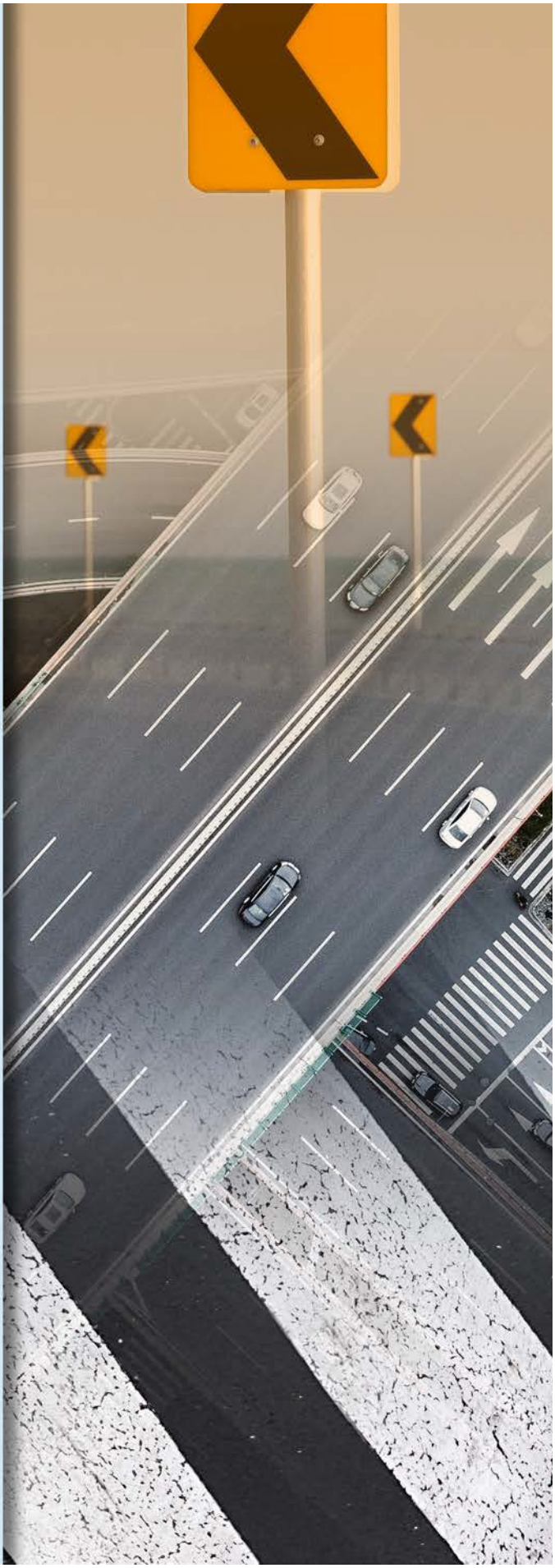
COLLIER
Metropolitan Planning Organization

Collier MPO
Local Road Safety Plan

Approved by MPO Board on May 14, 2021



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SECTION 1: EXECUTIVE SUMMARY

Introduction and Intent

Collier MPO's Local Road Safety Plan (LRSP) is a collaborative and comprehensive plan that identifies transportation safety issues and provides a framework for reducing fatalities and serious injuries on highways and local public roads. This framework is developed through data analysis and public outreach, along with the development and adoption of recommendations. The data analysis step allows for the identification of emphasis areas which represent the most critical safety concerns within Collier County. Emphasis areas are then matched with strategies and action steps for reducing roadway fatalities and serious injuries.

These strategies will be grouped under the 4 Es of safety: Engineering, Enforcement, Education, and Emergency Response.

In addition to a thorough analysis of safety issues in Collier County and development of recommended strategies, other high-level objectives of this project include the following:

- Quality Control (QC) of Collier Crash Data Management System to ensure the best quality data for development of the Plan and identification of potential areas of improvement for crash data reporting.
- Develop implementable short-term recommendations to address critical safety issues.
- Provide input to Collier MPO's 2045 Long Range Transportation Plan (LRTP) to address long-term strategies and funding needs.
- Identify ways the MPO can support FDOT's Vision Zero targets

The Collier MPO LRSP incorporates strategies currently being promoted by the Federal Highway Administration (FHWA) and Florida Department of Transportation (FDOT) and will be implemented in close coordination with these agencies, Collier MPO Member Governments, and local law enforcement.

Key Conclusions and Recommendations

Based on the data analysis conducted as part of the Collier MPO LRSP, four key emphasis areas were identified for further analysis and identification of high-crash corridors. The following crash types were identified as having a high severity ratio (constituting a greater percentage of severe crashes than all crashes) and accounting for a high overall number of severe crashes (more than 5% of total severe crashes):

- Bicycle
- Pedestrian
- Left-turn
- Angle
- Hit fixed object

Additionally, rear-end, single vehicle, head-on, and run-off-road crash types either account for a high frequency of severe crashes or have a high severity ratio. Based on similar characteristics and countermeasure profiles, these crash types can be combined to form the following Emphasis Areas:

- Non-Motorized (Bicycle and Pedestrian Crashes)
- Intersection (Left-Turn and Angle Crashes)
- Lane Departure (Hit Fixed Object, Single Vehicle, Head-On, and Run-Off-Road Crashes)
- Same Direction (Rear-End and Sideswipe Crashes)

Table 1-1 is a summary of Emphasis Area crash statistics (2014-2018) excluding private roads and interstate highways. Each emphasis area is discussed further in Section 2: including maps and tables illustrating crash concentrations and high-crash corridors for each area. [*A single crash may be counted in more than one category*.]

Table 1-1: Emphasis Area Summary

	All Crashes	Non-Motorized	Intersection	Lane Departure	Same Direction
Total Crashes	38,887	862	6,819	3,829	23,419
Injury Crashes	3,469	448	1,030	567	1,111
Total Injuries	4,719	470	1,621	747	1,492
Total Serious Injuries	928	136	326	201	187
Fatal Crashes	148	38	39	53	10
Total Fatalities	160	38	40	64	10
Severity Ratio	2.4%	15.8%	4.8%	5.2%	0.8%
Percent of All Crashes	NA	2%	18%	10%	60%
Percent of Severe Injuries	NA	15%	35%	22%	20%
Percent of Fatalities	NA	24%	25%	40%	6%

In addition to the definition of Collier MPO-specific emphasis areas, the following key conclusions help to formulate data-driven recommendations for reducing crashes, injuries, and fatalities in Collier County:

1. **Roadway Safety Relative to Florida**: Collier County has fewer crashes, traffic injuries, and traffic fatalities than Florida as a whole as a function of population and daily vehicle miles of travel (VMT).
2. **Major Roadway Focus**: As is common in many urbanized Florida communities, a significant majority of public road traffic crashes, including severe injury crashes, occur along elements of the County's arterial and collector road network.
3. **Local Autonomy:** Because Collier County has a relatively sparse network of State highways and many County-maintained roadways that carry significant traffic volume, approximately 2/3 of crashes occur along County-maintained roadways. This means Collier County has substantial agency to self-manage safety outcomes on its roadway network.
4. **Driver Demographics:** Driver age data show that older road users do not disproportionately contribute to crashes in Collier County; however, inferential time-of-day data suggest that older drivers (age 55+) also have less exposure to nighttime and rush-hour driving.
5. **Moderate Enforcement:** Fewer traffic citations per capita and per vehicle mile of travel are issued in Collier County than in Florida as a whole and within a group of similarly sized coastal counties.
6. **High Severity Emphasis Areas:** Certain crash types contribute disproportionately to incapacitating injury and fatal crashes. Collectively, non-motorized road user, angle, left-turn, and lane departure crashes account for 30% of all crashes but result in 72% of severe injuries and 89% of fatalities.
7. **High Frequency Emphasis Area:** Though significantly less likely to result in severe injury than the crash types noted above, rear-end and sideswipe crashes result in a significant number of incapacitating injuries due to their frequency.

Based on the LRSP Emphasis Areas and the summary conclusions described above, infrastructure and non-infrastructure strategies have been identified. These are summarized in Table 1-2 and 1-3 and described in detail in Section 4:.

Table 1-2: Infrastructure Strategies Matrix

Infrastructure Strategies	Non-Motorized	Intersection	Lane Departure	Same Direction
Speed Management	•	•	•	•
Alternative Intersections (ICE Process)	•	•		•
Intersection Design Best Practices for Pedestrians	•			
Median Restrictions/Access Management		•		•
Right Turn Lanes	?			•
Signal Coordination	?			•
Rural Road Strategies including:				
• Paved shoulder	•		•	
• Safety edge			•	
• Curve geometry, delineation, and warning			•	
• Bridge/culvert widening/attenuation			•	
• Guardrail/ditch regrading/tree clearing			•	
• Isolated intersection conspicuity/geometry		•		
Shared Use Pathways, Sidewalk Improvements	•			
Mid-Block Crossings & Median Refuge	•			
Intersection Lighting Enhancements	•	•	•	
Autonomous Vehicles (Longer-Term)	TBD	•	•	•

(= Applicable Strategy ? = Possible Contra-indications

Table 1-3: Non-Infrastructure Strategies Matrix

Non-Infrastructure Strategies	Intersection	Lane Departure	Non-Motorized	Rear End/ Sideswipe
Traffic Enforcement				
• **Targeted Speed Enforcement**	X	X	X	X
• **Red Light Running Enforcement**	X		X	
• **Automated Enforcement**	X			?
• **Pedestrian Safety Enforcement**			X	
Bike Light and Retroreflective Material Give-Away			X	
Young Driver Education	X	X	X	X
WalkWise/BikeSmart or Similar Campaign			X	
Continuing Education	X	X	X	X
Safety Issue Reporting	X	X	X	X
Vision Zero Policy	X	X	X	X

Plan Organization

The Collier LRSP is divided into three main sections as follows:

- **Data and Analysis:** This section includes an analysis of the County's traffic crash history, a comparison of Collier County traffic citation data with the State of Florida and with "peer" counties, and a discussion of the four emphasis areas described above. The Data and Analysis Section of the LRSP also includes "Key Conclusions" derived from the analysis of the County's traffic crash and citation data.
- **Recommendations:** This section begins with a problem statement that builds from the "Key Conclusions" part of the Data and Analysis Section. Next Recommendations related to both infrastructure and non-infrastructure strategies are presented where "infrastructure" refers to public roadway design and operations and "non-infrastructure" refers to education/marketing, law enforcement, and other strategies.
- **Implementation Plan:** The LRSP Implementation Plan shows potential processes for addressing each of the infrastructure and non-infrastructure strategies identified in the Recommendations Section of the Report. Implementation measures are categorized by timeframe (short-term, longer-term) and by order of magnitude cost. The Implementation Plan also includes recommendations for evaluating and updating the Plan.

In addition to the three main report section, the LRSP also includes the following appendices:

- **Glossary of Technical Terms (Appendix 1):** This is a glossary of technical terms used in the LRSP and is provided to make the document more legible for audiences that are not familiar with traffic engineering terms.
- **Traffic Crash Data Quality Control Technical Memorandum (Appendix 2):** As part of the LRSP, a five year history of Collier County's crash data was manually reviewed to ensure fatal and incapacitating injury crashes and non-motorized crashes were located correctly and that key data attributes were consistent with the crash report collision diagram and narrative. This appendix summarizes the methodology and findings of that process.
- **Community Survey Summary (Appendix 3):** As part of the public outreach process for the LRSP, a web-based community survey was distributed to better understand the perception and attitudes of Collier County residents and workers with respect to traffic safety. The survey questions and findings are provided in this appendix.

SECTION 2: STATISTICAL ANALYSIS

Introduction and Methodology

Introduction

A critical input into the Collier MPO LRSP is analysis of traffic crash data and other relevant quantitative data inputs. This section provides a description of the data analysis methodology and findings used to inform the Collier MPO LRSP. Key elements of this memorandum include the following:

- Analysis of countywide crash data distributions and comparison with statewide norms
- Analysis of traffic citation data for Collier County and comparisons with statewide citation data and citation data from peer counties
- Establishment of Collier MPO-specific safety emphasis areas and identification of high-crash locations based on Safety Emphasis Areas
- Key Conclusions

Methodology

The Collier MPO LRSP uses traffic crash data from the Collier County Crash Data Management System (CDMS) for the years 2014 to 2018. As described in the LRSP Crash Data Quality Control Memorandum (Appendix 2), fatal, incapacitating injury, and bicycle/pedestrian crash reports were manually reviewed and key data fields were updated to ensure accuracy.

Next, crashes that occurred in parking lots and along private roads were removed from the data sample, and those that occurred along the County's major roadway network were assigned ID numbers from the major roadway database. This was done using a spatial query in which crashes within 100 ft of a major roadway segment were assigned to that segment. Data from Collier County's Annual Update and Inventory Report (AUIR) were then used to understand crash data distributions in the context of roadway system vehicle miles of travel (VMT), roadway characteristics, and other factors.

To evaluate traffic citations, data were collected from Florida Department of Highway Safety and Motor Vehicles (DHSMV) crash and citation reports and statistics web page. Data from Collier County, the State of Florida, and similar-size coastal counties were downloaded as Excel spreadsheets and compared.

A Glossary of Terms used in this section is provided as Appendix 1. Appendix 3 provides an overview of a public outreach survey that was disseminated by the Collier MPO to help understand public perceptions of traffic safety in Collier County.

Crash Data Analysis

This section of the LRSP Statistical Analysis summarizes the following traffic crash data distributions:

- Comparison of State and County Crash Rates

- Roadway Functional Class
- Major Roadway Maintenance Authority
- Major Roadway Number of Lanes
- Area Type (Urban/Rural)
- Lighting Condition
- Crash Type
- (At Fault) Driver Age
- Temporal Trends (Annual and Monthly)

State of Florida Crash Rate Comparison

Using data from FLHSMV (for consistency) the average number of reported crashes, fatalities, and injuries from the State of Florida and Collier County are shown in Table 2-1. These crash totals are represented as crash rates as a function of millions of daily vehicle miles of travel (DVMT) and as a function of 100,000 persons. The data shows that Collier County has fewer crashes and traffic fatalities and injuries than the State of Florida in terms of both population and vehicle miles of travel.

Table 2-1: Comparison of Collier County to State Average

	Florida	Collier County	Collier/State Average
Crashes	383,862	4,962	NA
Fatalities	2,972	38	NA
Injuries	242,709	2,829	NA
Daily VMT	582,491,060	9,939,709	2%
Crashes/m DVMT	659	499	24% lower
Fatalities/mDVMT	5.1	3.8	25% lower
Injuries/mDVMT	417	285	32% lower
Population	20,159,183	351,121	NA
Crashes/100k Pop.	1,904	1,413	26% lower
Fatalities/100k Pop.	15	11	27% lower
Injuries/100k Pop.	1,204	806	33% lower

Crash Distribution by Roadway Functional Class

Using the location data for each traffic crash report and a GIS layer representing Collier County's major road network (arterial and collector roads), all Collier County crashes for 2014–2018 were either assigned to a major roadway segment or classified as a local roadway crash. Figure 2-1 shows the distribution of all crashes and severe crashes in Collier County. Approximately 3/4 of crashes occurred along the County's major signalized arterial and collector road network, with fewer than 10% occurring along I-75 and fewer than 20% occurring along local streets.

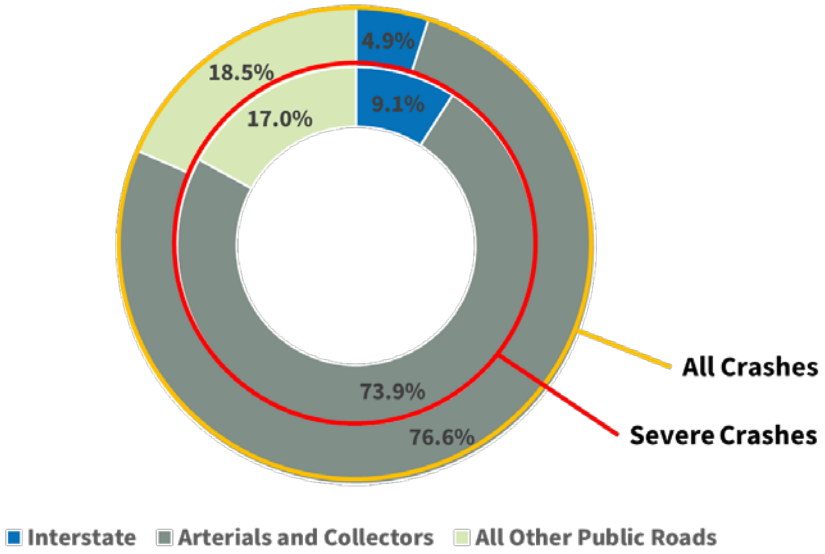


Figure 2-1: Crashes by Roadway Functional Classification

To put this data into context, Table 2-2 show how automobile traffic is distributed across Collier County's roadway network as compared with roadways statewide. The table shows that proportionally fewer vehicle miles of travel (VMT) in Collier County is handled by limited access highways (interstate, turnpike, etc.) while a greater share of VMT is handled by arterial roads and major collector roadways. These types of roadways tend have a higher number of reported crashes per VMT than limited access highways or lower-speed minor collectors and local roads.

Table 2-2: VMT Distribution of Collier County and Florida by Functional Classification

Roadway Functional Classification	Florida		Collier		Crash Characteristics
Interstate, Turnpike & Freeways	26%		21%		Limited Access, Low Crashes/VMT
Other Principle Arterials	25%	50%	16%	59%	Higher Speed, More Conflict Points
Minor Arterials	15%		29%		
Major Collectors	11%		14%		
Minor Collectors	2%	23%	2%	20%	Lower Speed, Less Severe Crashes
Locals	21%		18%		

Crash Distribution of Major Roadway Crashes by Maintenance Authority

To understand how Collier County, the Florida Department of Transportation (FDOT), and the cities of Naples and Marco Island each contribute to managing safety along the County's road network, it is useful to look at how crashes are distributed based on roadway ownership/maintenance responsibility. Figure 2-2 shows the distribution of all crashes, severe crashes, and vehicle miles of travel along the county's major roadway network excluding I-75.

The percentage of all crashes and severe crashes is more or less proportional to each maintenance jurisdictions' overall VMT, with a slightly higher proportion of severe crashes occurring along State roads compared with County-maintained roads. In more metropolitan areas of Florida, there is a

denser grid of State-maintained arterial roads than in Collier County. Accordingly, up to half of VMT and half of all crashes in those jurisdictions occur on the State Highway System (SHS). In Collier County, County-maintained major roadways that look and function like State highways carry a greater share of the load and therefore account for a more significant proportion of crashes.

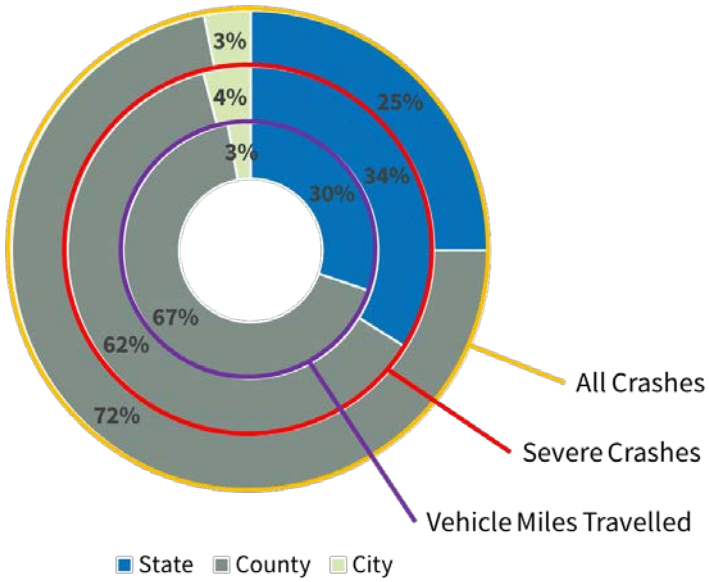


Figure 2-2: Crash Distribution by Major Roadway Maintenance Authority

Crash Distribution of Major Roadway Number of Lanes

Another way to understand Collier County's crash history, especially when comparing concentrations of severe crashes, is to look at the distribution of crashes by the number of roadway lanes along the major roadway network (excluding I-75). Referring to the inner ring of Figure 2-3, roadways with six or more lanes account for half of arterial and collector roadway VMT and overall crashes but only 38% of severe crashes. Conversely, two-lane roadways account for 31% of VMT but 41% of severe crashes.

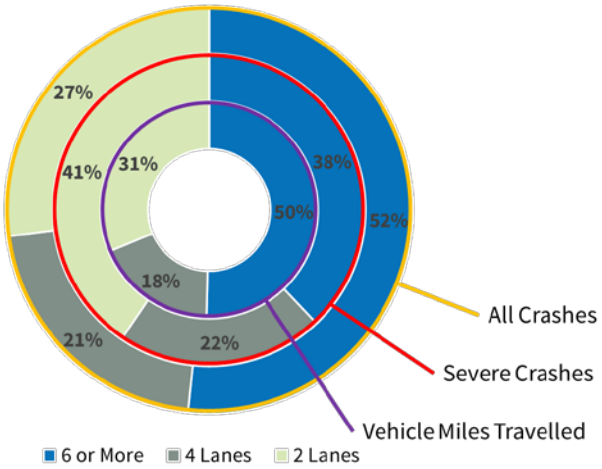


Figure 2-3: Crash Distribution by Major Roadway Number of Lanes

Crash Distribution by Area Type

The proportion of all crashes, severe crashes, and VMT was also compared for the western, more urban part of the county and the eastern, more rural part of the county using CR-951/Collier Boulevard as an approximate meridian. Including travel on I-75, approximately 60% of all VMT occurs on major roadways to the west of and including CR-951, and these roadways account for nearly 3/4 of all crashes and about 57% of severe crashes.

Roadways in the eastern, more rural part of the county account for proportionally fewer crashes overall but a somewhat higher proportion of severe crashes compared with VMT. These data, combined with the prior analysis of crash severity by number of lanes, indicate a potential issue with rural highway safety, including a potential for single-vehicle (lane departure) crashes.

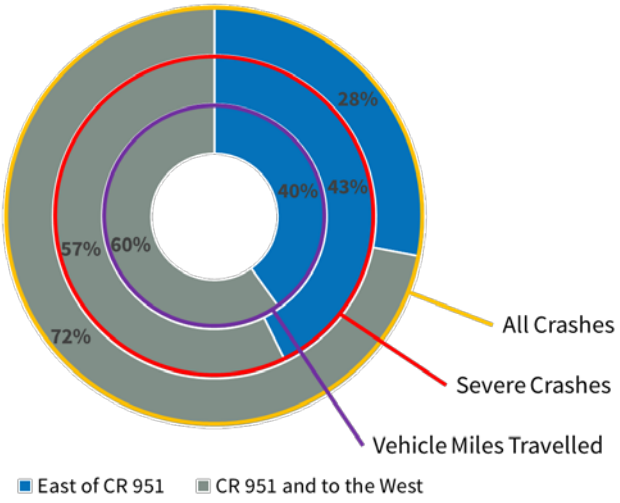


Figure 2-4: Major Roadway Crashes by Sub-Area

Crash Distribution by Lighting Condition

In addition to the roadway characteristics of the County's crash history, it is also helpful to understand key environmental conditions. One of the most useful of these is the lighting conditions in which crashes occurred. Because crash report coding of lighting condition does not always reflect whether nighttime lighting is functionally adequate (i.e., meets applicable AASHTO or FDOT standards), it is better to focus on whether crashes occurred during daylight or non-daylight conditions as a primary indicator while considering the specific non-daylight conditions as a secondary measure.

The chart on the left of Figure 2-5 compares the observed lighting condition of all crashes and severe crashes, and the chart on the right shows a comparison of all non-motorized crashes, severe non-motorized crashes and all crashes. The overall percentage of non-daylight crashes (22%) is about typical for Florida (25%). These data also show that severe crashes are more likely to occur outside of daylight hours for both motorized and non-motorized crashes.

The preponderance of severe non-motorized crashes during non-daylight hours is also a common finding statewide and nationally and reflects the fact that driver ability to observe, react, and respond to non-motorized users in the roadway is drastically diminished at night due to the frequent lack of adequate running lights on bicycles or use of retroreflective clothing by cyclists and pedestrians.

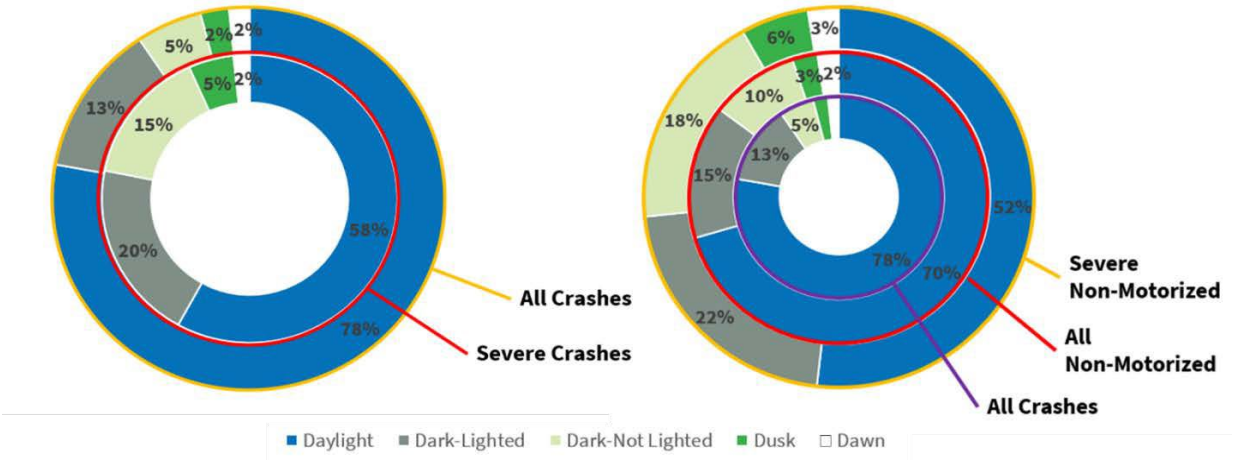


Figure 2-5: Lighting Conditions

Crash Type Distribution

A critical way of looking at Collier County's crash history is to understand what types of crashes occur most frequently and what types result in the most incapacitating injuries and fatalities. **Figure 2-6** shows all crashes ranked by crash type and the percentage of severe crashes for each. These data show that rear-end crashes are the most common overall crash type (nearly 50%) and result in the highest overall number of severe crashes, but the relative severity of rear-end crashes is lower than many other crash types.

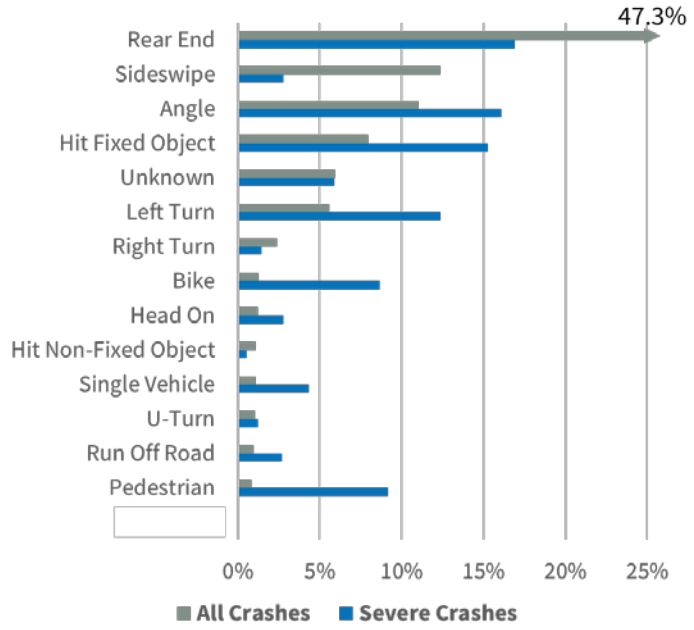


Figure 2-6: Crash Type Distribution

Table 2-3 shows crash type and severity data shown in Figure 2-7 presented as a two-by-two matrix. The top left quadrant represents crash types that have a high severity ratio (account for a greater percentage of severe crashes than overall crashes) and also a high absolute number of severe crashes (account for more than 5% of all severe crashes). This quadrant is the most important strategically since eliminating a relatively small percentage of overall crashes can have a relatively large effect in reducing life-altering injuries and fatalities.

Table 2-3: Crash Type and Severity Matrix

	High Severity Ratio	Low Severity Ratio
High Severity Frequency (> 5% of All Severe Crashes)	Bike Pedestrian Left-Turn Angle Hit Fixed Object	Rear-End Unknown/Other
Low Severity Frequency (<5% of All Severe Crashes)	Head-On Single Vehicle U-Turn Run Off Road	Sideswipe Right-Turn Hit Non-Fixed Object

Driver Age

In addition to understanding where and how crashes occur in Collier County, it is also useful to consider demographic information about the people involved in crashes. Figure 2-7 shows the relative contribution of different age drivers to crashes countywide and also shows the extent to which each age bracket contributes to the County's overall population. These data indicate that young drivers are more likely to be cited as "at fault" in crashes both in absolute terms and in proportion to their representation in the County's population.

Although it is common to find that younger drivers are at a greater risk of being involved in a crash, it is unusual to find that middle-age adult drivers are over-represented compared to older drivers. To understand these data better, crash time-of-day data were compared to at-fault driver age for drivers ages 54 and younger and 55 and up. Figure 2-7 confirms that some of the difference between older and younger driver risk is related to time of day.

Across all time periods, drivers age 54 and younger account for 70% of all crashes, and drivers age 55 and older account for the remaining 30% of all crashes. Accordingly, the younger age group is over-represented in late-night crashes and also during morning and afternoon rush hours and in the evening. Conversely, older drivers very rarely are at fault in late-night crashes but are over-represented during the midday period.

Although not definitive proof, these data imply that part of the lower risks attributed to older drivers is that they are less likely to drive at night and may also avoid driving during the most congested times of day.

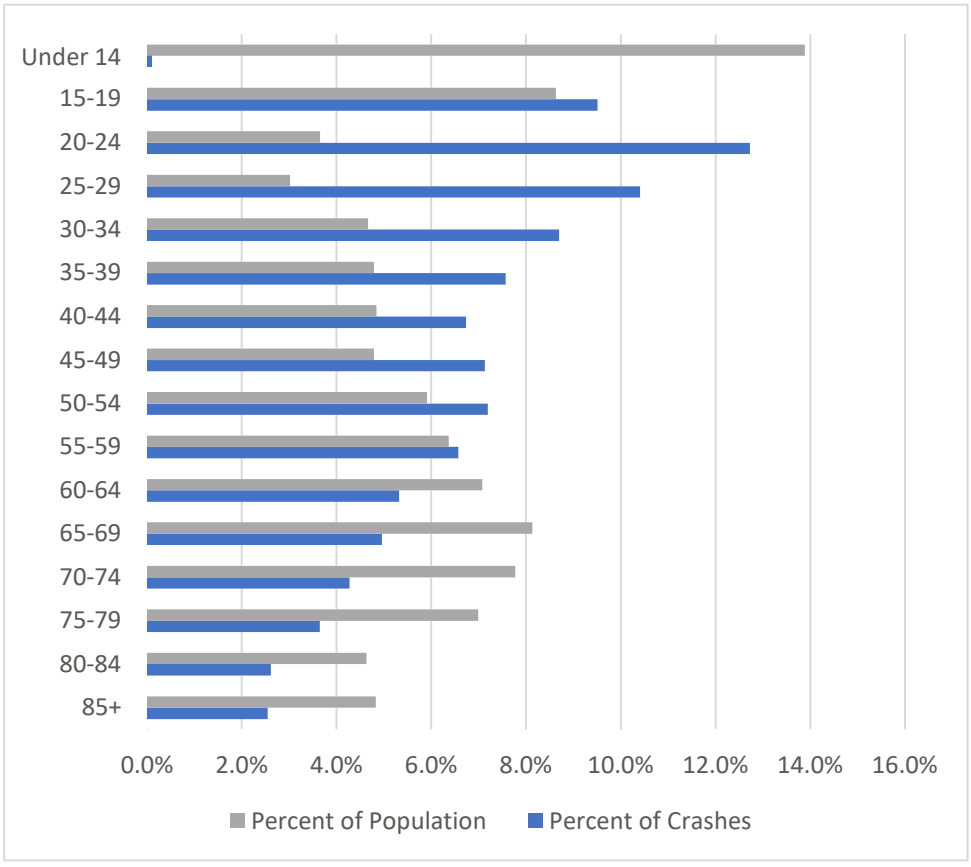


Figure 2-7: At Fault Driver Age

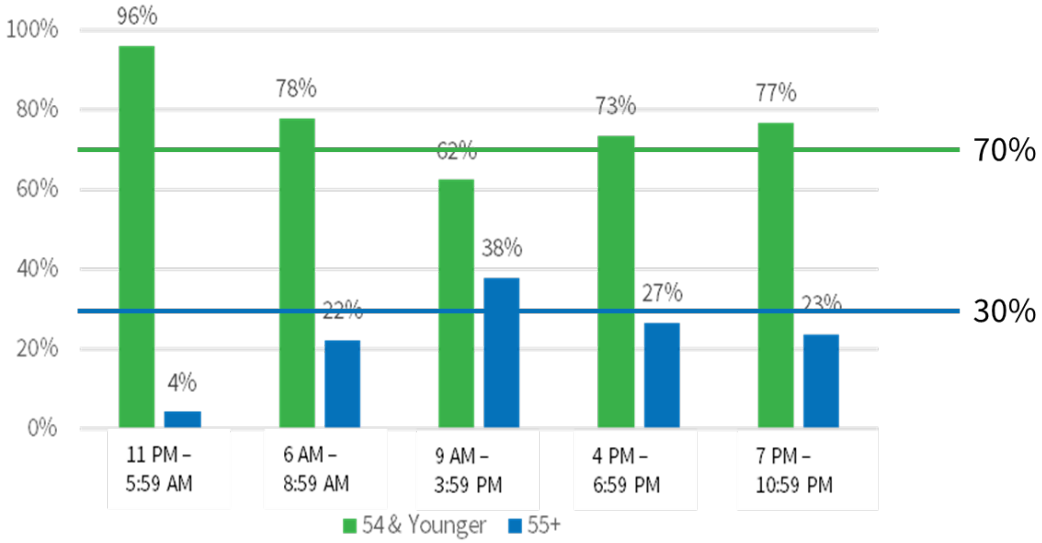


Figure 2-8: Crash Distribution for Age 54 and Younger vs. Age 55 and Older

Temporal Trends

Figure 2-9 shows annual crash frequencies for crashes in Collier County for 2014–2018. Reported crashes ranged from a low of approximately 7,600 crashes in 2014 to a high of nearly 9,000 crashes in 2016. Nominally, the trend in crash frequency is increasing by about 130 crashes per year; however, the year-over-year data are somewhat erratic, resulting in a low R2 value of about 0.20.

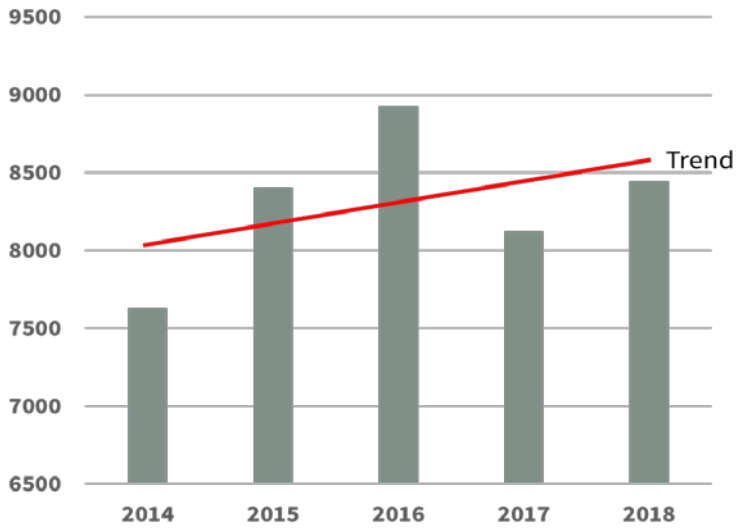


Figure 2-9: Crash Trend, 2014–2018

Figure 2-10 shows average monthly crash frequencies Collier County for 2014–2018. Over this period, there was an average of approximately 700 reported crashes per month, with a monthly distribution that generally reflects the overall seasonal traffic patterns exhibited in Collier County.

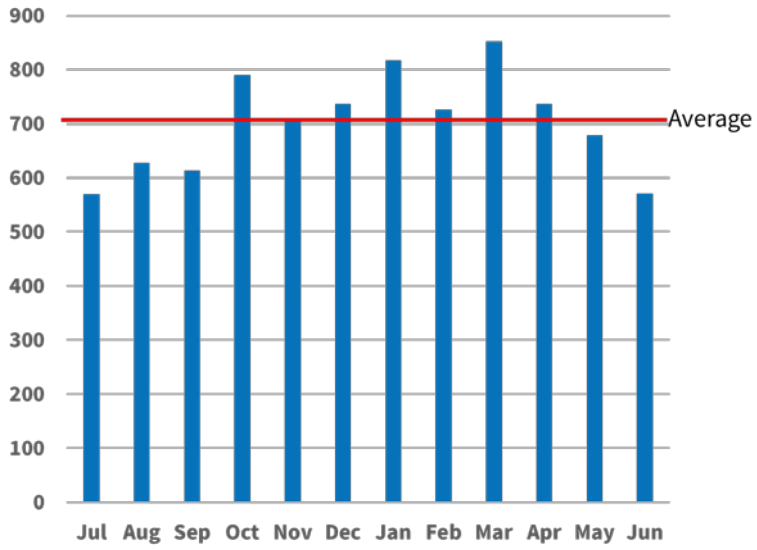


Figure 2-10: Average Crashes per Month

Traffic Citation Analysis

Traffic citation data are another lens through which to analyze traffic safety in Collier County. For the LRSP, citation data for 2014–2018 were obtained from the Florida Department of Highway Safety and Motor Vehicles (DHSMV) for Collier County, the State of Florida, and several "peer" counties.

Figure 2-6 shows the most common moving violations recorded in Collier County. "Exceeding the Posted Speed" (speeding) accounts for more than half of all moving violations, followed by "Disregard Traffic Control Device" (e.g., ran stop sign or yield sign) and "Disregard Traffic Signal" (ran red light).

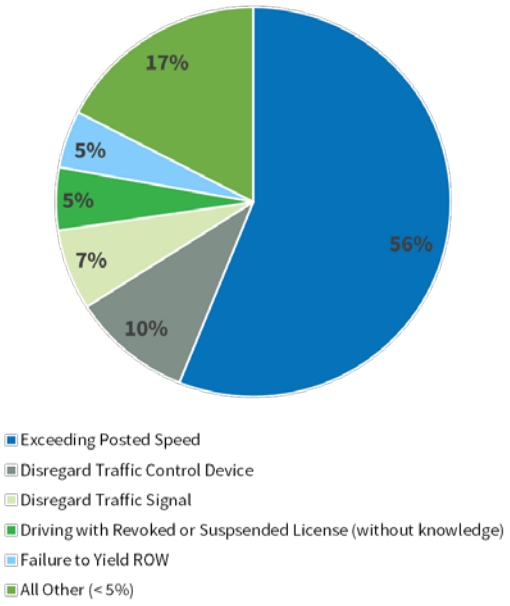


Figure 2-6: Most Common Collier County Moving Violations

Figure 2-7 shows the distribution of traffic citations by issuing agency for Collier County. These data indicate that the Collier County Sheriff's Office accounts for about 45% of all traffic citations, followed by the Florida Highway Patrol at 39%. Naples and Marco Island collectively issue about 15% of the citations countywide.

Table 2-3 compares traffic citation activity in Collier County with similarly sized coastal Florida counties and Florida overall. These data suggest that Collier County law enforcement agencies issue fewer citations on average than the State of Florida and most peer counties in terms of both citations per capita and citations per vehicle miles of travel.

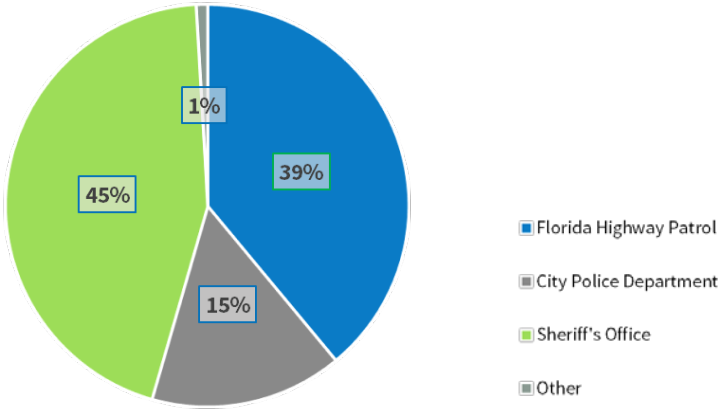


Figure 2-7: Traffic Citation by Law Enforcement Agency (LEA)

Table 2-3: Traffic Citations per Capita and per VMT Comparison

State and County	Violations (2014–18)	Total VMT (2014–18)	Citations per 100K VMT	Population	Citations per 100K Pop.
Florida	1,978,741	582,491,060	340	20,159,183	9,816
Collier	22,136	9,939,709	223	351,121	6,304
Brevard	29,592	17,784,554	166	568,367	5,206
Escambia	24,176	9,657,445	250	310,556	7,785
Lee	83,614	20,667,894	405	682,448	12,252
Manatee	23,208	10,038,803	231	358,616	6,472
Sarasota	33,880	12,052,890	281	400,694	8,455

Table 2-5 shows the types of criminal, non-criminal (moving), and non-moving traffic violations in Collier County compared with Florida. Generally, high-frequency citation types in Collier County align with those issued statewide; however, the following exceptions are noteworthy:

- Collier County issues a lower percentage of citations for driving with a suspended or revoked driver's license. This may be due, in part, to the relative affluence of Collier County compared with Florida.
- Collier County does not have red-light running cameras. These account for approximately 15% of moving violations statewide.

Table 2-4: Traffic Citations (State Totals vs. Collier County) Collier LRSP Emphasis Areas

COLLIER COUNTY			STATE TOTALS		
Infraction	**Average Annual Citations**	**Percent of Annual Citations**	**Infraction**	**Average Annual Citations**	**Percent of Annual Citations**
CRIMINAL					
DR/DL/Sus/RV	1,287	25%	DR/DL/SUS/RV	149,717	37%
No/Imp/Expired Driver's License	1,243	24%	No/Imp/Expired Driver's License	87,385	22%
DUI	1,173	23%	DUI	45,791	11%
Other Crime	349	7%	Other Crime	36,220	9%
No/Imp/Exp. Tag	240	5%	No/Imp/Exp. Tag	20,857	5%
All Other (< 5%)	400	9%	All Other (<5%)	30,648	8%
NON-CRIMINAL (MOVING)					
Exceeding Posted Speed	12,428	56%	Exceeding Posted Speed	746,886	38%
Disregard Traffic Control Device	2,182	10%	Disregard Traffic Control Device	302,601	15%
Disregard Traffic Signal	1,480	7%	Disregard Traffic Signal	203,096	10%
Driving with Revoked or Suspended License (w/o knowledge)	1,154	5%	Driving with Revoked or Suspended License (w/o knowledge)	116,733	6%
Failure to Yield ROW	1,053	5%	Failure to Yield ROW	93,217	5%
All Other (< 5%)	3,850	17%	All Other (<5%)	516,207	26%
NON-MOVING INFRACTIONS					
Exp/Fail Display Tag	2,637	25%	Exp/Fail/ Display Tag	253,969	28%
No Proof of Insurance	2,518	24%	No Proof of Insurance	215,538	24%
Seat Belt Viol	2,215	21%	Seat Belt Viol	159,253	18%
Other	1,185	11%	Other	81,346	9%
Exp/Fail Display DL	1,097	10%	Exp/Fail Disp DL	67,964	8%
Def/Unsafe Equip	536	5%	Def/Unsafe Equip	63,465	7%
All Other (<5%)	199	2%	All Other (<5%)	30,158	3%

Based on the data analysis described, four key Collier MPO LRSP emphasis areas were identified for further analysis and identification of high-crash corridors. The following crash types were identified as having a high severity ratio (constituting a greater percentage of severe crashes than all crashes) and accounting for a high overall number of severe crashes (more than 5% of total severe crashes):

- Bicycle
- Pedestrian
- Left-turn
- Angle
- Hit fixed object

Additionally, rear-end, single vehicle, head-on, and run-off-road crash types either account for a high frequency of severe crashes or have a high severity ratio. Based on similar characteristics and countermeasure profiles, these crash types can be combined to form the following Emphasis Areas:

1. Non-Motorized (Bicycle and Pedestrian Crashes)
2. Intersection (Left-Turn and Angle Crashes)
3. Lane Departure (Hit Fixed Object, Single Vehicle, Head-On, and Run-Off-Road Crashes)
4. Same Direction (Rear-End and Sideswipe Crashes)

Table 2-5 is a summary of Emphasis Area crash statistics excluding private roads and interstate highways. Each emphasis area is discussed further in this section, including a summary of high-crash corridors and a "heat map" showing crash concentrations for each emphasis areas. Because much of Collier County is undeveloped, the maps focus on the western, urban part of the county and the area around Immokalee and Marco Island.

Table 2-5: Emphasis Area Summary

	All Crashes	Non-Motorized	Intersection	Lane Departure	Same Direction
Total Crashes	38,887	862	6,819	3,829	23,419
Injury Crashes	3,469	448	1,030	567	1,111
Total Injuries	4,719	470	1,621	747	1,492
Total Serious Injuries	928	136	326	201	187
Fatal Crashes	148	38	39	53	10
Total Fatalities	160	38	40	64	10
Severity Ratio	2.4%	15.8%	4.8%	5.2%	0.8%
Percent of All Crashes	NA	2%	18%	10%	60%
Percent of Severe Injuries	NA	15%	35%	22%	20%
Percent of Fatalities	NA	24%	25%	40%	6%

Emphasis Area 1: Non-Motorized Crashes

Non-motorized crashes (crashes in which a pedestrian or bicyclist are involved) are a statewide Emphasis Area and an important component of traffic safety challenges in Collier County. These crashes account for only 2% of all reported crashes in Collier County but constitute 15% of the county's severe injury crashes and 24% of the county's crash fatalities.

Table 2-6 shows a list of major roadway corridors with the most non-motorized crashes, and Figure 2-8 is a "heat map" of non-motorized user crashes. Consistent with prior Collier MPO bicycle/pedestrian safety analyses, key focus areas include the area defined by US-41 (Tamiami Trail), Airport Road, and Davis Boulevard and SR-29 through Immokalee. Other critical corridors are listed in Table 2-7 and highlighted in Figure 2-9.

Table 2-6: Non-Motorized High Crash Corridors 2014-2018

On Street	From Street	To Street	Crashes	Fatal Crashes	Incap. Injury Crashes
Airport Rd	US-41 (Tamiami Trail)	Davis Blvd	31	2	3
Tamiami Trail E	Davis Blvd	Airport Rd	24	2	2
Tamiami Trail N	Vanderbilt Beach Rd	Immokalee Rd	22	1	0
SR 29	1st St	9th St	21	1	4
Bayshore Dr	Thomasson Dr	US-41 (Tamiami Trail)	20	0	3
Radio Rd	Livingston Rd	Santa Barbara Blvd	20	0	2
SR 29	9th St	Immokalee Dr	19	0	5
Tamiami Trail E	Airport Rd	Rattlesnake Hammock Rd	19	0	2
Collier Blvd	Vanderbilt Beach Rd	Immokalee Rd	16	0	1
Lake Trafford Rd	Carson Rd	SR-29	16	1	3
Immokalee Rd	Stockade Rd	SR-29	15	0	2
Davis Blvd	Lakewood Blvd	County Barn Rd	14	0	2
SR-29	Immokalee Dr	CR-29A North	14	1	2
Airport Rd	Davis Blvd	North Rd	13	0	2
Airport Rd	Radio Rd	Golden Gate Pkwy	13	0	1

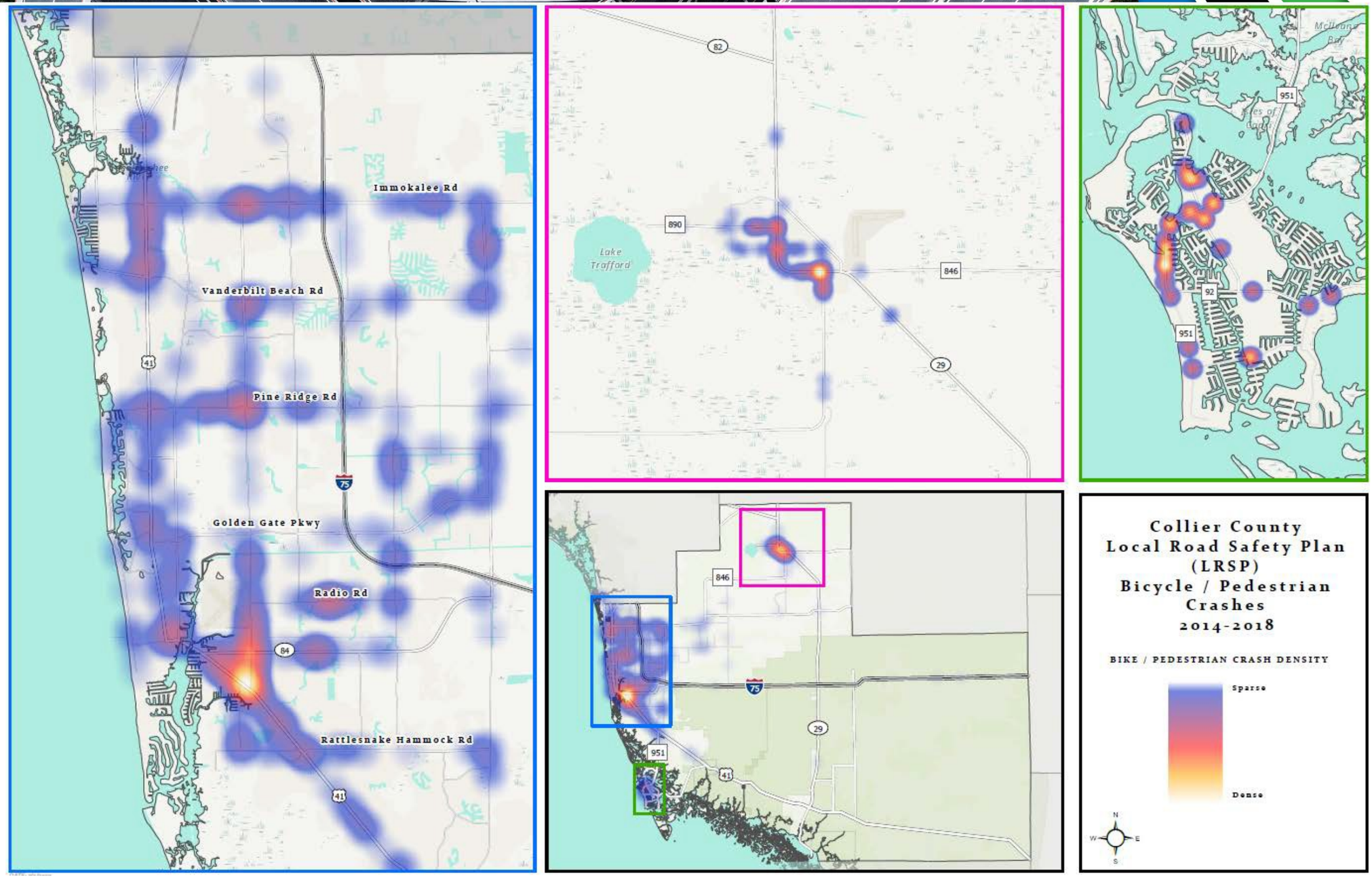


Figure 2-8: Non-Motorized Crash Heat Map

Emphasis Area 2: Intersection Crashes (Angle and Left-Turn)

Angle and left-turn crashes involve either two motor vehicles traveling at roughly perpendicular directions or a motor vehicle making a left turn across the path of an oncoming vehicle. Because these crashes are often extremely violent, high-energy events, they are more likely to result in incapacitating or fatal injuries than crashes in which vehicles are traveling in the same direction. These crashes account for only 18% of all crashes but 35% of severe injuries and 25% of fatalities.

Table 2-7 shows a list of major roadway corridors with the most angle and left turn crashes based on the data mapped in Figure 2-9. Many of the high-crash corridors include one or more high-volume arterial intersections; however, some corridors, including Golden Gate Parkway (Santa Barbara Blvd. to Collier Blvd.) include crash concentrations associated with lower-volume intersections.

Table 2-7: Intersection (Angle and Left-Turn) High-Crash Corridors 2014-2018

On Street	From Street	To Street	Crashes	Fatal Crashes	Incap. Injury Crashes
Golden Gate Pkwy	Santa Barbara Blvd	Collier Blvd	190	0	4
Tamiami Trail N	SR-84 (Davis Blvd)	CR-851 (Goodlette Rd S)	136	0	1
Collier Blvd	Golden Gate Pkwy	Green Blvd	111	1	4
Tamiami Trail N	12th Ave	Park Shore Dr/ Cypress Woods Dr	106	0	4
Goodlette-Frank Rd	US-41 (Tamiami Trail)	Golden Gate Pkwy	87	0	3
Tamiami Trail N	Park Shore Dr/ Cypress Woods Dr	Pine Ridge Rd/ Seagate Dr	84	1	2
Santa Barbara Blvd	Golden Gate Pkwy	Green Blvd	82	0	1
Airport Rd	Radio Rd	Golden Gate Pkwy	81	1	1
Airport Rd	Pine Ridge Rd	Orange Blossom Dr	74	2	1
Goodlette-Frank Rd	Golden Gate Pkwy	Pine Ridge Rd	74	0	4
Pine Ridge Rd	Airport Rd	Livingston Rd	73	0	2
Collier Blvd	Vanderbilt Beach Rd	Immokalee Rd	67	0	4
SR-29	9th St	Immokalee Dr	67	0	2
Tamiami Trail N	Pine Ridge Rd/ Seagate Dr	Gulf Park Dr	65	1	4
Tamiami Trail E	Airport Rd	Rattlesnake Hammock Rd	63	1	2

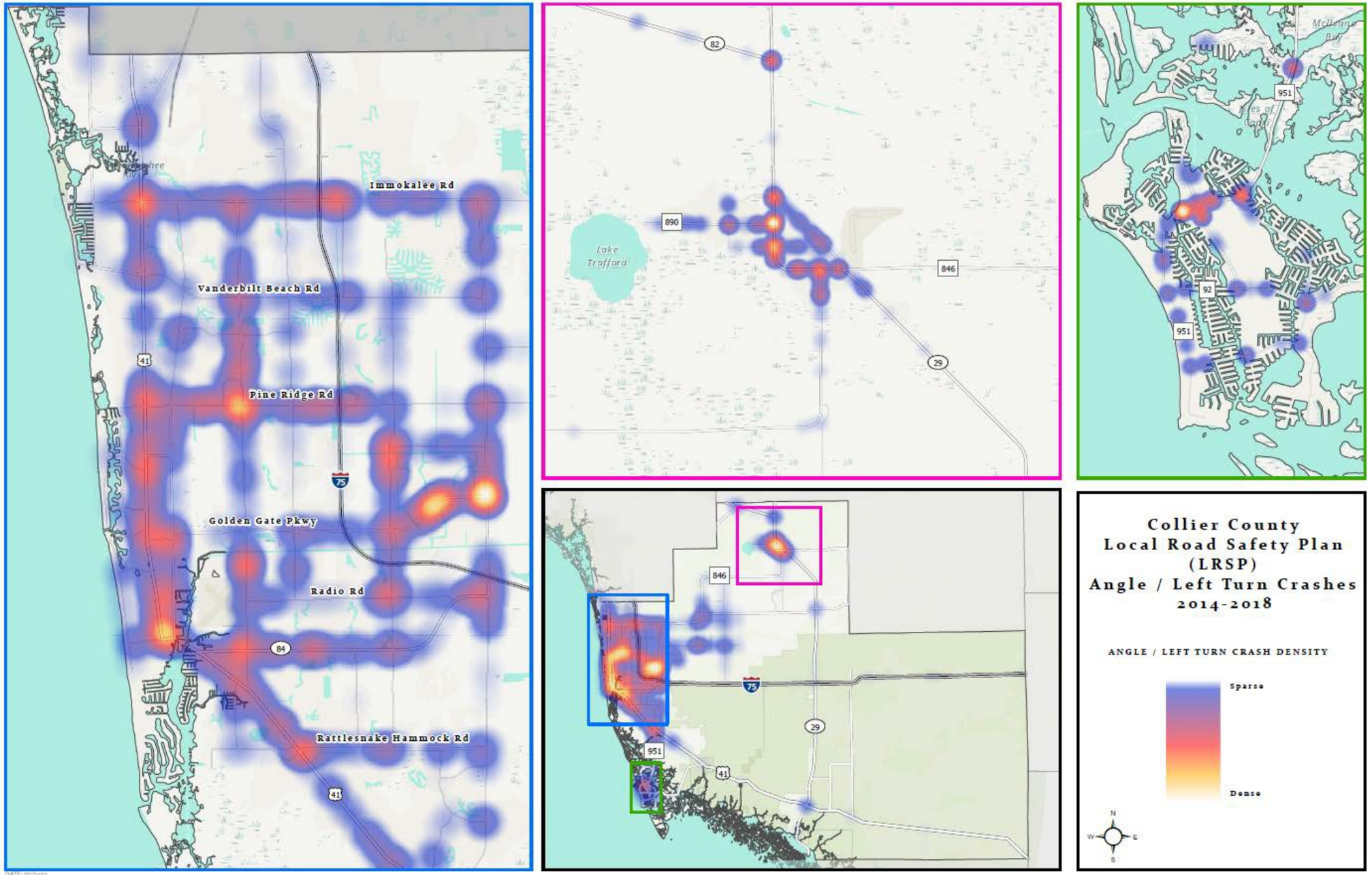


Figure 2-9: Angle and Left Turn Crash Heat Map

Emphasis Area 3: Lane Departure

Lane departure crashes, referred to as "run-off-road" crashes, include crash types in which a single vehicle leaves the roadway and either strikes a fixed object or otherwise crashes. Head-on crashes, though rare events, are included in this Emphasis Area as they are precipitated by similar circumstances. Because these types of crashes often involve vehicles traveling at high speeds, they are more likely to have severe outcomes. In Collier County, roadway departure crashes account for only 10% of overall crashes but are responsible for 22% of severe injuries and 40% of fatalities.

Table 2-8 shows a list of major roadway corridors with the most lane departure crashes and Figure 2-10 shows a "heat map" of non-motorized user crashes. While more lane departure crashes occur in the along busier roadways west of and including Collier Boulevard, approximately 40% of these crashes occur along rural highways and local roadways in the eastern part of Collier County.

Table 2-8: Lane Departure High Crash Corridors 2014-2018

On Street	From Street	To Street	Crashes	Fatal Crashes	Incap. Injury Crashes
Immokalee Rd	Collier Blvd	Wilson Blvd	51	1	3
Immokalee Rd	Oil Well Rd	Stockade Rd	45	0	4
Golden Gate Blvd	Collier Blvd	Wilson Blvd	43	0	2
Airport Rd	Radio Rd	Golden Gate Pkwy	39	0	1
Airport Rd	Pine Ridge Rd	Orange Blossom Drive	35	0	1
Goodlette-Frank Rd	US-41 (Tamiami Trail)	Golden Gate Pkwy	35	0	1
Collier Blvd	Vanderbilt Beach Rd	Immokalee Rd	33	0	2
Tamiami Trail N	12th Ave	Park Shore Dr/ Cypress Woods Dr	33	0	0
Tamiami Trail N	SR-84 (Davis Blvd)	CR-851 (Goodlette Rd S)	33	0	0
Collier Blvd	US-41 (Tamiami Trail)	Rattlesnake Hammock Rd	32	0	2
Collier Blvd	Rattlesnake Hammock Rd	Davis Blvd	31	0	2
Collier Blvd	Mainsail Drive	Manatee Rd	29	0	0
Tamiami Trail E	Rattlesnake Hammock Rd	Treetops Dr	29	0	2
Vanderbilt Beach Rd	Logan Blvd	Collier Blvd	28	0	1
Pine Ridge Rd	Airport Rd	Livingston Rd	28	0	1

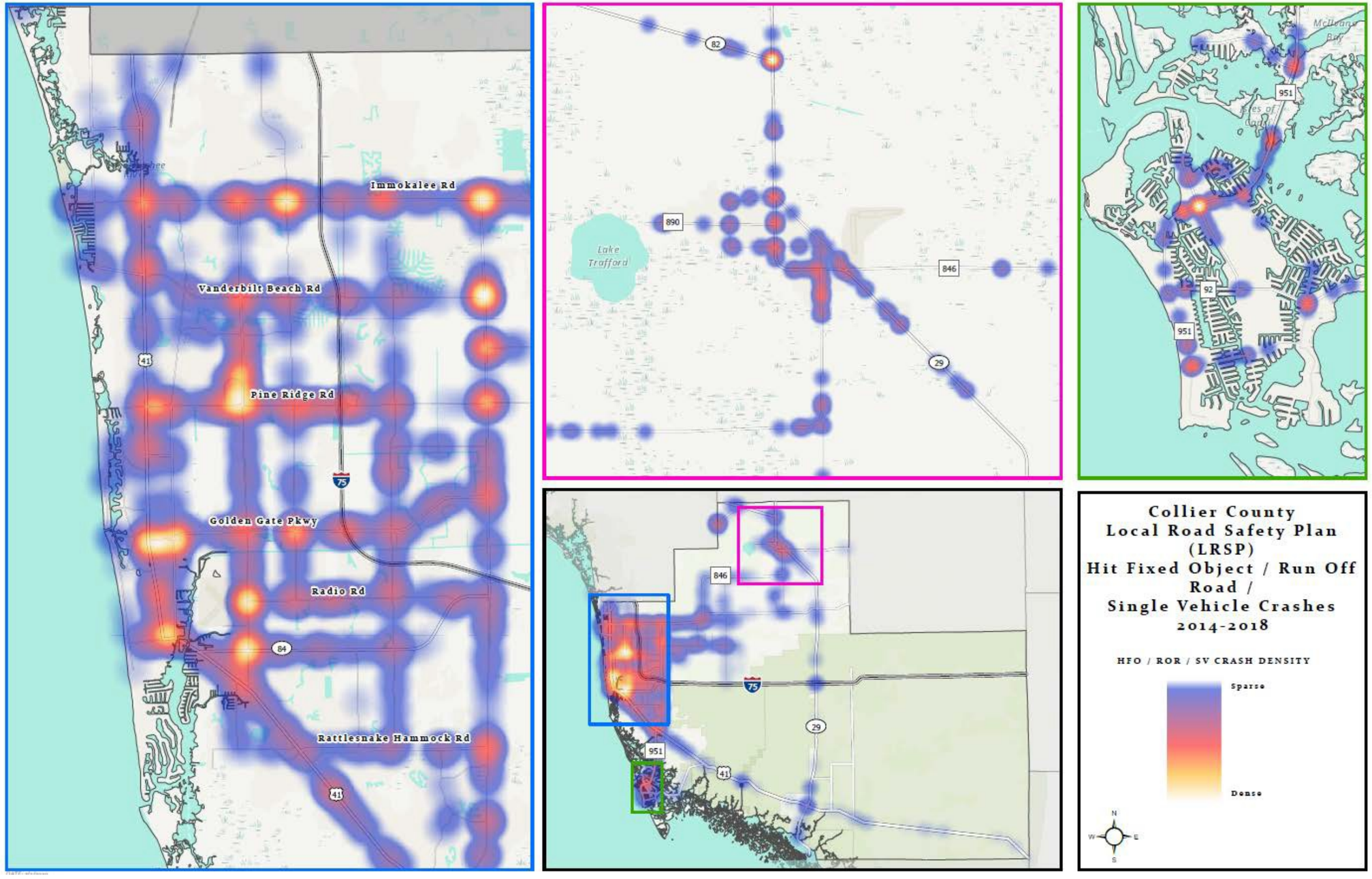


Figure 2-10: Lane Departure Crash Heat Map

Emphasis Area 4: Same Direction (Rear-End and Sideswipe) Crashes

Rear-end and sideswipe crashes are much less likely to result in incapacitating or fatal injuries than crash types included in the other three emphasis areas; however, these crashes are the most common type of crash to occur and contribute to injuries and deaths as a function of their frequency.

Table 2-9 shows a list of major roadway corridors with the most non-motorized crashes and Figure 2-11 shows a "heat map" of non-motorized user crashes. Consistent with prior Collier MPO Bicycle/Pedestrian safety analyses, key focus areas include the area defined by US 41 (Tamiami Trail), Airport Road, and Davis Boulevard and SR 29 through the town of Immokalee.

Table 2-9: Same Direction High Crash Corridors 2014-2018

On Street	From Street	To Street	Crashes	Fatal Crashes	Incap. Injury Crashes
Golden Gate Parkway	Santa Barbara Boulevard	Collier Boulevard	190	0	4
Tamiami Trail North	SR 84 (Davis Blvd)	CR 851 (Goodlette Rd South)	136	0	1
Collier Boulevard	Golden Gate Pkwy	Green Boulevard	111	1	4
Tamiami Trail North	12th Ave	Park Shore Dr / Cypress Woods Dr	106	0	4
Goodlette-Frank Road	US 41 (Tamiami Trail)	Golden Gate Parkway	87	0	3
Tamiami Trail North	Park Shore Dr / Cypress Woods Dr	Pine Ridge Rd / Seagate Dr	84	1	2
Santa Barbara Boulevard	Golden Gate Parkway	Green Boulevard	82	0	1
Airport Road	Radio Road	Golden Gate Parkway	81	1	1
Airport Road	Pine Ridge Road	Orange Blossom Drive	74	2	1
Goodlette-Frank Road	Golden Gate Parkway	Pine Ridge Road	74	0	4
Pine Ridge Road	Airport Road	Livingston Road	73	0	2
Collier Boulevard	Vanderbilt Beach Road	Immokalee Road	67	0	4
SR 29	9th Street	Immokalee Dr	67	0	2
Tamiami Trail North	Pine Ridge Rd / Seagate Dr	Gulf Park Drive	65	1	4
Tamiami Trail East	Airport Road	Rattlesnake Hammock Road	63	1	2

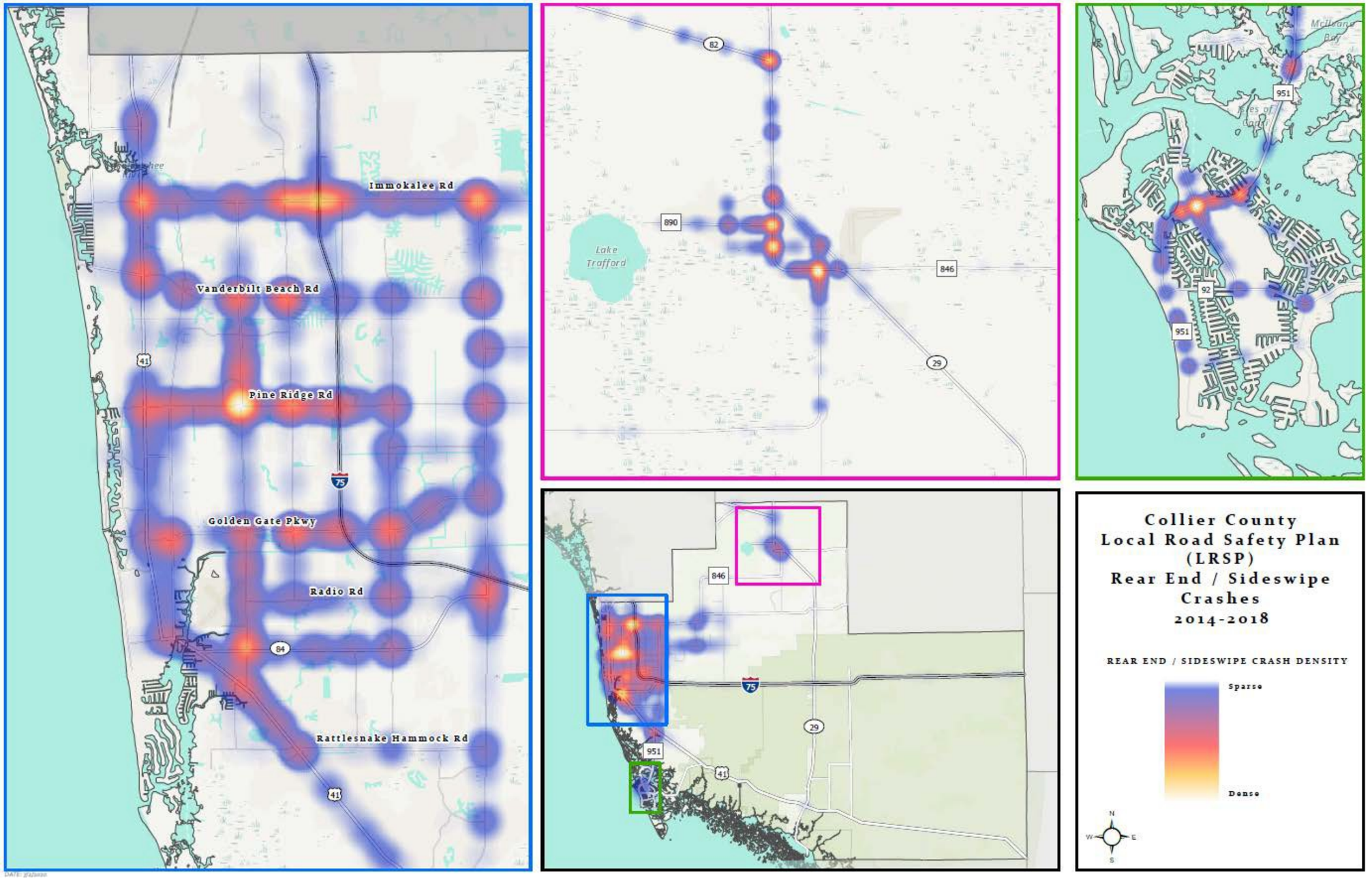


Figure 2-11: Same Direction Crash Heat Map

Key Conclusions

Based on the data analysis summarized above, the following key conclusions are evident:

- Collier County has fewer crashes, traffic injuries, and traffic fatalities than Florida as a whole as a function of population and daily VMT.
- As is common in many urbanized Florida communities, a significant majority of public road traffic crashes, including severe injury crashes, occurs along elements of the County's arterial and collector road network.
- Because Collier County has a relatively sparse network of State highways and many County-maintained roadways that carry significant traffic volume, approximately 2/3 of crashes occur along County-maintained roadways. This means Collier County has substantial agency to self-manage safety outcomes on its roadway network.
- Driver age data show that older road users do not disproportionately contribute to crashes in Collier County; however, inferential time-of-day data suggest that older drivers (age 55+) also have less exposure to nighttime and rush-hour driving.

- Tindale Oliver noted that fewer traffic citations per capita and per vehicle mile of travel are issued in Collier County than in Florida and within a group of similarly-sized coastal counties. The County Sheriff's Office responded that "This may be misleading in substance. Viewing Table 2-3 on P. 2-11, the number of citations are not critically lower on a statistical level than Manatee, Brevard, Escambia, and Sarasota Counties. Further, these numbers only count citations. They do not count the overall number of traffic stops and warnings issued. As noted in a footnote below Table 2-3, Collier County does not have red light cameras that cause number variations in other Florida jurisdictions; red light cameras issuing a 100% citation rate for identified violators. Beyond that, Conclusion #5 listed 2 paragraphs below this sentence articulates the significant impact municipalities have on citation statistics and the small municipalities in Collier County.

  Of note as well is that Manatee, Brevard, Escambia, Lee, and Sarasota Counties all have Florida Highway Patrol (FHP) Troop stations located within their county boundaries. FHP can be relied upon for issuing a notable number of citations from their Troopers. Collier County no longer has a Troop Station located in its boundaries; it was removed years ago. Collier County relies upon the Lee County Troop Station to supply Troopers to Collier County which can cause staffing anomalies in the county as the local Troopers must travel to north of RSW for administrative functions."

- Certain crash types contribute disproportionately to incapacitating injury and fatal crashes. Collectively, non-motorized road user, angle, left-turn, and lane departure crashes account for 30% of all crashes but result in 72% of severe injuries and 89% of fatalities.
- Though significantly less likely to result in severe injury than the crash types discussed above, rear-end and sideswipe crashes result in a significant number of incapacitating injuries due to their frequency.

- High crash corridors identified in the LRSP can be flagged for consideration of safety mitigation measures in association with other roadway improvements.

3: RECOMMENDATIONS

Introduction and Problem Statement

Based on the data analysis documented in the preceding section on Data Analysis , the following key conclusions help to formulate data-driven recommendations for reducing crashes, injuries, and fatalities in Collier County:

1. **Roadway Safety Relative to Florida**: Collier County has fewer crashes, traffic injuries, and traffic fatalities than Florida as a whole as a function of population and daily vehicle miles of travel (VMT).
2. **Major Roadway Focus**: As is common in many urbanized Florida communities, a significant majority of public road traffic crashes, including severe injury crashes, occur along elements of the county's arterial and collector road network.
3. **Local Autonomy:** Because Collier County has a relatively sparse network of State highways and many County-maintained roadways that carry significant traffic volume, approximately 2/3 of crashes occur along County-maintained roadways. This means Collier County has substantial agency to self-manage safety outcomes on its roadway network.
4. **Driver Demographics:** Driver age data show that older road users do not disproportionately contribute to crashes in Collier County; however, inferential time-of-day data suggest that older drivers (age 55+) also have less exposure to nighttime and rush-hour driving.
5. **Moderate Enforcement:** Fewer traffic citations per capita and per vehicle mile of travel are issued in Collier County than in Florida as a whole and within a group of similarly-sized coastal counties.
6. **High Severity Emphasis Areas:** Certain crash types contribute disproportionately to incapacitating injury and fatal crashes. Collectively, non-motorized road user, angle, left-turn, and lane departure crashes account for 30% of all crashes but result in 72% of severe injuries and 89% of fatalities.
7. **High Frequency Emphasis Area:** Though significantly less likely to result in severe injury than the crash types noted above, rear-end and sideswipe crashes result in a significant number of incapacitating injuries due to their frequency.
8. **High Crash** Corridors and Intersections identified in the LRSP can be flagged for integration of safety mitigation measures in association with other roadway improvements.

Each of these conclusions is considered below to begin formulating recommended strategies.

Conclusions #1 and 4: Roadway Safety Relative to Florida and Driver Demographics

Data from 2014–2018 indicate that Collier County experiences approximately 25% fewer traffic crashes and fatalities than Florida as a whole when normalized for both population and VMT. Understanding factors that contribute to this can help to build on Collier County's existing strengths. Some potential explanations for Collier County's relatively low rate of traffic crashes and fatalities compared with Florida as a whole include the following:

Demographics: Collier County has a lower proportion of younger drivers than Florida as a whole. Statewide, approximately 18.4% of the population is ages 15–29, whereas in Collier County only 14.4% of the population falls within this age range. Less experienced drivers are more likely to be involved in crashes than older drivers, so a community with proportionately fewer younger drivers should exhibit fewer crashes per capita than average. When statewide crash rates for each age bracket are applied to Collier County's population, the expected number of crashes in Collier County is approximately 90% of statewide figures. Accordingly, driver demographics may explain part of the reason why Collier County has fewer crashes per capita and per VMT than Florida overall.

- **Roadway Characteristics:** Compared with Florida as a whole, Collier County has a similar proportion of VMT on relatively safe roadway types such as limited access highway, minor collector streets, and local roads but carries substantially less VMT on signalized principal arterials and, instead, handles more traffic with its minor arterial network. Although both principal arterials and minor arterials are focused on longer-distance mobility, minor arterials tend to be more compact and generally operate at somewhat lower ambient speeds. Although difficult to quantify, this may, in part, contribute to Collier County's superior safety performance compared with Florida as a whole.
- **Land Use and Network Characteristics:** With some exceptions, commercial land uses in Collier County tend to be organized around major intersection nodes rather than along thoroughfare roadways. This means that between major intersections, access points are limited, resulting in fewer potential conflicts.

As Collier County continues to grow, it is reasonable to expect its demographic profile will "regress to the mean," resulting in a more normal proportion of young drivers and associated increase in crashes. Strategies to improve driver training and education for younger drivers and services to provide mobility for older road users are discussed in Section 3. Strategies to further enhance safety on the county's major roadway network and maintain good access controls are discussed in Section 2.

Conclusions #2 and #3: Major Roadway Focus and Local Autonomy

Because a majority of crashes in Collier County occur along County-maintained minor arterial and collector roadways, Collier County, in conjunction with the Collier MPO, has the ability to be proactive in making roadway safety infrastructure investments while continuing to coordinate with the Florida Department of Transportation (FDOT) to enhance safety on I-75 and major state highways such as US-41 and SR-29, Davis Boulevard, and State-maintained sections of Collier Boulevard.

Specific strategies applicable to the county's roadway network are discussed in Section 2.

Conclusion #5: Moderate Enforcement Efforts

Statewide, more than half of Floridians live in municipalities, and just over half of all traffic citations are issued by City police departments, with the remainder split roughly 60/40 between County Sheriffs and the Florida Highway Patrol. Because the municipalities in Collier County account for only about 10% of the county's population, the role of City police departments in traffic enforcement is less prevalent in Collier County, with approximately 15% of citations being issued by municipal police. Section 3 addresses strategies to target and enhance traffic enforcement where appropriate.

The Collier County Sheriff's Office notes that "Statewide, more than half of Floridians live in municipalities, and just over half of all traffic citations are issued by City police departments, with the remainder split roughly 60/40 between County Sheriffs and the Florida Highway Patrol. Because the municipalities in Collier County account for only about 10% of the county's population, the role of City police departments in traffic enforcement is less prevalent in Collier County, with approximately 15% of citations being issued by municipal police. Section 3 addresses strategies to target and enhance traffic enforcement where appropriate."

Conclusions #6 and 7: High Severity Ratio and High Frequency Crash Emphasis Areas

Because specific crash types are more likely to result in incapacitating injury or death, it is logical that these should be the focus of both infrastructure and non-infrastructure strategies to enhance traffic safety in Collier County. All types of crashes and crash severities may be reduced by speed management strategies and strategies to combat distracted driving, whereas other crash types respond to specific infrastructure and non-infrastructure interventions.

The remainder of this section offers infrastructure and non-infrastructure strategies that relate to the conclusions from the LRSP's data and analysis described above.

Conclusion #8: High Crash Corridors and Intersections

The LRSP identifies High Crash Corridors / Intersections and strategies to address the prevalent crash types. These corridors can be flagged for integration of safety mitigation measures in association with other roadway improvements.

Infrastructure Strategies

The term "**substantive safety**" refers to the measurable safety performance of a roadway or roadway system, usually expressed in terms of crashes, injuries, and fatalities normalized for user exposure, typically expressed in terms of VMT. The design and operating characteristics of a roadway system affect the substantive safety performance of the system based on the interplay of two other expressions of safety—nominal safety and perceived safety.

"**Nominal safety**" refers to the application of evidence-based design standards and best practices intended to reduce the frequency and severity of crashes. Examples include elements such as minimum lane widths, speed limits, effective drainage, clear and level roadside shoulders, curve super-elevation, guardrails, roadway lighting, and hundreds of other roadway design and operating standards. Each of these elements is intended to reduce the likelihood of automobile crashes and/or

to reduce the severity of crashes if they occur.

"**Perceived safety**" refers to how roadway users gauge the relative safety of the roadway system, including the crashworthiness of their automobiles. This is important because for most roadway users, perceived safety impacts their level of focus and operating behavior. Roadway users who perceive a particular roadway environment to be relatively safe are more likely to relax their concentration and may engage in higher-risk driving behaviors such as speeding, multi-tasking, and "jaywalking," whereas roadway users who perceive a roadway environment to be less safe are more likely to remain vigilant.

There are two primary challenges implicit in the interaction of these fundamental aspects of roadway safety. The first is that many of the measures intended to make roadways nominally safer also result in increased perception of safety by roadway users and corresponding increases in riskier user behavior. This riskier behavior, in turn, diminishes the safety benefits of the roadway system design.

The second challenge is that typical roadway users are not well-equipped to accurately assess their risk operating in a modern roadway system. The former challenge is intuitive but nonetheless problematic to the extent that the very design decisions that are meant to make a roadway system safer often contribute to the abuse of that system by its users. The latter challenge is a function of both biological and cognitive limitations which, when combined, can contribute to unsafe user behavior.

From a biological perspective, the speeds, distances, and complexities of modern roadway environments are outside the normal parameters of what the "human animal" has encountered for the vast majority of our recorded history. Multiple times per minute, a human roadway user will pass within arm's length of objects that are comparable in mass to some of the largest animals on earth, traveling at speeds that are naturally achievable only by falling from a high place. Rationally, human/automobile interactions should be terrifying, but most modern humans have been conditioned since childhood to accept them as a normal, low-risk activity.

From a cognitive perspective, most people's ability to accurately assess and process risk is more limited when probabilities are very low and outcomes are extreme. For example, most people can easily understand both the probabilities and the outcomes of a $1.00 bet against a coin toss but have almost no capacity to logically process the risk/reward proposition of buying a lottery ticket. By the same mechanism, most people cannot intuitively process the extent to which individual higher-risk, but otherwise routine, behaviors alter their probability of being involved in an automobile crash.

Historically, the traffic safety industry has focused considerable attention on nominal safety, both in terms of roadway system design and operations and motor vehicle design (bumpers, crush zones, air bags, etc.). Generally, the assumption has been made that roadway users will behave as "rational actors" using available information to make benefit/cost analyses that govern choices expected to deliver preferred outcomes. Based on quantitative and qualitative assessment of crash histories, there is ample evidence that road users do not consistently perform according to the rational actor model. This includes incidences of wantonly irrational behavior (road racing, driving while intoxicated, etc.) but more commonly occurs from a failure to accurately process risk.

The Collier LRSP considers infrastructure strategies from the perspective of nominal safety and from the standpoint of how each strategy provides better information to roadway users to help them make safer decisions about how they interact with each other and the roadway system.

Table 3-1 provides a summary of infrastructure strategies and shows how each strategy is applicable to the four emphasis areas defined through the analysis of Collier County's crash history.

The remainder of this section provides more information about each strategy and discusses how the strategies relate to one another. Non-infrastructure strategies are addressed in Section 3 of this chapter.

Table 3-1: Infrastructure Strategies Matrix

Infrastructure Strategies	Non-Motorized	Intersection	Lane Departure	Same Direction
Speed Management	•	•	•	•
Alternative Intersections (ICE Process)	•	•		•
Intersection Design Best Practices for Pedestrians	•			
Median Restrictions/Access Management		•		•
Right Turn Lanes	?			•
Signal Coordination	?			•
Rural Road Strategies including:				
• Paved shoulder	•		•	
• Safety edge			•	
• Curve geometry, delineation, and warning			•	
• Bridge/culvert widening/attenuation			•	
• Guardrail/ditch regrading/tree clearing			•	
• Isolated intersection conspicuity/geometry		•		
Shared Use Pathways, Sidewalk Improvements	•			
Mid-Block Crossings & Median Refuge	•			
Intersection Lighting Enhancements	•	•	•	
Autonomous Vehicles (Longer-Term)	TBD	•	•	•
(= Applicable Strategy ? = Possible Contra-indications				

Speed Management

Speed is a critical factor in both a driver's ability to perceive, react, and effectively respond to roadway conflicts and in determining crash outcomes/severity. "Speed management" refers to a combination of infrastructure and non-infrastructure strategies to both curtail incidences of speeding—traveling too fast for conditions or exceeding the posted speed limit—and designing roadways to deliver operating speeds that match the land use and access contexts of the roadway. From an infrastructure standpoint, key elements of speed management include:

- Context classification and establishment of target speeds
- Design interventions
- Proactive signal management

Each of these elements is discussed in greater detail below.

Context Classification and Target Speeds

As part of FDOT's implementation of "Complete Streets," the Department has established a process for classifying major roadways based on land use and roadway network connectivity to create a continuum of context classifications ranging from rural preserve to urban core (Figure 3-1). The context classification assignment of each segment of the State Highway System (SHS) is then used to define design specifications including appropriate design speed ranges.

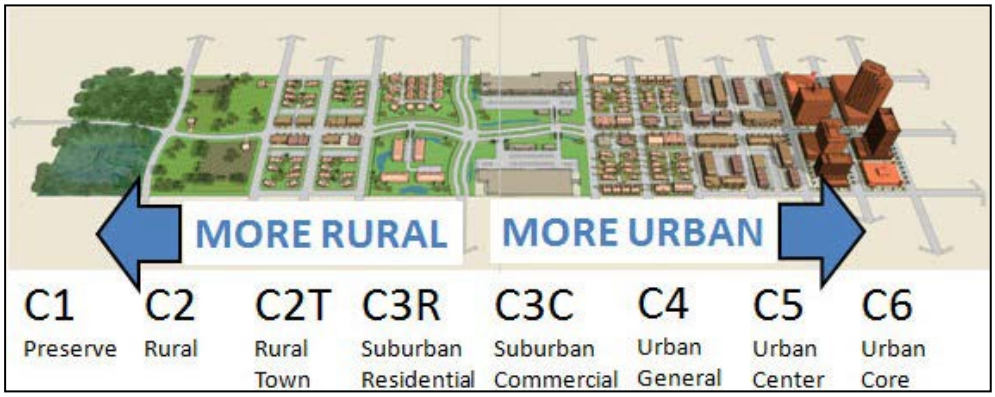


Figure 3-1: FDOT Context Classification System

In addition to design elements such as lane width and multimodal facilities requirements, a roadway's context classification establishes allowable design speed ranges and identifies speed management strategies for each context class and design speed range. Context classifications also provide guidance for establishing appropriate target speeds, the desired operating speed for any given segment of roadway based on strategic safety and mobility objectives. When a roadway's target speed is not supported by the roadway's design characteristics (e.g., design speed), the roadway owner (City, County, FDOT) can establish short-, medium-, and longer-term strategies to modify the subject roadway so that the target speed is achieved.

Design Interventions

There are many design techniques to modify roadway characteristics to achieve a desired target speed, but generally they correspond with the concepts of Enclosure, Engagement, and Deflection. Chapter 202 of FDOT's 2020 *Florida Design Manual* (FDM) defines these concepts as follows:

- **Enclosure** is the sense that the roadway is contained in an "outside room" rather than in a limitless expanse of space. A driver's sense of speed is enhanced by providing a frame of reference in this space. The same sense of enclosure that provides a comfortable pedestrian experience also helps drivers remain aware of their travel speed. Street trees, buildings close to the street, parked cars, and terminated vistas help to keep drivers aware of how fast they are traveling. This feedback system is an important element of speed management.
- **Engagement** is the visual and audial input connecting a driver with the surrounding environment. Low-speed facilities use engagement to help bring awareness to the driver, resulting in lower operating speeds. As the cognitive load on a driver's decision-making increases, he/she needs more time for processing and will manage speed accordingly. Uncertainty is one element of engagement; the potential of an opening car door, for instance, alerts drivers to drive more cautiously. On-street parking and proximity of other moving vehicles in a narrow-lane are important elements of engagement, as are architectural detail, shop windows, and even the presence of pedestrians.

Deflection is the horizontal or vertical movement of a driver from the intended path of travel. It is used to command a driver's attention and manage speeds. Being a physical sensation, deflection is the most visceral and powerful of the speed management strategies. Whereas enclosure and engagement rely, in part, on psychology, deflection relies primarily on physics. Examples includes roundabouts, splitter medians (horizontal deflection), and raised intersections (vertical deflection). Deflection may not be appropriate if it hinders truck or emergency service vehicle access.

Chapter 202 of the FDM describes specific design strategies and provides a matrix of applicable strategies to achieve various speed ranges for each roadway context classification.

Signalization

Traffic signalization is another method of providing actionable information to drivers to help achieve desired operating speeds. When traffic signals are spaced at intervals of not more than 0.25 miles and are timed in a coordinated pattern consistent with a desired operating speed, most road users will learn to drive at the signal "progression speed" rather than race ahead to stop at a standing queue. Alternative performance measures for signal timing are discussed further later in this section.

Current Practice

Collier County's roadway network falls primarily within the C-1 to C-3 range in FDOT's context classification system. The wide spacing between intersections (2 to 6 miles) and low-density development make it difficult to implement speed management strategies. There are exceptions, however – locations that are more urban in character with a greater mix of uses, higher densities and shorter blocks – where speed management could be a useful tool to apply, as noted in the Implementation Section which follows.

Recommendation

MPO staff does not recommend further action at this time.

Alternative Intersections (ICE Process)

According to the Federal Highway Administration (FHWA), the term "alternative intersections" refers to at-grade intersections that remove one or more conventional left-turn movements. By removing one or more of the critical conflicting traffic maneuvers from the major intersection, fewer signal phases are required for signal operation. This can result in shorter signal cycle lengths, shorter delays, and higher capacities compared to conventional intersections.

Alternative intersections also offer substantial safety benefits, with expected crash reductions of at least 15%, depending on the specific treatment. When deployed along an integrated corridor, alternative intersections can also aid in speed management and other systemic safety improvements. The key concepts, constraints, and safety benefits of common alternative intersections are described below.

ICE Process - Current Practice

Intersection Control Evaluation (ICE) is a data-driven process to objectively identify optimal geometric and control solutions for roadway intersections. Factors considered in the ICE process include capacity/operational analysis, safety, and feasibility/cost. ICE is required for new intersections and for substantial changes to existing intersections on FDOT roadways. The MPO's member agencies apply the ICE process used by FDOT to County and City-maintained roadways as

well.

Recommendation

MPO staff does not recommend that additional action be taken at this time.

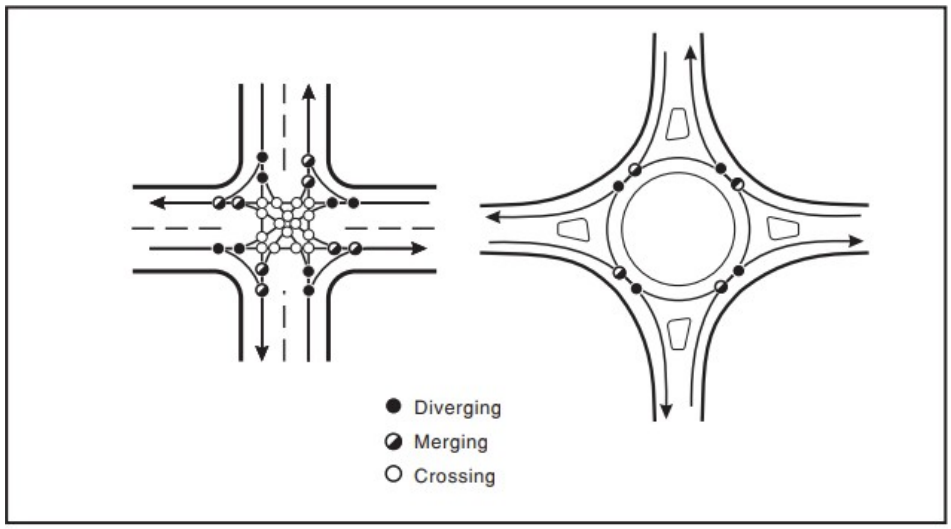
Roundabouts

FHWA's informational guide on roundabouts (FHWA-DR-00-067) explains that "roundabouts are circular intersections with specific design and traffic control features. These features include yield control of all entering traffic, channelized approaches, and appropriate geometric curvature to ensure that travel speeds on the circulatory roadway are typically less than 30 mph." Modern roundabouts may connect three or more roadway approaches and may have one or more circulating lanes.

The key safety benefit of roundabouts is that they eliminate high-energy "crossing" conflicts and have fewer overall conflicts than conventional intersections. Figure 3-25, from FHWA-DR-00-067, shows and explains the difference in conflict points between roundabouts and conventional intersections. Attention is directed to the fact that whereas traffic signals assign right-of-way to crossing conflicts, these conflicts are not eliminated by signals in cases of red-light-running and permissive left-turn movements. Merge conflicts also exist in the context of right-turn-on-red movements.

Properly designed roundabouts also are generally easier/safer to navigate for pedestrians and bicyclists, and pedestrian crossings at multi-lane roundabouts can be supplemented with various mid-block crossing devices (see discussion on pedestrian mid-block crossing elsewhere in this section). Because of these motorized and non-motorized user safety benefits, roundabouts have been found to reduce crashes overall by about 37% and reduce injury crashes by 51%.

The principal constraint of roundabouts is that they often require a greater right-of-way footprint than conventional intersections of equivalent capacity. This is especially challenging in retrofit scenarios along commercial corridors where right-of-way costs may make roundabout retrofits cost prohibitive. Because the safety benefits of roundabouts diminish as more circulating lanes are added, most roundabouts are limited to two circulating lanes. Accordingly, they are most commonly used at the intersections of either two 2-lane roadways or a 4-lane roadway and 2-lane roadway.



Conflicts can be divided into three basic categories, in which the degree of severity varies, as follows:

- *Queuing conflicts.* These conflicts are caused by a vehicle running into the back of a vehicle queue on an approach. These types of conflicts can occur at the back of a through-movement queue or where left-turning vehicles are queued waiting for gaps. These conflicts are typically the least severe of all conflicts because the collisions involve the most protected parts of the vehicle and the relative speed difference between vehicles is less than in other conflicts.
- *Merge and diverge conflicts.* These conflicts are caused by the joining or separating of two traffic streams. The most common types of crashes due to merge conflicts are sideswipes and rear-end crashes. Merge conflicts can be more severe than diverge conflicts due to the more likely possibility of collisions to the side of the vehicle, which is typically less protected than the front and rear of the vehicle.
- *Crossing conflicts.* These conflicts are caused by the intersection of two traffic streams. These are the most severe of all conflicts and the most likely to involve injuries or fatalities. Typical crash types are right-angle crashes and head-on crashes.

Figure 3-2: Roundabout Safety Benefits

Restricted Crossing U-Turn and Median U-Turn Intersections

Restricted Crossing U-Turn (RCUT) and Median U-Turn (MUT) intersections are illustrated in Figure 3-3 and Figure 3-4 from FHWA Informational Guides #FHWA-SA-14-070 and #FHWA-SA-14-069, respectively. Generally, RCUT intersections are more effective when the minor street thru volumes are lower than the major street left-turn volumes, with the reverse true for MUT intersections. RCUT intersections, when sequenced together in a corridor, also allow each direction of the major street to

thru movements to be coordinated separately which can have exceptional benefits for mainline capacity.

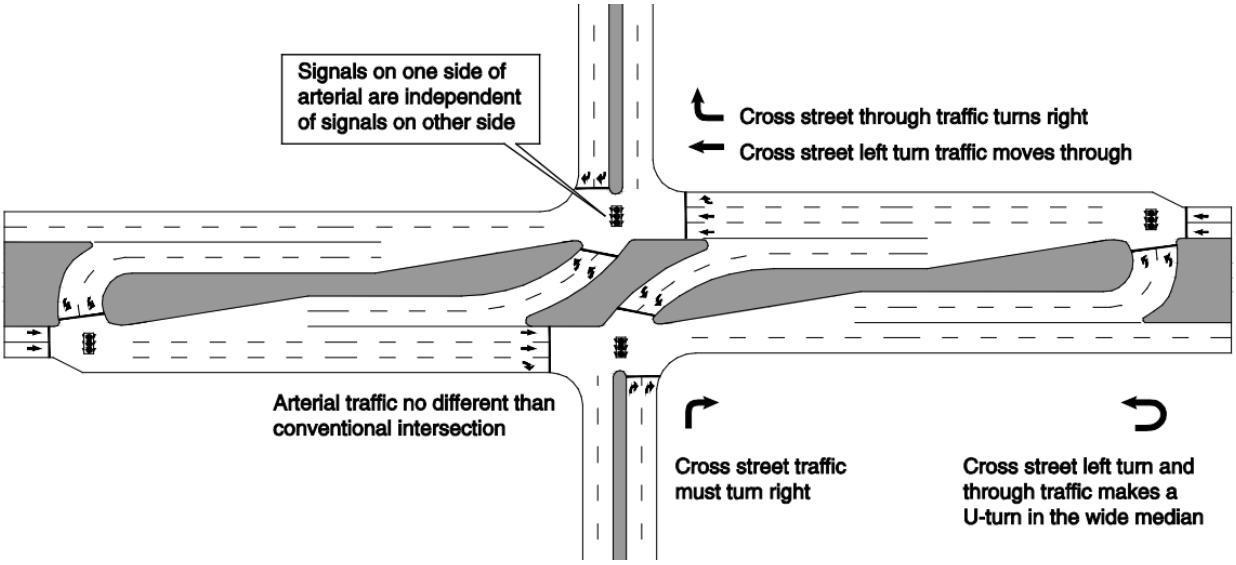


Figure 3-3: Diagram of Signalized RCUT Intersection

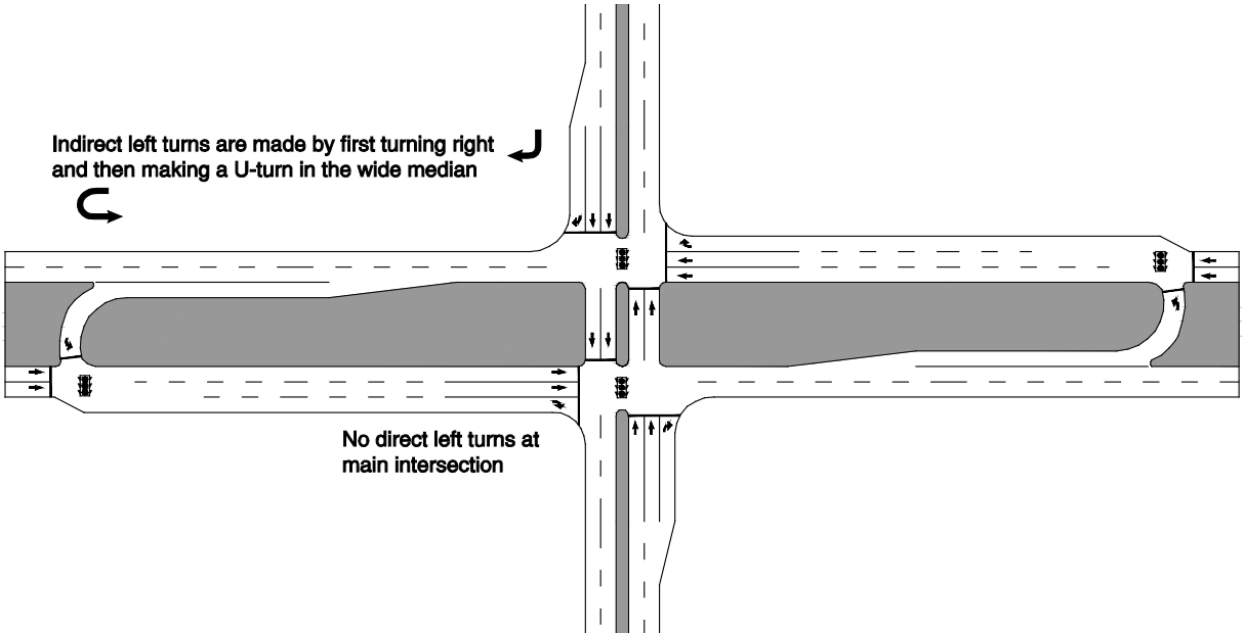


Figure 3-4: Diagram of Median U-Turn Intersection

Common features of both these alternative intersection types include the following:

- Both RCUT and MUT intersections use adjacent "secondary" intersections to help process the movements that are restricted at the main intersection. These are usually about 1/8-mile from the main intersection and may be signalized, as shown in Figure 2-3, or stop/yield controlled, similar to commonplace directional median openings. When signalized, these secondary intersections provide an opportunity for mid-block pedestrian crossing locations.
- When either intersection type displaces truck movements, either an extra-wide median or U-turn aprons, sometimes referred to as "loons," are necessary to accommodate truck movements. The U-turn diameter (referred to as the swept-path) for a typical tractor-trailer is just under 90 ft, but the U-turn diameter of a typical 6-lane arterial with a standard 22 ft median is a little over 60 ft.
- Except in cases where the displaced movements represent an unusually high proportion of all intersection movements, RCUT and MUT intersections generally offer substantial reductions to major roadway delay and more moderate reductions in overall intersection delay. The distance traveled by displaced movements is naturally increased, but delay for displaced movements may be slightly reduced or only moderately increased depending on a range of operational factors.
- Both RCUT and MUT intersections allow for reduced signal cycle length, especially when pedestrian crossings of the major roadway are handled as two-stage movements. This, combined with greater signal density from the use of secondary intersections, can help with speed management and platooning of vehicles along alternative intersection corridors.

Similar to roundabouts, RCUTs and MUTs convert some high-energy crossing conflicts to lower energy merge-diverge conflicts, helping to reduce crash frequency and severity. According to FHWA-HRT-17-073, RCUT intersections can have an overall crash reduction of 15% and reduce injury crashes by 22% compared with conventional intersections. MUT intersections have similar benefits, with a 16% overall crash reduction and 30% injury crash reduction compared to conventional intersections.

As noted, the principal constraint on converting existing 4-phase conventional intersections to 2-phase RCUT or MUT intersections is available right-of-way to accommodate truck U-turn movements, about 140 ft for a 6-lane road and about 130 ft for a 4-lane road. Other constraints include the suitability of the RCUT or MUT operations with respect to individual intersection turning volumes and driver education about navigating the intersections.

Other Alternative Intersections

Besides RCUTs and MUTs, other alternatives at-grade intersections include displaced left turn intersections (DLT), as shown in Figure 3-5 (FHWA-SA-14-068) and quadrant intersections, as shown in Figure 3-6 (FHWA-SA-19-029). The safety outcomes of these intersection alternatives are less well understood than for RCUT and MUT intersections and, for reasons discussed below, their limited applicability makes them less integral to the LRSP than roundabout, RCUT, and MUT intersections. Nonetheless, they are included in the County's toolkit should specific circumstances warrant their use.

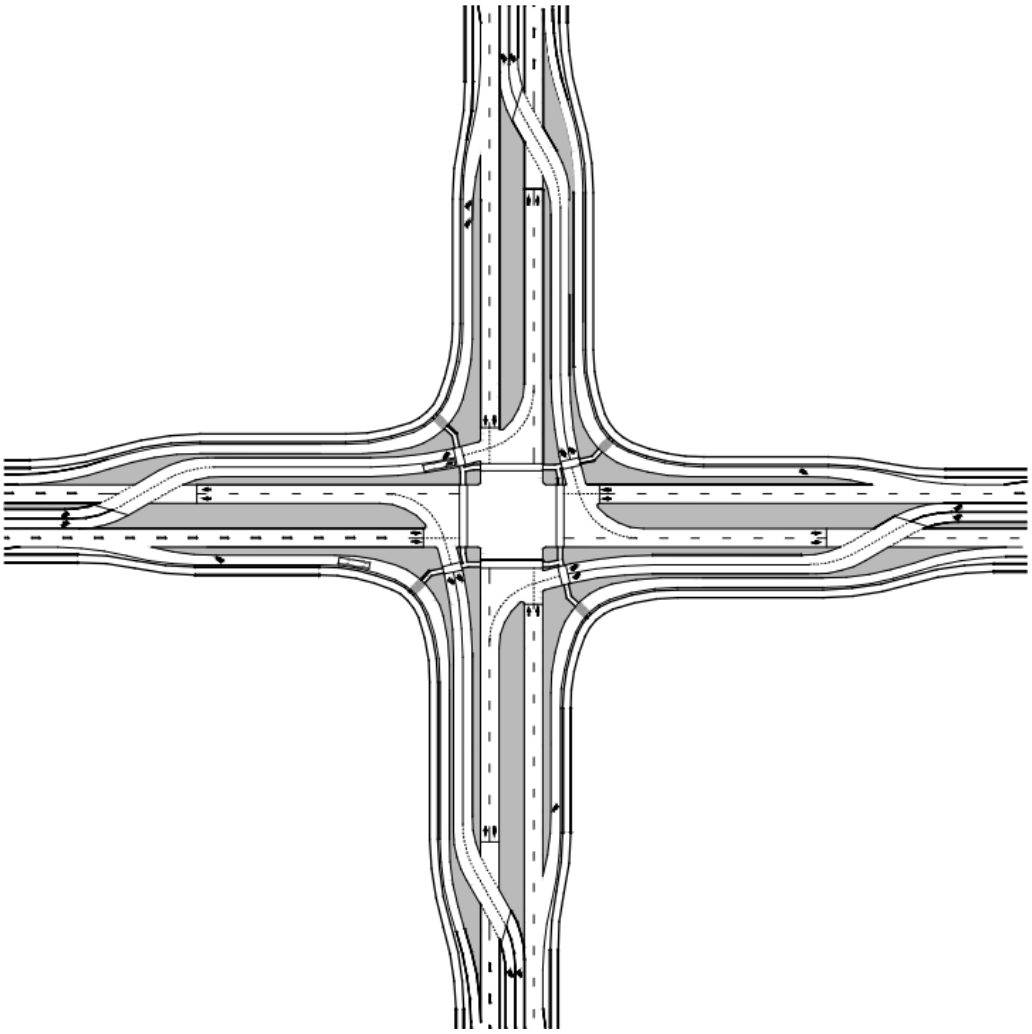


Figure 3-5: Displaced Left Turn Intersection

DLT intersections are very-high-capacity at-grade intersections that "displace" left-turn movements at "cross-over" intersections in advance of the main intersection. This allows left-turn and thru movements from the same roadway to occur concurrently. Given the high capacity, complexity, and cost of DLT intersections, they are perhaps better thought of as alternatives to grade separation (trading right-of-way costs for structure costs) rather than alternatives to conventional intersections. Because of their substantial right-of-way footprints and potential for substantial business access impacts to adjacent land uses, DLT intersections are challenging to implement as retrofit projects.

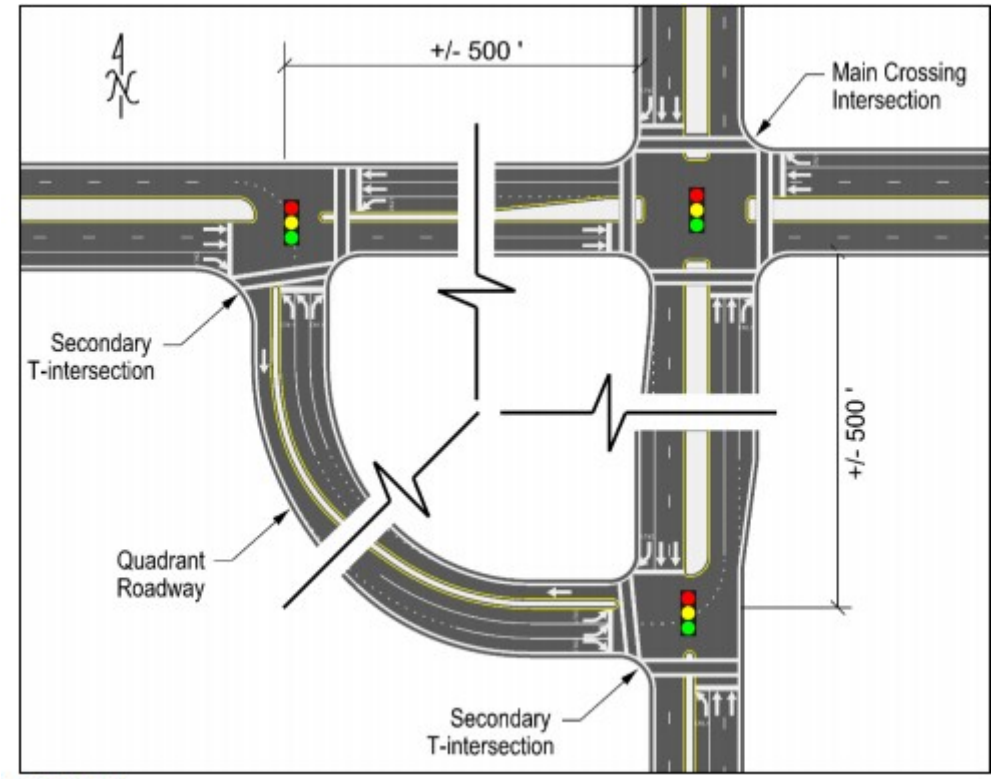


Figure 3-6: Quadrant Intersection Diagram

Quadrant intersections distribute turning movements at the main intersection across multiple smaller intersections, allowing left-turn movements at the main intersection to be eliminated or limited to either roadway. Although all turning movements can be accommodated with a single-quadrant roadway, quadrant intersections offer more benefits when diagonal opposing quadrants, or all four quadrants can be fitted with perimeter roads. Unlike DLT intersections, quadrant intersections allow the main intersection to be quite compact; however, existing land uses often preclude the construction of the quadrant roadways except in greenfield or redevelopment scenarios.

Recommendation

MPO staff does not recommend taking further action at this time. Collier MPO member governments already apply FDOT's ICE process to provide data-driven analysis of intersection alternatives as part of new intersection construction and substantial modification of existing intersections. Collier MPO established a funding mechanism for safety projects in the 2045 LRTP. In response to a Call for Projects, member governments c may select candidate intersections and corridors identified in the LRSP and the BPMP) to conduct feasibility studies (Stage 1 ICE/SPICE analysis) for prioritizing and programming retrofit projects.

Intersection Design for Pedestrians

Many existing major roadway intersections in Collier County (as well as throughout Florida) were designed with the primary intention of maximizing motor-vehicle throughput. In addition to arterial intersections often having multiple thru traffic lanes and auxiliary left- and right-turn lanes, the radii

of an intersection's curbs are also often very large. All of these features increase the exposure of pedestrians to motor vehicle traffic and can contribute suboptimal placement of crosswalks and curb ramps, which may make crosswalks longer than necessary and/or place pedestrians in positions where they may be difficult for turning drivers to see.

When pedestrians are exposed to overly-large intersections with right-turning traffic and permissive left turns, they may not see a value proposition in using signalized intersection pedestrian features. This may result in pedestrians crossing away from intersections, relying on their own judgment rather than trusting motorists to yield and reducing pedestrian compliance with traffic signals.

Curb Radii

Large curb radii are sometimes necessary to allow trucks to navigate turns without running over the curb, damaging infrastructure, and posing a hazard to pedestrians waiting to cross. However, in many cases, urban and suburban intersections are using highway design principles where large curb radii are provided to reduce friction between right-turning vehicles and high-speed thru traffic. This makes sense in a rural setting where pedestrians are rare, but when right-turning drivers can navigate a turn at high speeds, their ability to perceive and react to pedestrians in a crosswalk is severely limited.

Whenever possible, urban intersection should be designed with the smallest possible radii that still can accommodate the appropriate design vehicle. When there are multiple lanes, intersection should be designed so that trucks turn into the interior lane(s) rather than the curb lane. When large radii cannot be avoided due to heavy truck movements, channelization (discussed below) or use of truck aprons is preferable to very large radii.

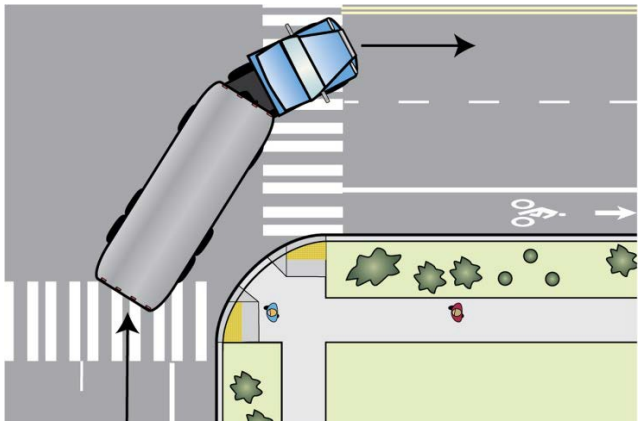


Figure 3-7: Truck Turning Into Interior Lane

Figure 3-8: Truck Apron Helps Slow Turning Cars

Channelization

Using channelizing islands to break pedestrian crossings into multiple smaller stages can make large, high-capacity intersections safer and more accommodating for pedestrians. Figure 3-9 shows the preferred design for right-turn islands in which approach traffic has a clear view of the crosswalk between the curb and the island and also good views of approaching traffic. The graphic also shows the crosswalk "engaged" with the median nose, which helps ensure that left-turning drivers cannot cut the corner, thereby helping to moderate their speed.

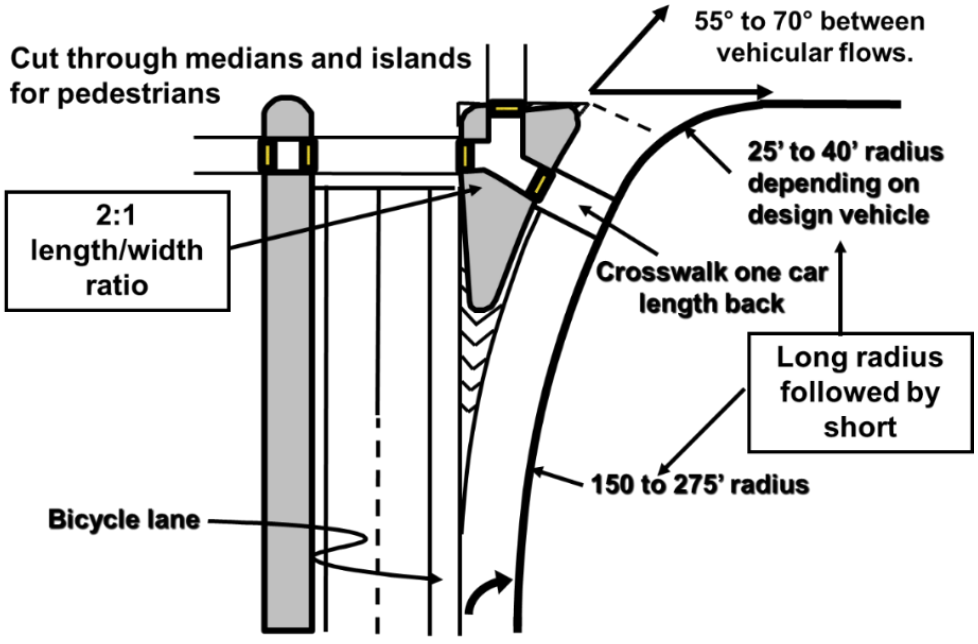


Figure 3-9: Preferred Right-Turn Island Design Parameters and "Engaged" Median

Crosswalk Design & Operation

As shown in Figure 3-10, crosswalks should be marked using both lateral and transverse markings, be placed with individual/directional curb ramps, where possible, and generally be aligned parallel to the roadway they are along. Although crosswalks must be a minimum of 10 ft wide, they may be

wider where pedestrian volumes are high or intersection geometry is irregular. Textured or colored pavement is acceptable to supplement the retroreflective pavement markings but should not be a substitute for those markings.

At signalized intersections, crosswalks should be supplemented with countdown pedestrian signals and the "Walk" phase should be provided automatically for crossing along the major roadway and whenever the concurrent minor roadway thru-green signal interval is greater than or equal to the minimum pedestrian crossing interval. Except in special circumstances where high pedestrian volumes may effectively prohibit right-turning traffic to pass through an intersection, the "Walk" interval should be timed so that the countdown reaches zero when the concurrent thru-green signal changes from green to amber, thereby maximizing the available time for pedestrians to cross.

When heavy right-turn movements conflict with pedestrian crossings, a leading pedestrian interval (LPI) should be considered. An LPI provides pedestrians with a "Walk" indication a few seconds before parallel traffic gets a green signal, giving the pedestrian an opportunity to "take possession" of the crosswalk before turning traffic commences.

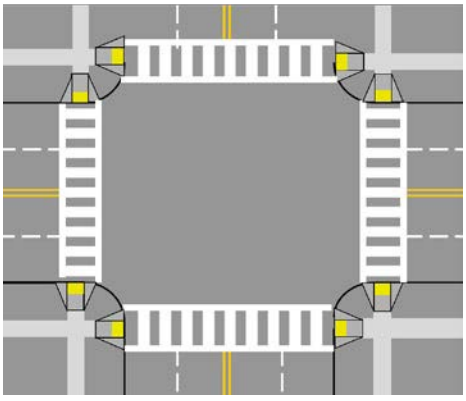


Figure 3-10: Proper Crosswalk Placement and Markings

Figure 3-11: Countdown Pedestrian Signal

Current Practice

The summary presented above provides confirmation that the MPO's BPMP's design guidelines are consistent with current Best Practices. The BPMP will be updated at least once every five years to keep current and up-to-date. The BPMP's evaluation criteria gives priority to projects to mitigate high crash corridors and intersections.

Recommendation

MPO staff does not recommend taking further action at this time.

Median Restrictions/Access Management

FDOT and Collier County both have sophisticated approaches to managing access along arterial roadway corridors. Strategies include restricting median access to prohibit direct left turns from unsignalized approaches, consolidation of driveways, provisions for interconnected parking lots, reverse-frontage access, and avoiding driveways within major intersection influence areas.

Although the default approach to access management is to convert full-access medians to directional medians, as shown in Figure 3-12 along Radio Road, maintaining cross-access and providing a new traffic signal may help to address speed management and signal coordination issues as discussed elsewhere in this section.

Figure 3-12: Conversion of Full Access Median to Dual Directional Median

Current Practice

Collier MPO member governments currently employ access management strategies to minimize curb cuts and encourage right-turn-then-U-turn movements instead of direct left turns across high-volume arterial streets. In more urban contexts, member governments give consideration to signalizing problem intersections as an alternative to installing directional medians with the intent of providing more controlled crossings for motorists and non-motorized road users and facilitating greater signal density to help with corridor signal coordination.

Recommendation

MPO staff does not recommend taking further action at this time.

Right Turn Lanes

Right-turn lanes can help reduce rear-end and sideswipe crashes by allowing turning traffic to move out of the way of thru traffic; however, in urban contexts, right -lanes can present the following safety challenges:

- Right-turn lanes can make intersections larger than they need to be, posing challenges to pedestrians.

- Right-turns lane between signalized intersections (i.e., at commercial driveways) create higher-speed conflict points for cyclists travelling in bike lanes.
- When right-turn lanes extend a substantial distance from an intersection, right-turning traffic may be able to speed past standing queues waiting at the signal. If another vehicle or a pedestrian is "nosing" thru the queues of stopped traffic to access a driveway, the resulting crash can be very severe.
- Right-turn lanes facilitate right-turn-on-red movements because the lane will never be blocked by a vehicle waiting to pass thru an intersection. Right-turn-on-red movements can make crossing more challenging for pedestrians, especially if the failure of right-turning traffic to yield to pedestrians in the crosswalk results in inadequate time to safely cross the intersection.

Current Practice

Right-turn lanes are used primarily along higher-speed, high-volume suburban roadways where the mitigation of high-speed rear-end and sideswipe crashes outweighs the challenges presented by the scenarios above.

Recommendation

MPO staff does not recommend taking further action at this time.

Signal Coordination

Signal coordination refers to the timing of traffic signals relative to one another to manage the flow of traffic along a roadway corridor. Generally, the goal of signal coordination is to minimize delay along major roadways while allowing for side-street approaches to process traffic with a reasonable amount of delay. Although this approach is effective to maintain roadway level of service (LOS) along major thoroughfares, it is not always the best approach for promoting safety.

When traffic signals along a corridor are optimized to process thru traffic, the cycle-length of signals often becomes very long, taking 3, 3.5, or even 4 minutes to completely cycle through all the various signal phases. Long cycle lengths combined with signals spaced a half-mile or more apart can result in vehicles being randomly-spaced along a roadway with greater variation in speeds. Conversely, when signal cycle lengths are short and traffic signals are more closely spaced, vehicles tend to group together in "platoons"; this grouping, combined with visual cues from the next traffic signal, result in drivers maintaining a more consistent speed.

The top section of Figure 3-13 shows traffic moving along a roadway with widely-spaced signals and long cycle lengths. Because there is little driver feedback and a very wide "green band" in which approaching traffic can clear the next signal, cars are spread out along the roadway with few adequate gaps for drivers, pedestrians, and cyclists to cross the road or turn across oncoming traffic. The lower section shows the same number of cars in a platoon, with large gaps between the beginning of one platoon and the end of the preceding one. These gaps allow cross-traffic maneuvers can be made more safely.

Gaps between platoons also mean fewer vehicles will be caught in the "dilemma zone" when approaching a changing traffic signal in which the driver must quickly decide whether to brake or try

and accelerate to clear the signal. Keeping traffic out of the dilemma zone can reduce both rear-end crashes and left turn/angle crashes.

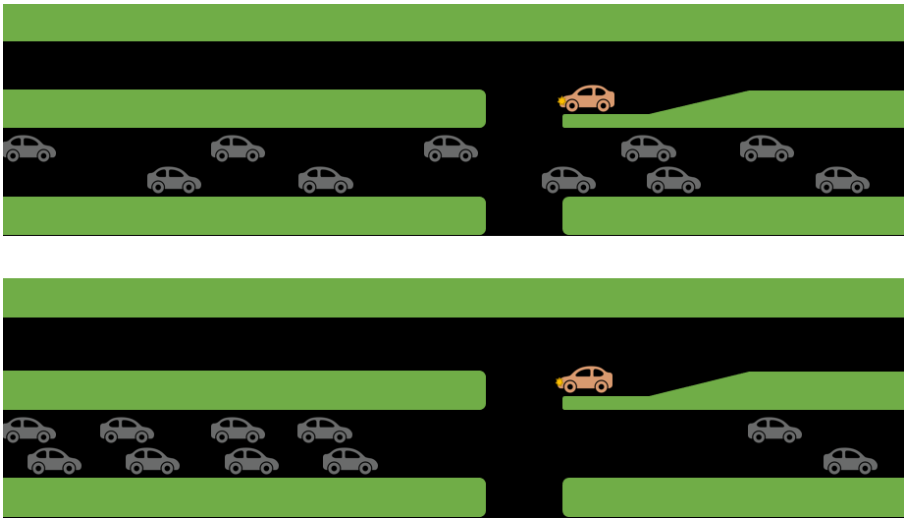


Figure 3-13: Graphic Depicting Random vs. Platooned Traffic

Current Practice

As discussed, converting roadway corridors to two-phase signal operation using alternative intersection designs is an excellent method of reducing cycle length and increasing signal density to allow for more effective platooning of traffic and achieving resulting safety outcomes. Independent of alternative intersection implementation, In response to the MPO's Call for Projects (Safety and/or Congestion Management), Collier MPO member governments have the option to select high crash corridors identified in the LRSP and BPMP where alternative signal coordination approaches may be feasible. This may include reducing cycle lengths off-peak, operating minor intersections between arterial intersections at half the cycle length of the adjacent major intersections and identifying locations where a new traffic signal might help the coordinated signal system perform more efficiently and more safely.

Recommendation

MPO staff does not recommend taking further action at this time.

Rural Road Strategies

Rural roadways tend to have lower traffic volumes and fewer crashes per mile than busy urban roads; however, because of generally higher travel speeds and the potential for fixed objects and/or deep ditches along the roadside, crash severity tends to be higher. The strategies discussed below can be used to treat known problem locations but should also deployed in a systemic approach to reduce severe crashes along rural highways and local streets.

Paved Shoulder, Safety Edge, and Audible-Vibratory Markings

Where possible, rural roadways should have 5-ft paved shoulders and adequate, level clear zones to facilitate recovery of vehicles that leave the roadway. Audible-vibratory pavement markings or ground-in rumble strips should be provided between the travel lanes and the shoulder to help alert drivers before they leave the roadway, and retroreflective pavement markings should be used to

delineate both the roadway centerline and the outside edge of the travel lanes.

When drivers do leave the roadway, steering the tires back onto the pavement against a vertical edge can make it difficult to safely re-enter the travel lane; drivers may oversteer and lose control of the vehicle, leading to severe crashes. As shown in Figure 3-14, providing a 30-degree contoured pavement “safety edge” can mitigate this issue, especially on roadways that lack adequate paved shoulders and warning strips.

Figure 3-14: Photo Depicting "Safety Edge" Pavement Design

Curve Geometry, Warning, and Delineation

Because rural highways often have long, straight segments with few discerning features, drivers may become complacent and not exercise due care when entering curves. Accordingly, curves should be well-marked with pavement markings and chevrons, and attempts should be made to provide adequate shoulders and recovery areas. Where necessary, the roadway should be super-elevated to help drivers navigate high-speed curves, and guardrail should be used when roadside hazards within the clear zone cannot be completely eliminated. Devices such as solar static or actuated flashing beacons and speed feedback signs may also be used to alert drivers to curve advisory speeds.

Clear Zone Hazards

Common hazards adjacent to the roadway include trees and ditches as well as lateral and cross-drain structures and concrete bridge barrier walls. Efforts should be made to inventory infrastructure elements within roadway clear zones and implement measures to mitigate the hazards they pose. This can include removing trees, re-grading ditches, providing attenuation in advance of bridge walls, and converting projecting or square edge drains to mitered-end-section designs.

Figure 3-15: Mitered-End-Section Drain Pipe

Intersection Conspicuity/Geometry

Much like curves along rural highways that may catch drivers by surprise, rural intersections can be unexpected features, and drivers traveling along a rural highway may not be prepared to respond to crossing traffic. Rural intersections may also exhibit irregular or skewed geometry and may have foliage interrupting sight triangles or may exhibit other features that make it more challenging for side-street traffic to maneuver safely. Mitigation strategies include correcting poor geometry, consistently maintaining sight triangles, and posting advance warning signs with/or without flashing beacons to raise awareness of approaching drivers.

Current Practice and Recommendation

Specific, known issues along rural highways should be mitigated, but a proactive, systemic approach would improve the overall safety performance of rural road systems. Collier MPO member governments have the option of selecting high crash corridors identified in the LRSP in response to an MPO Call for Safety Projects to analyze potential systemic improvements to the county's rural and exurban roadways, including curve and isolated intersection treatments, improved shoulders and edge treatment, and mitigation of roadside hazards.

Low-Stress, Separated Cycling Facilities

Since the 1970s, "vehicular cycling" has been the predominant approach to accommodating bicyclists within the roadway network. This approach means that cyclists operate using the same rules as motor vehicle traffic and share the roadway with motor vehicles either operating in marked bicycle lanes or riding with traffic. Vehicular cycling can be an effective approach for faster, confident cyclists to safely interact with traffic; however, a substantial majority of cyclists do not fall within this group and are uncomfortable or unwilling to ride with traffic on higher-volume, higher-speed roadways.

Although vehicular cycling has been shown to help cyclists avoid certain crash risks, sideswipe and rear-end crash types that would generally result in less severe outcomes between two motor vehicles can have severe outcomes when one of the vehicles is a bicycle. This is especially true when the speed differential between the cyclist and overtaking traffic is large. For example, a typical road cyclist operates at speeds of 15–20 mph, so along 30–35 mph roadways, the closing speed of the cyclist and overtaking traffic is not more than 20 mph. Whereas this can result in a serious crash, the overtaking motorist has more time to observe and react to the cyclist, and if a crash does occur, it is

likely to be survivable. Conversely, along roadways with operating speeds of 45 mph or greater, a faster closing speed means a motorist is less likely to react and respond to a cyclist, and if a crash does occur, it is much more likely to be fatal.

For these reasons, many agencies, including FDOT, Collier MPO and its member governments, are working to provide separated bicycle facilities, especially along roadways that operate at speeds greater than 35 mph. Separated facilities include protected bike lanes, sometimes referred to as cycle tracks, and shared-use pathways along the edge of roadways. Other low-stress bicycling facilities form alternative networks to thoroughfare streets and include "bike boulevards" and off-road trails.

Cycle tracks may be two-way or directional and feature some type of physical barrier between motor vehicle lanes and the cycling facility. Figure 3-16 shows an example of a two-way cycle track in downtown Tampa that uses a raised curb and on-street parking to separate bicycle and motor-vehicle traffic. The cycle track features special signals and other design features at intersections to help mitigate bicycle/turning motor vehicle conflicts.

Figure 3-16: Rendering of 2-way Cycle Track in Downtown Tampa along Jackson Street/SR-60

When separated facilities cannot be provided along thoroughfare streets, parallel "bike boulevards" are an option to provide for bicycle mobility. Bike boulevards are streets that have been designed, designated, and prioritized for bicycle travel and can provide a safe, inviting, low-stress option for bicyclists of varying degrees of experience. Although there is no set design template for bike boulevards, a few common principles apply:

- Logical, direct, and continuous bike route
- Safe and comfortable intersection crossings
- Reduced bicyclists delay
- Enhanced access to desired destinations
- Low motor vehicle speeds
- Low motor vehicle volumes

Current Practice

Consistent with emerging guidance from FDOT and FHWA and the Collier MPO's BPMP, the MPO and its member governments have prioritized major roadway corridors to provide separated bicycle facilities and an interconnected network that meets current standards.

The BPMP design guidelines identify a range of potential solutions to apply to situations where ROW is limited. The MPO is coordinating with the Community Traffic Safety Team (CTST) to promote traffic safety education that targets drivers, cyclists and pedestrians.

Recommendation

There is growing support from a safety perspective to provide bike/pedestrian separation from the roadways where possible. The MPO's BPMP design guidelines (reference Table 17, page 61) support this approach. The BPMP design guidelines do not appear to require updating at this time. The next BPMP update will begin in 2023, at which time state and national facility design guidance may have changed and can be incorporated.

Pedestrian Crossings and Median Refuge

Given the distances between traffic signals along most of Collier County's suburban roadway network, it is reasonable to expect that pedestrians will cross major roadways between signalized intersections. Elements such as adequate lighting, traffic platooning, and speed management make it safer to cross the street generally; however, specific infrastructure to facilitate pedestrian crossings is also necessary. These include median refuge areas and mid-block crossings.

Median Refuge Areas

When pedestrian crossing patterns are not concentrated between obvious origins and destinations, continuous raised medians or intermittent median islands allow pedestrians to break roadway crossings into two discreet movements. Ensuring that medians are dry, level walking surfaces can help encourage pedestrians to wait for an adequate gap before attempting the second leg of their crossing.

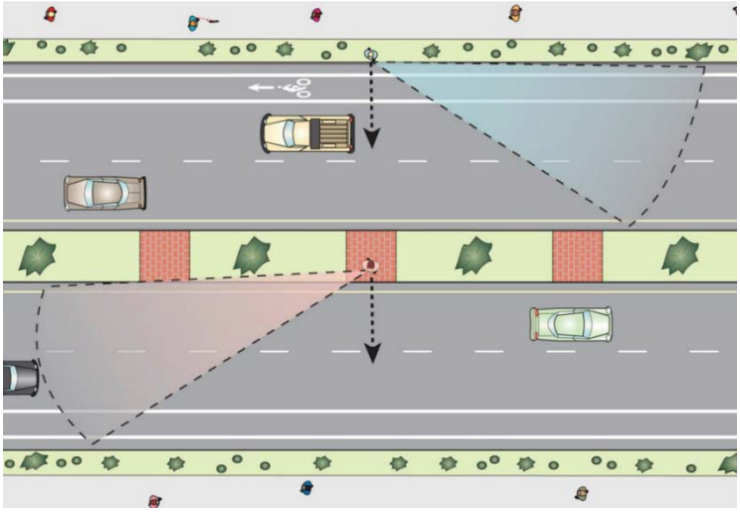


Figure 3-17: Median Refuge Breaks Complex Crossing into Two Simple Crossings

When pedestrian crossing patterns are more tightly clustered, mid-block marked crosswalks should

be considered to provide a safer crossing option; however, along multilane roadways, a marked crosswalk alone is insufficient to provide a safe crossing, and the crosswalk markings should be supplemented with warning beacons or traffic control devices. Beacons such as a rectangular rapid-flashing beacon (RRFB), shown in Figure 3-18, should be pedestrian-actuated and are best suited to roadways with no more than four lanes and speeds of 35 mph or less.

If a midblock crosswalk is provided across a roadway with more than four lanes or speeds greater than 35 mph, a pedestrian hybrid beacon (PHB) is the preferred supplemental device. A PHB is like a traffic signal but creates less motor vehicle delay by switching to a flashing red (stop sign) operation after the first few seconds of the walk interval, as shown in Figure 3-19.

Figure 3-18: RRFB

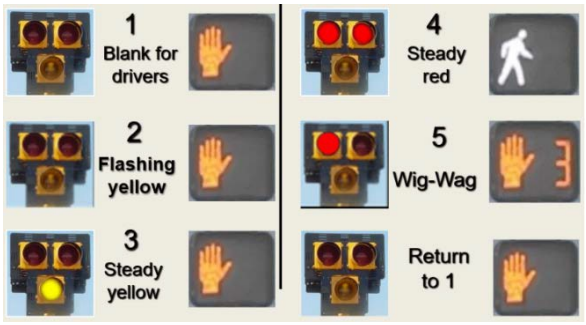


Figure 3-19: Pedestrian Hybrid Beacon Sequence

Current Practice

Median refuge islands and pedestrian mid-block crossings complement speed management and signal coordination strategies to allow pedestrians to more safely cross major roadways. Medians are typically used when there are not clear concentrations of pedestrian traffic, and crosswalks are considered to connect origins and destinations such as transit stops and neighborhood serving commercial lane uses. Marked crosswalks across major roadways generally require supplemental devices and are selected based on the speed and characteristics of motor vehicle travel.

As with considerations related to restricting median access, traffic engineers also investigate whether a midblock crossing need might be better served by signalizing a local street intersection to provide for controlled crossings at that point while also helping to provide downstream gaps for other crossing movements. Retrofit projects are eligible for funding when the MPO issues a Call for

Projects for Congestion Management, Bike-Ped or Safety.

Recommendation

MPO staff does not recommend taking further action at this time.

Lighting

Roadway lighting helps drivers see roadway features at night and, if properly designed, can help drivers detect pedestrians and cyclists. Adequate lighting and well-maintained pavement markings reduce lane departure crashes but also can reduce all types of nighttime crashes by reducing the workload necessary for drivers to stay in their lane, thereby freeing up mental resources for other defensive driving tasks.

Intersection lighting provides the same function for drivers, but if designed correctly, can also help drivers see pedestrians at night. Figure 3-20 shows how intersection lighting should be in advance of crosswalk approaches to that light reflects from pedestrians back towards approaching traffic. Section 231.3.2–4 of the Florida Design Manual defines lighting criteria for intersections, roundabouts, and mid-block crosswalks to help ensure pedestrians are visible to approaching drivers.

Figure 3-21 shows a roadway corridor with light-emitting diode (LED) street lights. Contemporary LED lights offer energy cost savings compared to conventional street lights and the spectrum of light is more effective to promote safety.

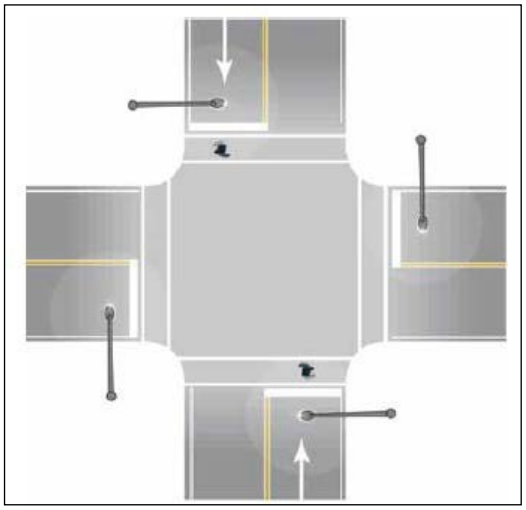


Figure 3-20: Simplified Intersection Lighting

Figure 3-21: LED Lighting

Current Practice

Collier MPO member governments are familiar with FDOT's current intersection lighting standards and balance that consideration with residents desire to maintain the integrity of views of the night sky. The current practice is to keep nighttime skies dark, reduce glare, and put the right amount of light in the right place and at the right time to ensure the safety of all.

Recommendation

Intersection lighting is a tool that will be evaluated on a case-by-case basis.

Autonomous and Connected Vehicles

Because the majority of traffic crashes involve some element of human error, the promise of automated vehicles offers tremendous crash reduction potential, especially when those vehicles are not only able to sense the roadway environment but also capable of communicating with one another.

Although this technology is generally thought of as futuristic, the reality is that vehicle automation has been with us for some time. Figure 3-22 shows how elements such as cruise control, anti-lock brakes, and various warning sensors have been part of our vehicle fleet for some time, and Figure 2-23 shows the various levels of vehicle autonomy with level one and two being common today.

Some challenges with automated vehicles include delay between the time fully-automated technologies are available and there is sufficient saturation in the motor vehicle fleet to result in effective use of vehicle-to-vehicle communications and measurable safety benefits. Another challenge is the limitations of automated/connected vehicles in detecting non-motorized road users. Specifically, pedestrians and cyclists are relatively small, varied in appearance, hard to predict, most exposed/fragile, and not "connected" to vehicle-to-vehicle communication systems.

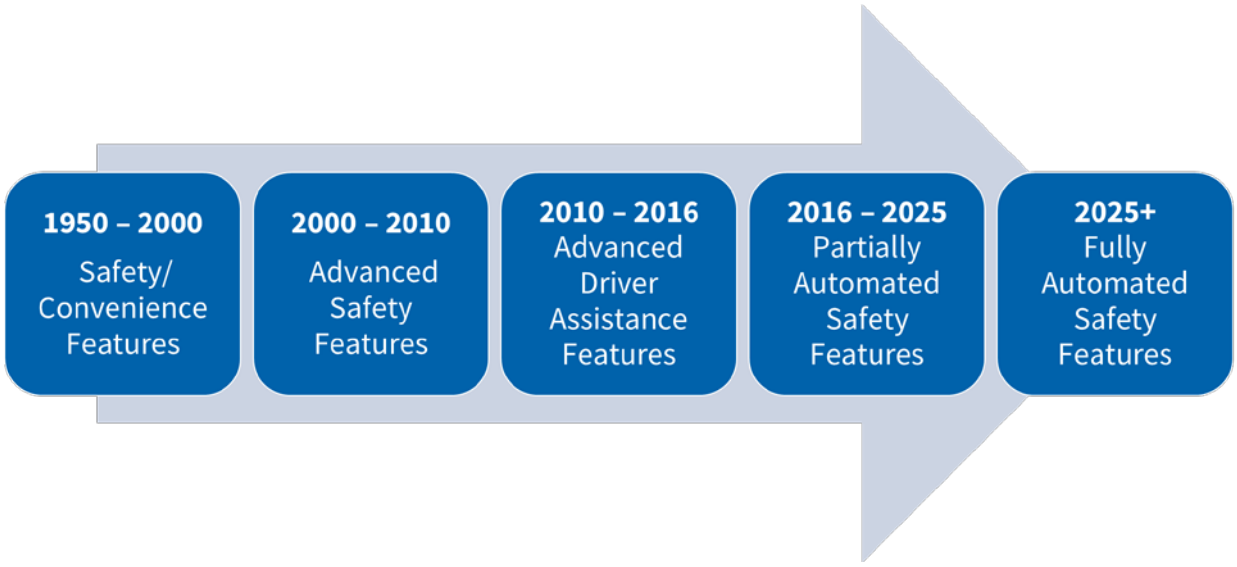


Figure 3-22: History and Future of Autonomous Vehicles

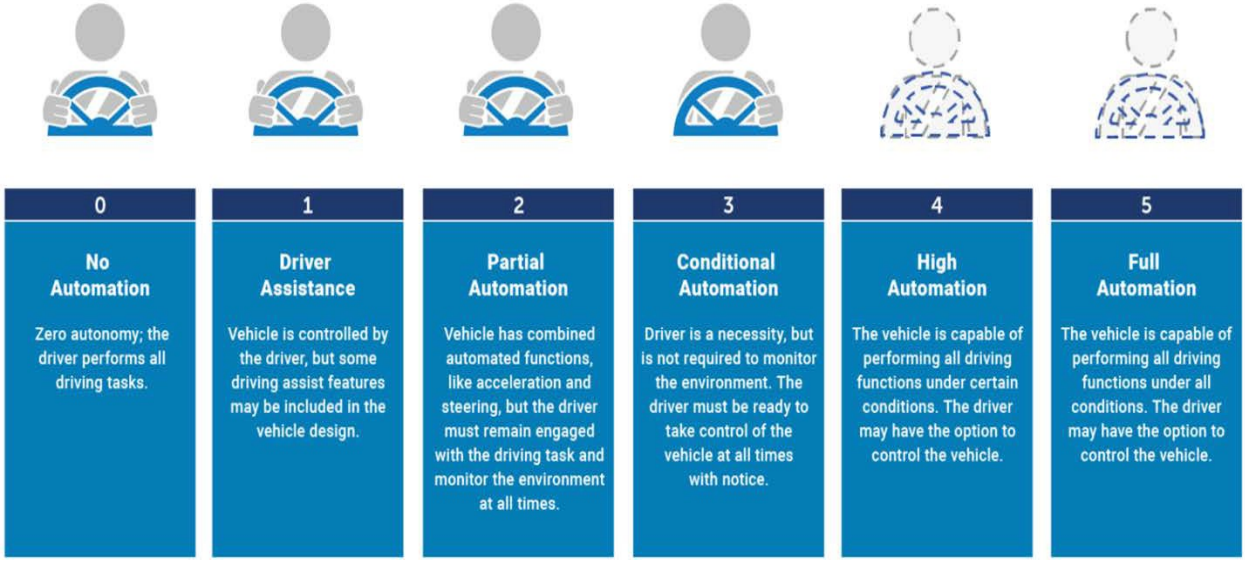


Figure 3-23: Vehicle Autonomy Levels and Features

Current Practice and Recommendation

Collier MPO staff does not recommend taking further action at this time. Within the 2045 LRTP timeframe, FDOT District 1 projects that Connected and Automated Vehicles will comprise approximately 35% of Collier County's motor vehicle fleet; however, in the interim, proactive spot and systemic safety measures are still necessary. Good design of roadways with a balance between mobility and connectivity and good infrastructure for non-motorized road users will provide benefits even once the majority of motorized vehicles drive themselves.

Non-Infrastructure Strategies

Referring to the same four emphasis areas, Table 3-2 shows a list of non-infrastructure strategies and the emphasis areas to which they correspond.

Non-Infrastructure Strategies	Intersection	Lane Departure	Non-Motorized	Rear End/ Sideswipe
Traffic Enforcement				
• **Targeted Speed Enforcement**	X	X	X	X
• **Red Light Running Enforcement**	X		X	
• **Automated Enforcement**	X			?
• **Pedestrian Safety Enforcement**			X	
Bike Light and Retroreflective Material Give-Away			X	
Young Driver Education	X	X	X	X
WalkWise/BikeSmart or Similar Campaign			X	
Continuing Education	X	X	X	X
Safety Issue Reporting	X	X	X	X
Vision Zero Policy	X	X	X	X

Table 3-2: Non-Infrastructure Strategies Matrix

Traffic Enforcement

The Statistical Analysis Technical Memorandum indicates that Collier County records fewer traffic citations per capita and per vehicle mile of travel. This appears to be in part due to relatively small municipal law enforcement agencies and therefore a greater reliance on the Collier County Sheriff's Office and the Florida Highway Patrol to handle traffic enforcement needs. Based on the Statistical Analysis Technical Memorandum, the following enforcement areas could help to reduce severe crashes in Collier County.

- Speed Enforcement
- Red Light Running Enforcement
- Non-Motorized User Safety Enforcement (focusing on driver yield behaviors)

Although automated enforcement (red light running cameras) was suspended in Collier County in 2013, a transparent use of red-light cameras with revenues directed to fund other traffic safety programs should be considered as part of the County's toolkit.

Current Practice

Traffic enforcement is one aspect of an effective speed management program and should be used to target drivers who are significantly exceeding the Speed Limit. Collier County law enforcement agencies regularly apply for FDOT High Visibility Enforcement Grants for bicycle and pedestrian enforcement.

Recommendation

Collier MPO staff does not recommend taking further action at this time.

Material Give-Aways

The LRSP Statistical Analysis (Section 2) notes that while Collier County does not have a disproportionate ratio of nighttime crashes overall, non-motorized road user crashes are more likely to occur at night. A common tactic to reduce nighttime non-motorized user crashes it to provide retro-reflective materials to vulnerable populations including:

- School-age children
- Transit customers
- Homeless shelter clients
- Shift workers who may commute at night

Examples of retroreflective materials include low-cost backpacks with reflective strips, Velcro ankle strips to keep pant cuffs from catching in bicycle gears, and simple safety vests. Low-cost bicycle light kits can also be distributed and may be provided as part of a warning stop when police officers notice cyclists riding at night without proper lights.

Current Practice and Recommendation
The Collier County Sheriff's Office provided the following information:

"The Collier County Sheriff's Office has a variety of community outreach events per year involving contact with adults and juveniles for bicycle and pedestrian safety. These include our in-school Youth Relations Bureau, Community Policing Units, and Crime Prevention Unit that provide bicycle, bicycle helmet, literature, lights, and reflective material giveaways in addition to verbal education. These have occurred during general school hours, targeted community events on the weekends, or random 'pop-up' events in the community at targeted locations.

The Crime Prevention Unit and District Community Policing Units hold targeted 'pop-up' events in areas that patrol units, citizen complaints, or statistical data show dangerous pedestrian and bicycle activity. One of these areas, for example, is on East Tamiami Trail between Airport-Pulling Road South and Bayshore Drive; see Figure 2-8 on P. 2-17. Bicycle helmet, bicycle light, reflective materials, and literature giveaways in conjunction with dialogue take place several times per year with these events.

We believe that these events proactively have kept the number of bicycle and pedestrian crashes to not be statistically significant. We are largely able to do this with safety product giveaways. Thus, we would encourage the contribution of these products and literature to our agency for continued proactive safety educational measures. Increasing local contributions would be beneficial in maintaining our efforts.

The Collier County Sheriff's Office Safety and Traffic Enforcement Bureau receives funding through the Florida Department of Transportation High Visibility Enforcement (H.V.E.) grant. Various methodologies are used with this grant to reduce bicycle and pedestrian crashes and increase safety. The Safety and Traffic Enforcement Bureau works in conjunction with District Community Policing Units, Patrol Units, Crime Prevention Unit, Youth Relations Bureau, Media Relations Bureau, and other entities to promote the goals of this program."

Recommendation
MPO staff will look for free materials to give-away at MPO events.

Figure 3-24: Example Retroreflective Promotional Materials

Young Driver Education

A key conclusion from the LRSP Statistical Analysis is that Collier County's demographics likely play a role in its better than average safety performance. Because Collier County does not have a high proportion of younger drivers, the overall expected crash rates as a function of population age demographics are better than Florida as a whole. In the future, as Collier County continues to grow, it is likely that its demographic profile will become more "normal" and the introduction of more, young drivers will begin to adversely impact Collier County crash statistics.

Although older drivers certainly have limitations in terms of vision, reflexes, and other age-related deficits, these drivers are more likely to recognize their limitations than younger drivers and act accordingly. This is born-out by data showing that older drivers are less likely to be involved in nighttime crashes or crashes during rush hour because these drivers choose to avoid higher-risk times of day.

To help reduce crashes among younger drivers, supplemental drivers' education programs should be considered. One such program, funded by FDOT District 7, provides high school seminars focused on teen driver safety issues including bicycle and pedestrian safety, motorcycle safety, and impacts of DUI. Statewide FDOT provides grants under the umbrella of the State Safety Office Teen Driver Safety program to fund programs that help to educate teen drivers.

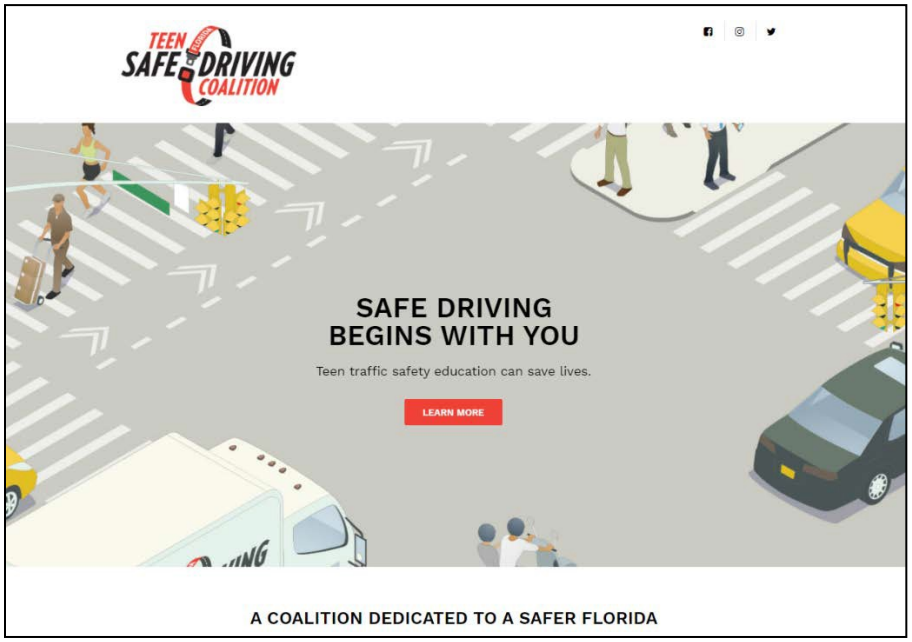


Figure 3-25: Florida Teen Safe Driving Coalition Homepage

Current Practice

FDOT and the state MVD conduct training sessions for young drivers. The Collier County Sheriff's Office provided the following information:

"The Collier County Sheriff's Office Youth Relations Bureau and Crime Prevention Unit provide direct and indirect education programs to Young Drivers. The Youth Relations Bureau provides the "Teen Driver Challenge" to young, high school aged drivers in order to provide them with a comprehensive view of safe driving habits and legalities surrounding the challenge of driving as a youth. They also integrate with drivers' education courses and other school functions in providing educational literature and dialogue with young drivers (and future drivers) in order to prepare them for real life encounters on the roadway. One of the significant focuses they have made is with respect to Texting and Driving; with state laws that make texting and driving illegal under certain conditions and the significant focus that youth have on their cell phones. They also speak with the students in Drivers Ed about the dangers of driving under the influence of alcohol and drugs.

Youth Relations Bureau members and Crime Prevention Unit members also make hundreds of contacts with young drivers every year in settings not specifically structured towards driving but that still allow specific educational opportunities for young drivers to be educated on legalities and safe methods of driving."

Recommendation

MPO staff does not recommend taking further action at this time. Adult Traffic Safety Education

From the public outreach survey responses, it is clear that many Collier County residents do not feel safe biking or walking along major roadways and that driver behavior with respect to yielding/making space for non-motorized users is inadequate. The Bike/Walk Tampa Bay program, administered by the University of South Florida and funded by FDOT District 7, offers virtual and in-person pedestrian, driver and bicyclist safety presentations to adult audiences. The presentation uses an Audience Response System to quiz the audience and poll their opinions.

Nonmotorized Safety Education

Since 2015 over 30,000 individuals have participated in seminars with each participant taking a "pledge" to WalkWise, BikeSmart, and Drive Safely and work to educate others about the importance of safe behaviors.

Figure 3-26: Walk Wise Class Photo

Current Practice

The Collier MPO is following-up on the more detailed safety analysis contained in the BPMP and is an active participant in the Community Traffic Safety Team (CTST), which includes FDOT District 1 and Local Law Enforcement Agencies, in promoting traffic safety education for drivers, pedestrians and cyclists.

The Collier County Sheriff's Office added the following information:

"The Collier County Sheriff's Office participates in sporadic speaking engagements with community organizations specific to drivers, pedestrians, and cyclist safety laws, regulations, and safety tips. Further, The Collier County Sheriff's Office participates in hundreds of community events every year that involve proactive community outreach. Literature, giveaways, and dialog about motorized and non-motorized vehicle safety are often included in these events.

The Collier County Sheriff's Office Media Relations Bureau provides safety tips and messages for drivers, pedestrians, and cyclists through news releases and a variety of online publications. These messages generate hundreds of thousands of views on CCSO's various social media platforms. The MRB also works closely with local news organizations to promote the agency's safety message.

To address the growing problem of motorcycle crashes, fatalities, and injuries, Collier County Sheriff's Office seeks to start the implementation of the Safe Motorcycle and Rider Techniques (SMART) training program, a countermeasure addressed in chapter 5, section 3.2 "Motorcycle Rider Training" of the National Highway Traffic Safety Administration (NHTSA's) Countermeasures That Work guide. It will be a six-hour course supported by the University of South Florida's Center for Urban Transportation Research.

The program will be design around skill sets taken from the Basic Police Motorcycle Operators Course. The instructor ratio will be no less than 1:6 with one lead instructor. Each class will hold a maximum of 36 students in an effort to maximize saddle time and course repetition without creating undue fatigue. There will be six stations that emphasize fundamental principles and that have real world applications. Each station will be 45 minutes long with a 15-minute break in between stations. During each break, there will be an additional five minutes of instruction on a relevant motorcycle operation topic. The breaks will be designed as a working break in which questions and additional comments would be addressed."

Recommendation:
MPO staff recommend, and will report on, taking a more proactive approach to bike-ped safety education by working closely with the MPO's Bicycle and Pedestrian Advisory Committee, FDOT, the CTST and the informal Naples Bike-Ped Safety Coalition to promote bike/ped safety informational videos, brochures and special events.

Continuing Education

Continuing education programs for safety professionals can help ensure that as standards and practices evolve, the professional community remains abreast with the state of the art. This is especially important in Collier County where so much of the public roadway system is constructed by private developers. The Collier MPO should encourage participation in FDOT's Local Agency Traffic Safety Academy (LATSA).

LATSA is a free webinar series focused on:

- Sharing knowledge about traffic safety
- Discussing new and ongoing safety programs
- Explaining available funding sources
- Presenting local best practices,
- Learning about new safety treatments and technologies
- Discussing project delivery processes

Current Practice and Recommendation

The Collier MPO will continue to promote and distribute safety education materials geared towards professional engineers and planners, including LATSA webinars.

Safety Issue Reporting System

Non-emergency reporting systems can help identify potential safety issues before crash histories are established. Applications such as Wikimaps allow agencies to collect "crowdsourced" tips which can be categorized. These applications also allow users to click on and concur with previously reported issues and/or upload photos so that monitoring agencies can gather more actionable intelligence about potential issues. In the northeast Florida Area, FDOT District 2 maintains a Community Traffic Safety Team engineering issues system which allows safety partners to submit engineering concerns with pictures and follow-up contact information.

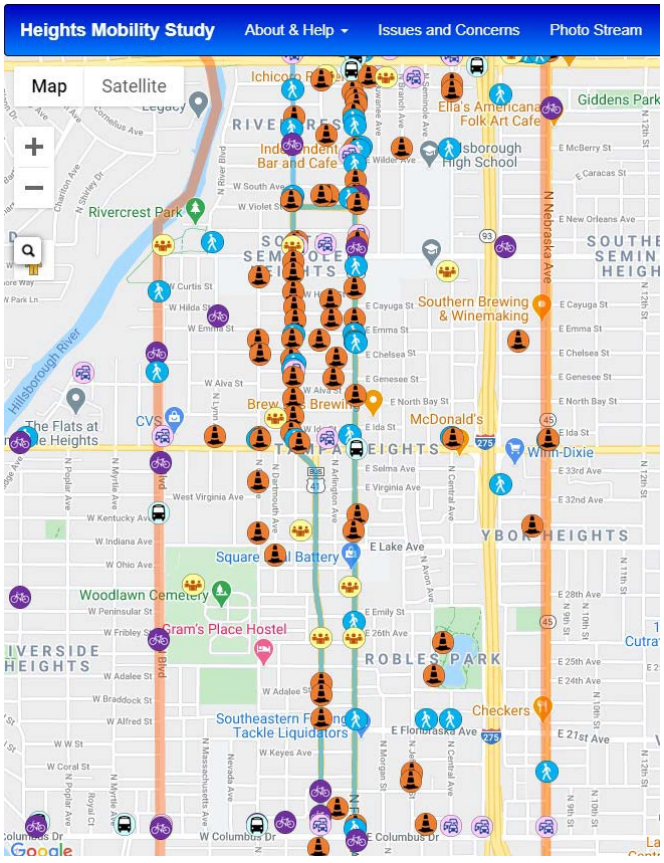


Figure 3-27: Example Wikimaps Issue Page

Recommendation

Collier County's 311 Reporting System addresses the strategy. MPO staff does not recommend taking further action at this time.

Vision Zero Performance Measures and Targets

The Collier MPO has adopted FDOT's Vision Zero safety performance measures and targets. The development of the LRSP expands the MPO's awareness and understanding of traffic safety data. The data analysis component of the LRSP has been factored into the project prioritization methodology in the Traffic System Performance Report (TSPR) and the 2045 LRTP. The LRSP recommendations for nonmotorized users safety are consistent with the design guidelines and prioritization criteria in the MPO's BPMP, adopted in 2019.

Recommendation

The Collier MPO has adopted FDOT's Vision Zero performance measures and targets. As part of the implementation process for the Collier LRSP, MPO member governments are encouraged to explore the merits of adopting a Vision Zero approach to safety in Collier County.

SUMMARY

MPO staff interviewed technical staff of member agencies to identify current practices related to each of the strategies identified by the consultant team, and in the process, refined the preliminary draft recommendations to focus on enhanced practices addressing three key strategies:

1) Flag high crash locations identified in the LRSP to incorporate safety analysis in the project scoping and design for road improvement projects and stand-alone bike/ped facility projects.

2) Flag high crash locations for Road Safety Audits using MPO SU safety set-aside and/or state, federal funds. The BPMP already does this for stand-alone bike-ped projects.

3) Promote bike-ped safety videos, handouts and special events more proactively as part of the CTST / Blue Zones Naples Bike-Ped Safety Coalition.

SECTION 4: IMPLEMENTATION PLAN

LOCAL BEST PRACTICES

Collier MPO staff interviewed member agency staff to determine the extent to which the Recommendations described in the previous section have already been put into practice. The following is a brief summary of current, local Best Practices.

City of Naples – Traffic Department, Police Department Activities

Engineering Analysis and Response to Serious Injury and Fatal Crashes - The City of Naples Traffic Department reviews all serious injury and fatal crashes to determine if there is a need for engineering modifications. If City staff identify any recommended actions Streets and Drainage Division and Planning Division staff review police reports on fatal crashes to determine if there may be a need for an engineering [design] solution. If staff has actions to recommend actions on State roads, they reach out to FDOT and request consideration of any modifications.

Engineering Analysis of High Crash Corridors & Intersections - If there are a significant number of crashes at a particular intersection, the Naples Police Department typically notifies the Traffic Department for an assessment.

Enforcement - If Traffic Department staff notice areas of concern, they work with the Naples Police Department to increase enforcement by placing speed trailers out or integrating police presence.

Education - The Traffic Department is researching ways to incorporate more safety education into their programs, particularly for pedestrian/bike safety and understanding of the rules of the road by all users – motorized and non-motorized.

Special Studies and Activities **-** Traffic Department staff often perform speed studies, review intersections for line-of-sight issues, evaluate local needs for intersection improvements including stop signs or other modifications to determine if they meet warrants, and incorporate bike/pedestrian markings and signage where a need is identified.

Collier County – Growth Management Department -Traffic Operations Division and Transportation Planning Division

Engineering Analysis and Response to Serious Injury and Fatal Crashes – The Traffic Operations Division has a FTE for a PE to monitor and report on crash data. The staff member maintains the County's Crash Data Management System (CDMS), and regularly pulls crash reports to determine whether there is an indication that roadway design could be an issue. The Division develops potential solutions and seeks funding to implement them.

Engineering Analysis of High Crash Corridors & Intersections – The Traffic Operations Division prepares an annual report on high crash intersections.

Enforcement – The Traffic Operations Division has fixed and portable speed monitoring signs. The Division places the portable signs in locations in response to public requests and keeps them in place for a two-week period. The County Sheriff's Office also deploys speed monitoring signs in problem areas. The Traffic Operations Division and the Sheriff's office have a cooperative working relationship and share information regarding enforcement needs and capabilities.

The County's five (5) fixed messaging signs are located on high crash locations along:

- Immokalee Road
- Collier Blvd
- Golden Gate Blvd
- Randall Blvd
- Oil Well Road

Special Studies and Activities

Traffic Operations produces an annual report identifying high crash intersections. Staff reviews all crash data for three subsets of intersections:

- Energized (signalized)
- 4-way unsignalized
- 3-way unsignalized

Staff ranks intersections by comparing crash rates over 1, a crash rate over the "mean" of all intersections, a statistical computation of any intersection with a crash rate over the critical crash rate, a comparison of the expected value, and injury severity. Next, staff reviews each noted intersection in depth and implements corrective actions where needed.

Collier County Sheriff's Office (CCSO)

Education and Enforcement

The CCSO takes a proactive approach that combines traffic safety education and enforcement. The Community Engagement Division focuses on public outreach and education and works closely with the Traffic Enforcement group. The CCSO notes that in a community with a large number of tourists and part-time residents, there are instances when educating a member of the public on local laws is more effective than issuing a citation. The County Sheriff's Office maintains multiple data bases on crashes and deploys enforcement strategically to high crash locations. If engineering design modifications appear to be needed, the CCSO contacts the local road agency.

CONCLUSIONS

Based on the foregoing set of recommendations proposed by the MPO's consultant, Tindale Oliver, and MPO staff's compilation of current practices, staff concludes that the following recommendations have already been sufficiently implemented:

1. The high crash corridor and intersection locations identified in the LRSP have been incorporated into project prioritization criteria in plans recently approved by the MPO Board:
   - 2045 Long Range Transportation Plan (LRTP) approved December 11, 2020
   - Transportation System Performance Report and Action Plan, approved September 11, 2020

2. The high crash corridor and intersection locations identified in the LRSP may be considered eligible for expenditure of MPO TMA SU funds in addition to those locations identified by:
   - Collier County Traffic Operations Section on an annual basis
   - FDOT's annual reporting system
   - The MPO's Bicycle and Pedestrian Master Plan (2019)

3. The 2045 LRTP establishes funding for safety projects using TMA SU funds; the MPO will periodically issue a Call for Safety Projects

4. The LRSP provides confirmation of the following strategies already in use by member governments:
   Infrastructure
   - Speed Management – limited to deploying speed monitoring signs in specific locations
   - Alternative Intersections (FDOT's ICE Process)
   - Median Restrictions/Access Management
   - Right Turn Lanes
   - Signal Coordination
   - Rural Road Strategies
   - Design Best Practices for pedestrians and cyclists including:
     - Intersection design
     - Shared Use Pathways and Sidewalk Improvements
     - Mid-Block Crossings & Median Refuge
     - Intersection Lighting Enhancements

5. The LRSP pointed out the desirability of creating a Traffic Safety Coalition to raise awareness and promote traffic safety education. While the LRSP was in development, the Blue Zones of Southwest Florida began organizing and promoting an informal partnership referred to as the Naples Bike-Ped Safety Coalition as an outgrowth of the Community Traffic Safety Team (CTST). The CTST concept was initiated by FDOT, Membership is fluid and informal. Blue Zones currently hosts the CTST, which welcomes participation by state agencies, health and emergency service providers, local law enforcement, other Nongovernment Organizations (such as Naples Pathways Coalition, and Naples Velo), local governments and the MPO. MPO staff has long been active in the CTST and has joined forces with the Naples Bike-Ped Safety Coalition. As a further implementation step, MPO staff is proactively promoting bike-ped safety videos, handouts and special events sponsored by other entities.

Staff Recommended Enhanced Practice:

Monitor and report on progress made:

- Speed management – project specific in high crash locations identified by the LRSP.
- Bike-ped safety education – more proactive engagement by the MPO and member governments; include safety material give-aways that can be acquired free of charge from FDOT and NHTSA.
- Road Safety Audits – coordinate with FDOT on programming the MPO's priority safety projects in the Work Program.
- Safety Analysis - include in project scoping and design for road improvement projects and stand-alone bike/ped facility projects in high crash locations identified in the LRSP and BPMP.

Relationship to Collier MPO 2045 Long Range Transportation Plan and Transportation Improvement Program

The MPO's 2045 Long Range Transportation Plan (LRTP) documents multimodal transportation needs and cost-feasible project priorities over the 20-year period from 2026 – 2045. Committed projects slated for construction prior to 2026 are incorporated in the MPO's 5-year Transportation Improvement Program (TIP). The Draft 2045 LRTP incorporates the LRSP by reference and also incorporates the MPO's Bicycle and Pedestrian Master Plan.

Infrastructure Strategy Implementation Opportunities

Table 4-16 on the following page shows the relationship of the projects prioritized in the 2045 LRTP – Cost Feasible Plan to corridors identified as having an overrepresentation of emphasis area crashes in Section 2 of the LRSP. Each LRTP project shown in the table represents an opportunity to advance the infrastructure strategies described in Section 3 of the LRSP. While there is significant overlap between 2045 LRTP projects and LRSP high crash corridors, some corridors do not have planned capital projects and are eligible for $3m in SU funding set-aside for Safety projects under the LRTP, in addition to any State funds that may be available for stand-alone studies and enhancements consistent with the LRSP.

In addition to the potential for substantive safety improvements to be incorporated in the LRTP Cost-Feasible Plan projects, the LRTP sets aside over $41m of funding for implementation of the Collier Bicycle Pedestrian Master Plan. While not all bicycle and pedestrian mobility projects have an inherent safety nexus, the prominence of non-motorized user safety as a planning factor in developing the mobility project priorities for cyclists and pedestrians means that implementation of this plan, as a component part of the LRTP, will generally advance non-motorized user safety. The Transportation System Performance Report and Action Plan, also incorporated into the 2045 LRTP by reference, includes traffic safety as a prioritization criterion. The 2045 LRTP allocates $41m in SU funding for congestion management projects.

LRSP Update Cycle

Because the LRTP sets funding priorities for the Federal and State dollars within the MPO's purview, the most effective timeframe to update the Collier MPO LRSP is concurrent with or in advance of the LRTP. The Final Draft of the 2045 LRTP identifies the LRSP as a core document to be updated and incorporated by reference into future updates of the LRTP as a component part. The 5-year cycle of the LRTP update process allows for adequate time to assess the recommended LRSP monitoring measures (discussed below) and for the data-driven analysis of safety performance in Collier County to influence capital project priorities.

MPO SEGMENT ID	LRTP Project ID, Description, and Construction Timeframe		On Street	From Street	To Street	Total Crashes	Total Fatal Crashes	Total Severe Injury Crashes	Bike/ Pedestrian Rank	Lane Departure Rank	Intersection Rank	Rear End/ Sideswipe Rank
40			Airport Road	US 41 (Tamiami Trail)	Davis Boulevard	263	2	4	1			
41			Airport Road	Davis Boulevard	North Rd	306	1	4	14			
43			Airport Road	Radio Road	Golden Gate Parkway	688	1	7	15	4	8	2
45			Airport Road	Pine Ridge Road	Orange Blossom Drive	668	2	3		5	9	3
70			Bayshore Drive	Thomasson Drive	US 41 (Tamiami Trail)	232	0	7	5			
132			Collier Boulevard	Mainsail Drive	Manatee Road	296	0	5		12		
136			Collier Boulevard	US 41 (Tamiami Trail)	Rattlesnake Hammock Road	217	0	3		10		
137			Collier Boulevard	Rattlesnake Hammock Road	Davis Boulevard	447	1	7		11		
141			Collier Boulevard	Golden Gate Pkwy	Green Boulevard	363	2	6			3	
145			Collier Boulevard	Vanderbilt Beach Road	Immokalee Road	576	0	7	9	7	12	5
222			Davis Boulevard	Lakewood Boulevard	County Barn Road	331	1	8	12			
250			Golden Gate Boulevard	Collier Boulevard	Wilson Boulevard	453	2	11		3		
263	78 - Major Intersection @ Livingston; 23 - Interchange @ I-75	FY26 - 30	Golden Gate Parkway	Livingston Road	I-75	425	0	4				8
265			Golden Gate Parkway	Santa Barbara Boulevard	Collier Boulevard	665	0	7			1	6
270			Goodlette-Frank Road	US 41 (Tamiami Trail)	Golden Gate Parkway	453	0	9		6	5	
271			Goodlette-Frank Road	Golden Gate Parkway	Pine Ridge Road	499	1	9			10	14
343	66 - Major Intersection @ Livingston	FY26 - 30	Immokalee Rd	Livingston Road	I-75	431	0	3				12
344	25 - Interchange Improvement @ I-75	FY26 -30	Immokalee Rd	I-75	Logan Boulevard	569	4	3				4
345	97 - Major Intersection @ Logan	FY36 - 45	Immokalee Rd	Logan Boulevard	Collier Boulevard	497	0	7				9
346			Immokalee Rd	Collier Boulevard	Wilson Boulevard	364	2	9		1		
348			Immokalee Rd	Oil Well Road	Stockade Rd	258	2	6		2		
349			Immokalee Rd	Stockade Rd	SR 29	182	0	5	11			
361			Lake Trafford Rd	Carson Rd	SR 29	223	1	5	10			
523			Pine Ridge Road	Airport Road	Livingston Road	808	0	8		15	11	1
524			Pine Ridge Road	Livingston Road	I-75	464	0	8				11
531			Radio Road	Livingston Road	Santa Barbara Boulevard	275	1	11	6			
593			Santa Barbara Boulevard	Golden Gate Parkway	Green Boulevard	295	1	6			7	
648			SR 29	1st St	9th Street	99	1	4	4			
649			SR 29	9th Street	Immokalee Dr	215	0	7	7		13	
650			SR 29	Immokalee Dr	CR 29A North	171	1	3	13			
670			Tamiami Trail East	Davis Boulevard	Airport Road	302	3	8	2			
671			Tamiami Trail East	Airport Road	Rattlesnake Hammock Road	501	3	10	8		15	10
672			Tamiami Trail East	Rattlesnake Hammock Road	Treetops Dr	307	2	8		13		
690	57 - Major Intersection @ Goodlette-Frank	FY31-35	Tamiami Trail North	SR 84 (Davis Blvd)	CR 851 (Goodlette Rd South)	398	0	4		9	2	
692			Tamiami Trail North	12th Ave	Park Shore Dr / Cypress Woods Dr	436	0	9		8	4	
693			Tamiami Trail North	Park Shore Dr / Cypress Woods Dr	Pine Ridge Rd / Seagate Dr	361	2	7			6	
694			Tamiami Trail North	Pine Ridge Rd / Seagate Dr	Gulf Park Drive	378	2	9			14	
696			Tamiami Trail North	Vanderbilt Beach Road	Immokalee Road	462	2	4	3			
697	111 - Intersection Improvement @ Immokalee	FY26 -30	Tamiami Trail North	Immokalee Road	Wiggins Pass Road	502	1	8				7
712			Vanderbilt Beach Road	Goodlette-Frank Road	Airport Road	414	1	1				15
714			Vanderbilt Beach Road	Livingston Road	Logan Blvd	425	0	4				13
715	99 - Minor Intersection @ Logan	FY36 - 45	Vanderbilt Beach Road	Logan Blvd	Collier Blvd	337	1	4		14		

Table 4-16: Relationship of Emphasis Areas Corridors and DRAFT 2045 LRTP Cost Feasible Projects

Monitoring and Performance Measures

Safety Performance Measures

The Collier MPO has adopted FDOT's Vision Zero safety performance measures and targets on an annual basis. The MPO Director provides an annual report to the MPO Board in December which tracks how well the MPO is performing in meeting its performance targets. In addition, the 2045 LRTP includes a Transportation System Performance Report using a template developed by FDOT and the MPO Advisory Council (MPOAC). A similar report is incorporated in the MPO's Transportation Improvement Program (TIP).

Monitoring of Plan Implementation

The MPO Director will include information on progress made towards implementing the LRSP to the Annual Report; most likely in combination with reporting on progress towards meeting safety targets generally due to the linkages established between the LRSP, the TSPR, the BPMP and the 2045 LRTP.

Updating the Local Roads Safety Plan

The baseline data analysis captured in this first iteration of the LRSP will be updated every 5 years in preparation for developing the next iteration of the LRTP. The traffic safety updates may not necessitate a stand- alone document like the LRSP; rather, they could be incorporated in other planning efforts, such as the Transportation System Performance Report. New strategies and recommendations will be incorporated as needed, and the plan may shift focus overtime.

APPENDIX 1: GLOSSARY OF TECHNICAL TERMS

GLOSSARY

- **AADT –** Average Annualized Daily Traffic: Daily traffic volumes collected over multiple (usually three) days and adjusted for seasonal variations in traffic volumes.

- **Emphasis Area –** Emphasis areas are usually divided into 22 categories based on extensive research by the AASHTO and National Cooperative Highway Research Program in their Strategic Highway Safety Plan (NCHRP). These include infrastructure (e.g., utility pole collisions), crash types (e.g., head-on collisions, lane departures), behavior (e.g., alcohol, speeding, occupant protection), vehicle types (e.g., bicycles, motorcycles, heavy trucks), and at risk populations (e.g., young drivers, older drivers). Implementation guides have been developed for these emphasis areas and are available as 22 volumes of the NCHRP Report 500. Emphasis Areas for the Collier LRSP represent a combination of similar crash types related to non-motorized road users, intersection crashes, lane departure crashes, and same direction (rear-end/side-swipe) crashes.

- **Functional Classification –** System used to classify roadways based on a transect of mobility vs. access.

    - **Freeway & Expressway -** Roads in this classification have directional travel lanes usually separated by some type of physical barrier, and their access and egress points are limited to on- and off-ramp locations or a very limited number of at-grade intersections. These roadways are designed and constructed to maximize their mobility function, and abutting land uses are not directly served by them.
    - **Arterial Roadway (Major) -** These roadways serve major centers of metropolitan areas, provide a high degree of mobility and can also provide mobility through rural areas. Forms of access include driveways to specific parcels and at-grade intersections with other roadways.
    - **Arterial Roadway (Minor) -** Minor Arterials provide service for trips of moderate length, serve geographic areas that are smaller than their higher Arterial counterparts and offer connectivity to the higher Arterial system. In an urban context, they interconnect and augment the higher Arterial system, provide intra-community continuity and may carry local bus routes. In rural settings, Minor Arterials should be identified and spaced at intervals consistent with population density, so that all developed areas are within a reasonable distance of a higher level Arterial. The spacing of Minor Arterial streets may typically vary from 1/8- to 1/2-mile in the central business district (CBD) and 2 to 3 miles in the suburban fringes. Normally, the spacing should not exceed 1 mile in fully developed areas
    - **Collector Roadway -** Collectors serve a critical role in the roadway network by gathering traffic from Local Roads and funneling them to the Arterial network. Collectors are broken down into two categories: Major Collectors and Minor Collectors. Major Collector routes are longer in length; have lower connecting driveway densities; have higher speed limits; are spaced at greater intervals; have higher annual average traffic volumes; and may have more travel lanes than their Minor Collector counterparts. In rural areas, AADT and spacing may be the most significant designation factors. Major Collectors offer more mobility and Minor Collectors offer more access. Overall, the total

mileage of Major Collectors is typically lower than the total mileage of Minor Collectors, while the total Collector mileage is typically one-third of the Local roadway network
    - **Local Street –** Locally classified roads account for the largest percentage of all roadways in terms of mileage. They are not intended for use in long distance travel, except at the origin or destination end of the trip, due to their provision of direct access to abutting land.

- **ICE –** Intersection Control Evaluation: A FHWA and FDOT process for evaluating appropriate traffic control measures at major intersections.

- **Signal Timing** – Refers to a set of parameters for controlling traffic signals what include:

    - Cycle Length – the time for a traffic signal to complete all phases
    - Phase – a set of allowed concurrent movements
    - Split – the amount of time allocated to each phase
    - Offset – the time between common phases at adjacent traffic signals. This is used to progress traffic along a roadway from upstream to downstream signals
    - Platoon – a group of vehicles travelling between coordinated traffic signals

- **VMT –** Vehicle Miles Traveled: A measure of driver exposure based on miles of roadway travel.

APPENDIX 2: CRASH DATA QUALITY CONTROL TECHNICAL MEMORANDUM

Collier County MPO
Local Road Safety Plan

Crash Data QC Technical Memorandum

March 24, 2020

FINAL

Prepared for:

Prepared by:

Tindale Oliver

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APPENDICES

SECTION 1: INTRODUCTION

A five-year crash history from 2014 to 2018 was queried using data from the Collier County Crash Data Management (CDMS) for both motorized vehicles and crashes involving non-motorized road users. Table 1-1 shows a five-year total of motorized vehicle and non-motorized road user crashes based on the highest injury severity for each report.

Table 1-1: Summary of Crashes (2014-2018)

Severity	Motor-Vehicle		Non-Motorized		Total
	Crashes	Percent	Crashes	Percent	
Fatal	130	74%	45	26%	175
Incapacitating Injury	669	80%	170	20%	839
Non-Incapacitating Injury	2,758	85%	501	15%	3,259
Possible Injury	5,290	92%	454	8%	5,744
Property Damage Only	45,175	99%	315	1%	45,490
TOTAL	**54,022**	**97%**	**1485**	**3%**	**55,507**

As part of the Collier County Local Road Safety Plan (LRSP), key attributes of the more severe crashes in the data set were reviewed to verify that the coded crash data accurately corresponds to the narrative information and collision diagrams included in each crash report. This was done to ensure that reasonably accurate data is used for the purpose of developing the LRSP recommendations and to identify potential data coding trends and issues to address with each of the reporting Law Enforcement Agencies.

The purpose of this memorandum is to summarize the methodology used to review and re-code crash reports, as well as summarize the findings from the review process. Consistent with the LRSP Scope of Services, the following crash reports were reviewed:

- Motor Vehicle Crashes: Fatal, Incapacitating Injury, and Non-Incapacitating Injury (3,557 Crashes).
- Non-Motorized User Crashes: Fatal, Incapacitating Injury, Non-Incapacitating Injury, and Possible Injury (1,170 Crashes).

For each of these crash reports, the following data items were checked:

- Crash Location: Verification and correction of crash node assignment and approximate XY coordinates.
- Crash Type: Verification and correcting collision diagram crash type. (Note: this is a data attribute that is calculated by the Collier CDMS from other crash data attributes including vehicle direction, vehicle movement, manner of collision, and first harmful event.)
- Checking for completeness and compare key data fields with narrative and diagram as follows:
  - Manner of collision

- First Harmful Event
- Event Impact
- First Harmful Event Relation to Junction
- Driver Action (First)
- Driver Restraint System (Vehicle 1 and 2)
- Non-Motorized User Data:
    - Description
    - Action Prior to Crash
    - Location at Time of Crash
    - Actions/Circumstances (First)
    - Safety Equipment (First)

SECTION 2: METHODOLOGY AND DATA REVIEW

Attribute fields for motorized and non-motorized crash data were exported from the Collier WebCDMS database and manually reviewed and checked for accuracy by an engineering technician. When individual data elements were deemed inaccurate, a revised value was coded in a separate data field. An input was deemed inaccurate if the crash report data input was inconsistent with the crash report's written narrative or illustrated collision diagram.

As shown in Table 2-1, Collier County Sheriff's Office collects the highest number of crash reports, followed by Florida Highway Patrol, Naples Police Department (PD), and Marco Island PD. Collier County Sherriff's Office has the highest number (60 percent) of reports that were revised during the clean-up process, followed by Marco Island PD and Naples PD.

Table 2-1: Revised Data Input by Reporting Agency

Reporting Agency	Reports Reviewed	Reports Revised	Percent Reports Revised
Florida Highway Patrol (FHP)	1,895	608	32%
Collier County Sheriff's Office (CCSO)	2,690	1,613	60%
Naples Police Department (PD)	327	155	47%
Marco Island PD	124	91	73%
Other	6	3	50%
TOTAL	**5,042**	**2,470**	**49%**

During the review process, the fields with the most inconsistent coding needing editing were Event Relation to Intersection, Crash Type, and Impact Type. There were twelve (12) motorized and eight (8) non-motorized crash entries that did not have XY coordinates. These crash entries were manually reviewed, and a location was added.

Table 2-2 shows a summary of the total revisions to these attributes for Motor Vehicle (MV) crashes and Non-Motorized User (NM) crashes for each reporting agency.

Table 2-2: Frequently Revised Data Fields

Reporting Agency	Event Relation to Intersection		Crash Type		Impact Type		Location	
	MV Crashes	NM Crashes	MV Crashes	NM Crashes	MV Crashes	NM Crashes	MV Crashes	NM Crashes
FHP	96	34	310	12	90	168	0	0
CCSO	471	415	339	381	108	682	2	0
Naples PD	43	45	35	17	6	39	9	0
Marco Island PD	18	25	25	28	4	37	1	7
Other	0	3	0	1	0	0	0	1
TOTAL	**628**	**522**	**709**	**439**	**208**	**926**	**12**	**8**

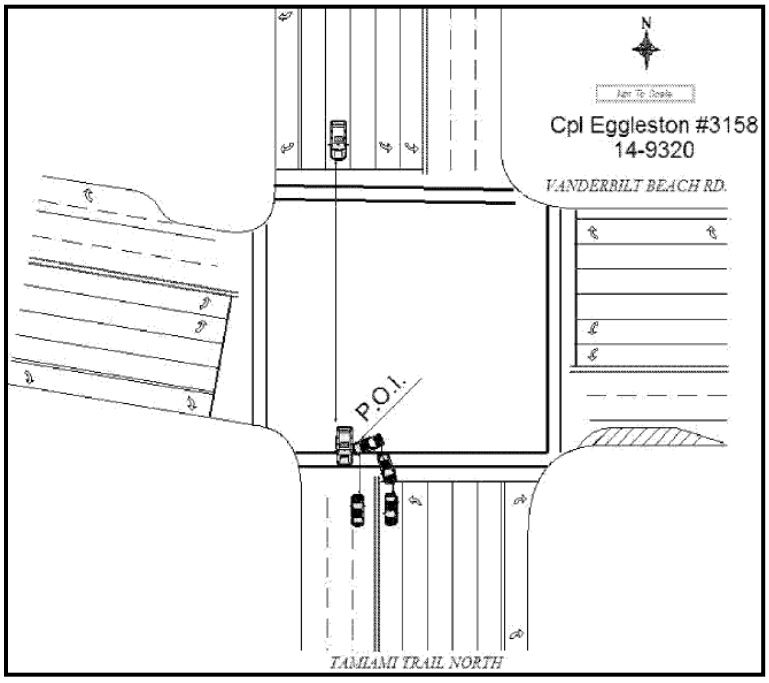
MV: Motor Vehicle **NM:** Non-Motorized

Example cases of each commonly miscoded crash type are described on the following pages of this memorandum. Appendices A and B show cross tabulations for each of these crash data attributes for motor vehicle and non-motorized user crashes respectively.

EVENT RELATION TO INTERSECTION

This field indicates where the crash event occurred on the roadway. There are 12 categories under this field:

- Non-Junction
- Intersection
- Intersection-Related
- Driveway/Ally Access Related
- Railway Grade Crossing
- Entrance/Exit Ramp
- Crossover-Related
- Shared Use Path or Trail
- Acceleration/Deceleration Lane
- Through Roadway
- Unknown
- Other



The image above was initially coded as “Non-Junction” then revised to “Intersection”

The QC process showed that the top 3 revised categories under Event Relation to Intersection were:

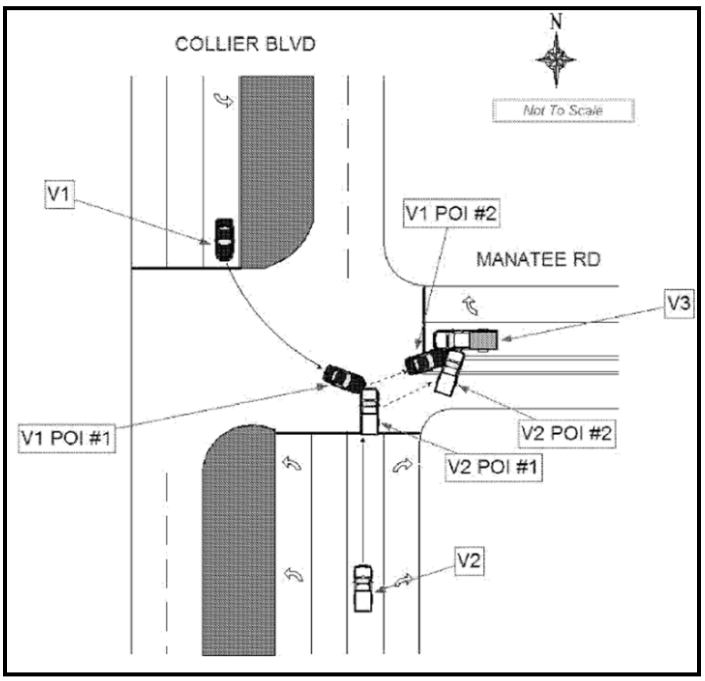
Motorized Vehicles:
- Non-junction
- Intersection
- Intersection-related

Non-Motorized:
- Non-Junction
- Intersection
- Driveway/Alley Access Related

CRASH TYPE

This field defines the overall type of the crash and is used to generate collision diagrams. There are 14 crash types:

- Angle
- Head On
- Hit Fixed Object
- Hit Non-Fixed Object
- Left Turn
- Rear End
- Right Turn
- Run Off Road
- Sideswipe
- Single Vehicle
- U-Turn
- Unknown
- Bike
- Pedestrian



The crash in the image above was correctly recoded to the intersection rather than a non-junction, and recategorized as a Left-Turn crash instead of the incorrect “Angle” crash.

The top 3 revised categories under Crash Type were:

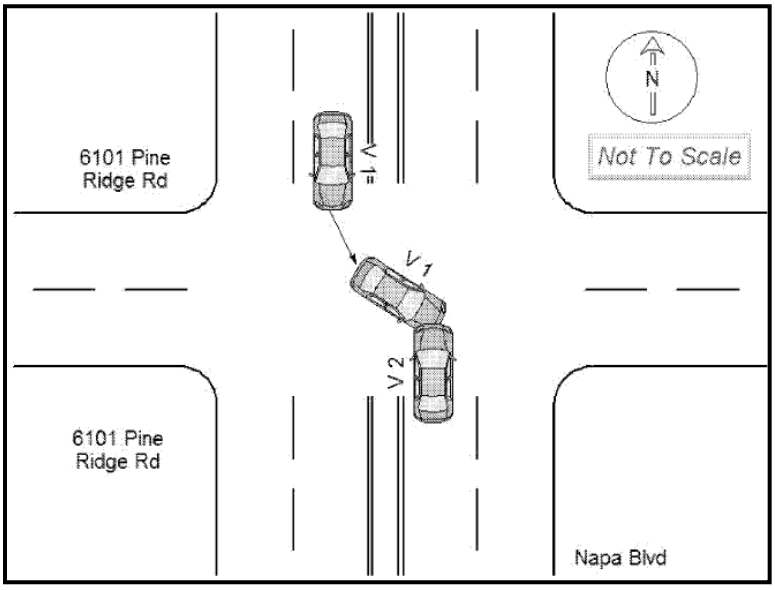
Motorized Vehicles:
- Angle
- Sideswipe
- Rear End
- Hit Fixed Object

Non-Motorized:
- Hit Non-Fixed Object
- Rear End
- Bike
- Pedestrian

IMPACT TYPE

This field defines the manner and direction of the collision. There are 9 impact type categories:

- Front to Rear
- Front to Front
- Angle
- Sideswipe (Same Direction)
- Sideswipe (Opposite Direction)
- Rear to Side
- Rear to Rear
- Unknown
- Other



The image above shows an example of a crash report initially coded as “Front to Front” then revised to “Angle”

The top 3 most revised categories under Impact Type:

Motorized Vehicles:
- Front to Rear
- Angle
- Sideswipe (same direction)

Non-Motorized:
- Angle
- Sideswipe (Same Direction)
- Rear to Rear

SECTION 3: CONCLUSIONS AND RECOMMENDATIONS

Coding errors and inconsistencies within crash reports impact the usefulness of crash data for both strategic planning and traffic study purposes. Specifically, inaccurate location coding can contribute to misidentified corridor and spot location priorities. Improper Relation to Intersection information can create confusion as to whether there is a problem with an intersection or if there are issues with the intersection approaches (e.g. adjacent commercial driveways or median openings). Incorrect or internally inconsistent coding of crash attributes such as First Harmful Event, Vehicle Movement, and Vehicle Direction can result in either incorrect Crash Type assignment or result in an inability to determine the Crash Type. This data field is critical for understanding overall crash patterns and is also a fundamental element in analyzing corridors or spot locations.

Differences in crash report edits between law enforcement agencies in Collier County suggest that data entry methods and training may play a part in determining the accuracy of crash reporting. As the Local Road Safety Plan progresses, the intent to discover what are the leading causes for crash report inconsistency and inaccuracy. Follow up interview will be conducted with LEA officers from different departments to gain additional insight on crash reporting and learn ways to improve accuracy and consistency.

Based on the data analysis conducted thus far, key question areas include methods to capture crash location and consistency of coding those data points that contribute to Crash Type assignment.

Appendix A: Revised Motorized Vehicle Crashes

EVENT RELATION TO INTERSECTION

		Reports Reviewed	Reports Revised	Percent Report Revised
Reporting Agency	CCSO	1,689	471	28%
	FHP	1,603	96	6%
	Naples PD	202	43	21%
	Marco Island PD	60	18	30%
	Other	3	0	0%

		TOTAL	REVISED VALUE												TOTAL REVISED	PERCENT REVISED
			Non-Junction	Intersection	Intersection-Related	Driveway/Ally Access Related	Railway Grade Crossing	Entrance/Exit Ramp	Crossover-Related	Shared Use Path or Trail	Acceleration/ Deceleration Lane	Through Roadway	Unknown	Other		
ORIGINAL VALUE	Non-Junction	2229	-	298	172	57	0	5	0	0	0	0	0	0	532	24%
	Intersection	838	5	-	0	1	0	1	0	0	0	0	0	0	7	1%
	Intersection-Related	253	3	9	-	1	0	0	0	0	0	0	0	0	13	5%
	Driveway/Ally Access Related	51	3	2	0	-	0	0	0	0	0	0	0	0	5	10%
	Railway Grade Crossing	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0%
	Entrance/Exit Ramp	26	0	2	0	0	0	-	0	0	0	0	0	0	2	8%
	Crossover-Related	5	1	2	2	0	0	0	-	0	0	0	0	0	5	100%
	Shared Use Path or Trail	7	0	2	3	0	0	0	0	-	0	0	0	0	5	71%
	Acceleration/Deceleration Lan	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0%
	Through Roadway	89	1	13	8	3	0	0	0	0	0	-	0	0	25	28%
	Unknown	6	1	3	2	0	0	0	0	0	0	0	-	0	6	100%
	Other	53	5	8	9	6	0	0	0	0	0	0	0	-	28	53%

CRASH TYPE

		Reports Reviewed	Reports Revised	Percent Report Revised
Reporting Agency	CCSO	1,689	339	20%
	FHP	1,603	310	19%
	Naples PD	202	35	17%
	Marco Island PD	60	25	42%
	Other	3	0	0%

		TOTAL	REVISED VALUE													TOTAL REVISED	PERCENT REVISED
			Angle	Head On	Hit Fixed Object	Hit Non-Fixed Object	Left Turn	Rear End	Right Turn	Run Off Road	Sideswipe	Single Vehicle	U-Turn	Unknown	Bike	Pedestrian		
ORIGINAL VALUE	Angle	647	-	4	9	4	60	6	1	1	18	0	8	0	2	0	113	17%
	Head On	83	9	-	9	1	7	1	0	0	5	1	1	0	0	0	34	41%
	Hit Fixed Object	537	4	1	-	22	1	10	0	1	10	10	0	0	0	0	59	11%
	Hit Non-Fixed Object	18	0	1	2	-	0	1	0	0	0	0	0	0	0	0	4	22%
	Left Turn	439	61	4	4	0	-	9	0	0	8	7	3	0	0	0	96	22%
	Rear End	1106	10	1	6	4	1	-	2	0	37	3	2	0	0	1	67	6%
	Right Turn	69	1	2	6	0	0	10	-	0	4	6	0	0	1	0	30	43%
	Run Off Road	84	0	0	16	0	0	0	0	-	0	9	0	0	0	0	25	30%
	Sideswipe	173	1	0	4	0	0	35	1	1	-	0	0	0	0	0	42	24%
	Single Vehicle	142	0	0	21	1	0	0	0	5	3	-	0	0	0	0	30	21%
	U-Turn	55	1	0	1	0	1	2	0	0	4	0	-	0	0	0	9	16%
	Unknown	204	10	0	66	7	0	7	0	14	6	84	1	-	2	3	200	98%
	Bike	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0%
	Pedestrian	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0%

IMPACT TYPE

		Reports Reviewed	Reports Revised	Percent Report Revised
Reporting Agency	CCSO	1,689	107	6%
	FHP	1,603	90	6%
	Naples PD	202	6	3%
	Marco Island PD	60	4	7%
	Other	3	0	0%

		TOTAL	REVISED VALUE									TOTAL REVISED	PERCENT REVISED
			Front to Rear	Front to Front	Angle	Sideswipe (Same Direction)	Sideswipe (Opposite Direction)	Rear to Side	Rear to Rear	Unknown	Other		
ORIGINAL VALUE	Front to Rear	1,135	-	0	15	2	0	0	0	0	0	17	1%
	Front to Front	160	0	-	20	2	3	0	0	0	0	25	16%
	Angle	1,071	13	5	-	36	13	0	0	0	0	67	6%
	Sideswipe (Same Direction)	126	5	1	3	-	0	0	0	0	0	9	7%
	Sideswipe (Opposite Direction)	37	0	0	5	0	-	0	0	0	0	5	14%
	Rear to Side	13	1	0	1	2	0	-	0	0	0	4	31%
	Rear to Rear	1	0	0	0	0	0	0	-	0	0	0	0%
	Unknown	255	1	1	2	1	0	0	0	-	0	5	2%
	Other	759	9	0	61	4	1	0	0	0	-	75	10%

Appendix B: Revised Non-Motorized Crashes

EVENT RELATION TO INTERSECTION

		Reports Reviewed	Reports Revised	Percent Report Revised
Reporting Agency	CCSO	1,001	414	41%
	FHP	292	33	12%
	Naples PD	125	45	36%
	Marco Island PD	64	25	39%
	Other	3	3	100%

		TOTAL	REVISED VALUE												TOTAL REVISED	PERCENT REVISED
			Non-Junction	Intersection	Intersection-Related	Driveway/Ally Access Related	Railway Grade Crossing	Entrance/Exit Ramp	Crossover-Related	Shared Use Path or Trail	Acceleration/ Deceleration Lane	Through Roadway	Unknown	Other		
ORIGINAL VALUE	Non-Junction	986	-	254	36	137	0	1	0	0	0	0	0	2	430	44%
	Intersection	239	0	-	1	2	0	1	0	0	0	0	0	0	4	2%
	Intersection-Related	82	1	3	-	0	0	0	0	0	0	0	0	0	4	5%
	Driveway/Ally Access Related	74	3	1	0	-	0	0	0	0	0	0	0	0	4	5%
	Railway Grade Crossing	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0%
	Entrance/Exit Ramp	4	0	0	0	0	0	-	0	0	0	0	0	0	0	0%
	Crossover-Related	6	1	4	0	1	0	0	-	0	0	0	0	0	6	100%
	Shared Use Path or Trail	8	0	3	1	2	0	0	0	-	0	0	0	0	6	75%
	Acceleration/Deceleration Lane	1	1	0	0	0	0	0	0	0	=	0	0	0	1	100%
	Through Roadway	26	1	6	2	4	0	0	0	0	0	-	0	0	13	50%
	Unknown	2	0	1	0	1	0	0	0	0	0	0	-	0	2	100%
	Other	57	18	18	2	12	0	0	0	0	0	0	0	-	50	88%

CRASH TYPE

		Reports Reviewed	Reports Revised	Percent Report Revised
REPORTING AGENCY	**CCSO**	1,001	380	38%
	FHP	291	12	4%
	Naples PD	125	17	14%
	Marco Island PD	64	28	44%
	Other	3	1	33%

		TOTAL	REVISED VALUE													TOTAL REVISED	PERCENT REVISED
			Angle	Head On	Hit Fixed Object	Hit Non-Fixed Object	Left Turn	Rear End	Right Turn	Run Off Road	Sideswipe	Single Vehicle	U-Turn	Unknown	Bike	Pedestrian		
ORIGINAL VALUE	Angle	**42**	-	0	3	2	0	1	0	0	0	0	0	0	24	6	**36**	86%
	Head On	**12**	0	-	0	2	0	0	0	0	0	0	0	0	5	4	**11**	92%
	Hit Fixed Object	**79**	0	0	-	9	0	1	0	0	3	0	0	0	2	9	**24**	30%
	Hit Non-Fixed Object	**17**	0	0	0	-	0	0	0	0	1	0	0	0	4	3	**8**	47%
	Left Turn	**22**	0	0	2	4	-	0	0	0	0	0	0	0	5	10	**21**	95%
	Rear End	**36**	0	0	1	1	0	-	0	0	2	0	0	0	6	9	**19**	53%
	Right Turn	**38**	0	0	1	1	0	0	-	0	0	0	0	0	25	10	**37**	97%
	Run Off Road	**1**	0	0	0	0	0	0	0	-	0	0	0	0	0	0	**0**	0%
	Sideswipe	**21**	0	0	0	1	0	0	0	0	-	0	0	1	3	8	**13**	62%
	Single Vehicle	**6**	0	0	0	0	0	0	0	0	0	-	0	0	3	2	**5**	83%
	U-Turn	**1**	0	0	0	0	0	0	0	0	0	0	-	0	0	0	**0**	0%
	Unknown	**158**	0	0	4	5	0	0	0	0	0	0	0	-	50	98	**157**	99%
	Bike	**587**	0	0	1	1	0	5	0	0	1	0	0	0	-	1	**9**	2%
	Pedestrian	**465**	0	0	3	10	3	4	0	0	3	0	0	0	75	-	**98**	21%

IMPACT TYPE

		Reports Reviewed	Reports Revised	Percent Report Revised
Reporting Agency	CCSO	1,001	679	68%
	FHP	291	168	58%
	Naples PD	125	39	31%
	Marco Island PD	64	37	58%
	Other	3	0	0%

		TOTAL	REVISED VALUE									TOTAL REVISED	PERCENT REVISED
			Front to Rear	Front to Front	Angle	Sideswipe (Same Direction)	Sideswipe (Opposite Direction)	Rear to Side	Rear to Rear	Unknown	Other		
ORIGINAL VALUE	Front to Rear	**87**	-	0	1	1	0	1	3	0	1	**7**	8%
	Front to Front	**35**	0	-	7	1	0	0	0	0	0	**8**	23%
	Angle	**313**	0	3	-	8	0	3	0	1	0	**15**	5%
	Sideswipe (Same Direction)	**41**	1	0	1	-	0	1	0	0	0	**3**	7%
	Sideswipe (Opposite Direction)	**13**	0	0	0	0	-	0	0	0	0	**0**	0%
	Rear to Side	**13**	0	0	0	0	0	-	0	1	0	**1**	8%
	Rear to Rear	**9**	0	0	0	0	1	0	-	1	0	**2**	22%
	Unknown	**460**	26	20	286	17	15	26	10	-	19	**419**	91%
	Other	**514**	16	10	350	24	14	46	7	1	-	**468**	91%

APPENDIX 3: COMMUNITY SURVEY SUMMARY

Collier MPO

Local Road Safety Plan

Community Survey Summary

10/09/2020

Final

Prepared for

Prepared by

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Appendix

SECTION 1: INTRODUCTION

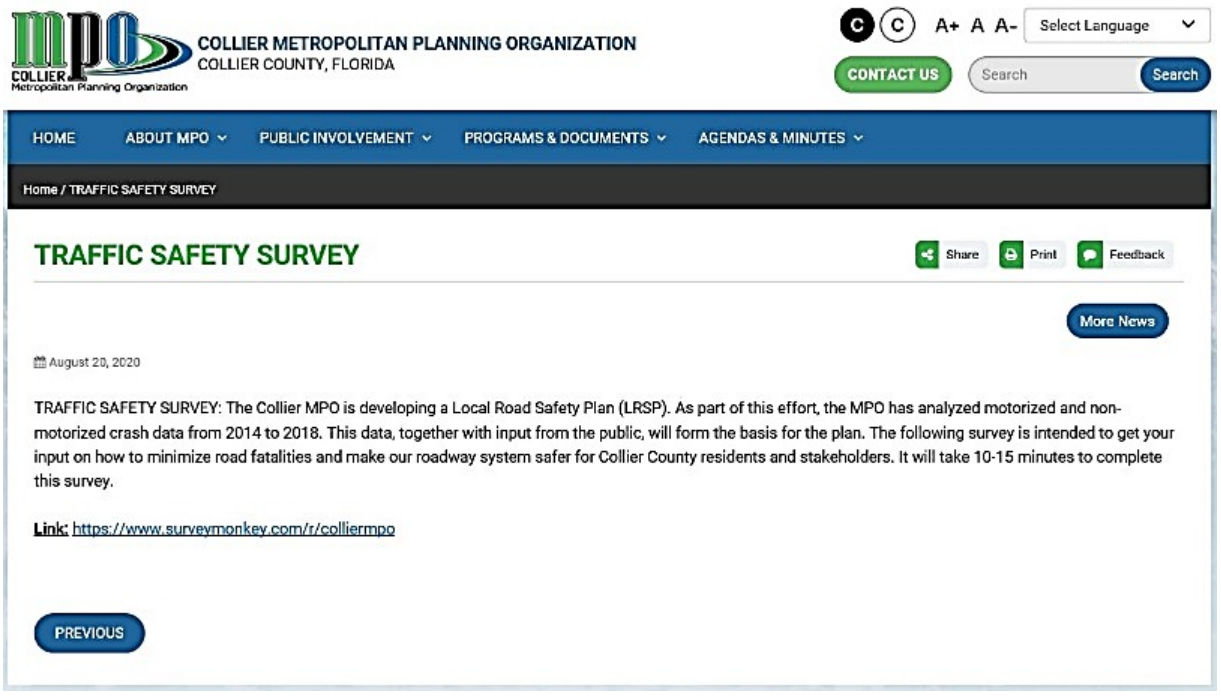
The Collier Metropolitan Planning Organization (MPO) is developing a Local Road Safety Plan (LRSP) with the goal of prioritizing opportunities to improve roadway safety, budget programs, and projects, develop highway safety strategies, and reduce the loss of life, injuries, and property damage while improving the performance and capacity of the county-wide street and highway network.

The purpose of the LRSP is to:

- Identify and define areas to improve the safety of Collier County's streets and highways.
- Define strategies and projects, including improvements to infrastructure (Engineering); driver, bicycle, and pedestrian behavior (Education); law enforcement programs (Enforcement); and response of emergency medical services (Emergency Services).
- Identify federal, State, and local funding programs.
- Provide structure for evaluating the progress in reducing crashes and fatalities.

The plan development process includes data analysis, public outreach, and plan drafting. The data analysis step looked at the county's motorized and non-motorized crash data from 2014 to 2018, and high-crash frequency locations, crash types, and roadway and weather conditions were reviewed. On August 20, 2020, a survey was sent out to capture the public's input on how to minimize roadway fatalities and make Collier County road systems safer for residents and stakeholders. The survey was posted on the Collier MPO website and Facebook page, sent out to the MPO's advisory committees and adviser network, and shared by WinkNews.

Figure 1-1: Website Survey Post



SECTION 2: KEY TAKEAWAYS

The survey was published in English and Spanish. Of 1,092 survey responses received, 1,060 were in English and 32 were in Spanish. Following are key takeaways from the survey.

Demographics and Travel Behavior

- A large number of survey respondents indicated that they either worked or lived in Collier County year-round, and a majority lived and worked in Naples and Immokalee. The top three home and work ZIP codes were as follows:
  - Home ZIP codes:
    - 34120 (Naples) – 186 participants
    - 34142 (Immokalee) – 146 participants
    - 34119 (Immokalee) – 84 participants
  - Work ZIP codes:
    - 34116 (Naples) – 129 participants
    - 34109 (Naples) – 93 participants
    - 34142 (Immokalee) – 77 participants
- More than two thirds of survey respondents were between ages 35 and 64.
- Survey respondents ranked driving, walking, and riding a bike as the top three most used modes of travel.
- Respondents ranked their top two destinations as "Retail Goods and Services" and "Work." It is important to note that this survey was conducted during the COVID-19 pandemic during which most people were working from home.
  - In total, 75% of respondents drove a motor vehicle every day, with daily travel taking 30 minutes or more.

Safety Concerns and Improvements

- Of the 13 safety concerns indicated on the survey (see Appendix A, Question 5), respondents chose the following as their top three:
  - Drivers using cell phones or conducting other activities while driving
  - Speeding and aggressive driving
  - Aging drivers
- A large majority indicated support for "increased traffic enforcement" as a desired safety improvement, corresponding with one of the top safety concerns of aggressive driving. Other desired improvements were ranked as follows:

  1 – Increased traffic enforcement

  2 – Improved rural roads (e.g., wider shoulders, better signs, pavement markings)

  3 – Increased safety on major roads for pedestrians (e.g., better intersection design, marked crosswalks, better lighting)

4 – Better bicycle facilities, including wider bicycle lanes and separated bike paths

5 – Better roadway lighting

6 – Reduced speeds on major roads through design and traffic signalization strategies

Driving Habit Comparison between Aging and Younger Drivers

Further analysis of survey responses compared the driving habits of aging drivers (those age 55 and above) and younger drivers' habits (those age 54 and below). Survey respondents included 40% aging drivers and 60% younger drivers. Following are some key takeaways:

- A large number of respondents in both age groups indicated that they drove a motor vehicle every day, and aging drivers (21%) indicated that they drove more than 4 times per week but not daily.
- A majority of drivers in both age groups spent at least 30 minutes traveling each day. A significant number of aging drivers, however, indicated that they spent less time traveling (20–30 minutes).
- Both age groups had opposite rankings for travel destinations. Aging drivers rated "Retail Goods and Services" as their top travel destination and "Work" as their second choice. Younger drivers ranked those two destinations the opposite, with "Work" as their top destination.
- Both groups indicated concern about different safety-related items. Younger drivers were concerned about "people who do not know the rules of the road" and "aging drivers," and aging drivers were concerned about "speeding and aggressive driving" and "people using cell phones or doing other activities while driving."

The following survey results support the above findings. ***Travel Time and Frequency***

Table 2-1: Travel Time

Question: How much time do you typically spend traveling each day?

Response	Aging Drivers (Age 55+)		Younger Drivers (< Age 54)	
	Count	Percentage	Count	Percentage
0–10 minutes	33	8%	17	3%
10–20 minutes	96	23%	78	12%
20–30 minutes	124	30%	113	18%
30 minutes or more	163	39%	426	67%

Table 2-2: Travel Frequency

Question: How often do you drive a motor vehicle?

Response	Aging Drivers (Age 55+)		Younger Drivers (< Age 54	
	Count	Percentage	Count	Percentage
Daily	246	59%	541	85%
2–4 times per week	69	17%	24	4%
More than 4 times per week	87	21%	64	10%
Once per week	14	3%	3	0%
Less than once per month	1	0%	1	0%

Mode of Travel

Question: How do you usually travel from place to place? (Rank from 1 to 6, with 1 being the most frequently used mode of transportation and 6 being the least used.)

Both age groups ranked their preferred modes of travel as the following:

- 1 – Drive
- 2 – Walk
- 3 – Bicycle
- 4 – Rely on others for rides
- 5 – Rideshare (e.g., Uber/Lyft)
- 6 – Bus

Travel Destination

Question: What is your usual destination when using your #1 ranked mode of transportation? (Rank from 1 to 5, with 1 being where you travel most often and 5 being where you travel least often.)

Younger drivers:

- 1 – Work
- 2 – Retail Goods and Services (e.g., shopping, dining out)
- 3 – Visiting friends/family
- 4 – School
- 5 – Medical Appointments

Aging drivers:

- 1 – Retail Goods and Services (e.g., shopping, dining out)
- 2 – Work
- 3 – Medical Appointments
- 4 – Visiting friends/family
- 5 – School

Top Three Safety Concerns

Question: Of the items below, which are your top three safety concerns about traveling in Collier County? (Choose three. See Appendix A, Question 5 for a full list.)

Younger drivers:

- 1 – People who do not know the "rules of the road"
- 2 – Aging drivers
- 3 – Speeding and aggressive driving

Aging drivers:

- 1 – Speeding and aggressive driving
- 2 – People using cell phones or doing other activities while driving
- 3 – People who do not know the "rules of the road"

Bike and Pedestrian Safety

- Almost half of respondents indicated that they walked and/or rode a bicycle less than once per month.
- Nearly one third of respondents (32%) indicated walking less than once per month, and another third (26%) walked daily.

- When respondents were asked if they felt safe and comfortable while riding a bicycle in Collier County, half either strongly or somewhat disagreed.
- More than half either strongly or somewhat agreed to feeling safe and comfortable while walking in Collier County.
- Almost half of survey respondents agreed that Collier County pedestrians and bicyclists do a good job of following the rules of the road.
- More than half of those surveyed expressed that Collier County drivers are not courteous about sharing the road with pedestrians and bicyclists.
- Respondents indicated the following as the top three improvements they believed could be done to make bicycling safer in Collier County:
  - More bicycle lanes that are physically separated from vehicle traffic
  - Reducing distracted driving
  - Making it easier to cross highways and high-speed streets

SECTION 3: TRAFFIC SAFETY SURVEY

Survey Respondent Demographics

Figure 3-1: Collier County Residence/Employment
Question: Please describe yourself by checking all that apply.

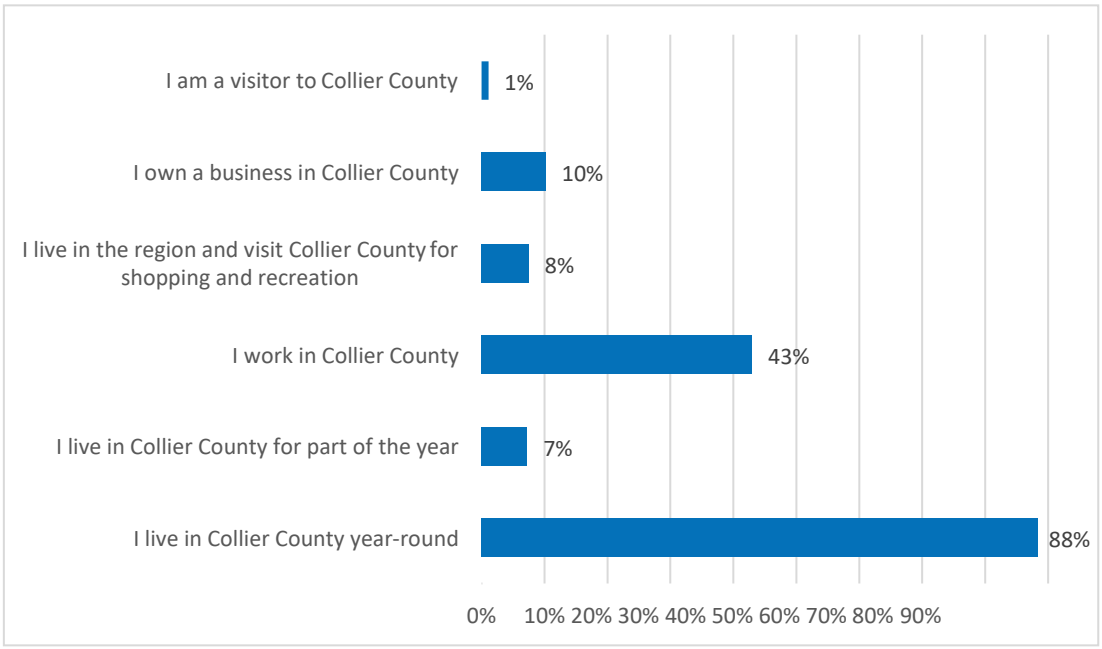


Figure 3-2: Age
Question: What is your age?

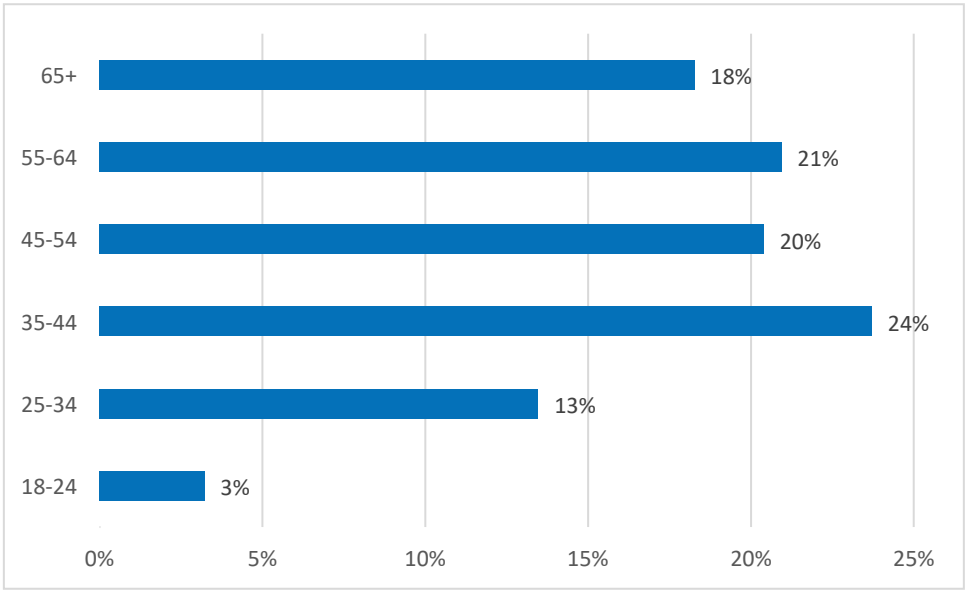
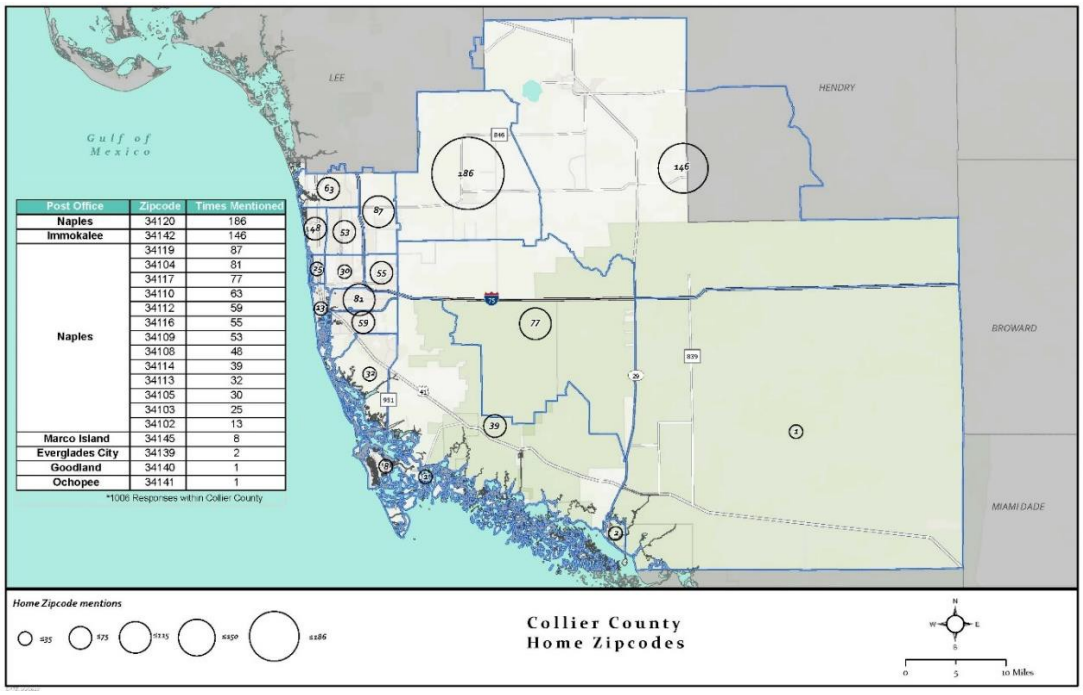


Figure 3-3: Home ZIP Code

Question: What is your home ZIP code?

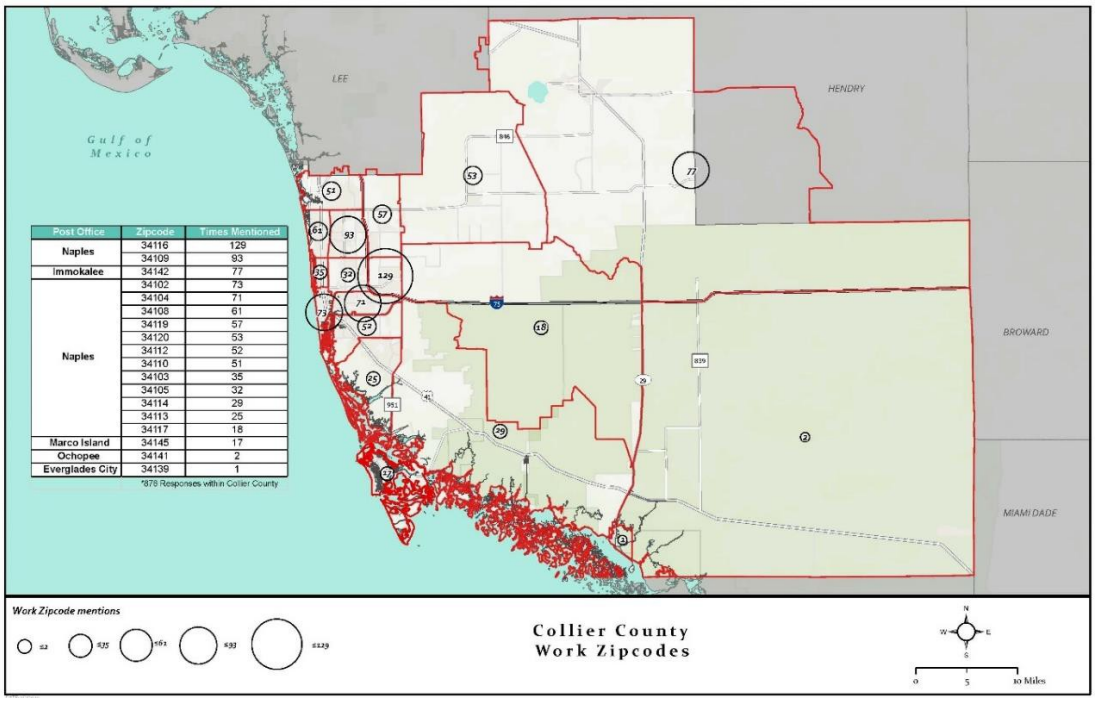


Post Office	Zipcode	Times Mentioned
Naples	34120	186
Immokalee	34142	146
Naples	34119	87
	34104	81
	34117	77
	34110	63
	34112	59
	34116	55
	34109	53
	34108	48
	34114	39
	34113	32
	34105	30
	34103	25
	34102	13
Marco Island	34145	8
Everglades City	34139	2
Goodland	34140	1
Ochopee	34141	1

*1006 Responses within Collier County

Figure 3-4: Work ZIP Code

Question: What is your work ZIP code?



Post Office	Zipcode	Times Mentioned
Naples	34116	129
	34109	93
Immokalee	34142	77
Naples	34102	73
	34104	71
	34108	61
	34119	57
	34120	53
	34112	52
	34110	51
	34103	35
	34105	32
	34114	29
	34113	25
	34117	18
Marco Island	34145	17
Ochopee	34141	2
Everglades City	34139	1

*878 Responses within Collier County

Figure 3-5: Travel Mode

Question: How do you usually travel from place to place? (Rank from 1 to 6, with 1 being the most frequently used mode of transportation and 6 the least used.)

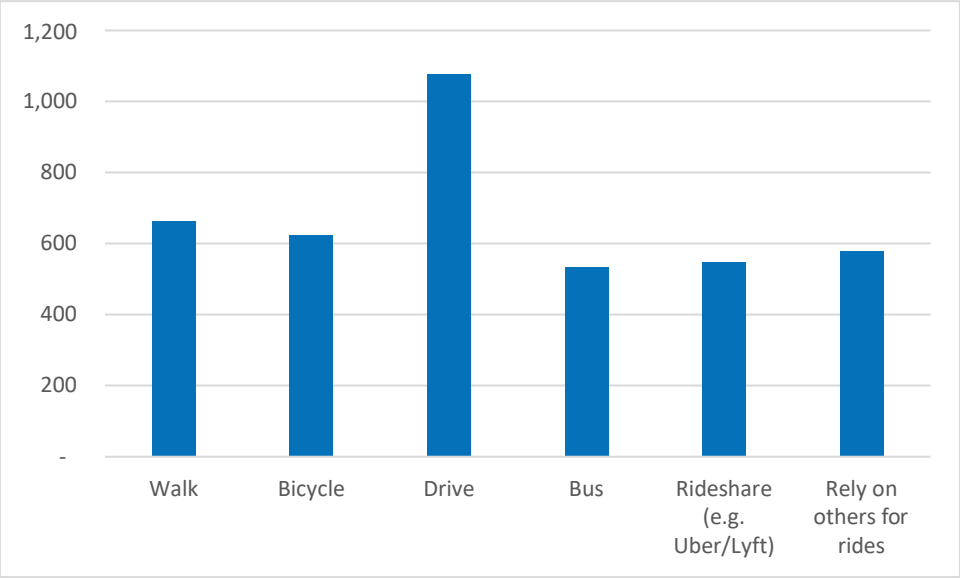


Figure 3-6: Travel Destination

Question: What is your usual destination when using your #1 ranked mode of transportation? (Rank from 1 to 5 with 1 where you travel most often and 5 where you travel least often.)

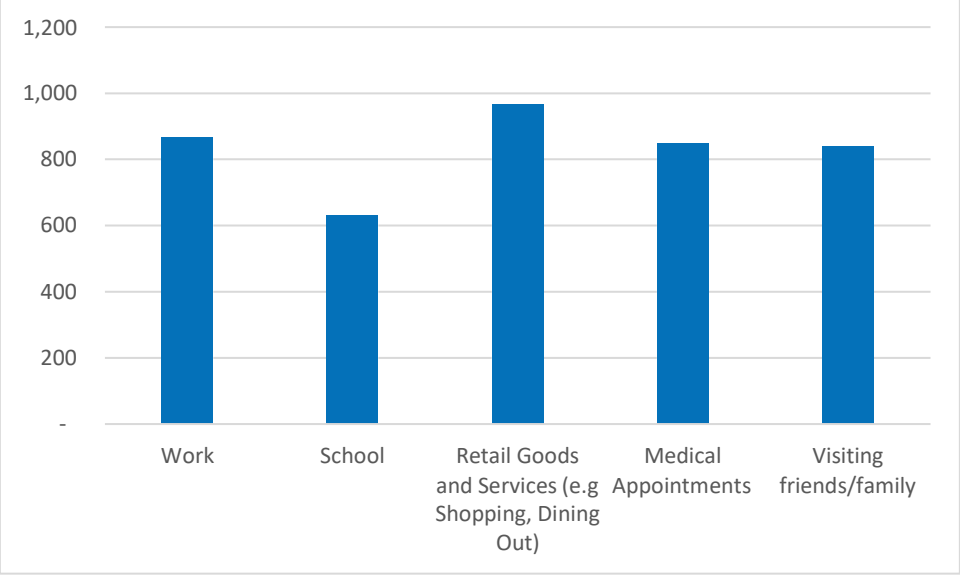


Figure 3-7: Driving Frequency

Question: How often do you drive a motor vehicle? (Select one.)

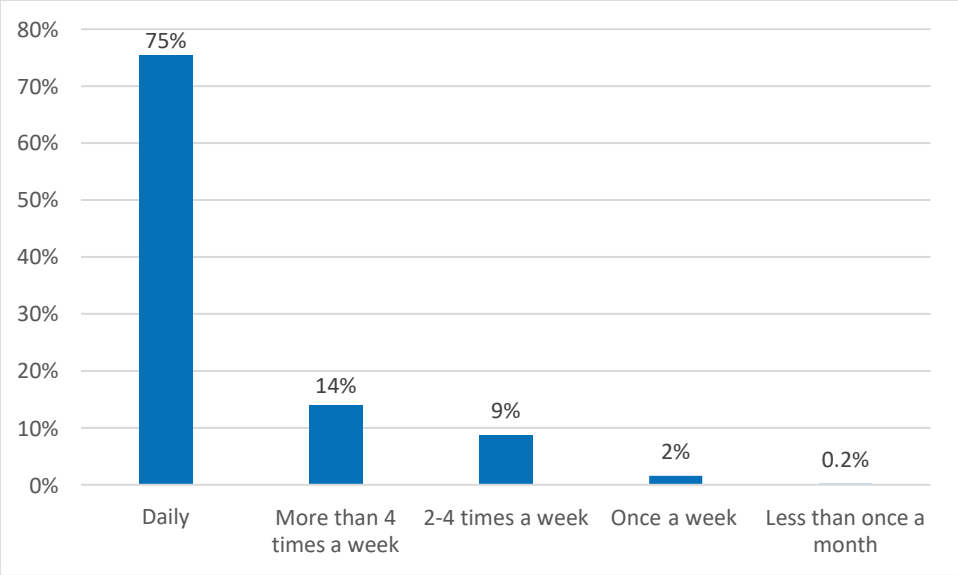


Figure 3-8: Travel Time

Question: How much time do you typically spend traveling each day? (Select one.)

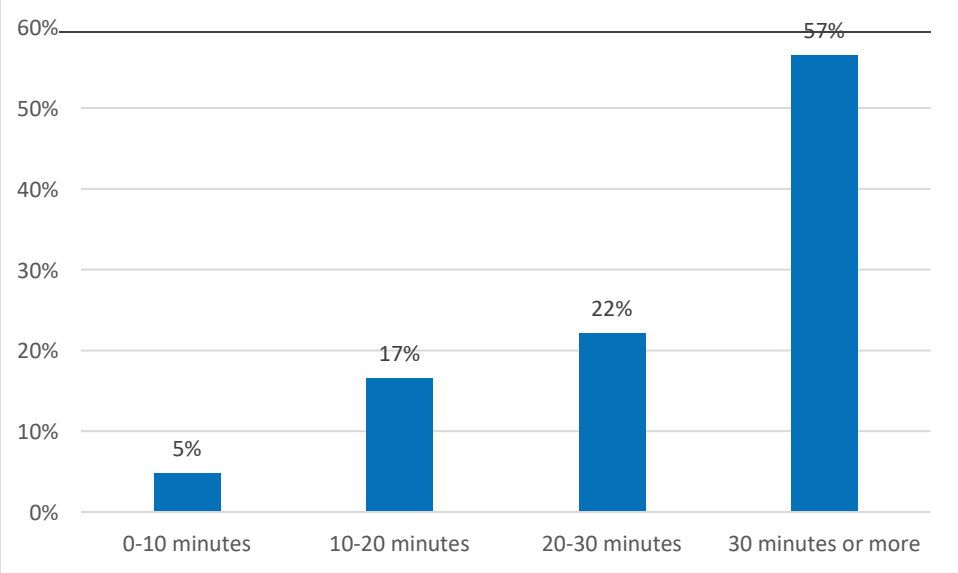


Figure 3-9: Travel Safety Concerns

Question: Of the items below, which are your top three safety concerns about traveling in Collier County? (Choose three.)

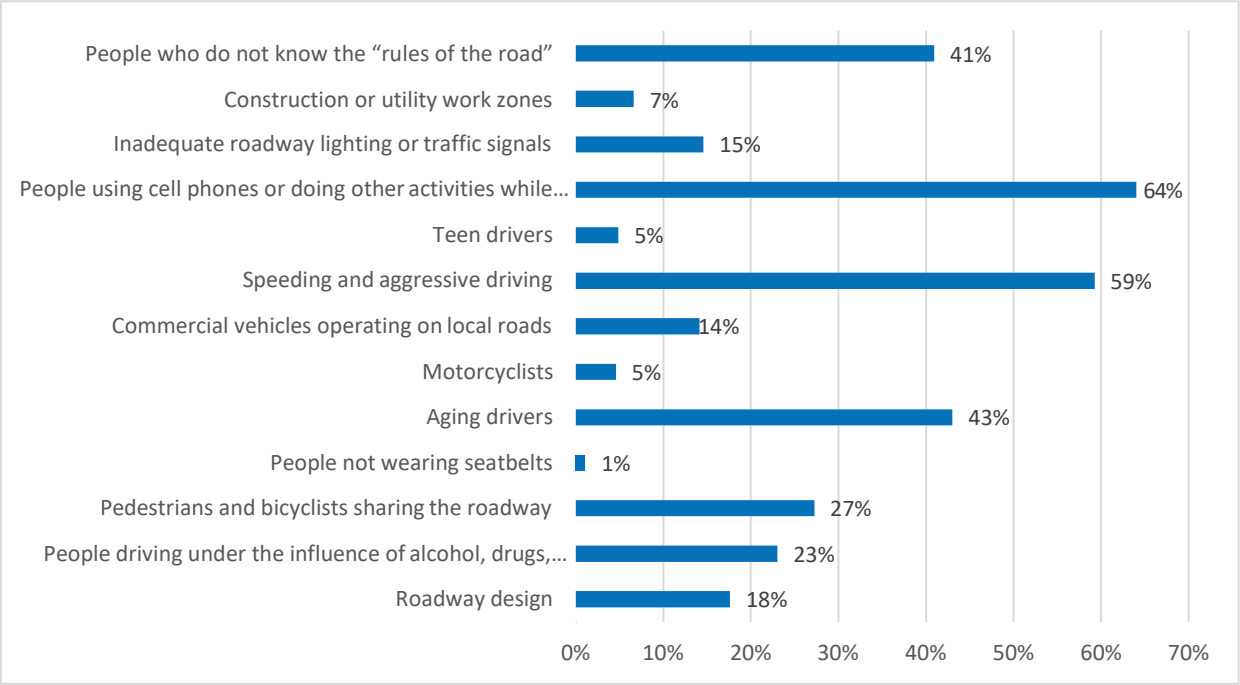
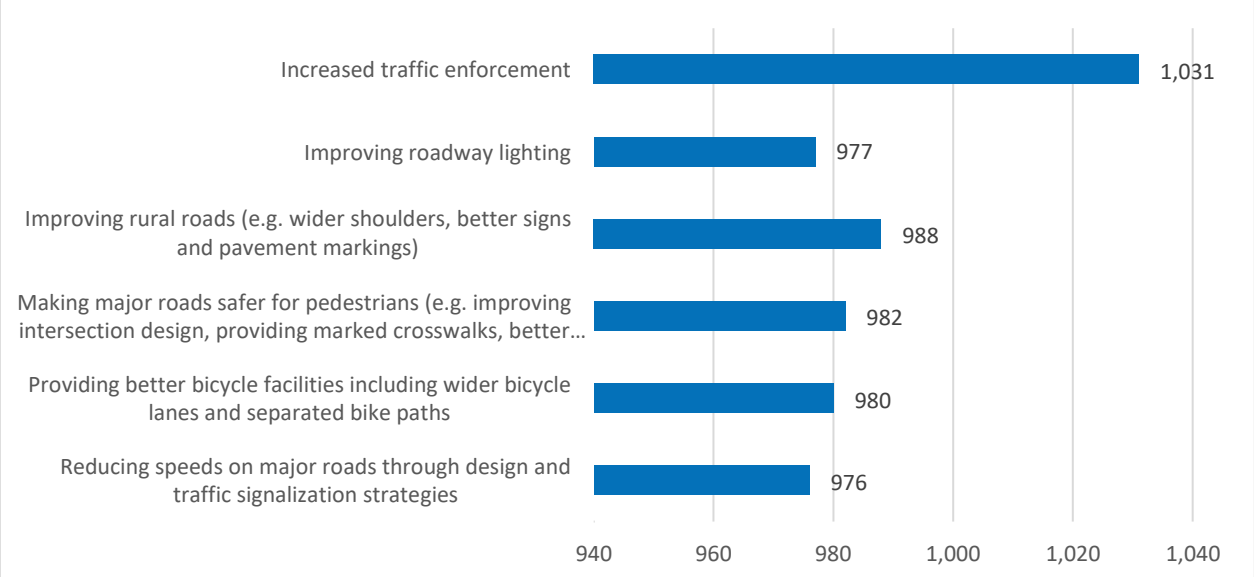


Figure 3-10: Safety Improvement Support

Question: What is your level of support for the following safety improvements? (Rank each from 1 to 5, with 1 being the most support and 5 being the least support.)



Bicyclists and Pedestrians

Figure 3-11: Walk and Bike Frequency
Question: How often do you walk and/or ride a bicycle? (Choose one.)

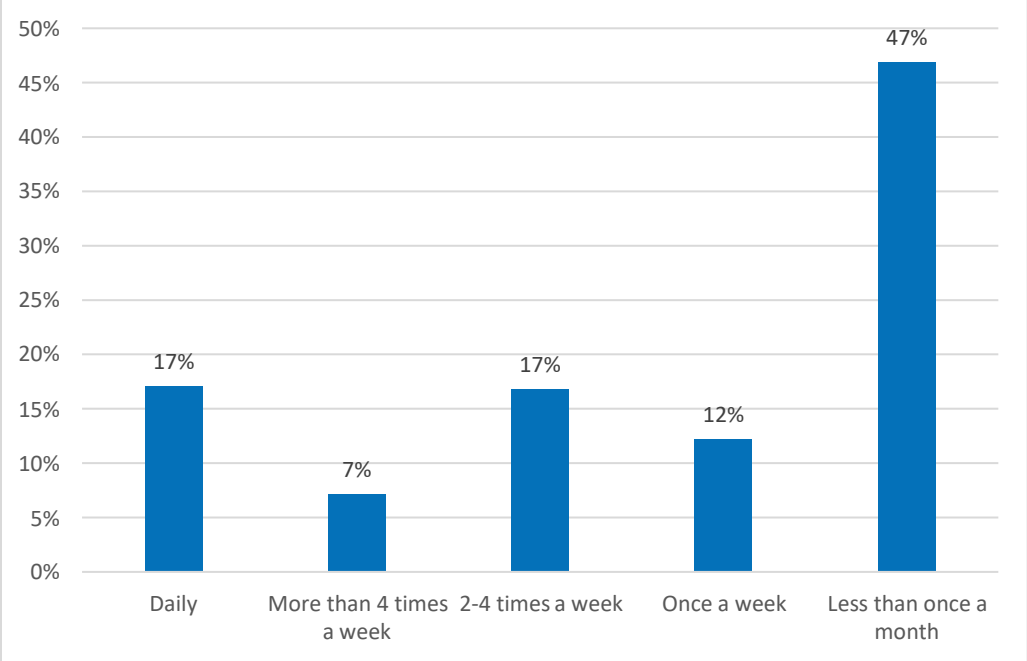


Figure 3-12: Walking Frequency
Question: How often do you walk? (Choose one.)

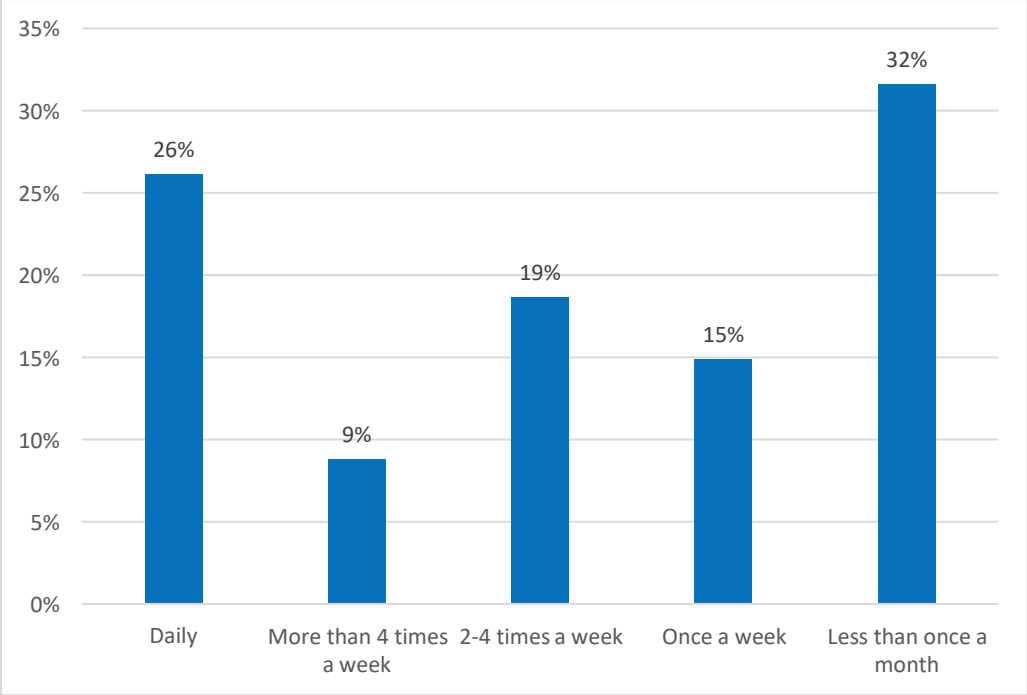


Figure 3-13: Bike Safety

Question: In general, I feel safe and comfortable while riding a bicycle in Collier County.

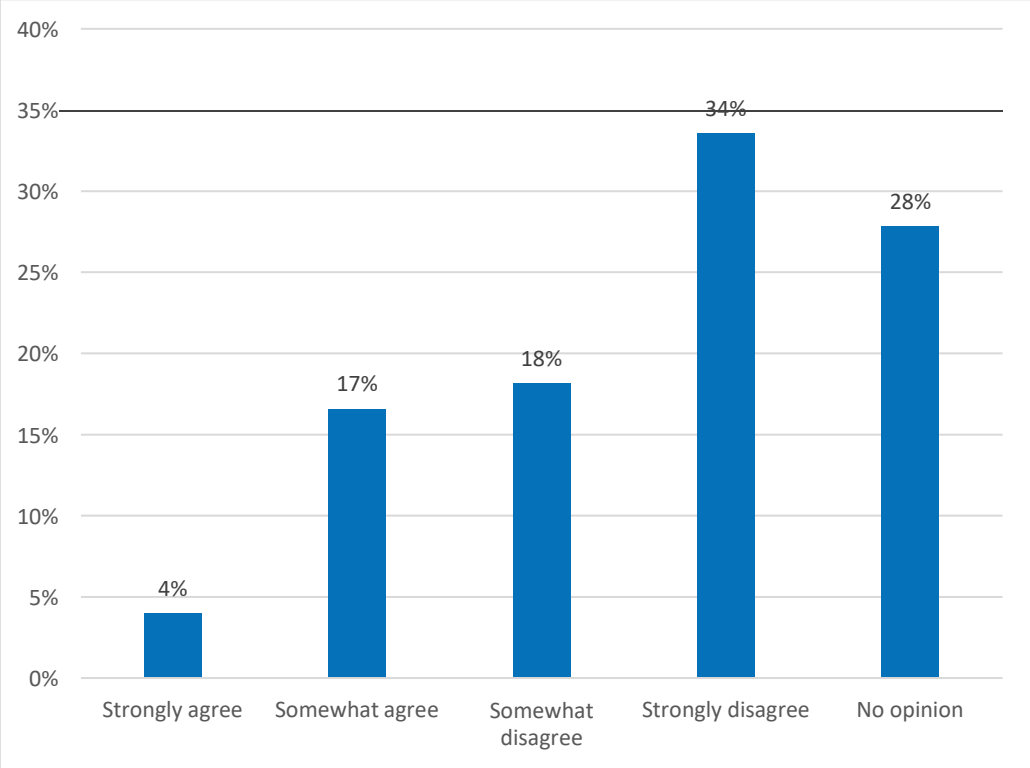


Figure 3-14: Pedestrian Safety

Question: In general, I feel safe and comfortable while walking in Collier County.

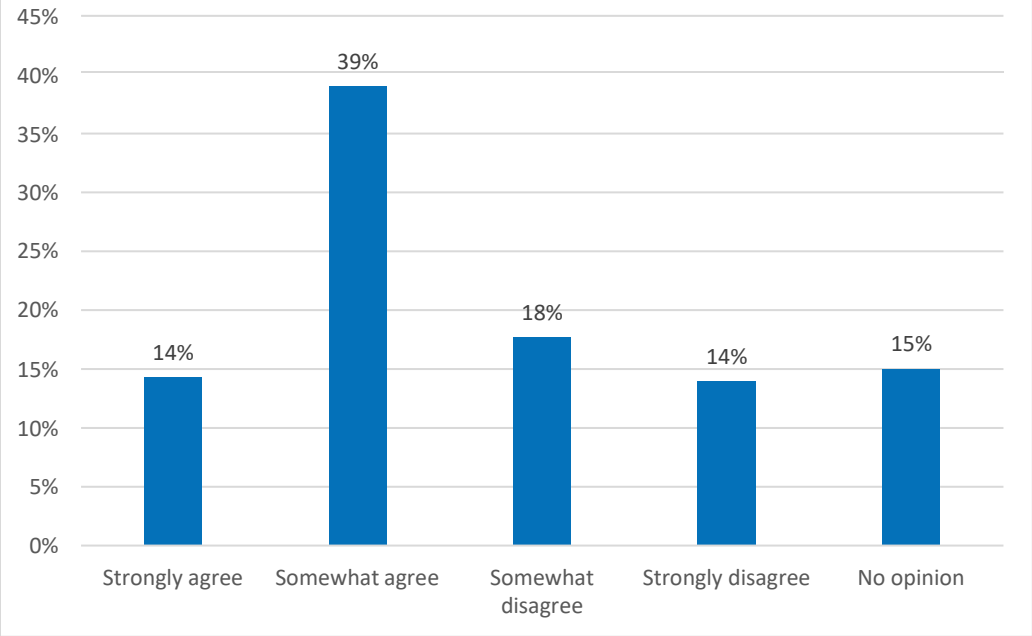


Figure 3-15: Traffic Rules Adherence

Question: In general, Collier County pedestrians and bicyclists do a good job following the rules of the road.

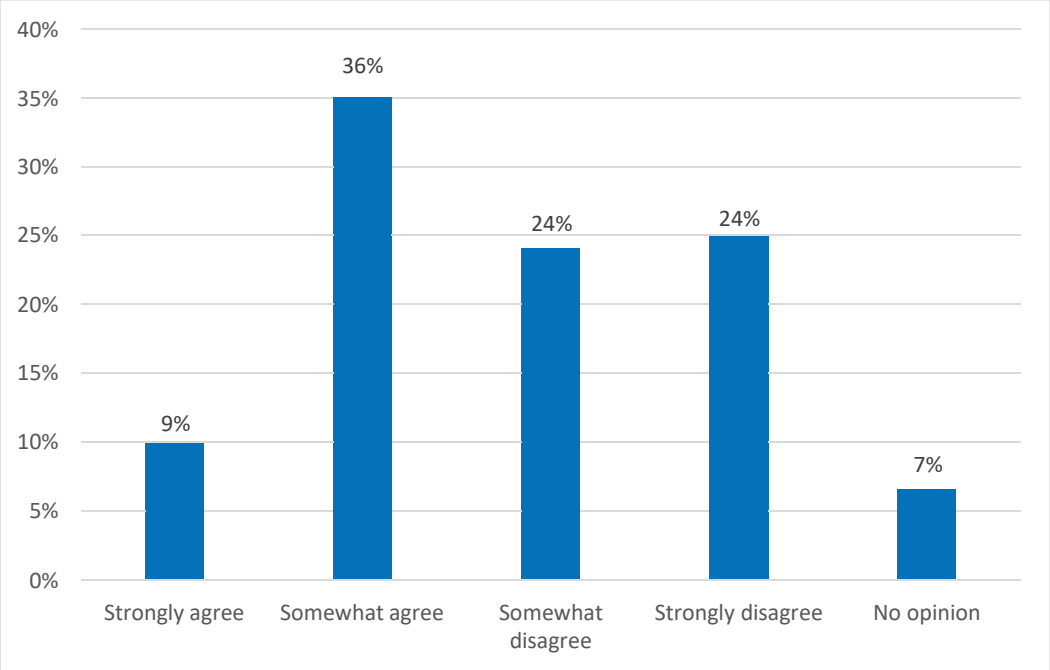


Figure 3-16: Driver Behavior

Question: In general, Collier County drivers are courteous about sharing the road with pedestrians and bicyclists.

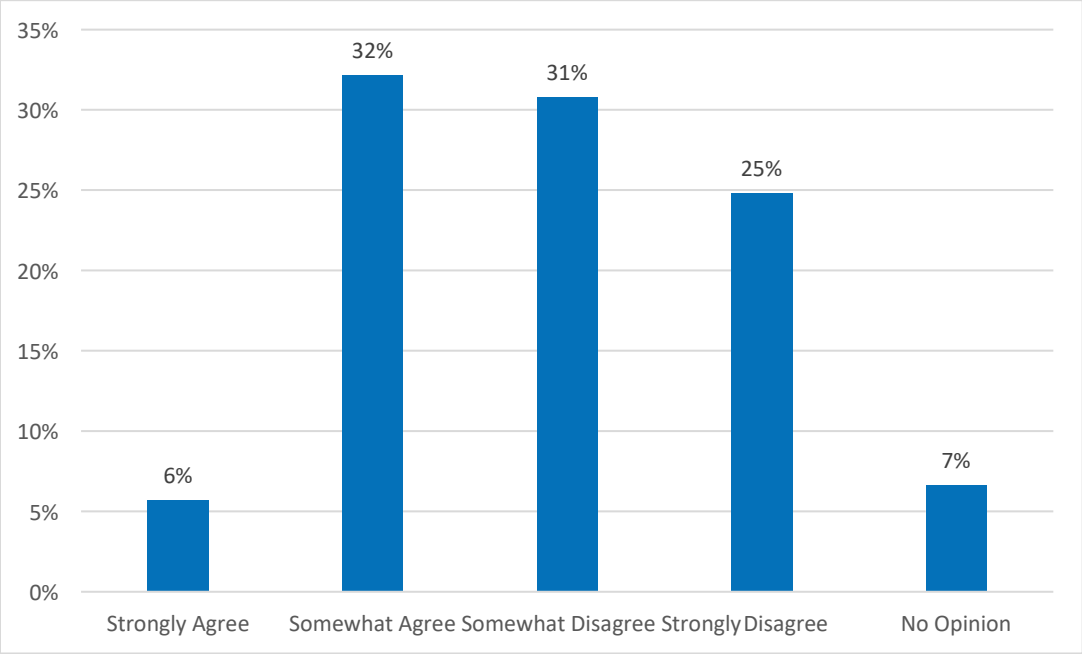
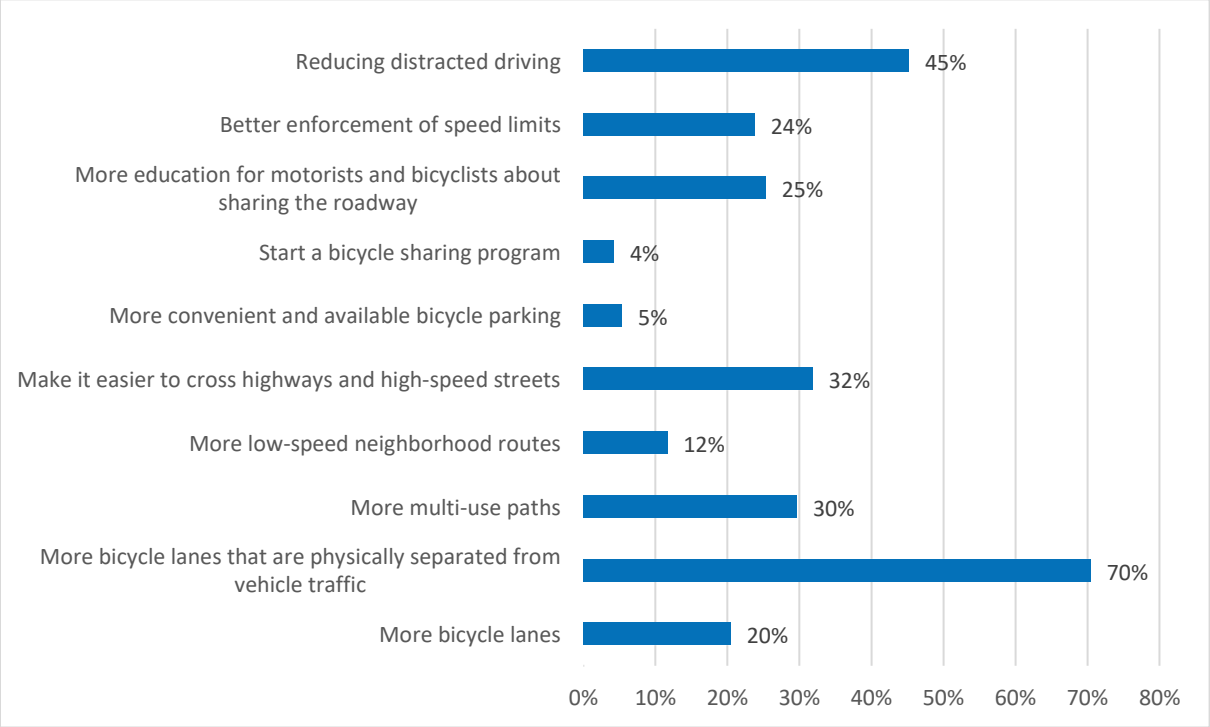


Figure 3-17: Bike Safety Improvement

Question: What could be done to make bicycling safer in Collier County? (Choose three.)



SECTION 4: ADDITIONAL OBSERVATIONS

Summary of Concerns for Local Road Safety

Aggressive/ Careless Driving/ Speeding – Concerns raised by Collier County residents and stakeholders regarding aggressive driving include speeding and tailgating, high-speed lane changing, running red lights and stop signs, drivers not using indicator lights before lane change, and drivers traveling dangerously below the posted speed limit. Survey respondents noted that aggressive drivers make it unsafe for drivers obeying traffic laws and gave US-41 as an example of a roadway segment with of excessive speeding.

Distracted Drivers – Distracted driving behavior includes using a cell phone either for a call or texting, loud music, and impaired driving under the influence of substances. Survey respondents suggested increased law enforcement for drivers that use cell phones while driving.

Law Enforcement – Survey participants indicated that increased enforcement is needed to crack down on high-speed drivers and cell phone users while driving.

Aging Drivers – Survey participants expressed that aging drivers have slower reaction times and drive below the speed limit, even in fast lanes. Participants suggested more frequent licensing retesting and better public transportation as options for aging drivers.

Traffic – Respondents indicated that there is traffic during AM and PM peak hours and during tourist seasons, noting that tourist season leads to overcrowding of roads, which slows down traffic and leads to accidents. Respondents provided examples of roadway systems that need immediate attention— Oil Well Road and the intersection of I-75 and Everglades Boulevard.

Bicyclist and Pedestrians – Respondents felt that bicyclists and pedestrians do not follow the rules of the road and that bike lanes are not fit for safe travel, indicating that bicyclists are ignored on the roadway. Suggestions included providing additional sidewalks for safer pedestrian travel and adding bike lanes to Vanderbilt Drive between 111th and Vanderbilt Beach Road.

Roadways/ Maintenance / Infrastructure – In general, survey participants were concerned about back roads being too small and that some landscapes are dangerous in that they act as an obstruction. They also pointed out that lack of traffic lights results in unsafe exiting and suggested adding more speed limit signs and improved infrastructure to combat high traffic volume. Examples noted were Immokalee Road being poorly lit and making it dangerous to drive at night and Oil Well Road needing maintenance and additional shouldering and lighting.

Miscellaneous – Some respondents commented that there were too many one-way roads and that additional education on driver safety is needed.

Table 4-1: Intersections/Roadway Corridors in Need of Improvement

Question: Please tell us if there is a specific roadway or intersection that you would most like to see improved.

Street	Times Mentioned	@ intersection of	Comments
Immokalee Rd	133	Livingston Rd, Collier Blvd, Goodlette-Frank Rd, Golden Gate Pkwy, US-41, I-75, Northbrooke Dr, Randall Blvd, Tarpon Bay Blvd, Strand Blvd, Collier Blvd, Airport-Pulling Rd, Oil Well Rd, Pine Ridge Rd, Vanderbilt Beach Rd	N/A
Oil Well Rd	95	Camp Keais Rd, SR-29, Everglades Blvd, Ave Maria, Desoto Blvd, Immokalee Rd	• Lack of overall knowledge by drivers using them.
Pine Ridge Rd	75	Livingston Rd, US-41, Airport-Pulling Rd, Taylor Rd, Goodlette-Frank Rd, Santa Barbara Blvd	N/A
Golden Gate Pkwy	56	Collier Blvd, Goodlette-Frank Rd, Livingston Rd, Santa Barbara Blvd, Sunshine Blvd, Wilson Blvd, Pine Ridge Rd	N/A
Airport-Pulling Rd	56	Pine Ridge Rd, Davis Blvd, Immokalee Rd, Horseshoe, Naples Blvd, Orange Blossom, Golden Gate Pkwy	N/A
Collier Blvd/ CR-951	51	US 41, I-75, Immokalee Rd, Davis Blvd, Championship Drive, Golden Gate Pkwy, Pine Ridge Rd, Tamiami Trail	• Aggressive driving.
US-41	35	Goodlette-Frank Rd, Bayshore, Immokalee Rd, Mooring Line Dr, Vanderbilt Beach Rd, Immokalee Rd, 91st Ave, Airport-Pulling Rd, Davis Blvd	• Too many red light runners. • People drive too fast. • Excessive bushes and other flora in median is huge safety risk.
Randall Blvd	20	Everglades Blvd, Immokalee Rd, 8th Ave, 16th Ave, Desoto Blvd	• Randall Blvd needs better flow; light is very long. • Needs more speed enforcement.
Livingston Rd	18	Immokalee Rd, Bonita Beach Rd, Osceola Trail, Golden Gate Pkwy, Osceola Trail, Learning Ln	• Accident zone. • Need traffic lights.
SR-49	18	SR 82 and Oil Well Rd	N/A
Davis Blvd	17	Airport, Corporate Cir, Brookside, Collier Blvd, Lakewood Blvd, Shadowland Dr	• So many potholes and bumps. • How people have to turn and maneuver is an accident waiting to happen. • Needs more traffic control.
I-75	12	Everglades Blvd, Immokalee Rd, Tamiami Trail, Golden Gate Pkwy	N/A

Street	Times Mentioned	@ intersection of	Comments
Everglades Blvd	11	Immokalee Rd, Randall Blvd, Pine Ridge Rd	• Aggressive driving, confusion, dangerous situations for people driving in both directions, cyclists, and pedestrians.
DeSoto Blvd	5	Golden Gate Pkwy, Oil Well Rd	• Reduce congestion by providing other options for access to/from I-75. • Unbearable traffic congestion during morning rush hour and from 5:00–6:00 pm. • Too many lights, traffic, speeding.
Goodlette-Frank Rd	4	Pine Ridge Rd, Golden Gate Pkwy, Frank Rd	• Traffic congestion, especially in season. • Red light runners. • Bad visibility. • Reckless driving.
Downtown Area/ 5th Ave	3	5th Ave	• Needs more lanes, too much traffic, Desoto Blvd needs left lane, more lighting, add medians.
10th St	2	US-41	• Additional lighting needed. • Add flyover at Airport-Pulling Rd. • Need additional enforcement.

Table 4-2: Intersections/Roadway Corridors in Need of Bike and Ped Improvement

Are there specific intersections or roadway corridors that you think need safety improvements for bicyclists or pedestrians? (Indicate up to 3.)

Street	Times Mentioned	@ intersection of	Comments
Immokalee Rd	93	Camp Keais Rd, Corkscrew Sanctuary, Collier Blvd, Livingston Rd, Strand Blvd, Valewood Dr, US-41, I-75, Airport Pulling Rd, Juliet, Logan, Oil Well Rd, Pine Ridge Rd, Randall Blvd, Tamiami Trail, Gulf Coast High School, Wilson Blvd, Goodlette-Frank Rd, 1st St	• Immokalee should have a pedestrian bridge or tunnel. Entire road needs improvement, as it hosts bike tournaments. • Immokalee Rd should not have bicyclists.
Pine Ridge Rd	92	Airport Pulling Rd, Livingston Rd, US-41, Collier Blvd, Logan, Vanderbilt Beach Rd, Whipoorwill, I-75, Orange Blossom, Naples Blvd, Goodlette-Frank Rd, SeaGate	• Pine Ridge Rd needs sidewalk improvements, they are so close to road; if someone were to get in accident and go into sidewalk and someone was walking, they would be dead.
US 41	90	Collier Blvd, Lakewood Blvd, Bayshore, 91st, Airport Pulling Rd, Immokalee Rd, Ohio Rd, Pine Ridge Rd, Rattlesnake, Vanderbilt Beach Rd, Golden Gate Parkway, Fleishmann/Orchid, Neapolitan, Grenada, 5th Ave, 92nd Ave N, Davis Blvd, Goodlette-Frank Rd, Thomasson, Triangle Blvd, Fiddlers Creek, Courthouse, Wiggins Pass, 99th Ave	• Many sections of US-41. • In front of St Mathews between Glades Blvd & Great Blue Dr.
Airport-Pulling Rd	70	Immokalee Rd, US-41, Davis Blvd, Orange Blossom, Pine Ridge Rd, Radio Rd, Vanderbilt Beach Rd, Golden Gate Parkway, Estey Ave, East Trail	• Along Airport-Pulling Rd near The Beach House; would be great to see bike trail go through woods to take bikers off Airport on their way to North Rd & Baker Park. VERY scary biking and walking along Airport Rd; jaywalking.
Collier Blvd/ CR-951	69	Bald Eagle, Green, Livingston Rd, Barfield, Golden Gate Pkwy, Airport, US-41, 17th Ave SW, David, Immokalee Rd, Lely, Manatee Rd, Pine Ridge Rd, Tamiami Tr, Vanderbilt Beach Rd, Oakridge Middle School, Radio Rd	• Collier Blvd no place for bicyclists.
Oil Well Rd	63	Camp Keais Rd, SR-29, Desoto Blvd, Everglades Blvd, Immokalee Rd, Ave Maria, Everglades Blvd	• Improve roads for drivers commuting from Oil Well Rd to SR-29. • Full bike lane on Oil Well Rd. • Oil Well Rd should not have bicyclists. • Two-lane section of Oil Well Rd dangerous for bikes.

Street	Times Mentioned	@ intersection of	Comments
Vanderbilt Beach Rd	52	Airport Pulling Rd, Hammock Oak, Goodlette-Frank Rd, Livingston Rd, Tamiami, Gulf Shore, US 41	• Pedestrians competing with bicyclists on Vanderbilt Rd for sidewalk space. • Get bicyclists onto road and off sidewalks. • No bike lane; they ride in middle of road. • Vanderbilt and Livingston are great but more signs would be better.
Davis Blvd	42	US 41, Airport Pulling Rd, Collier Blvd, Radio Rd, Brookeside, Kings Lake Blvd, Rich King Memorial Greenway	N/A
Golden Gate Parkway	42	Livingston Rd, Airport Pulling Rd, Coronado, Goodlette-Frank Rd, Everglades Blvd, 53rd St. SW, Collier Blvd, Desoto Blvd, Santa Barbara Blvd, Max Hause Park, Wilson Blvd, I-75, Sunshine Blvd, US 41.	N/A
Livingston Rd	25	Bonita Beach Rd, Veterans, Airport Pulling Rd, Golden Gate Parkway, Pine Ridge Rd, Ravina Way, Vanderbilt Beach Rd, Immokalee Rd.	• Vanderbilt and Livingston are great but more signs would be better.
Randall Blvd	23	Wilson Blvd, 16th, Immokalee Rd, 8th St. NE, Everglades Blvd, Desoto Blvd.	N/A
Everglades Blvd	21	Oil Well Rd, Golden Gate Parkway, and Randall Blvd	N/A
Gulf Shore Blvd	19	Blue Hill/Immokalee Rd, Vanderbilt Beach Rd, 5th Ave North, Central Blvd, Gordon Drive	• People bike at night and without lights; difficult to see them; if car coming on opposite side. lights blind you. • You are doing a great job with downtown Naples, but Gulfshore Blvd is still a death trap.
Goodlette-Frank Rd	15	Vanderbilt Beach Rd, Golden Gate Parkway, Orange Blossom, Pine Ridge Rd, US 41	N/A
Tamiami Trail	12	Davis Blvd, 5th Ave, Collier Blvd, 7th Ave North, 111th, and Palm Drive.	N/A
Wilson Blvd	12	Golden Gate Parkway and Immokalee Rd.	N/A
Radio Rd	11	San Marco Blvd, Countryside Drive, Livingston Rd, Santa Barbara Blvd.	• Have seen several severe accidents by people making left off Radio to get into Countryside—very dangerous, bad visibility.
Brookside Drive	10	Davis Blvd, Estey Ave, Oakes Parking Lot, Harbor Lane, and Holiday	N/A
Pelican Bay Blvd	10	Gulf Park Drive, US 41, and Vanderbilt Beach Rd	N/A

Appendix 3: Traffic Safety Survey

General Traffic Safety Survey

1. How much time do you typically spend traveling each day (Choose one)
   - 0-10 minutes
   - 10-20 minutes
   - 20-30 minutes
   - 30 minutes or more
2. How do you usually travel from place to place? (Rank from 1-5 with 1 being the most frequently used mode of transportation and 5 is the least used)
   - Walk
   - Bicycle
   - Drive
   - Bus
   - Rideshare (e.g. Uber/Lyft)
   - Rely on others for rides
3. What is your usual destination when using your #1 ranked mode of transportation (Rank from 1-5 with 1 being where you travel most often and 5 being where you travel least often)
   - Work
   - School
   - Retail Goods and Services (e.g shopping, dining out)
   - Medical Appointments
   - Visiting Friends/Family
4. How often do you drive a motor vehicle (Choose one)
   - Daily
   - More than 4 times a week
   - 2-4 times a week
   - Once a week
   - Less than once a month
5. Of the items below, which are your top three safety concerns about traveling in Collier County (Choose three)
   - Roadway design
   - People driving under the influence of alcohol, drugs, medications or other substances
   - Pedestrians and bicyclists sharing the roadway
   - People not wearing seatbelts
   - Aging drivers
   - Motorcyclists
   - Commercial vehicles operating on local roads
   - Speeding and aggressive driving
   - Teen drivers

- People using cell phones or doing other activities while driving
- Inadequate roadway lighting or traffic signals
- Construction or utility work zones
- People who do not know the "rules of the road"

In your own words, what is your biggest concern for local road safety in Collier County? _____

6. What is your level of support for the following safety improvements? (Rank each from 1 to 5, with 1 being the most support and 5 being the least support)
   - Reducing speeds on major roads through design and traffic signalization strategies
   - Providing better bicycle facilities including wider bicycle lanes and separated bike paths
   - Making major roads safer for pedestrians (e.g. improving intersection design, providing marked crosswalks, better lighting
   - Improving rural roads (e.g. wider shoulders, better signs and pavement markings)
   - Improving roadway lighting
   - Increased traffic enforcement
7. Please tell us if there is a specific roadway or intersection that you would most like to see improved.

   _____

Bicyclists and Pedestrians

8. How often do you walk and/or ride a bicycle? (Choose one)
   - Daily
   - More than 4 times a week
   - 2-4 times a week
   - Once a week
   - Less than once a month
9. How often do you walk? (Choose one)
   - Daily
   - More than 4 times a week
   - 2-4 times a week
   - Once a week
   - Less than once a month
10. In general, I feel safe and comfortable while riding a bicycle in Collier County. (Choose one)
    - Strongly agree
    - Somewhat agree
    - Somewhat disagree
    - Strongly disagree
    - No opinion
11. In general, I feel safe and comfortable while walking in Collier County. (Choose one)
    - Strongly agree

- Somewhat agree
- Somewhat disagree
- Strongly disagree
- No opinion

12. In general, Collier County pedestrians and bicyclists do a good job following the rules of the road. (Choose one)
    - Strongly agree
    - Somewhat agree
    - Somewhat disagree
    - Strongly disagree
    - No opinion
13. In general, Collier County drivers are courteous about sharing the road with pedestrians and bicyclists (Choose one)
    - Strongly agree
    - Somewhat agree
    - Somewhat disagree
    - Strongly disagree
    - No opinion
14. Are there specific intersections or roadway corridors that you think need safety improvements for bicyclists or pedestrians? (select up to three)
15. What could be done to make bicycling safer in Collier County. (Choose three)
    - More bicycle lanes
    - More bicycle lanes that are physically separated from vehicle traffic
    - More multi-use paths
    - More low-speed neighborhood routes
    - Make it easier to cross highways and high-speed streets
    - More convenient and available bicycle parking
    - Start a bicycle sharing program
    - More education for motorists and bicyclists about sharing the roadway
    - Better enforcement of speed limits
    - Reducing distracted driving

Demographic and Contact information

16. Please describe yourself by checking all that apply
    - I live in Collier County year-round
    - I live in Collier County for part of the year
    - I work in Collier County
    - I live in the region and visit Collier County for shopping and recreation
    - I own a business in Collier County
    - I am a visitor to Collier County

17. What is your age range
    - 18-24
    - 25-34
    - 45-54
    - 55-64
    - 65+
18. What is your home ZIP code? _____
19. What is your work ZIP code? _____
20. If you would like to be contacted to provide input on future Collier County roadway safety survey programs and initiatives, please provide your preferred contact information below.

    Name: _____

    Address: _____

    Phone: _____

    Email: _____

_____