastbound over the causeway. The vehicles could not see the traffic signal at Peninsula Avenue and it was difficult for pedestrians to see vehicles coming around the corner. If the vehicle cannot see the traffic signal and is traveling at a high rate of speed, the potential for red light running and possible vehicle/pedestrian conflicts on the west crosswalk is increased.

Suggestions for Improvement:

As per the date of this report, FDOT submitted a maintenance work order and has since removed the vegetation/canopy so no trees are hanging over the right of way. Regular maintenance to keep the vegetation cut back should be considered around this corner.

As a near term improvement, consider adding a signal ahead warning sign (W3-3 in MUTCD) on the bridge in the eastbound direction. This could be coupled with a flashing beacon to inform approaching drivers to stop for the signal ahead. The beacon would only be active when the light is yellow/red.

Location: Peninsula Avenue Intersection

Issue #9: Sidewalk Terminus**Figure 18****Figure 19****Description of Issue:**

The sidewalk on the south side of SR A1A just west of Peninsula Avenue (**Figure 18**) ends just west of the bridge (**Figure 19**). There are no signs informing pedestrians at the Peninsula Drive intersection that the sidewalk on the south side of the roadway ends just west of the intersection.

Suggestions for Improvement:

The MUTCD does not have a warning sign for the end of a sidewalk, but the PAVEMENT ENDS sign W8-3 could be modified to read SIDEWALK ENDS. A SIDEWALK CLOSED sign R9-9 from section 6F.14 of the MUTCD could also be utilized to inform pedestrians the sidewalk ends. A warning plaque (W16-2aP) reading 200 FT could be installed below the SIDEWALK CLOSED sign to inform pedestrians how far ahead the sidewalk ends. Consider installing the preferred signage on the southwest corner of the Peninsula Avenue intersection to inform pedestrians they need to cross on the west leg crosswalk.

Location: Peninsula Avenue Intersection**Issue #10: Intersection Lighting****Figure 20****Figure 21****Description of Issue:**

Intersection lighting is provided on the southwest and northwest corners of the intersection as displayed in **Figure 20** but no intersection lighting is provided on the southeast or northeast (**Figure 21**) corners of the intersection.

Suggestions for Improvement:

Consider upgrading the lighting at the intersection to meet the requirements of section 7.3 in Volume 1 of the FDOT Plans Preparation Manual (PPM). This may require the existing lighting to be replaced.

Location: Peninsula Avenue Intersection

Issue #11: Turning Vehicles and Pedestrians in Crosswalk



Figure 22



Source: Google Earth

Figure 23

Description of Issue:

The field review team observed multiple conflicts between left/right turning vehicles from Peninsula Avenue and pedestrians utilizing the crosswalks on the west and east legs of the intersection. The study team also noted southbound right turning vehicles pulling past the stop bar and stopping just short of the north leg crosswalk (**Figure 22**) or stopping within the crosswalk itself. The curb return radius on the northwest corner is large (**Figure 23**) and southbound right turning vehicles were observed slowing, but not necessarily stopping, when making a right turn on red. One crash occurred with a bicycle crossing the north leg of the intersection who was struck by a southbound right turning vehicle.

Suggestions for Improvement:

Consider installing TURNING VEHICLES YIELD TO PEDESTRIANS (R10-15) signs for right and left turns on the southbound approach (would require further study). Consider implementing a leading pedestrian interval for the west and east leg crosswalks prior to the onset of the southbound green phase. If implemented, this should be done in concert with a blank-out NO RIGHT TURN ON RED sign facing the southbound approach that is active during the leading pedestrian interval. Blank-out sign options include a NO RIGHT TURN ON RED message that transitions to a YIELD TO PEDESTRIANS message at the onset of the southbound green phase.

In addition to the signage improvements, consider reducing the curb return radius on the northwest corner to encourage better stop compliance and slower southbound right turns.



* A fluorescent yellow-green background color may be used instead of yellow for this sign.

Location: Mid-Block between Peninsula Avenue and Horton Street/Saxon Drive

Issue #12: Mid-Block Crosswalk Enhancements



Figure 24



Figure 25



Figure 26



Figure 27

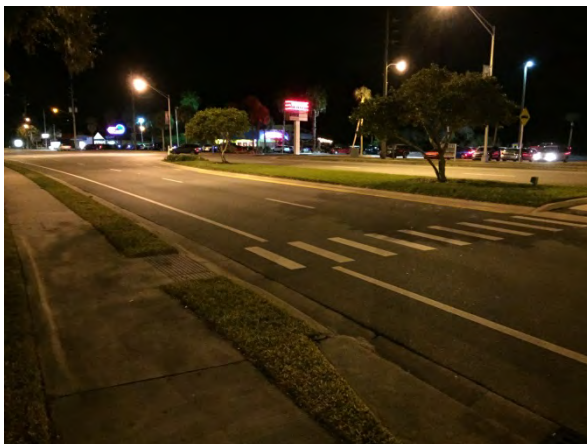


Figure 28

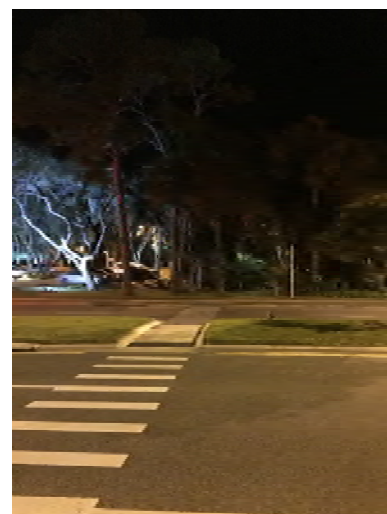


Figure 29

Description of Issue:

A mid-block crossing is located approximately 650' east of the SR A1A/Peninsula Avenue signalized intersection striped with old special emphasis crosswalk markings (**Figure 24**). The study team observed trees in the median which restricted sight distance for both vehicles approaching the crossing and pedestrians in the median attempting to cross the roadway (**Figure 25**). The study team also noted pedestrian warning signage at the crossing on the right side of the roadway in both directions (**Figure 26**) and advanced pedestrian warning signage approximately 450' west and east of the crossing (**Figure 27**). The pedestrian warning signage in the westbound direction was partially obstructed by a light pole as displayed in **Figure 26**.

During nighttime conditions, a large oak tree was observed casting a shadow across the markings for the westbound travel lanes (**Figure 28**) and the north side of the crossing was dark relative to the south side of the crossing (**Figure 29**).

Suggestions for Improvement:

The team discussed the following safety enhancements to be considered at the crossing:

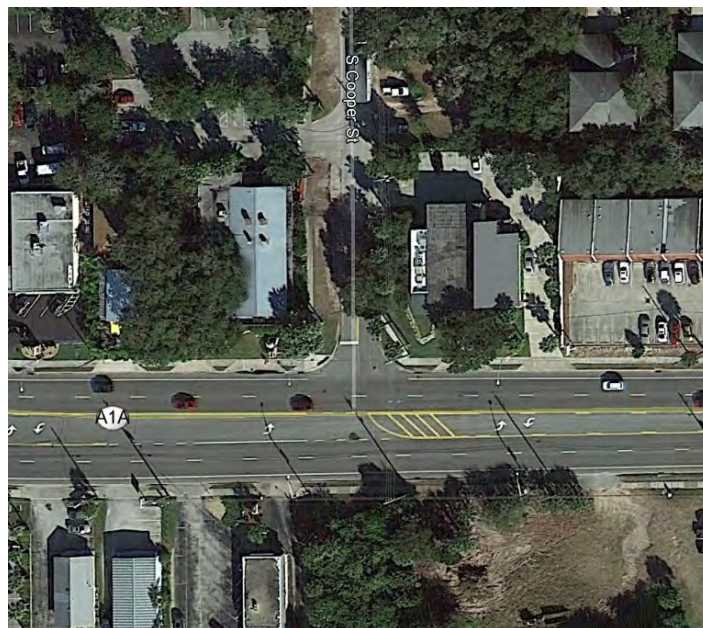
- Restripe the crosswalk with special emphasis crosswalk markings consistent with sheet 10 of the FDOT Design Index 17346 during the next resurfacing project.
- Remove the trees located in the median that are immediately adjacent to the crosswalk.
- Signage improvements –
 - As a maintenance type activity, move the pedestrian warning signage for the westbound direction so it is not obstructed by the light pole.
 - As a maintenance type activity, add pedestrian warning signage to the median side for each direction of travel.
 - As a maintenance type activity, move the advanced pedestrian warning signage approximately 150' closer to the crossing so it is 300' away based on sheet 10 of the FDOT Design Index 17346.
 - In the near term, consider providing an active warning device, such as Rapid Rectangular Flashing Beacon (RRFB), at the crosswalk. As part of this installation, pedestrian warning signage would be added in the median. RRFBs may also be used on the advance crosswalk signs per FHWA's interim approval memorandum. A mid-block crossing study would be needed for justification.
- Trim back the oak tree on the north side so the north side of the crosswalk is illuminated more than it is today. In the longer term consider installing pedestrian scale lighting on the north and south sides of the crosswalk.

Location: Mid-Block between Peninsula Avenue and Horton Street/Saxon Drive

Issue #13: Cooper Street Crossing



Figure 30



Source: Google Earth

Figure 31

Description of Issue:

As described in **Issue #1: Vehicular Speed**, the pavement width between Peninsula Avenue and Horton Street/Saxon Drive is wide (**Figure 30**) and presents a challenge for pedestrians attempting to cross SR A1A. Cooper Street is the only unsignalized intersection along the corridor (**Figure 31**), located approximately 650' west of Horton Street/Saxon Drive. One mid-block pedestrian crash occurred just west and one mid-block bicycle crash occurred just east of Cooper Street. Pedestrians/bicyclists were observed coming from Cooper Street and crossing SR A1A.

Suggestions for Improvement:

Constructing a raised median would be a long term suggestion for reducing vehicular speeds along the corridor, as described in **Issue #1: Vehicular Speed**. In the interim at Cooper Street specifically, a directional median providing eastbound left turning movements could be constructed in the near term.

To accommodate SR A1A pedestrian crossings at this location, consider performing a mid-block crossing study at this intersection. As part of this study, a marked crosswalk on the east leg of the intersection could be reviewed. If the intersection was converted to a directional median opening, a median refuge island would be provided on the east leg for the crosswalk. The following safety enhancements should be considered if a marked crosswalk is installed:

- Stripe a crosswalk on the east leg of the intersection with special emphasis crosswalk markings consistent with sheet 10 of the FDOT Design Index 17346.
- Consider providing an active warning device, such as a RRFB, at the crosswalk. In-roadway warning lights activated by the RRFB may be considered as well. Standards and guidance from section 4N.02 in the MUTCD should be reviewed when considering in-roadway lights.
- Install lighting on the crosswalk's west and east sides.

A marked crosswalk at Cooper Street would provide a marked pedestrian crossing approximately every 500' along the SR A1A study corridor.

Location: Mid-Block between Peninsula Avenue and Horton Street/Saxon Drive

Issue #14: Pot Hole Just East of Cooper Street



Figure 32



Figure 33

Description of Issue:

A pot hole is located in the eastbound paved shoulder (south side of roadway) just east of Cooper Street. This pot hole presents a hazard for any bicyclists utilizing the paved shoulder as they ride eastbound.

Suggestions for Improvement:

Consider repairing the roadway in the vicinity of the pot hole area.

Location: Horton Street/Saxon Drive Intersection

Issue #15: Pedestrian Facilities

Figure 34



Figure 35



Figure 36

Description of Issue:

The study team observed a blank-out sign that reads “NO TURN ON RED” for the southbound approach at the intersection (**Figure 34** and **Figure 35**) but that was not working during the field review. The study team also observed a leading pedestrian interval for the west and east leg crosswalks at the intersection (preceding the northbound/southbound phase). Two crashes occurred between left turning vehicles and pedestrians in the west and east leg crosswalks.

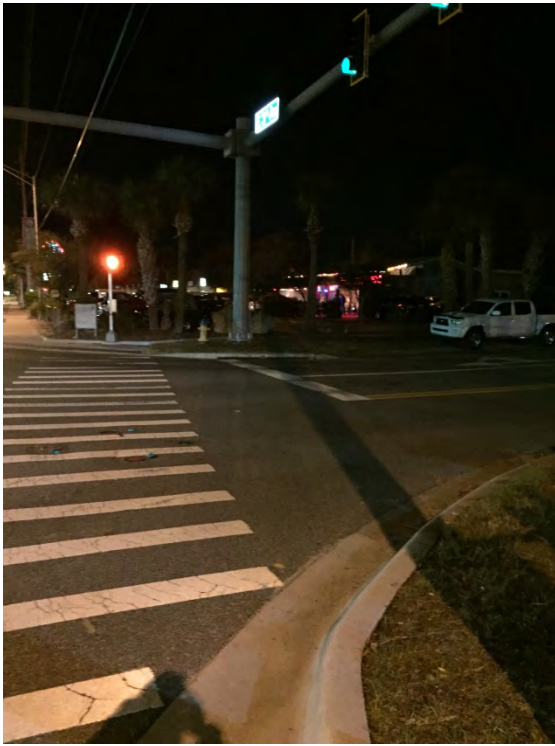
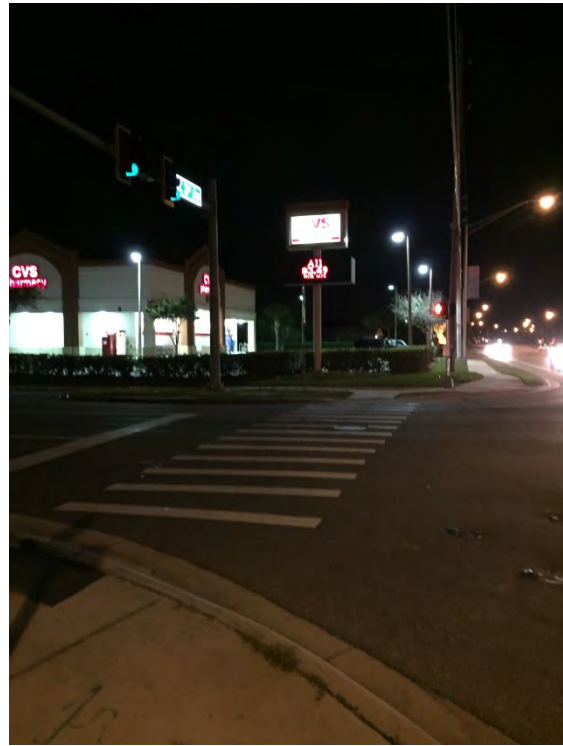
The intersection also had APS installed for the east leg crosswalk (**Figure 36**).

Suggestions for Improvement:

Consider making the blank-out NO TURN ON RED sign facing the southbound approach active during the leading pedestrian interval. Also consider converting the blank-out sign to a sign that transitions between the NO RIGHT TURN ON RED message and a YIELD TO PEDESTRIANS message at the onset of the southbound green phase.

Because APS is already installed for the east leg, consider improving the other crosswalks at the intersection with APS to improve accessibility for visually-impaired users. Refer to MUTCD Section 4E.11 and Chapter 6 of NCHRP 3-62: Guidelines for Accessible Pedestrian Signals (http://www.apsguide.org/chapter6_geometry.cfm).

Location: Horton Street/Saxon Drive Intersection

Issue #16: Intersection Lighting**Figure 37****Figure 38****Description of Issue:**

Intersection lighting is provided along SR A1A but the spacing of the light poles leaves the north crosswalk (**Figure 37**) and south crosswalk (**Figure 38**) partially or fully unlit.

Suggestions for Improvement:

Consider upgrading the lighting at the intersection to meet the requirements of section 7.3 in Volume 1 of the FDOT Plans Preparation Manual (PPM). This may require the existing lighting to be replaced.

Location: Mid-Block between Horton Street/Saxon Drive and E 3rd Avenue

Issue #17: Sidewalk Clutter



Figure 39

Description of Issue:

Newspaper/magazine stands are located within the sidewalk on the south side of the roadway next to the unused Votran bus stop/pullout just east of Horton Street/Saxon Drive (shown in **Figure 39**). While the sidewalk width in this area meets standard, the newspaper/magazine stands reduce the effective sidewalk width.

Suggestions for Improvement:

Consider coordinating with the City of New Smyrna Beach to either remove the newspaper/magazine stands or move them off the sidewalk so that the effective sidewalk width at those locations is not restricted.

Location: Mid-Block between Horton Street/Saxon Drive and E 3rd Avenue

Issue #18: Mid-Block Crosswalk



Figure 40

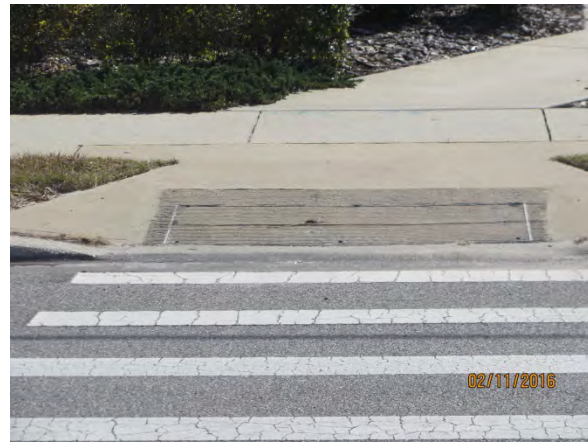


Figure 41

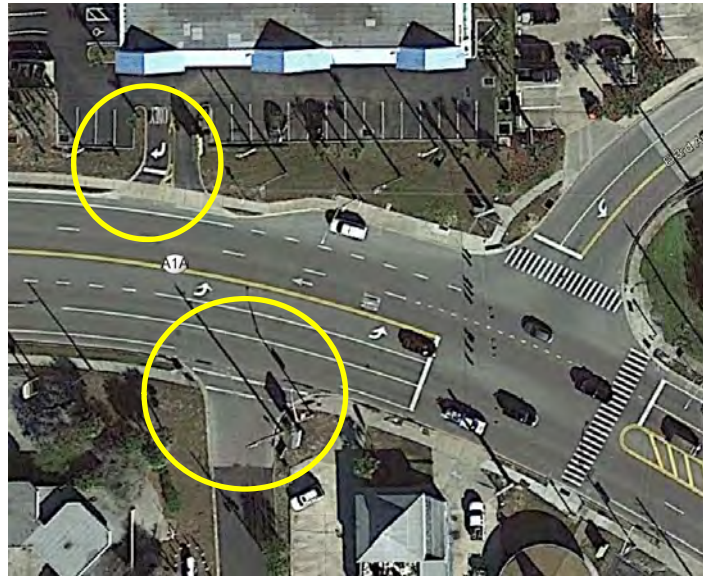
Description of Issue:

A mid-block crossing is located approximately 650' east of the SR A1A/Horton Street/Saxon Drive signalized intersection striped with old special emphasis crosswalk markings (**Figure 40**). The study team noted pedestrian warning signage at the crossing on the right side of the roadway in both directions and advanced pedestrian warning signage approximately 400' west and 425' east of the crossing. The south side of the crossing was missing a detectable warning surface as displayed in **Figure 41**.

Suggestions for Improvement:

The team discussed the following safety enhancements to be considered at the crossing:

- Restripe the crosswalk with special emphasis crosswalk markings consistent with sheet 10 of the FDOT Design Index 17346 during the next resurfacing project.
- Remove the trees located in the median that are immediately adjacent to the crosswalk.
- Signage improvements –
 - As a maintenance type activity, add pedestrian warning signage to the median side for each direction of travel.
 - As a maintenance type activity, move the advanced pedestrian warning signage approximately 100'-125' closer to the crossing so it is 300' away based on sheet 10 of the FDOT Design Index 17346.
 - In the near term, consider providing an active warning device, such as a RRFB, at the crosswalk. As part of this installation, pedestrian warning signage would be added in the median. RRFBs may also be used on the advance crosswalk signs per FHWA's interim approval memorandum. A mid-block crossing study would be needed for justification.
- Install a detectable warning surface on the south side of the crossing per FDOT Design Standard Index 304.

Location: E 3rd Avenue Intersection**Issue #19: Driveways near Intersection**

Source: Google Earth

Figure 42**Figure 43****Figure 44****Description of Issue:**

Two driveways are located just west of the 3rd Avenue intersection, as identified in **Figure 42**. The driveway on the north side of SR A1A is right out only and signage prohibiting left turns onto SR A1A are located on the stop sign and across the street on the south side of the roadway, as displayed in **Figure 43**. Even with the signage, vehicles were observed turning left onto SR A1A from the north side driveway.

The driveway on the south side of SR A1A had a sign prohibiting left turns (**Figure 44**) but it is located on the west side of the driveway. The field review team observed multiple vehicles attempting to make left turns from this driveway. With no physical obstruction prohibiting left turn movements, more vehicular

conflicts are present for the driver who now may not necessarily be looking for pedestrians/bicyclists attempting to cross the driveway.

Suggestions for Improvement:

As a maintenance activity, consider moving the NO LEFT TURN sign (R3-2) to the same sign post the stop sign is located on for the south driveway.

In the near term, consider the addition of a raised 2' or 4' concrete separator extending approximately 200' west of the 3rd Avenue intersection. The separator should be located between the eastbound left turn lane and the inside westbound through lane.

Location: E 3rd Avenue Intersection**Issue #20: Pedestrian Facilities****Figure 45****Description of Issue:**

During the field review, the study team observed multiple southbound left turn/east leg crosswalk pedestrian conflicts even though a leading pedestrian interval is present for the east leg crosswalk (preceding the northbound/southbound phase).

The field review team recorded a 20 second pedestrian clearance interval on the east leg 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 22 seconds is needed to accommodate a pedestrian walking across the 76-foot west leg.

Suggestions for Improvement:

Consider a blank-out sign that displays a YIELD TO PEDESTRIANS message at the onset of the southbound green phase to make southbound left turn drivers more aware of pedestrians in the east leg crosswalk.

The field review team coordinated with Volusia County after the safety review to review the pedestrian clearance interval on the east leg of the intersection and the County has updated the timing accordingly.

Location: E 3rd Avenue Intersection**Issue #21: Sidewalk Drop Off****Figure 46****Figure 47****Description of Issue:**

Immediately adjacent to the northeast corner of the intersection, a steep slope down into a drainage area was observed just off the sidewalk (**Figure 46** and **Figure 47**). If a pedestrian/bicyclist is utilizing the sidewalk in this location, they may accidentally step/ride off the sidewalk and fall into the drainage area.

Suggestions for Improvement:

Due to the steep slope behind the sidewalk on the northeast corner, 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 northeast edge of the sidewalk to prevent pedestrians/bicyclists from walking off the back of the sidewalk into the drainage area.

Summary of Suggestions

This pedestrian/bicycle safety review considers operational and safety related issues for pedestrians and bicyclists on SR A1A from Peninsula Avenue to E 3rd Avenue. This study was commissioned by the R2CTPO to develop suggestions to improve the safety of pedestrians and bicyclists within the study limits. Each suggestion identified in this study is classified into one of three categories:

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

The following Short-Term Maintenance suggestion should be prioritized for implementation before the other suggestions identified in this report:

- Issue #14: Pot Hole Just East of Cooper Street on page 22

The following tables summarize the suggestions of this study by priority (maintenance, near-term, or long-term).

Location	Issue Number	Issue	Suggestion
SHORT-TERM MAINTENANCE			
Corridor Wide	2	Detectable Warning Surfaces	Consider replacing/installing detectable warning surfaces at major driveways on the south side of the corridor per FDOT Design Standard Index 304.
Corridor Wide	5	Push Button Placement	Consider rotating the pedestrian push button detectors at each of the signalized intersections so the face of the pedestrian detectors is parallel to the crosswalk to be used, as discussed in section 4E.08 of the 2009 Manual of Uniform Traffic Control Devices (MUTCD).
Corridor Wide	7	Crosswalk Markings	At signalized intersections, consider restriping the crosswalks with special emphasis marked crosswalks as shown on sheet 9 of the FDOT Design Standard Index 17346 during the next resurfacing project. At Cooper Street, consider striping a crosswalk across the stop controlled approach with standard markings as shown on sheet 9 of the FDOT Design Standard Index 17346. Consider restriping the driveway crosswalks with standard crosswalk markings.
Peninsula Avenue Intersection	8	Landscape/Tree Maintenance	As per the date of this report, FDOT submitted a maintenance work order and has since removed the vegetation/canopy so no trees are hanging over the right of way. Regular maintenance to keep the vegetation cut back should be considered around this corner.
Peninsula Avenue Intersection	9	Sidewalk Terminus	The MUTCD does not have a warning sign for the end of a sidewalk, but the PAVEMENT ENDS sign W8-3 could be modified to read SIDEWALK ENDS. A SIDEWALK CLOSED sign R9-9 from section 6F.14 of the MUTCD could also be utilized to inform pedestrians the sidewalk ends. A warning plaque (W16-2aP) reading 200 FT could be installed below the SIDEWALK CLOSED sign to inform pedestrians how far ahead the sidewalk ends. Consider installing the preferred signage on the southwest corner of the Peninsula Avenue intersection to inform pedestrians they need to cross on the west leg crosswalk.
Peninsula Avenue Intersection	11	Turning Vehicles and Pedestrians in Crosswalk	Consider implementing a leading pedestrian interval for the west and east leg crosswalks prior to the onset of the southbound green phase. If implemented, this should be done in concert with a blank-out NO RIGHT TURN ON RED sign facing the southbound approach that is active during the leading pedestrian interval. Blank-out sign options include a NO RIGHT TURN ON RED message that transitions to a YIELD TO PEDESTRIANS message at the onset of the southbound green phase.
Mid-Block between Peninsula Avenue and Horton Street/Saxon Drive	12	Mid-Block Crosswalk Enhancements	The team discussed the following safety enhancements to be considered at the crossing: <ul style="list-style-type: none"> • Restripe the crosswalk with special emphasis crosswalk markings consistent with sheet 10 of the FDOT Design Index 17346 during the next resurfacing project. • Remove the trees located in the median that are immediately adjacent to the crosswalk. • Signage improvements – <ul style="list-style-type: none"> o Move the pedestrian warning signage for the westbound direction so it is not obstructed by the light pole. o Add pedestrian warning signage to the median side for each direction of travel. o Move the advanced pedestrian warning signage approximately 150' closer to the crossing so it is 300' away based on sheet 10 of the FDOT Design Index 17346. • Trim back the oak tree on the north side so the north side of the crosswalk is illuminated more than it is today.
Mid-Block between Peninsula Avenue and Horton Street/Saxon Drive	14	Pot Hole Just East of Cooper Street	Consider repairing the roadway in the vicinity of the pot hole area.
Horton Street/Saxon Drive Intersection	15	Pedestrian Facilities	Consider making the blank-out NO TURN ON RED sign facing the southbound approach active during the leading pedestrian interval. Also consider converting the blank-out sign to a sign that transitions between the NO RIGHT TURN ON RED message and a YIELD TO PEDESTRIANS message at the onset of the southbound green phase.

Location	Issue Number	Issue	Suggestion
SHORT-TERM MAINTENANCE			
Mid-Block between Horton Street/Saxon Drive and E 3rd Avenue	17	Sidewalk Clutter	Consider coordinating with the City of New Smyrna Beach to either remove the newspaper/magazine stands or move them off the sidewalk so that the effective sidewalk width at those locations is not restricted.
Mid-Block between Horton Street/Saxon Drive and E 3rd Avenue	18	Mid-Block Crosswalk	<p>The team discussed the following safety enhancements to be considered at the crossing:</p> <ul style="list-style-type: none"> • Restripe the crosswalk with special emphasis crosswalk markings consistent with sheet 10 of the FDOT Design Index 17346 during the next resurfacing project. • Remove the trees located in the median that are immediately adjacent to the crosswalk. • Signage improvements – <ul style="list-style-type: none"> o Add pedestrian warning signage to the median side for each direction of travel. o Move the advanced pedestrian warning signage approximately 100'-125' closer to the crossing so it is 300' away based on sheet 10 of the FDOT Design Index 17346. • Install a detectable warning surface on the south side of the crossing per FDOT Design Standard Index 304.
E 3rd Avenue Intersection	19	Driveways Near Intersection	Consider moving the NO LEFT TURN sign (R3-2) to the same sign post the stop sign is located on for the south driveway.

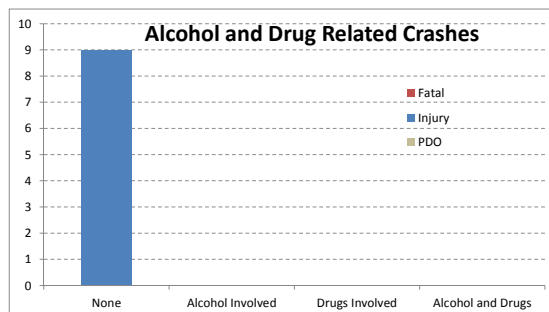
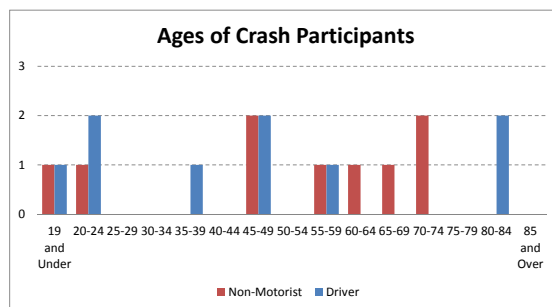
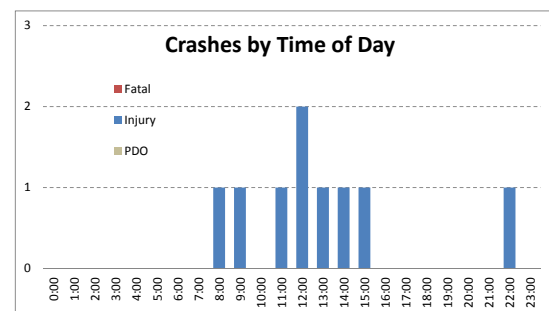
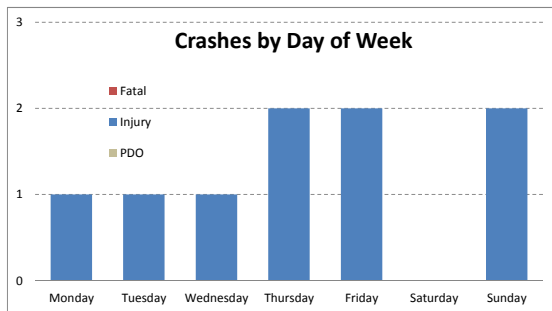
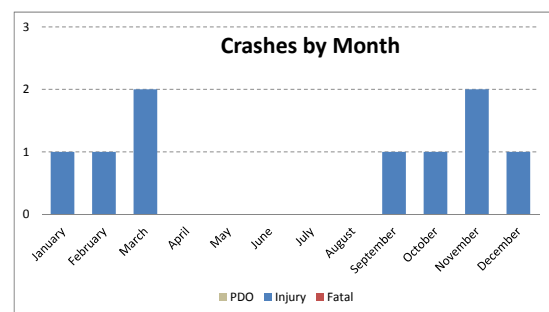
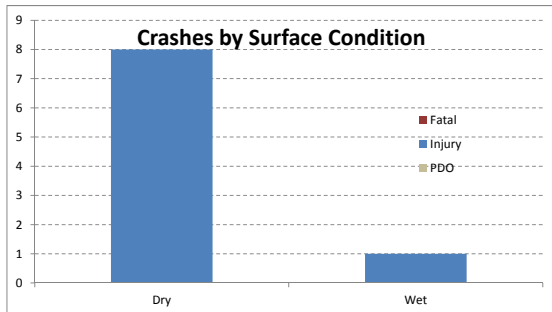
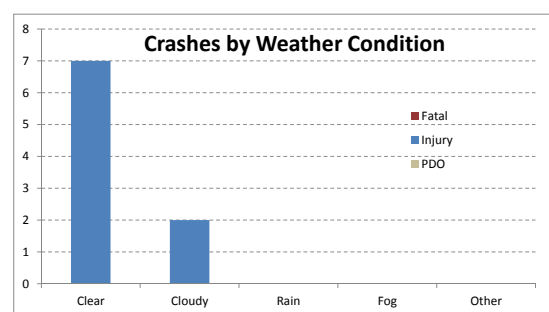
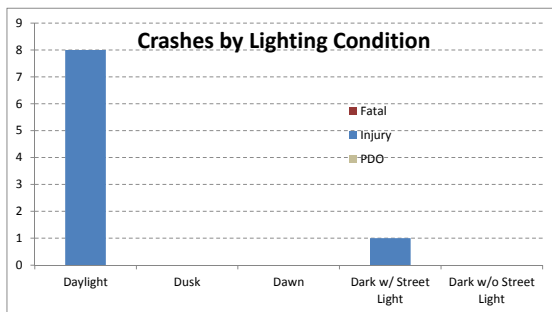
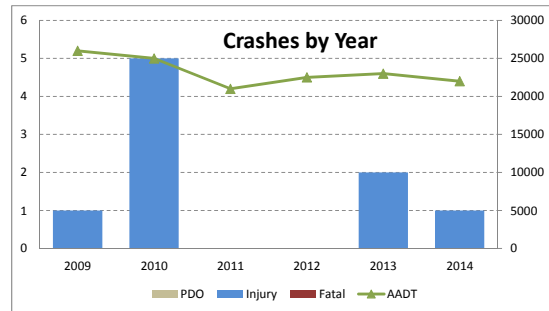
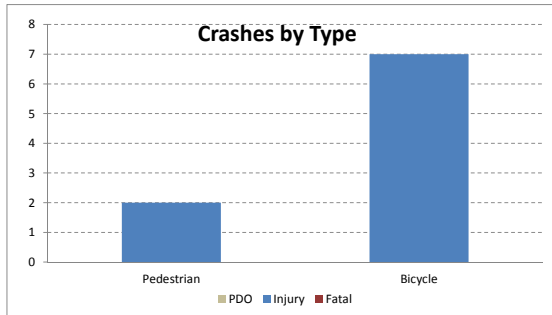
Location	Issue Number	Issue	Suggestion
NEAR-TERM IMPROVEMENT			
Corridor Wide	1	Vehicular Speed	<ul style="list-style-type: none"> • Reduce amount of cross sectional width for the travel lanes: <ul style="list-style-type: none"> o Currently 5' unmarked bicycle lanes are present along with four 12' lanes. o Restripe the pavement to have 11' lanes and a 7' buffered bike lane during the next resurfacing project. • Increase speed enforcement to encourage vehicles to drive closer to the posted speed limit based on the results of the speed study. Speed feedback signs that display how fast the vehicle is traveling may help deter speeding along the corridor.
Corridor Wide	4	Landscape Buffer Strips	Consider removing small landscape buffer strips at locations where water ponding/sand collection is occurring and replace with concrete to create a wider sidewalk area.
Peninsula Avenue Intersection	8	Landscape/Tree Maintenance	Consider adding a signal ahead warning sign (W3-3 in MUTCD) on the bridge in the eastbound direction. This could be coupled with a flashing beacon to inform approaching drivers to stop for the signal ahead. The beacon would only be active when the light is yellow/red.
Peninsula Avenue Intersection	10	Intersection Lighting	Consider upgrading the lighting at the intersection to meet the requirements of section 7.3 in Volume 1 of the FDOT Plans Preparation Manual (PPM). This may require the existing lighting to be replaced.
Peninsula Avenue Intersection	11	Turning Vehicles and Pedestrians in Crosswalk	<p>Consider installing TURNING VEHICLES YIELD TO PEDESTRIANS (R10-15) signs for right and left turns on the southbound approach (would require further study).</p> <p>Consider reducing the curb return radius on the northwest corner to encourage better stop compliance and slower southbound right turns.</p>
Mid-Block between Peninsula Avenue and Horton Street/Saxon Drive	12	Mid-Block Crosswalk Enhancements	<p>The team discussed the following safety enhancements to be considered at the crossing:</p> <ul style="list-style-type: none"> • Signage improvements – <ul style="list-style-type: none"> o Consider providing an active warning device, such as Rapid Rectangular Flashing Beacon (RRFB), at the crosswalk. As part of this installation, pedestrian warning signage would be added in the median. RRFBs may also be used on the advance crosswalk signs per FHWA's interim approval memorandum. A mid-block crossing study would be needed for justification. • Install pedestrian scale lighting on the north and south sides of the crosswalk.

Location	Issue Number	Issue	Suggestion
NEAR-TERM IMPROVEMENT			
Mid-Block between Peninsula Avenue and Horton Street/Saxon Drive	13	Cooper Street	<p>At Cooper Street specifically, a directional median providing eastbound left turning movements could be constructed. To accommodate SR A1A pedestrian crossings at this location, consider performing a mid-block crossing study at this intersection. As part of this study, a marked crosswalk on the east leg of the intersection could be reviewed. If the intersection was converted to a directional median opening, a median refuge island would be provided on the east leg for the crosswalk. The following safety enhancements should be considered if a marked crosswalk is installed:</p> <ul style="list-style-type: none"> • Stripe a crosswalk on the east leg of the intersection with special emphasis crosswalk markings consistent with sheet 10 of the FDOT Design Index 17346. • Consider providing an active warning device, such as a RRFB, at the crosswalk. In-roadway warning lights activated by the RRFB may be considered as well. Standards and guidance from section 4N.02 in the MUTCD should be reviewed when considering in-roadway lights. • Install lighting on the crosswalk's west and east sides.
Horton Street/Saxon Drive Intersection	15	Pedestrian Facilities	Because APS is already installed for the east leg, consider improving the other crosswalks at the intersection with APS to improve accessibility for visually-impaired users. Refer to MUTCD Section 4E.11 and Chapter 6 of NCHRP 3-62: Guidelines for Accessible Pedestrian Signals (http://www.apsguide.org/chapter6_geometry.cfm).
Horton Street/Saxon Drive Intersection	16	Intersection Lighting	Consider upgrading the lighting at the intersection to meet the requirements of section 7.3 in Volume 1 of the FDOT Plans Preparation Manual (PPM). This may require the existing lighting to be replaced.
Mid-Block between Horton Street/Saxon Drive and E 3rd Avenue	18	Mid-Block Crosswalk	<p>The team discussed the following safety enhancements to be considered at the crossing:</p> <ul style="list-style-type: none"> • Signage improvements – <ul style="list-style-type: none"> o Consider providing an active warning device, such as a RRFB, at the crosswalk. As part of this installation, pedestrian warning signage would be added in the median. RRFBs may also be used on the advance crosswalk signs per FHWA's interim approval memorandum. A mid-block crossing study would be needed for justification.
E 3rd Avenue Intersection	19	Driveways Near Intersection	Consider the addition of a raised 2' or 4' concrete separator extending approximately 200' west of the 3rd Avenue intersection. The separator should be located between the eastbound left turn lane and the inside westbound through lane.
E 3rd Avenue Intersection	20	Pedestrian Facilities	Consider a blank-out sign that displays a YIELD TO PEDESTRIANS message at the onset of the southbound green phase to make southbound left turn drivers more aware of pedestrians in the east leg crosswalk.
E 3rd Avenue Intersection	21	Sidewalk Drop Off	Due to the steep slope behind the sidewalk on the northeast corner, 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 northeast edge of the sidewalk to prevent pedestrians/bicyclists from walking off the back of the sidewalk into the drainage area.

Location	Issue Number	Issue	Suggestion
LONG-TERM IMPROVEMENT			
Corridor Wide	1	Vehicular Speed	<ul style="list-style-type: none"> • Perform an access management study to review the feasibility of: <ul style="list-style-type: none"> o A raised median between Peninsula Avenue and Horton Street/Saxon Drive. o Spot median installations between Horton Street/Saxon Drive and 3rd Avenue.
Corridor Wide	3	Driveway Aprons	<p>Consider driveway reconstruction during the roadway's next 3R project to provide a level path for the sidewalk and meet ADA guidance. As part of this construction, consider reducing the driveway widths down to the 36' maximum per FDOT Standard Index 515. Also as part of this future 3R project, consider eliminating unused driveways. These suggestions could also be performed as properties redevelop along the corridor and it appears these improvements can be done without negatively impacting parking or site circulation on the subject parcels.</p>
Corridor Wide	6	Sidewalk Connectivity to Properties	As properties redevelop along the corridor, consider requiring the property owner to construct sidewalks that connect to SR A1A.

Appendix A – Crash Analysis Reference Materials

CRASH ANALYSIS - SR A1A from Peninsula Ave. to 3rd Ave.





SR/CR A1A Pedestrian Safety & Mobility Study
Collision Diagram (2009 – 2014)
Location A: Peninsula Ave. to Outback Plaza

Figure
1



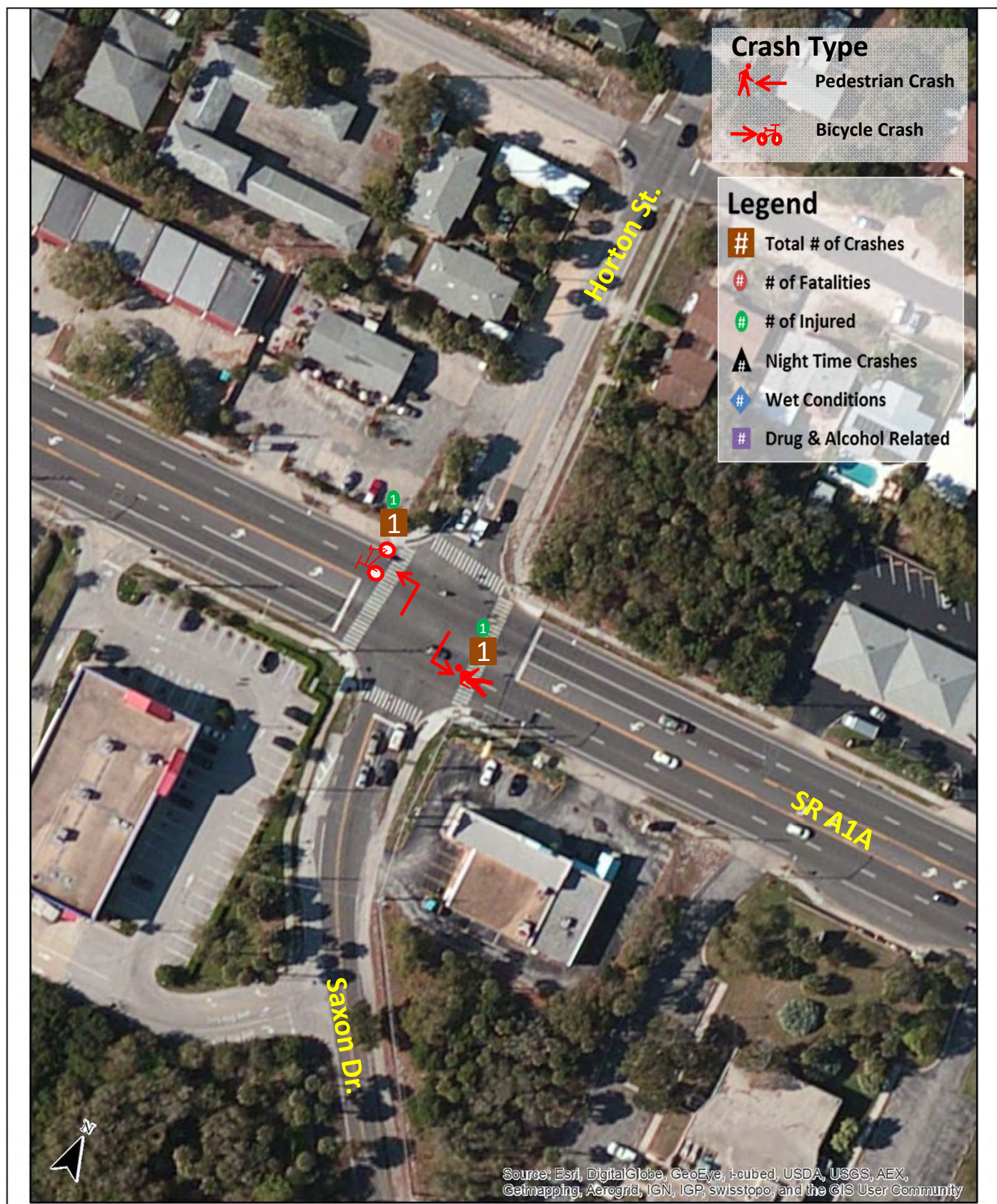
SR/CR A1A Pedestrian Safety & Mobility Study
Collision Diagram (2009 – 2014)
Location A: Outback Plaza to Cooper St.

Figure
2



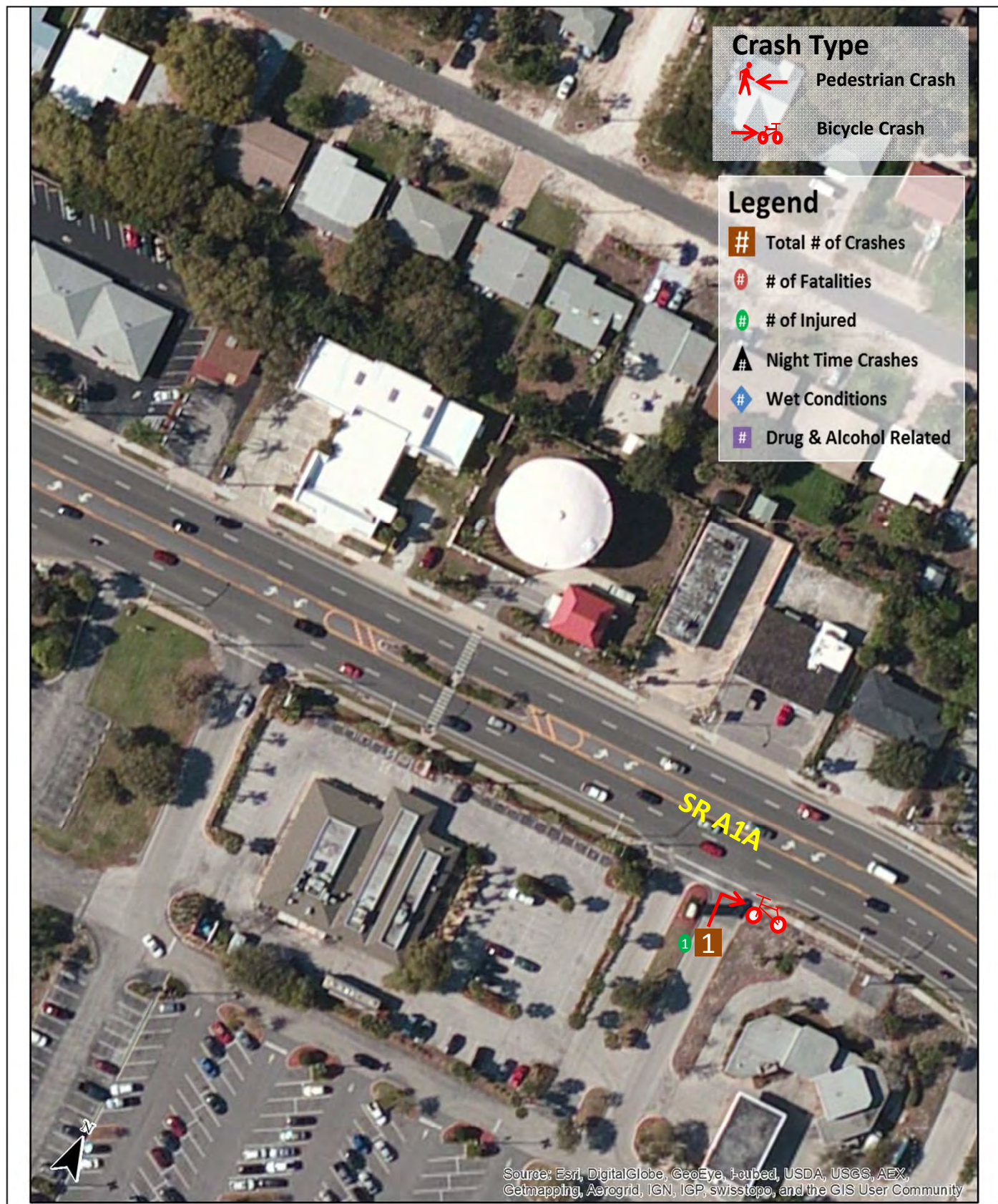
SR/CR A1A Pedestrian Safety & Mobility Study
Collision Diagram (2009 – 2014)
Location A: Cooper St. to Saxon Dr.

Figure
3



SR/CR A1A Pedestrian Safety & Mobility Study
Collision Diagram (2009 – 2014)
Location A: Saxon Dr.

Figure
4



SR/CR A1A Pedestrian Safety & Mobility Study
Collision Diagram (2009 – 2014)
Location A: Saxon Dr. to 5th Ave.

Figure
5



SR/CR A1A Pedestrian Safety & Mobility Study
Collision Diagram (2009 – 2014)
Location A: 5th Ave. to 3rd Ave.

Figure
6