

September 14, 2020

**TECHNICAL MEMORANDUM**

**INTERSECTION SAFETY STUDY**  
**SR 544 AT 42<sup>ND</sup> STREET/CHARLOTTE ROAD**

Roadway section ID: 16140000      Milepost: 0.517

Polk County

**Submitted to:**  
Florida Department of Transportation, District One

**PROFESSIONAL ENGINEER ENDORSEMENT**

I hereby certify that I am a Registered Professional Engineer in the State of Florida and practicing with Johnson, Mirmiran & Thompson, Inc. Johnson, Mirmiran, & Thompson, Inc. is authorized via Certificate Number EB-0005917 to operate as an Engineering Business by the Florida State Board of Professional Engineers, State of Florida Department of Professional Regulation. I have prepared or supervised the preparation of the evaluation, findings, conclusions, recommendations, or professional opinions/advice contained in this document. My endorsement constitutes my approval of these items.

**PROJECT:** FDOT District 1 District Wide Safety Studies and Minor Design  
\_\_\_\_\_

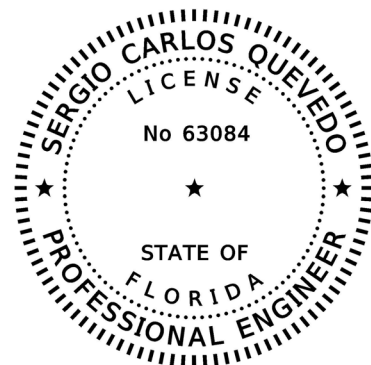
**LOCATION:** SR 544 at 42<sup>nd</sup> Street/Charlotte Road – Intersection Safety Study  
\_\_\_\_\_

**CLIENT:** Florida Department of Transportation  
District One  
\_\_\_\_\_

The results contained in this report were developed using procedures and references standard to the transportation engineering practice. These references and procedures were applied using professional judgment and experience.

**Name:** Sergio Quevedo, P.E.  
**P.E. No.:** 63084  
**Date:** October 12, 2021

**Signature** \_\_\_\_\_



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## 1.0 INTRODUCTION

The Florida Department of Transportation, District One Safety Office has retained Johnson, Mirmiran, & Thompson, Inc. (JMT) as part of the District Wide Safety and Minor Design contract to perform a safety analysis and recommend improvements at the intersection of SR 544 and 42<sup>nd</sup> Street/Charlotte Road in Polk County, Florida.

The analysis methods used in conducting this study are consistent with those set forth in the Highway Capacity Manual (HCM), Manual on Uniform Traffic Control Devices (MUTCD) and Toolbox for Countermeasures and Their Potential Effectiveness for Intersection Crashes, and the Florida Department of Transportation's (FDOT's) Manual on Uniform Traffic Studies (MUTS), and Traffic Engineering Manual (TEM). The rate and frequency-based methods that were used concentrate on the exposure and the quantity of crashes and the comparisons to the Florida statewide averages.

Crash analysis tools implemented include the Signal Four Analytics crash software and the Florida Department of Transportation's (FDOT's) Crash Analysis Reporting System (CARS) databases. Crash reports, rates, and statewide comparisons were analyzed using the crash data from January 1, 2015 through December 31, 2019. The FDOT's Florida Traffic Online 2019 software was utilized to compute the average daily entering volumes for the intersection, which were needed in order to calculate the average crash rate for the intersection.

## 2.0 EXISTING CONDITIONS

This section of the report describes the existing physical and operational condition of the intersection at SR 544 and 42<sup>nd</sup> Street/Charlotte Road.

SR 544 is a two-way, six-lane divided urban principal arterial and extends in the northwest-southeast direction located in Auburndale, Florida. **Figure 1** shows the study intersection in relation to the adjacent roadway system. There is 2-foot curb-and-gutter shoulder on both sides of SR 544. SR 544 in the study area has 12-foot lane widths. The posted speed limit along SR 544 is 45 mph. There is lighting along both sides of SR 544. There is existing sidewalk along both sides of SR 544. There are no designated bike lanes along SR 544 at the study intersection.

42<sup>nd</sup> Street is a two-way, two-lane undivided urban collector road and extends in the north-south direction located in Auburndale, Florida. 42<sup>nd</sup> Street in the study area has 12-foot lane widths. The posted speed limit along 42<sup>nd</sup> Street is 35 mph. There are 2-foot paved shoulders on both sides of 42<sup>nd</sup> Street and no bike lanes on either side of 42<sup>nd</sup> Street. There is no lighting on either side of 42<sup>nd</sup> Street. There is existing sidewalk on the east side of 42<sup>nd</sup> Street.

Charlotte Road is a two-way, two-lane undivided urban collector road and extends in the north-south direction located in Auburndale, Florida. Charlotte Road in the study area has 12-foot lane widths. The posted speed limit along Charlotte Road is 35 mph. There are 2-foot paved shoulders on both sides of Charlotte Road and no bike lanes on either side of Charlotte Road. There is no lighting on either side of Charlotte Road. There is no existing sidewalk on either side of Charlotte Road.

The intersection is currently a four-legged signalized intersection. A condition diagram is included in **Appendix A**.

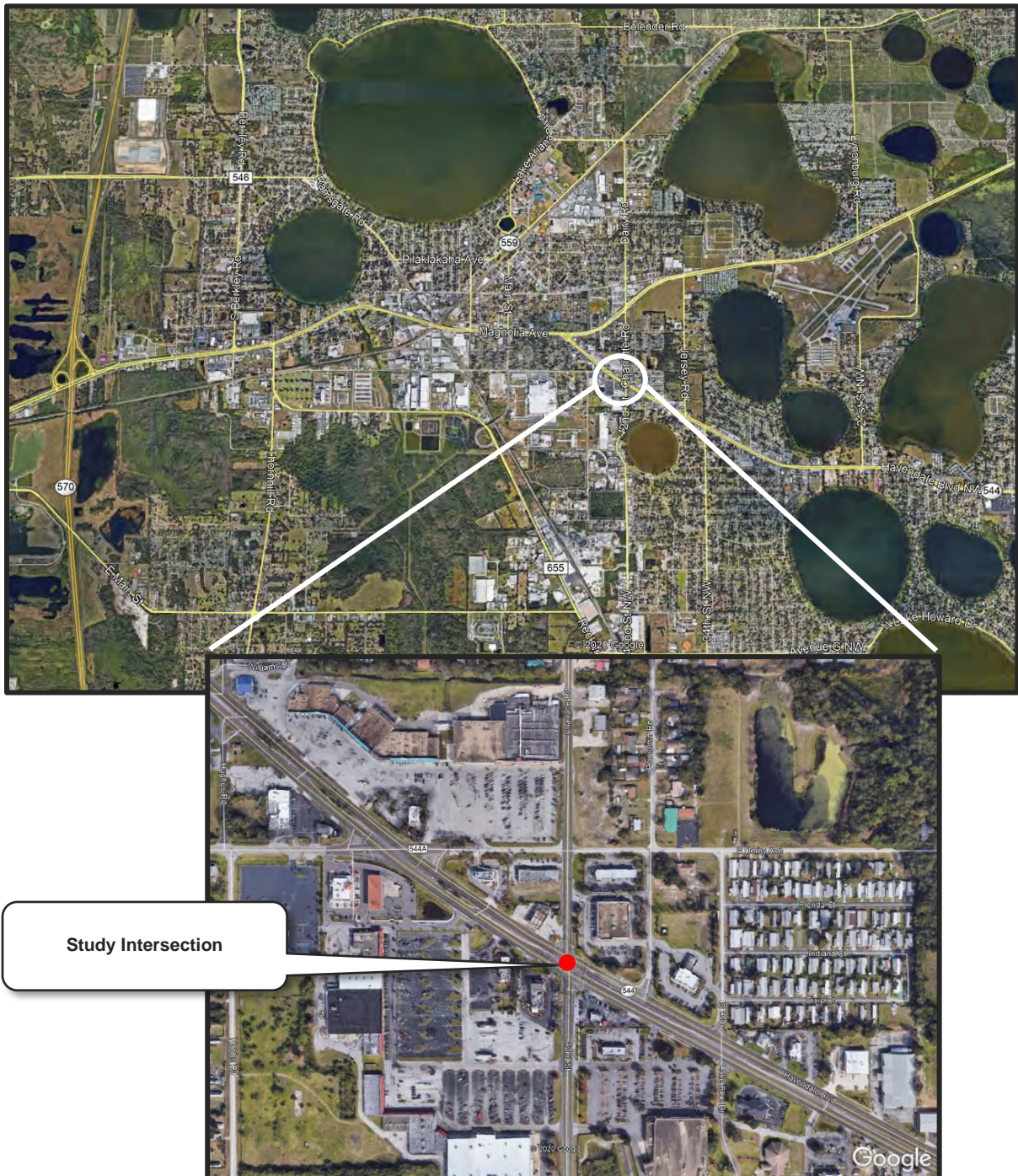


Figure 1: Study Intersection Location

## 3.0 QUALITATIVE ASSESSMENT

The following is an assessment of existing conditions at the study location.

- The posted speed limit along SR 544 is 45 mph. The posted speed limit along 42<sup>nd</sup> Street is 35 mph. The posted speed limit along Charlotte Road is 35 mph.
- FDOT's Florida Traffic Online (FTI) 2019 shows the daily truck percentages along SR 544 to be 5.5% about 1,000 feet northwest of the study intersection. It also shows the daily truck percentages along 42<sup>nd</sup> Street to be 9.8% about 3.5 miles south of the study intersection. These daily truck percentages at FDOT count stations around the study intersections are included in **Appendix B**.
- There is 2-foot curb-and-gutter shoulder on both sides of SR 544. There are no designated bike lanes along SR 544 at the study intersection. There are 2-foot paved shoulders on both sides of 42<sup>nd</sup> Street and no bike lanes on either side of 42<sup>nd</sup> Street. There are 2-foot paved shoulders on both sides of Charlotte Road and no bike lanes on either side of Charlotte Road.
- There are two Lakeland Area Mass Transit (Citrus Connection) bus stops within the vicinity of the intersection. The first bus stop is approximately 430 feet northwest of the study intersection on the south side of SR 544. The second bus stop is approximately 130 feet southeast of the study intersection on the north side of SR 544.
- There is existing sidewalk on both sides of SR 544. There is existing sidewalk on the east side of 42<sup>nd</sup> Street. There is no existing sidewalk on either side of Charlotte Road.
- There is lighting along both sides of SR 544. There is no lighting along either side of 42<sup>nd</sup> Street. There is no lighting along either side of Charlotte Road.
- There is a signalized intersection (SR 544 at Derby Avenue) approximately 0.12 miles northwest of the study intersection. There is a signalized intersection (SR 544 at Jersey Road) approximately 0.41 miles southeast of the study intersection. There is a signalized intersection (US 92 at Charlotte Road) approximately 0.47 miles north of the study intersection. There is a signalized intersection (Ave Q at 42<sup>nd</sup> Street) approximately 0.86 miles south of the study intersection.
- There are 7 driveway entrances within 500 feet northwest of the intersection along both sides of SR 544. There are 4 driveway entrances within 500 feet southeast of the intersection along both sides of SR 544. There are 4 driveway entrances within 500 feet south of the intersection along both sides of 42<sup>nd</sup> Street. There are 5 driveway entrances within 500 feet north of the intersection along both sides of Charlotte Road.
- Pavement condition at the intersection is fair to good. The left turn arrows at the northbound and southbound approaches are faded. The crosswalks at the intersection are damaged in places.
- The intersection is signalized with protected-permissive left turn phasing on all approaches.
- There are pedestrian signals and detectors complete with curb ramps and detectable warnings on all corners of the intersection.

## 4.0 CRASH ANALYSIS AND SAFETY EVALUATION

Crash reports were obtained from the University of Florida's Signal Four Analytics database and the FDOT CARS database for the 60-month period extending between January 2015 and December 2019. The crash data for this intersection within the five-year time period is summarized in **Table 1**, and collision diagrams and collision summary sheets are included in **Appendix C** of this report.

According to the crash data, there have been a total of 183 crashes reported within the 500-foot influence area of the intersection of SR 544 and 42<sup>nd</sup> Street/Charlotte Road over the five-year period. Sixty-two (34%) of the crashes were rear end collisions, fifty-two (28%) of the crashes were angle collisions, twenty-five (14%) of the crashes were sideswipe collisions, twenty-four (13%) of the crashes were left turn collisions, seven (4%) of the crashes were right turn collisions, five (3%) of the crashes were head-on collisions, four (2%) of the crashes were off-road collisions, two (1%) of the crashes were pedestrian collisions, and two (1%) of the crashes were other collisions. Fifty-one (28%) of the crashes resulted in personal injury and there was one (1%) fatality. The distribution of the crashes at this intersection by crash type is shown in **Figure 2**. Forty-three (23%) of the crashes occurred at night and twenty-six (14%) occurred on wet pavement. FDOT's Florida Traffic Online 2019 software was utilized to compute the average daily entering volumes for the intersection in order to calculate the average crash rate. An AADT of 40,000 was calculated. The relevant historical AADT sheets are shown in **Appendix B**. The average crash rate for this study intersection was calculated based on the number of crashes per million entering vehicles and was found to be 2.507 crashes per million entering vehicles (MEV). This is higher than the statewide average of 0.884 crashes/MEV for similar urban 4-leg 6+lane 2-way divided raised intersections from 2013 to 2017.

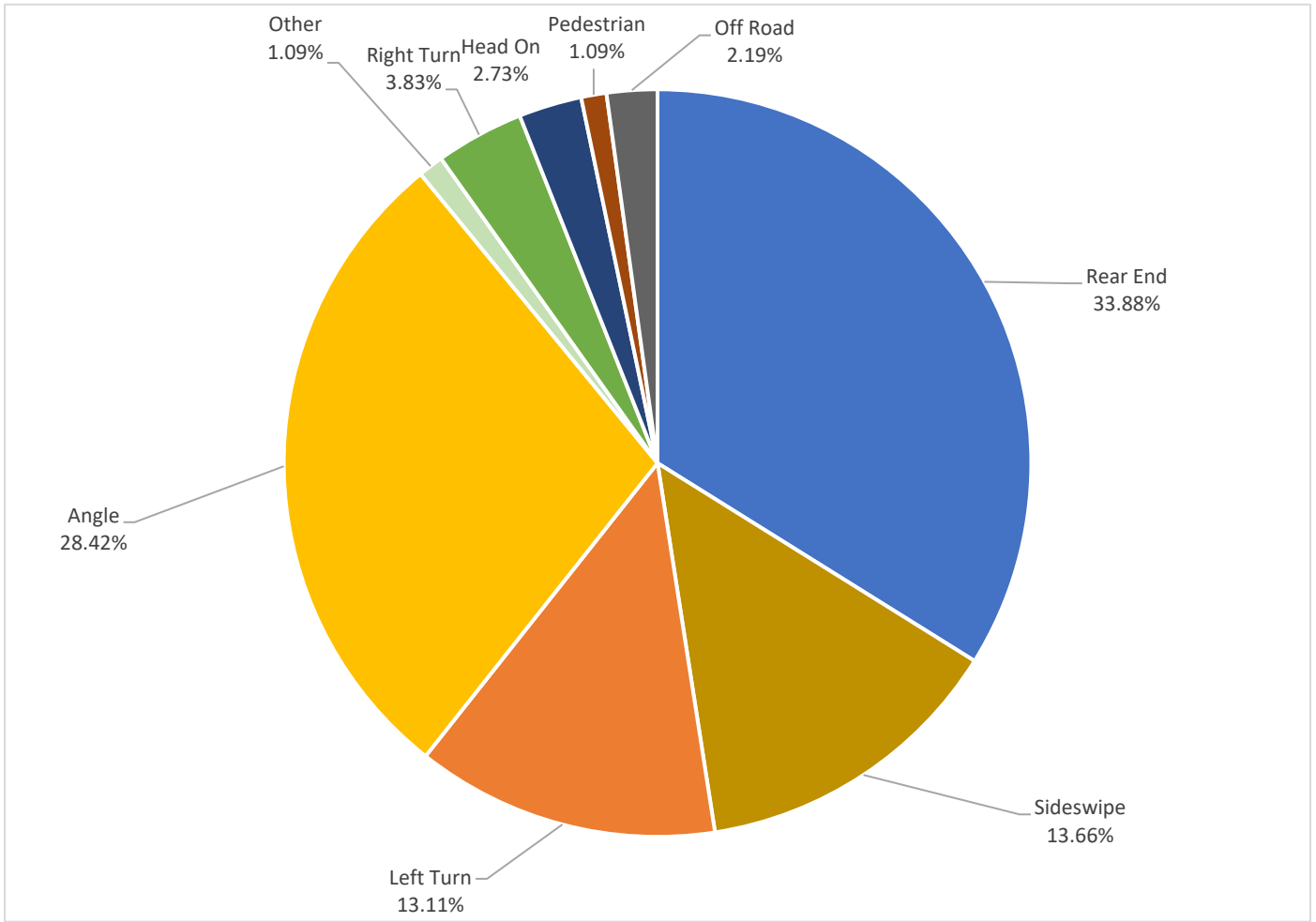


Figure 2: Crash Distribution at SR 544 and 42<sup>nd</sup> Street/Charlotte Road from January 2015 to December 2019



*Table 1: Collision Summary  
 SR 544 at 42<sup>nd</sup> Street/Charlotte Road  
 January 2015 - December 2019  
 (60 months of data)*

<b>COLLISION TYPE</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>TOTAL</b>
Rear End	8	10	12	13	19	62
Angle	9	10	14	8	11	52
Left Turn	3	4	4	7	6	24
Right Turn	1	2	1	1	2	7
Sideswipe	3	4	6	5	7	25
Run-Off-Road	2	1	1	0	0	4
Head-On	1	0	2	1	1	5
Pedestrian	2	0	0	0	0	2
Other	0	0	0	0	2	2
<b>Total</b>	<b>29</b>	<b>31</b>	<b>40</b>	<b>35</b>	<b>48</b>	<b>183</b>
Fatal Crashes	0	0	1	0	0	1
Injury Crashes	9	10	8	10	14	51
Property Damage Only	20	21	31	25	34	131
Day	15	23	29	31	42	140
Night	14	8	11	4	6	43
Wet	7	6	4	2	7	26
Dry	22	25	36	33	41	157
<b>CONTRIBUTING CAUSE</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>TOTAL</b>
Operated MV in Careless or Negligent Manner	8	10	9	11	18	56
Failed to Yield Right-of-Way	9	16	14	15	18	72
Failed to Keep in Proper Lane	3	2	4	5	5	19
Ran Red Light	6	2	4	1	1	14
Followed too Closely	2	1	7	3	5	18
Other Contributing Action	0	0	0	0	1	1
Improper Passing	0	0	1	0	0	1
DUI	1	0	1	0	0	2
Crash Rate (Crashes/MEV)	2.507					

The following is a brief synopsis of the one fatal crash that occurred at or within the influence of the study intersection within the five-year time period.

**Crash Report Number 85621543:** An angle collision between a passenger car (Vehicle 1) and a pick-up truck (Vehicle 2). This fatal crash occurred in 2017 at the intersection of CR 544A/Derby Avenue and Charlotte Road approximately 340 feet north of the study intersection. Vehicle 1 traveling eastbound on CR 544A violated stop sign at the intersection of Charlotte Road and hit Vehicle 2 that was traveling southbound on Charlotte Road. Vehicle 1 did not stop at the stop sign and pulled in the intersection therefore ended up colliding with Vehicle 2. It was determined that Vehicle 1 was at fault in this crash. This crash occurred at night under dark-lighted condition. Pavement condition was dry. It was determined that the driver of Vehicle 1 was under the influence of alcohol.

## 5.0 NET PRESENT VALUE/BENEFIT-COST ANALYSIS

This section presents the net present value and benefit-cost analysis that was performed for the recommended improvements at the study intersection as shown in the concept lay out included in **Appendix D**. The procedures outlined in the Department's *Highway Safety Improvement Program Guideline* were used to determine the net present value, and a benefit-cost form has been prepared for the proposed improvements.

The benefit-cost (B/C) analysis was conducted to evaluate the effectiveness of the proposed improvements in reducing crashes at the study intersection. The detailed calculations along with the crash modification factors (CMF) used are included in **Appendix E**.

The FHWA's *Crash Modification Factors Clearinghouse* was used as a reference to estimate the percentage of crashes that would be expected to be eliminated with the improvements. Each crash was also reviewed on an individual basis to determine if the proposed improvements would have potentially prevented the crash. Five years of crashes from 2015 to 2019 were used for this analysis. The 2019 five-year average statewide cost per crash based on the roadway typical section and functional classification was used, as reported in Table 122.6.1 of the FDOT Design Manual.

A crash reduction factor of 1.6% (CMF ID: 2449) was applied to the collisions that would potentially be impacted by the proposed improvement of installing advanced street name signs along all approaches to the study intersection. A second crash reduction factor of 9.9% (CMF ID: 4112) was applied to the collisions that would potentially be impacted by the proposed improvement of installing reflective signal backplates. A third crash reduction factor of 20.2% (CMF ID: 4211) was applied to the collisions that would potentially be impacted by the proposed improvement of increasing the all-red clearance interval at the study intersection. A fourth crash reduction factor of 99% (CMF ID: 4576) was applied to the collisions that would potentially be impacted by the proposed improvement of changing the left turn phasing from protected-permissive to protected only along all approaches. A fifth crash reduction factor of 50% (CMF ID: 2848) was applied to the collisions that would potentially be impacted by the proposed improvement of installing lighting along 42<sup>nd</sup> Street/Charlotte Road.

The costs for the proposed improvements are \$606,748.95 or \$54,546.73 annually. This estimate includes roadway, signing and pavement marking, signalization, maintenance of traffic, mobilization, project unknowns and C.E.I. costs. It does not include right-of-way costs. See **Appendix D** for the cost estimate for the project.

The proposed improvements provide the following net present value results:

- Number of Crashes Potentially Reduced: 49.8 (3.32 annually)
- Annual Monetary Value of Benefits: \$410,345.36
- Annual Monetary Value of Cost: \$54,546.73
- Benefit-Cost: 7.52
- Net Present Value: \$4,288,671.19 (assuming life of the improvements is 15 years)

The proposed improvements result in a high net present value and are expected to have a beneficial impact by reducing a number of the crashes occurring at the study intersection.

The *Highway Safety Improvement Program Guide* states that a project can qualify for HSP funds provided that the project is low cost, can be accomplished within three years, and has a net present value greater than 0.

Net Present Value calculations have also been included in **Appendix E** of this report.

## 6.0 CONCLUSION

Based on the results of the crash analysis and safety evaluation, qualitative assessment, and engineering judgment, the following recommendations were developed for the intersection of SR 544 and 42<sup>nd</sup> Street/Charlotte Road.

1. Consider enhancing the signal visibility by adding reflective backplates at the study intersection.
2. Consider installing advanced street name signs along all four approaches to the study intersection.
3. Consider reevaluating the clearance interval (yellow and all-red) at the study intersection.
4. Consider changing the left turn phasing from protected-permissive to protected only on the SR 544 (eastbound and westbound) approaches and adding one signal head per lane.
5. Consider adding stop ahead signs along CR 544A on both the eastbound and westbound approaches to the intersection with Charlotte Road. This will require coordination with the local maintaining agency since this location is off the state system.
6. Consider extending the eastbound left turn lane along SR 544 at the study intersection. This might require reducing the westbound left turn lane going into the Havendale Square Shopping Plaza.
7. Consider adding bike lanes along SR 544 and 42<sup>nd</sup> Street/Charlotte Road. This will require a corridor wide assessment to determine if the bike lanes can be installed beyond the intersection limits.
8. Consider adding lighting along 42<sup>nd</sup> Street/Charlotte Road.

The conceptual lay out of the study intersection with the proposed improvements along with the cost estimates have been included in **Appendix D**.

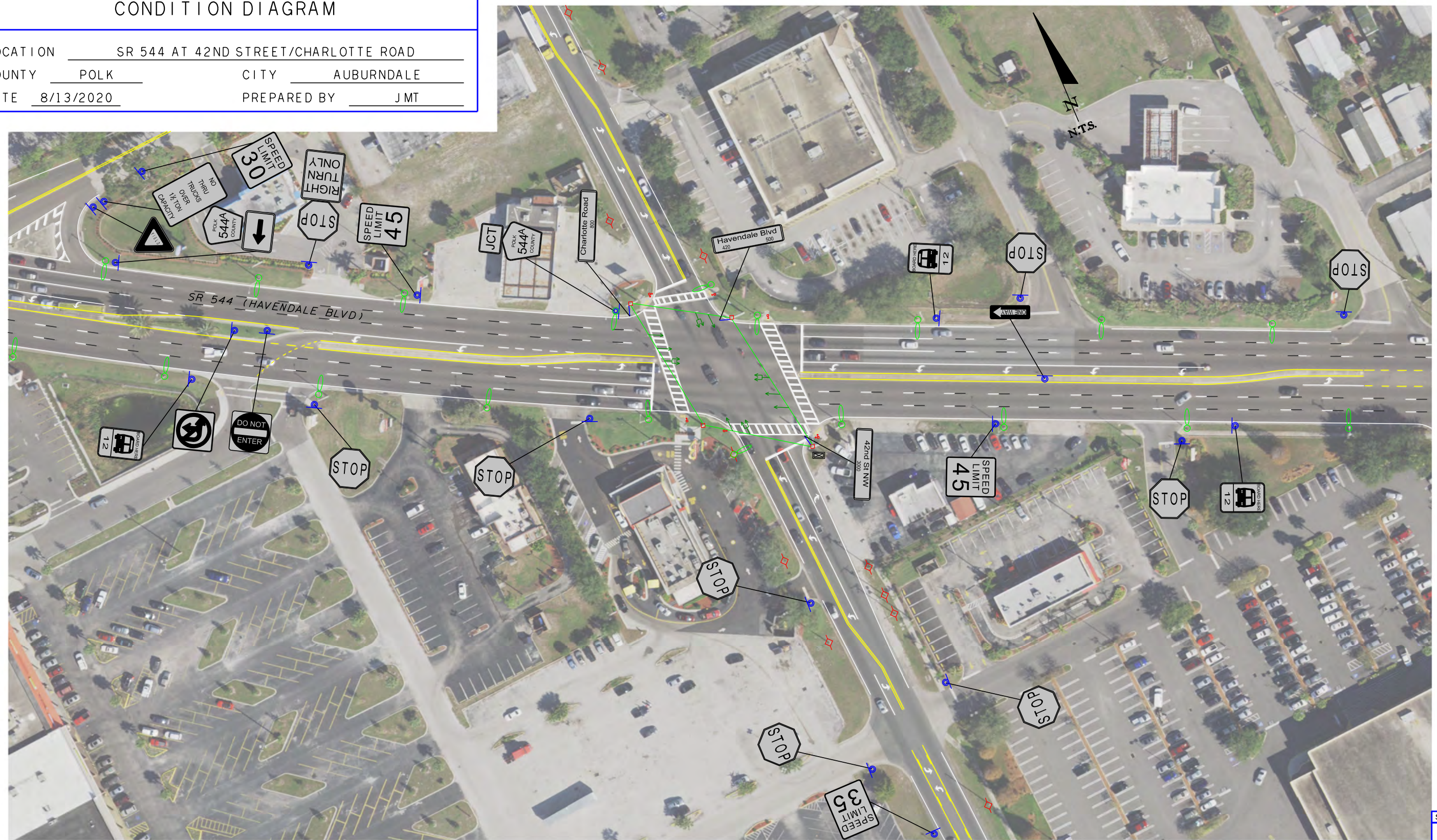


# **APPENDIX A**

## **CONDITION DIAGRAM**

# CONDITION DIAGRAM

LOCATION SR 544 AT 42ND STREET/CHARLOTTE ROAD  
 COUNTY POLK CITY AUBURDALE  
 DATE 8/13/2020 PREPARED BY JMT



SHEET  
1

## SYMBOLS

	TREES		POWER POLE		COMBINATION POLE		PED. SIGNAL HEAD		OVERHEAD SIGN		FENCE
	SHRUBS		SIGN		LIGHT POLE		SIGNAL POLE		HYDRANT		GUARDRAIL
	HEDGE		TRAFFIC SIGNAL POLE		SIGNAL HEAD		CONTROLLER CABINET		RR SIGNAL		BUILDING



# **APPENDIX B**

## FLORIDA TRAFFIC ONLINE SHEETS



FLORIDA DEPARTMENT OF TRANSPORTATION  
TRANSPORTATION STATISTICS OFFICE  
2019 HISTORICAL AADT REPORT

COUNTY: 16 - POLK

SITE: 0082 - SR 544, NW OF CR 544A/DERBY AVE                      AUBURNDALE

YEAR	AADT	DIRECTION 1	DIRECTION 2	*K FACTOR	D FACTOR	T FACTOR
2019	25500 C	E 12500	W 13000	9.00	56.00	5.50
2018	24000 C	E 12000	W 12000	9.00	54.50	5.20
2017	23500 C	E 11500	W 12000	9.00	54.50	6.00
2016	24500 C	E 12500	W 12000	9.00	53.30	4.40
2015	26500 C	E 13000	W 13500	9.00	55.70	4.80
2014	25000 C	E 12500	W 12500	9.00	55.60	4.90
2013	24000 F	E 12000	W 12000	9.00	55.90	4.80
2012	24000 C	E 12000	W 12000	9.00	55.80	4.80
2011	26000 F	E 13000	W 13000	9.00	55.70	4.70
2010	26000 C	E 13000	W 13000	9.55	56.07	4.70
2009	27000 C	E 13500	W 13500	9.36	56.35	5.60
2008	25000 C	E 12500	W 12500	9.78	55.29	5.30
2007	30000 C	E 15000	W 15000	9.66	55.30	5.50
2006	30000 C	E 15000	W 15000	9.62	55.83	6.10
2005	29000 C	E 14500	W 14500	9.30	54.80	8.40
2004	25000 C	E 13000	W 12000	9.50	55.70	8.70

AADT FLAGS: C = COMPUTED; E = MANUAL ESTIMATE; F = FIRST YEAR ESTIMATE  
S = SECOND YEAR ESTIMATE; T = THIRD YEAR ESTIMATE; R = FOURTH YEAR ESTIMATE  
V = FIFTH YEAR ESTIMATE; 6 = SIXTH YEAR ESTIMATE; X = UNKNOWN

\*K FACTOR: STARTING WITH YEAR 2011 IS STANDARDK, PRIOR YEARS ARE K30 VALUES

FLORIDA DEPARTMENT OF TRANSPORTATION  
 TRANSPORTATION STATISTICS OFFICE  
 2019 HISTORICAL AADT REPORT

COUNTY: 16 - POLK

SITE: 4333 - SPIRIT LAKE ROAD, S OF SR 540/WINTER LAKE RD PC 333

YEAR	AADT	DIRECTION 1		DIRECTION 2		*K FACTOR	D FACTOR	T FACTOR
2019	14500 C	N	7100	S	7400	9.00	56.00	9.80
2018	13700 C	N	6800	S	6900	9.00	54.50	8.70
2017	14500 T					9.00	54.50	7.40
2016	13700 S	N	6900	S	6800	9.00	53.30	9.60
2015	12900 F	N	6500	S	6400	9.00	55.70	9.60
2014	12300 C	N	6200	S	6100	9.00	55.60	9.60
2013	12200 S	N	6100	S	6100	9.00	55.90	8.40
2012	12200 F	N	6100	S	6100	9.00	55.80	8.40
2011	12200 C	N	6100	S	6100	9.00	55.70	8.40
2010	12100 S	N	6000	S	6100	9.55	56.07	6.40
2009	12300 F	N	6100	S	6200	9.36	56.35	6.40
2008	12500 C	N	6200	S	6300	9.78	55.29	6.40

AADT FLAGS: C = COMPUTED; E = MANUAL ESTIMATE; F = FIRST YEAR ESTIMATE  
 S = SECOND YEAR ESTIMATE; T = THIRD YEAR ESTIMATE; R = FOURTH YEAR ESTIMATE  
 V = FIFTH YEAR ESTIMATE; 6 = SIXTH YEAR ESTIMATE; X = UNKNOWN

\*K FACTOR: STARTING WITH YEAR 2011 IS STANDARDK, PRIOR YEARS ARE K30 VALUES



# **APPENDIX C**

## **COLLISION DATA**

## FDOT DISTRICT 1 COLLISION SUMMARY

Main Route: SR 544  
 Intersecting Route: Charlotte Road/42nd Street  
 Study Period: 1/1/2015 TO 12/31/2019

County: Polk  
 Engineer: JMT

No.	Date	Day	Time	Fatal	Injury	Property Damage	Crash Type	Day/ Night	Wet/ Dry	V1 Cause	V2 Cause
15-01	1/18/2015	Sun.	4:40 PM	0	0	\$0.00	Angle	Day	Dry	Ran Red Light	No Contributing Action
15-02	2/7/2015	Sat.	6:40 PM	0	0	\$0.00	Right Turn	Night	Dry	Failed to Yield Right-of-Way	No Contributing Action
15-03	3/1/2015	Sun.	1:05 PM	0	0	\$0.00	Sideswipe	Day	Dry	Failed to Keep in Proper Lane	No Contributing Action
15-04	3/5/2015	Thur.	10:10 AM	0	0	\$4,000.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
15-05	3/24/2015	Tues.	12:35 PM	0	0	\$4,500.00	Angle	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
15-06	4/12/2015	Sun.	8:27 PM	0	2	\$1,500.00	Rear End	Night	Wet	Operated MV in Careless or Negligent Manner	No Contributing Action
15-07	6/3/2015	Wed.	8:38 PM	0	5	\$18,500.00	Angle	Night	Dry	Ran Red Light	No Contributing Action
15-08	6/3/2015	Wed.	3:34 PM	0	0	\$0.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
15-09	6/12/2015	Fri.	2:20 PM	0	0	\$0.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
15-10	6/26/2015	Fri.	12:15 PM	0	2	\$11,000.00	Left Turn	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
15-11	7/31/2015	Fri.	4:03 PM	0	0	\$0.00	Sideswipe	Day	Dry	Failed to Keep in Proper Lane	No Contributing Action
15-12	8/1/2015	Sat.	9:36 AM	0	1	\$7,000.00	Angle	Day	Wet	Failed to Yield Right-of-Way	No Contributing Action
15-13	8/11/2015	Tues.	6:00 PM	0	0	\$0.00	Rear End	Day	Dry	Followed too Closely	No Contributing Action
15-14	8/15/2015	Sat.	6:50 PM	0	0	\$4,000.00	Angle	Day	Wet	Ran Red Light	No Contributing Action
15-15	8/29/2015	Sat.	12:05 PM	0	1	\$4,000.00	Angle	Day	Dry	Ran Red Light	No Contributing Action
15-16	8/31/2015	Mon.	6:13 AM	0	0	\$0.00	Rear End	Night	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
15-17	9/12/2015	Sat.	9:04 PM	0	6	\$27,000.00	Head On	Night	Dry	DUI	No Contributing Action
15-18	9/17/2015	Thur.	9:30 PM	0	0	\$0.00	Sideswipe	Night	Wet	Failed to Keep in Proper Lane	No Contributing Action
15-19	9/17/2015	Thur.	8:50 PM	0	2	\$25,000.00	Left Turn	Night	Wet	Failed to Yield Right-of-Way	No Contributing Action
15-20	10/2/2015	Fri.	7:42 PM	0	1	\$0.00	Pedestrian	Night	Wet	Operated MV in Careless or Negligent Manner	No Contributing Action
15-21	10/2/2015	Fri.	11:13 PM	0	0	\$0.00	Off Road	Night	Dry	Ran Red Light	N/A
15-22	10/3/2015	Sat.	12:45 AM	0	0	\$0.00	Off Road	Night	Dry	Operated MV in Careless or Negligent Manner	N/A
15-23	10/16/2015	Fri.	5:05 PM	0	0	\$0.00	Rear End	Day	Dry	Followed too Closely	No Contributing Action
15-24	10/27/2015	Tues.	10:30 PM	0	0	\$0.00	Angle	Night	Wet	Failed to Yield Right-of-Way	No Contributing Action
15-25	11/4/2015	Wed.	2:23 PM	0	0	\$0.00	Angle	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
15-26	11/16/2015	Mon.	8:24 PM	0	0	\$0.00	Left Turn	Night	Dry	Ran Red Light	No Contributing Action
15-27	12/9/2015	Wed.	2:37 PM	0	0	\$0.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
15-28	12/11/2015	Fri.	7:44 PM	0	0	\$0.00	Angle	Night	Dry	Failed to Yield Right-of-Way	No Contributing Action
15-29	12/21/2015	Mon.	6:30 PM	0	1	\$5,000.00	Pedestrian	Night	Dry	Failed to Yield Right-of-Way	No Contributing Action
16-01	1/6/2016	Wed.	7:54 AM	0	1	\$1,200.00	Rear End	Day	Wet	Operated MV in Careless or Negligent Manner	No Contributing Action
16-02	1/9/2016	Sat.	6:50 PM	0	0	\$0.00	Angle	Night	Wet	Ran Red Light	No Contributing Action
16-03	2/15/2016	Mon.	7:55 PM	0	0	\$1,000.00	Sideswipe	Night	Wet	Failed to Yield Right-of-Way	No Contributing Action
16-04	3/19/2016	Sat.	9:38 AM	0	1	\$1,000.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
16-05	3/26/2016	Sat.	12:00 PM	0	0	\$0.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
16-06	3/28/2016	Mon.	11:39 AM	0	0	\$0.00	Angle	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
16-07	4/9/2016	Sat.	8:41 AM	0	3	\$6,000.00	Left Turn	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
16-08	4/18/2016	Mon.	4:35 PM	0	1	\$10,000.00	Angle	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
16-09	4/25/2016	Mon.	9:47 PM	0	0	\$0.00	Angle	Night	Dry	Failed to Yield Right-of-Way	No Contributing Action
16-10	5/5/2016	Thur.	5:18 PM	0	0	\$8,000.00	Angle	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
16-11	5/16/2016	Mon.	5:33 PM	0	0	\$0.00	Rear End	Day	Wet	Operated MV in Careless or Negligent Manner	No Contributing Action

16-12	5/20/2016	Fri.	3:00 PM	0	3	\$7,000.00	Angle	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
16-13	6/17/2016	Fri.	5:21 PM	0	1	\$5,000.00	Left Turn	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
16-14	6/30/2016	Thur.	5:49 PM	0	0	\$0.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
16-15	7/1/2016	Fri.	5:17 PM	0	0	\$300.00	Right Turn	Day	Wet	Failed to Yield Right-of-Way	No Contributing Action
16-16	7/12/2016	Tues.	3:12 PM	0	3	\$10,000.00	Left Turn	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
16-17	7/20/2016	Wed.	5:35 PM	0	0	\$15,000.00	Angle	Day	Dry	Ran Red Light	No Contributing Action
16-18	8/2/2016	Tues.	6:33 PM	0	0	\$500.00	Sideswipe	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
16-19	8/9/2016	Tues.	5:00 AM	0	1	\$10,000.00	Right Turn	Night	Dry	Failed to Yield Right-of-Way	No Contributing Action
16-20	8/10/2016	Wed.	8:54 PM	0	0	\$20,000.00	Angle	Night	Wet	Failed to Yield Right-of-Way	No Contributing Action
16-21	9/28/2016	Wed.	8:35 PM	0	0	\$0.00	Rear End	Night	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
16-22	10/13/2016	Thur.	7:10 PM	0	0	\$0.00	Off Road	Night	Dry	Operated MV in Careless or Negligent Manner	N/A
16-23	10/17/2016	Mon.	1:30 PM	0	0	\$200.00	Sideswipe	Day	Dry	Failed to Keep in Proper Lane	No Contributing Action
16-24	10/25/2016	Tues.	3:20 PM	0	1	\$5,000.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
16-25	10/26/2016	Wed.	4:35 PM	0	0	\$0.00	Rear End	Day	Dry	Followed too Closely	No Contributing Action
16-26	11/5/2016	Sat.	3:00 PM	0	0	\$0.00	Left Turn	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
16-27	11/11/2016	Fri.	7:08 PM	0	0	\$0.00	Sideswipe	Night	Dry	Failed to Keep in Proper Lane	No Contributing Action
16-28	11/26/2016	Sat.	1:35 PM	0	1	\$20.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
16-29	12/20/2016	Tues.	9:25 AM	0	0	\$0.00	Angle	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
16-30	12/23/2016	Fri.	8:45 AM	0	0	\$6,000.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
16-31	12/31/2016	Sat.	3:45 PM	0	0	\$10,000.00	Angle	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
17-01	1/6/2017	Fri.	10:00 PM	0	0	\$0.00	Right Turn	Night	Wet	Failed to Yield Right-of-Way	No Contributing Action
17-02	1/23/2017	Mon.	7:15 AM	0	0	\$0.00	Rear End	Day	Dry	Followed too Closely	No Contributing Action
17-03	2/12/2017	Sun.	9:50 PM	0	2	\$8,000.00	Angle	Night	Dry	Ran Red Light	No Contributing Action
17-04	2/25/2017	Sat.	5:20 PM	0	0	\$0.00	Angle	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
17-05	4/4/2017	Tues.	3:52 PM	0	0	\$0.00	Sideswipe	Day	Dry	Improper Passing	No Contributing Action
17-06	4/9/2017	Sun.	6:00 PM	0	0	\$0.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
17-07	4/21/2017	Fri.	7:15 PM	0	1	\$7,500.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
17-08	5/4/2017	Thur.	8:36 PM	0	2	\$20,000.00	Left Turn	Night	Dry	Failed to Yield Right-of-Way	No Contributing Action
17-09	5/12/2017	Fri.	4:58 PM	0	0	\$3,000.00	Left Turn	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
17-10	5/21/2017	Sun.	10:20 AM	0	0	\$0.00	Rear End	Day	Dry	Followed too Closely	No Contributing Action
17-11	5/25/2017	Thur.	5:45 PM	0	0	\$0.00	Rear End	Day	Dry	Followed too Closely	No Contributing Action
17-12	6/3/2017	Sat.	9:15 AM	0	0	\$0.00	Angle	Day	Dry	Ran Red Light	No Contributing Action
17-13	6/9/2017	Fri.	7:29 PM	0	0	\$0.00	Angle	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
17-14	6/13/2017	Tues.	10:12 PM	0	0	\$0.00	Head On	Night	Wet	Operated MV in Careless or Negligent Manner	No Contributing Action
17-15	6/27/2017	Tues.	7:46 PM	0	0	\$20,000.00	Sideswipe	Day	Wet	Failed to Keep in Proper Lane	No Contributing Action
17-16	7/13/2017	Thur.	3:00 PM	0	0	\$500.00	Sideswipe	Day	Dry	Failed to Keep in Proper Lane	No Contributing Action
17-17	7/17/2017	Mon.	1:00 AM	0	3	\$23,000.00	Angle	Night	Dry	Ran Red Light	No Contributing Action
17-18	8/12/2017	Sat.	12:20 PM	0	0	\$2,000.00	Sideswipe	Day	Dry	Failed to Keep in Proper Lane	No Contributing Action
17-19	8/14/2017	Mon.	4:35 PM	0	0	\$4,000.00	Angle	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
17-20	8/14/2017	Mon.	9:48 PM	0	0	\$5,000.00	Left Turn	Night	Dry	Failed to Yield Right-of-Way	No Contributing Action
17-21	8/16/2017	Wed.	8:29 PM	0	0	\$5,000.00	Angle	Night	Dry	Failed to Yield Right-of-Way	No Contributing Action
17-22	8/18/2017	Fri.	7:40 PM	0	0	\$3,000.00	Rear End	Day	Dry	Followed too Closely	No Contributing Action
17-23	9/4/2017	Mon.	7:44 PM	0	1	\$3,500.00	Left Turn	Night	Wet	Failed to Yield Right-of-Way	No Contributing Action
17-24	9/11/2017	Mon.	10:15 PM	0	2	\$5,000.00	Angle	Night	Dry	Ran Red Light	No Contributing Action
17-25	9/12/2017	Tues.	3:38 PM	0	1	\$2,000.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action

17-26	9/16/2017	Sat.	6:50 PM	0	0	\$2,000.00	Rear End	Day	Dry	Followed too Closely	No Contributing Action
17-27	10/7/2017	Sat.	12:10 PM	0	0	\$2,000.00	Angle	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
17-28	10/9/2017	Mon.	1:45 PM	0	0	\$100.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
17-29	10/11/2017	Wed.	1:05 PM	0	0	\$5,000.00	Angle	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
17-30	10/22/2017	Sun.	2:15 PM	0	0	\$5,000.00	Off Road	Day	Dry	Operated MV in Careless or Negligent Manner	N/A
17-31	11/2/2017	Thur.	2:15 PM	0	0	\$2,000.00	Head On	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
17-32	11/3/2017	Fri.	5:40 PM	0	0	\$2,000.00	Rear End	Day	Dry	Followed too Closely	No Contributing Action
17-33	11/4/2017	Sat.	9:20 PM	1	1	\$20,000.00	Angle	Night	Dry	DUI	No Contributing Action
17-34	11/9/2017	Thur.	1:40 PM	0	0	\$8,000.00	Angle	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
17-35	11/16/2017	Thur.	2:20 PM	0	0	\$1,500.00	Angle	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
17-36	11/18/2017	Sat.	10:14 AM	0	0	\$4,000.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
17-37	12/8/2017	Fri.	6:00 PM	0	0	\$500.00	Sideswipe	Night	Dry	Failed to Keep in Proper Lane	No Contributing Action
17-38	12/22/2017	Fri.	4:25 PM	0	1	\$100.00	Sideswipe	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
17-39	12/28/2017	Thur.	9:40 AM	0	0	\$250.00	Rear End	Day	Dry	Followed too Closely	No Contributing Action
17-40	12/28/2017	Thur.	12:40 PM	0	0	\$6,000.00	Angle	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
18-01	1/10/2018	Wed.	10:31 PM	0	0	\$8,000.00	Angle	Night	Dry	Failed to Yield Right-of-Way	No Contributing Action
18-02	2/13/2018	Tues.	4:40 PM	0	0	\$5,000.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
18-03	2/23/2018	Fri.	1:30 PM	0	0	\$5,000.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
18-04	3/3/2018	Sat.	1:10 PM	0	3	\$2,000.00	Rear End	Day	Dry	Followed too Closely	No Contributing Action
18-05	3/3/2018	Sat.	10:10 AM	0	0	\$1,500.00	Rear End	Day	Dry	Followed too Closely	No Contributing Action
18-06	3/6/2018	Tues.	8:40 AM	0	0	\$500.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
18-07	3/24/2018	Sat.	6:23 PM	0	0	\$1,500.00	Left Turn	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
18-08	4/11/2018	Wed.	8:15 AM	0	0	\$8,000.00	Left Turn	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
18-09	4/12/2018	Thur.	3:35 PM	0	0	\$400.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
18-10	4/13/2018	Fri.	12:55 PM	0	0	\$600.00	Sideswipe	Day	Dry	Failed to Keep in Proper Lane	No Contributing Action
18-11	4/13/2018	Fri.	6:52 AM	0	0	\$300.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
18-12	4/17/2018	Tues.	6:10 PM	0	0	\$6,000.00	Left Turn	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
18-13	4/18/2018	Wed.	6:15 PM	0	0	\$3,000.00	Rear End	Day	Dry	Followed too Closely	No Contributing Action
18-14	4/19/2018	Thur.	9:40 PM	0	1	\$2,500.00	Rear End	Night	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
18-15	4/23/2018	Mon.	7:48 PM	0	0	\$5,000.00	Sideswipe	Day	Dry	Failed to Keep in Proper Lane	No Contributing Action
18-16	5/4/2018	Fri.	4:58 PM	0	3	\$2,000.00	Left Turn	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
18-17	6/23/2018	Sat.	5:11 PM	0	3	\$6,000.00	Angle	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
18-18	8/16/2018	Thur.	8:10 AM	0	0	\$3,000.00	Angle	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
18-19	8/23/2018	Thur.	3:50 PM	0	0	\$4,000.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
18-20	8/23/2018	Thur.	7:50 PM	0	0	\$1,000.00	Right Turn	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
18-21	9/2/2018	Sun.	4:30 PM	0	1	\$3,000.00	Rear End	Day	Wet	Operated MV in Careless or Negligent Manner	No Contributing Action
18-22	9/6/2018	Thur.	7:30 AM	0	0	\$12,000.00	Angle	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
18-23	9/7/2018	Fri.	5:45 PM	0	0	\$800.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
18-24	9/14/2018	Fri.	9:45 AM	0	0	\$300.00	Head On	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
18-25	9/22/2018	Sat.	10:05 AM	0	0	\$5,000.00	Angle	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
18-26	11/2/2018	Fri.	8:20 AM	0	0	\$600.00	Left Turn	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
18-27	11/9/2018	Fri.	2:50 PM	0	1	\$9,000.00	Angle	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
18-28	11/13/2018	Tues.	9:40 AM	0	0	\$50.00	Sideswipe	Day	Dry	Failed to Keep in Proper Lane	No Contributing Action
18-29	11/29/2018	Thur.	6:10 PM	0	0	\$2,000.00	Left Turn	Night	Dry	Failed to Yield Right-of-Way	No Contributing Action
18-30	11/30/2018	Fri.	1:40 PM	0	0	\$5,000.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action

18-31	12/18/2018	Tues.	6:30 PM	0	1	\$700.00	Sideswipe	Night	Dry	Failed to Keep in Proper Lane	No Contributing Action
18-32	12/20/2018	Thur.	4:45 PM	0	1	\$20,000.00	Left Turn	Day	Wet	Failed to Yield Right-of-Way	No Contributing Action
18-33	12/22/2018	Sat.	11:15 AM	0	0	\$1,000.00	Sideswipe	Day	Dry	Failed to Keep in Proper Lane	No Contributing Action
18-34	12/22/2018	Sat.	5:52 PM	0	1	\$5,000.00	Angle	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
18-35	12/24/2018	Mon.	7:23 AM	0	1	\$12,000.00	Angle	Day	Dry	Ran Red Light	No Contributing Action
19-01	1/2/2019	Wed.	7:34 PM	0	0	\$2,250.00	Rear End	Night	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
19-02	1/4/2019	Fri.	12:25 PM	0	0	\$1,000.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
19-03	1/17/2019	Thur.	6:15 PM	0	0	\$2,000.00	Head On	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
19-04	1/23/2019	Wed.	12:05 PM	0	0	\$5,000.00	Sideswipe	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
19-05	2/19/2019	Tues.	5:31 PM	0	1	\$8,000.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
19-06	2/20/2019	Wed.	4:50 PM	0	0	\$3,000.00	Angle	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
19-07	2/23/2019	Sat.	6:50 PM	0	0	\$5,000.00	Angle	Day	Dry	Ran Red Light	No Contributing Action
19-08	3/1/2019	Fri.	2:15 PM	0	0	\$2,000.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
19-09	3/3/2019	Sun.	1:25 PM	0	0	\$2,000.00	Sideswipe	Day	Dry	Failed to Keep in Proper Lane	No Contributing Action
19-10	3/14/2019	Thur.	6:58 AM	0	0	\$4,000.00	Angle	Night	Dry	Failed to Yield Right-of-Way	No Contributing Action
19-11	3/22/2019	Fri.	4:37 PM	0	0	\$4,000.00	Angle	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
19-12	3/23/2019	Sat.	11:47 AM	0	5	\$9,300.00	Left Turn	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
19-13	4/17/2019	Wed.	4:45 PM	0	0	\$600.00	Rear End	Day	Dry	Followed too Closely	No Contributing Action
19-14	4/28/2019	Sun.	1:10 PM	0	1	\$6,500.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
19-15	5/9/2019	Thur.	3:45 PM	0	0	\$300.00	Sideswipe	Day	Dry	Failed to Keep in Proper Lane	No Contributing Action
19-16	5/17/2019	Fri.	10:26 AM	0	0	\$2,300.00	Sideswipe	Day	Dry	Failed to Keep in Proper Lane	No Contributing Action
19-17	5/23/2019	Thur.	8:30 PM	0	1	\$10,000.00	Left Turn	Night	Dry	Failed to Yield Right-of-Way	No Contributing Action
19-18	6/6/2019	Thur.	5:42 PM	0	0	\$6,000.00	Rear End	Day	Wet	Followed too Closely	No Contributing Action
19-19	6/18/2019	Tues.	4:09 PM	0	0	\$3,000.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
19-20	6/20/2019	Thur.	7:53 PM	0	2	\$10,000.00	Right Turn	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
19-21	7/16/2019	Tues.	12:20 PM	0	0	\$1,000.00	Sideswipe	Day	Dry	Failed to Keep in Proper Lane	No Contributing Action
19-22	7/25/2019	Thur.	3:22 PM	0	0	\$1,000.00	Angle	Day	Wet	Operated MV in Careless or Negligent Manner	No Contributing Action
19-23	7/28/2019	Sun.	7:06 PM	0	1	\$8,000.00	Angle	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
19-24	8/9/2019	Fri.	3:30 PM	0	0	\$1,600.00	Right Turn	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
19-25	8/28/2019	Wed.	6:44 PM	0	0	\$100.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
19-26	9/4/2019	Wed.	4:54 PM	0	0	\$2,500.00	Rear End	Day	Dry	Followed too Closely	No Contributing Action
19-27	9/4/2019	Wed.	3:47 PM	0	3	\$15,000.00	Left Turn	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
19-28	9/22/2019	Sun.	2:55 PM	0	0	\$10,000.00	Left Turn	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
19-29	9/24/2019	Tues.	5:24 PM	0	0	\$20,000.00	Angle	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
19-30	9/30/2019	Mon.	5:40 PM	0	0	\$0.00	Sideswipe	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
19-31	10/5/2019	Sat.	6:45 AM	0	1	\$8,500.00	Rear End	Day	Dry	Followed too Closely	No Contributing Action
19-32	10/9/2019	Wed.	5:45 PM	0	2	\$10,000.00	Left Turn	Day	Wet	Failed to Yield Right-of-Way	No Contributing Action
19-33	10/18/2019	Fri.	9:58 PM	0	0	\$2,500.00	Sideswipe	Night	Wet	Failed to Keep in Proper Lane	No Contributing Action
19-34	10/18/2019	Fri.	10:26 PM	0	1	\$15,000.00	Left Turn	Night	Wet	Failed to Yield Right-of-Way	No Contributing Action
19-35	10/19/2019	Sat.	12:32 PM	0	0	\$2,000.00	Rear End	Day	Wet	Operated MV in Careless or Negligent Manner	No Contributing Action
19-36	10/20/2019	Sun.	6:55 PM	0	1	\$2,000.00	Rear End	Night	Dry	Followed too Closely	No Contributing Action
19-37	10/28/2019	Mon.	8:41 AM	0	0	\$1,000.00	Other	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
19-38	10/29/2019	Tues.	3:47 PM	0	0	\$6,000.00	Angle	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
19-39	11/18/2019	Mon.	7:35 AM	0	0	\$1,500.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
19-40	11/21/2019	Thur.	11:56 AM	0	0	\$4,500.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action

19-41	11/25/2019	Mon.	12:36 PM	0	1	\$100.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
19-42	11/26/2019	Tues.	5:45 PM	0	1	\$2,500.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
19-43	12/5/2019	Thur.	1:10 PM	0	0	\$1,500.00	Other	Day	Dry	Other Contributing Action	No Contributing Action
19-44	12/8/2019	Sun.	4:05 PM	0	0	\$500.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
19-45	12/19/2019	Thur.	1:55 PM	0	0	\$1,500.00	Angle	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
19-46	12/23/2019	Mon.	10:40 AM	0	1	\$0.00	Rear End	Day	Dry	Operated MV in Careless or Negligent Manner	No Contributing Action
19-47	12/24/2019	Tues.	4:00 PM	0	0	\$4,500.00	Angle	Day	Dry	Failed to Yield Right-of-Way	No Contributing Action
19-48	12/27/2019	Fri.	1:22 PM	0	0	\$8,000.00	Angle	Day	Wet	Failed to Yield Right-of-Way	No Contributing Action
<b>TOTAL</b>				<b>1</b>	<b>89</b>	<b>\$756,470.00</b>					

	Total No.	Fatal	Injury	Property Damage	Angle	Rear End	Left Turn	Sideswipe	Off Road	Head On
Total	183	1	51	131	52	62	24	25	4	5
%		1%	28%	72%	28%	34%	13%	14%	2%	3%
Pedestrian	Bicycle	Right Turn	Rollover	Other	Day	Night	Dry	Wet	Operated MV in Careless or Negligent Manner	Failed to Yield Right-of-Way
2	0	7	0	2	140	43	157	26	56	72
1%	0%	4%	0%	1%	77%	23%	86%	14%	31%	39%
Ran Red Light	Improper Backing	Failed to Keep in Proper Lane		Followed too Closely	Other Contributing Action	Improper Passing	DUI	Failure to Obey Traffic Signs	Exceeded Posted Speed	
14	0	19		18	1	1	2	0	0	
8%	0%	10%		10%	1%	1%	1%	0%	0%	



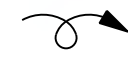




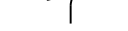









# COLLISION DIAGRAM

LOCATION SR 544 AT CHARLOTTE ROAD / 42ND STREET  
 COUNTY POLK CITY AUBURNDALE  
 DATE RANGE 1/1/2015 TO 12/31/2015 PREPARED BY JMT



SHEET  
1

### SYMBOLS

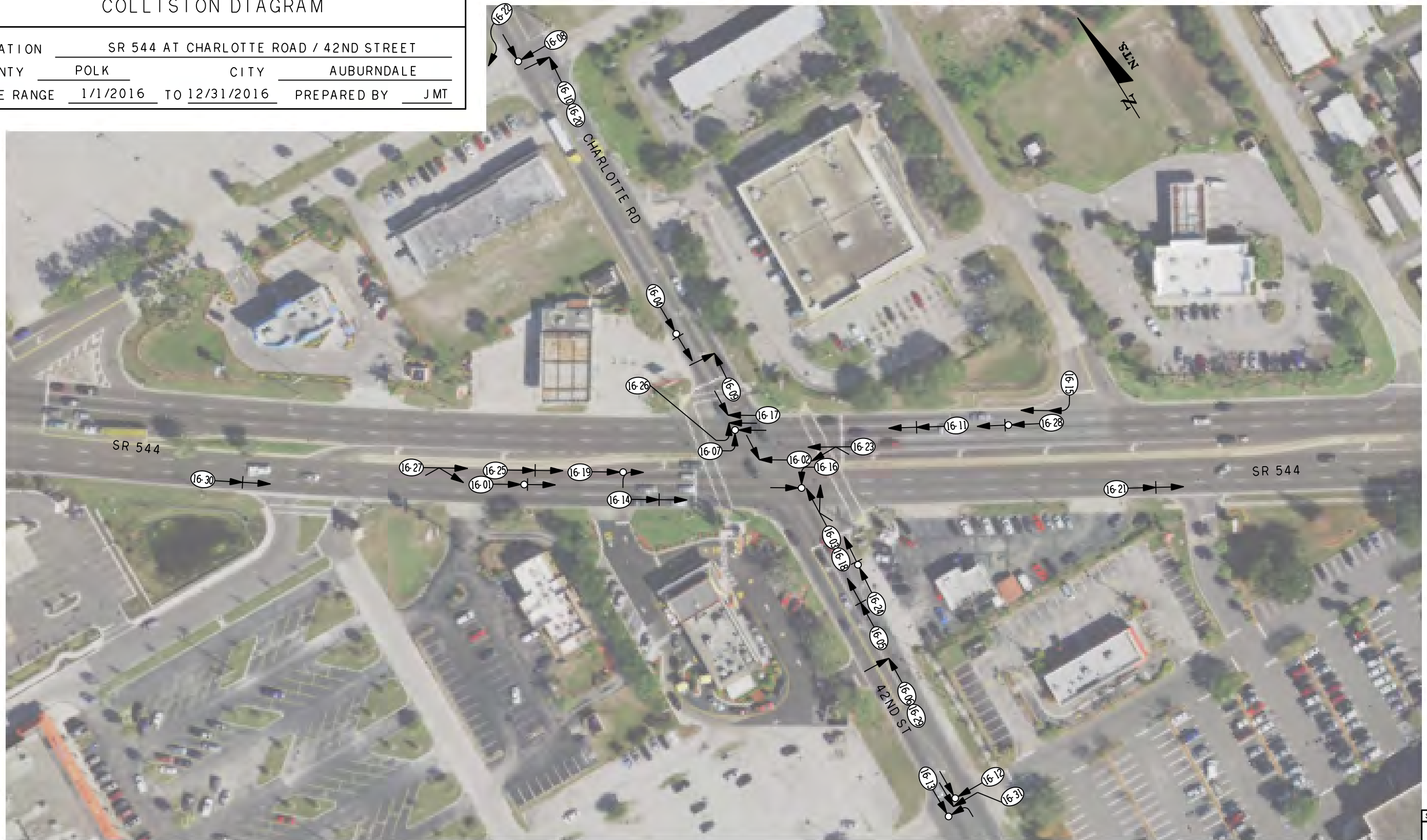
 OVERTURNED VEHICLE   BACKING VEHICLE   OUT OF CONTROL	 HEAD-ON COLLISION   ANGLE COLLISION   RIGHT TURN COLLISION	 COLLISION W/ PED.   COLLISION W/ BIKE   LEFT TURN COLLISION	 REAR-END COLLISION   SIDE SWIPE   PERSONAL INJURY  FATALITY	 COLLISION NUMBER  YEAR OF COLLISION (I.E. 13 = 2013)
-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

### CRASH SUMMARY











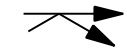




	PROPERTY DAMAGE ONLY	INJURY	FATAL	TOTAL
DAYTIME	12	3	0	15
NIGHTTIME	8	6	0	14
<b>TOTAL</b>	<b>20</b>	<b>9</b>	<b>0</b>	<b>29</b>

# COLLISION DIAGRAM

LOCATION SR 544 AT CHARLOTTE ROAD / 42ND STREET  
 COUNTY POLK CITY AUBURNDALE  
 DATE RANGE 1/1/2016 TO 12/31/2016 PREPARED BY JMT



### SYMBOLS

  	  	  	  	  
-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

### CRASH SUMMARY

	PROPERTY DAMAGE ONLY	INJURY	FATAL	TOTAL
DAYTIME	14	9	0	23
NIGHTTIME	7	1	0	8
<b>TOTAL</b>	<b>21</b>	<b>10</b>	<b>0</b>	<b>31</b>

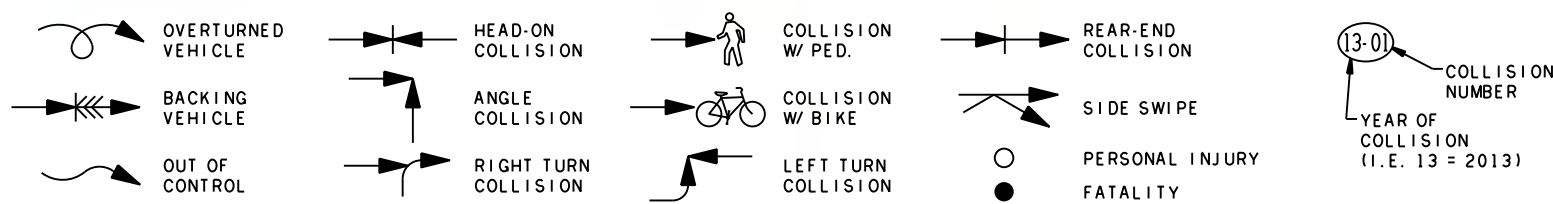
# COLLISION DIAGRAM

LOCATION SR 544 AT CHARLOTTE ROAD / 42ND STREET  
 COUNTY POLK CITY AUBURNDALE  
 DATE RANGE 1/1/2017 TO 12/31/2017 PREPARED BY JMT



SHEET  
3

### SYMBOLS

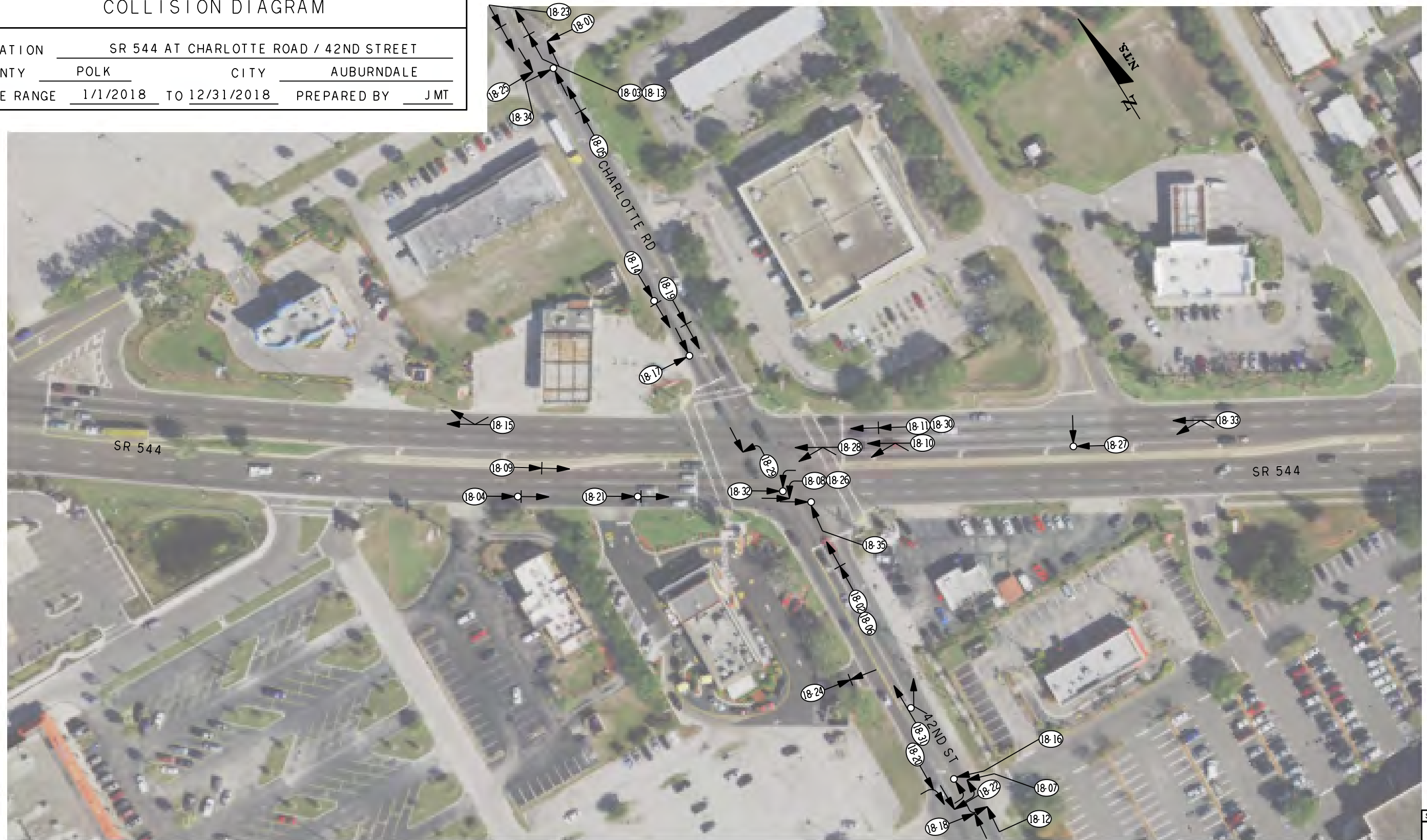


### CRASH SUMMARY

	PROPERTY DAMAGE ONLY	INJURY	FATAL	TOTAL
DAYTIME	26	3	0	29
NIGHTTIME	5	5	1	11
<b>TOTAL</b>	<b>31</b>	<b>8</b>	<b>1</b>	<b>40</b>

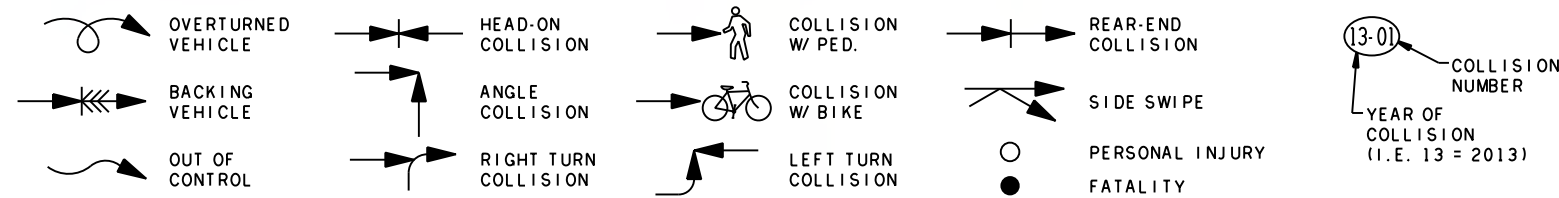
# COLLISION DIAGRAM

LOCATION SR 544 AT CHARLOTTE ROAD / 42ND STREET  
 COUNTY POLK CITY AUBURDALE  
 DATE RANGE 1/1/2018 TO 12/31/2018 PREPARED BY JMT



SHEET  
4

### SYMBOLS



### CRASH SUMMARY

	PROPERTY DAMAGE ONLY	INJURY	FATAL	TOTAL
DAYTIME	23	8	0	31
NIGHTTIME	2	2	0	4
<b>TOTAL</b>	<b>25</b>	<b>10</b>	<b>0</b>	<b>35</b>

# COLLISION DIAGRAM

LOCATION SR 544 AT CHARLOTTE ROAD / 42ND STREET  
 COUNTY POLK CITY AUBURNDALE  
 DATE RANGE 1/1/2019 TO 12/31/2019 PREPARED BY JMT



### SYMBOLS

  	  	  	   	 COLLISION NUMBER YEAR OF COLLISION (I.E. 13 = 2013)
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### CRASH SUMMARY

	PROPERTY DAMAGE ONLY	INJURY	FATAL	TOTAL
DAYTIME	31	11	0	42
NIGHTTIME	3	3	0	6
<b>TOTAL</b>	<b>34</b>	<b>14</b>	<b>0</b>	<b>48</b>

REPORT CARPJ96  
 DATE 01/10/2020  
 TIME 12:14:06

FLORIDA - DEPARTMENT OF TRANSPORTATION  
 C A R - CRASH ANALYSIS REPORTING SYSTEM  
 CRASHES PER MILLION VEHICLES ENTERING BY INTERSECTION TYPE  
 STATEWIDE FOR 2013 - 2017

PAGE NO 2  
 AS OF 12/20/2019 21:15:13

COMMENTS:

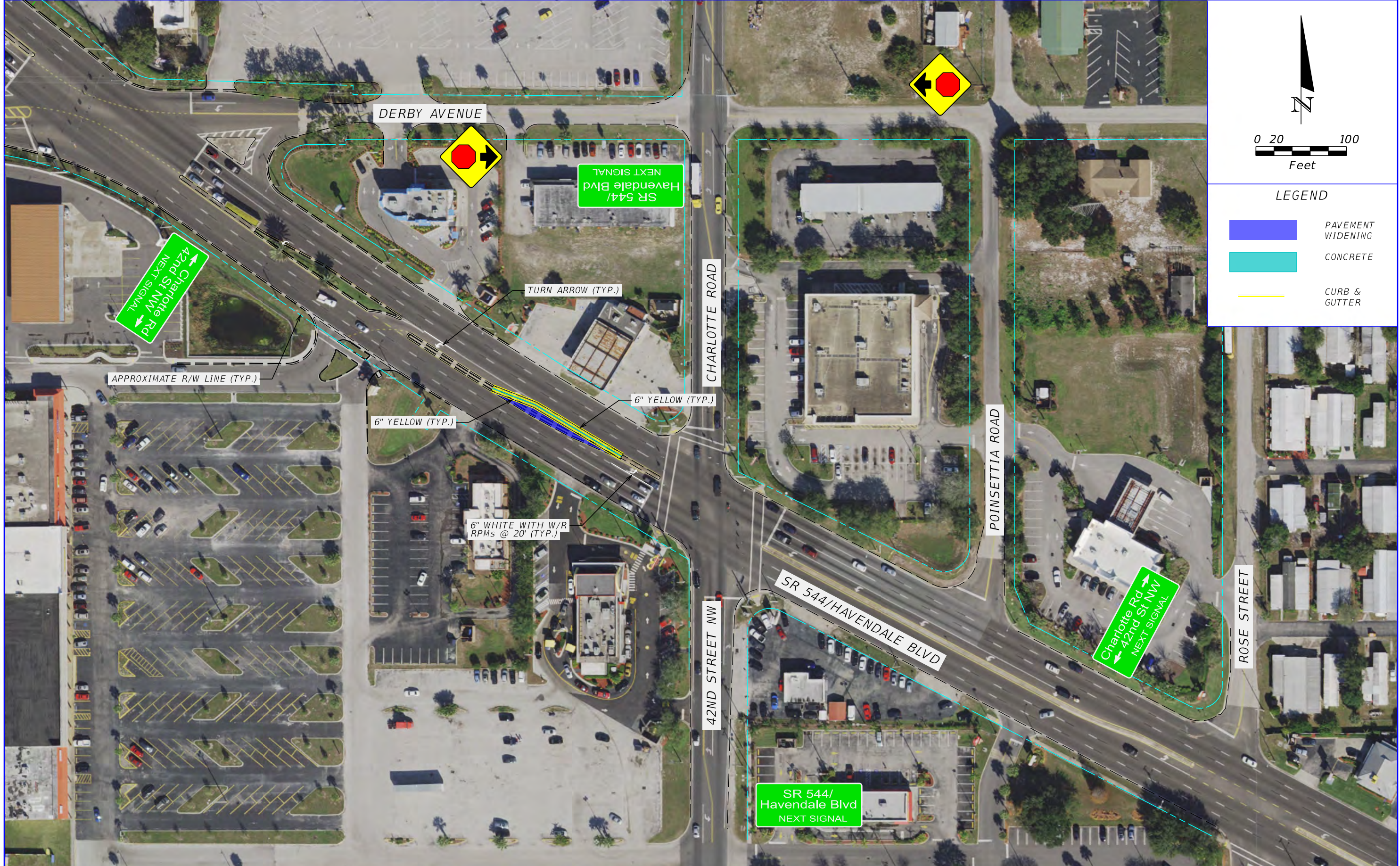
USERID: SF945BJ

CC - CRASH RATE CATEGORY CODE DESCRIPTION	3 LEGS		4 LEGS		5 LEGS		6+ LEGS	
	RATE # INTS	# CRASHES/ MILL VEH	RATE # INTS	# CRASHES/ MILL VEH	RATE # INTS	# CRASHES/ MILL VEH	RATE # INTS	# CRASHES/ MILL VEH
17 - RURAL 2-3LN 2WY DIVD PAVD	0.265 795	2542/ 9601.722	0.366 179	1444/ 3941.624	0.187 3	6/ 32.030		
18 - RURAL 2-3LN 2WY UNDIVD	0.191 6206	9194/ 48140.556	0.229 1191	2556/ 11156.723	0.412 7	16/ 38.817	0.130 1	1/ 7.701
20 - URBAN 4-5LN 2WY DIVD RASD	0.419 6329	117902/ 281627.821	0.623 2662	80671/ 129510.639	0.750 40	1380/ 1840.846	1.401 5	554/ 395.422
21 - URBAN 4-5LN 2WY DIVD PAVD	0.533 4072	93538/ 175601.549	0.769 2130	73425/ 95513.995	1.210 25	1637/ 1353.073	0.966 11	508/ 526.074
22 - URBAN 4-5LN 2WY UNDIVD	0.563 770	13368/ 23757.046	0.800 526	13255/ 16568.869	0.730 9	243/ 332.953	1	27.046
23 - SUBURBAN 4-5LN 2WY DIVD RASD	0.270 4865	61348/ 227608.192	0.517 1381	35737/ 69058.480	1.031 16	937/ 908.740	1.678 1	109/ 64.970
24 - SUBURBAN 4-5LN 2WY DIVD PAVD	0.314 445	7232/ 23023.133	0.542 166	4221/ 7790.391	0.194 1	8/ 41.281		
25 - SUBURBAN 4-5LN 2WY UNDIVD	0.195 78	389/ 1991.221	0.188 35	184/ 978.181				
26 - RURAL 4-5LN 2WY DIVD RASD	0.202 1696	7350/ 36343.356	0.210 479	3263/ 15530.769	0.923 3	105/ 113.788		
27 - RURAL 4-5LN 2WY DIVD PAVD	0.136 23	51/ 375.083	0.096 3	13/ 135.022				
28 - RURAL 4-5LN 2WY UNDIVD	0.076 4	2/ 26.243	3.217 1	33/ 10.256				
30 - URBAN 6+LN 2WY DIVD RASD	0.479 9151	344769/ 719927.885	0.884 3137	227937/ 257723.745	1.139 34	3928/ 3448.318	1.214 4	339/ 279.202
31 - URBAN 6+LN 2WY DIVD PAVD	0.473 504	17014/ 35943.159	0.686 255	12312/ 17951.660	0.900 4	355/ 394.492		
32 - URBAN 6+LN 2WY UNDIVD	1.829 7	153/ 83.647	2.572 4	235/ 91.359				
33 - SUBURBAN 6+LN 2WY DIVD RASD	0.343 1850	52472/ 152905.887	0.749 643	42028/ 56142.241	1.862 10	1593/ 855.585	0.433 1	41/ 94.717



# **APPENDIX D**

## **CONCEPTUAL LAYOUT COST ESTIMATE**



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

JOHNSON, MIRMIRAN, & THOMPSON, INC.  
 2000 E 11TH AVENUE, SUITE 300  
 TAMPA, FL 33605-3830

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION		
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 544	POLK	

SR 544 AT CHARLOTTE ROAD  
 INTERSECTION IMPROVEMENTS

CONCEPT PLAN

SHEET NO.



**ENGINEER'S ESTIMATE**  
**FLORIDA DEPARTMENT OF TRANSPORTATION DISTRICT 1**

<b>FINANCIAL PROJECT ID # :</b>	SR 544
<b>PROJECT DESCRIPTION:</b>	SR 544 AT CHARLOTTE ROAD
<b>PAY ITEM SPEC YEAR:</b>	January 2020
<b>SUBMITTAL TYPE:</b>	Concept
<b>COUNTY:</b>	Polk
<b>DATE:</b>	September 2, 2020
<b>ENGINEERING CONSULTANT FIRM:</b>	Johnson, Mirmiran & Thompson, Inc.
<b>CONTACT NAME:</b>	Sergio Quevedo
<b>PHONE NUMBER:</b>	(818) 868-6511
<b>FILE VERSION:</b>	EE_01-14_Rev30
<b>PAGE NUMBER:</b>	1 of 4

**COMPONENT GROUPS**

100 - STRUCTURES	<i>NOT USED</i>	
200 - ROADWAY		\$19,141.31
300 - SIGNING & PAVEMENT MARKINGS		\$35,389.51
400 - LIGHTING		\$35,735.00
500 - SIGNALIZATION		\$305,234.85
550 - ITS	<i>NOT USED</i>	
600 - LANDSCAPE / PERIPHERALS	<i>NOT USED</i>	
700 - UTILITIES	<i>NOT USED</i>	
800 - ARCHITECTURAL	<i>NOT USED</i>	
900 - MASS TRANSIT	<i>NOT USED</i>	
1000 - INVALID & OTHER ITEMS	<i>NOT USED</i>	
	<b>COMPONENT SUB-TOTAL</b>	\$395,500.67
(102-1) MOT (Maintenance of Traffic)	5%	\$19,775.03
	<b>SUB-TOTAL</b>	\$415,275.70
(101-1) MOB (Mobilization)	10%	\$41,527.57
	<b>SUB-TOTAL</b>	\$456,803.27
PU (Project Unknowns)	10%	\$45,680.33
	<b>SUB-TOTAL</b>	\$502,483.60
(999-25) Initial Contingency (Do Not Bid) (5%)		\$25,124.18
	<b>PROJECT GRAND TOTAL</b>	<b>\$527,607.78</b>

**NOTES:**

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# **APPENDIX E**

## **NET PRESENT VALUE/ BENEFIT-COST ANALYSIS**

Net Present Value (NPV) Calculation for SR 544 at Charlotte Road

Year	CRF x (PC/YD)	Cost per Crash	(P/F,I,y) Factor	Present Value
1	3.32	\$123,598.00	0.97	\$398,035.00
2	3.32	\$123,598.00	0.94	\$385,724.64
3	3.32	\$123,598.00	0.92	\$377,517.73
4	3.32	\$123,598.00	0.89	\$365,207.37
5	3.32	\$123,598.00	0.86	\$352,897.01
6	3.32	\$123,598.00	0.84	\$344,690.10
7	3.32	\$123,598.00	0.81	\$332,379.74
8	3.32	\$123,598.00	0.79	\$324,172.83
9	3.32	\$123,598.00	0.77	\$315,965.93
10	3.32	\$123,598.00	0.74	\$303,655.57
11	3.32	\$123,598.00	0.72	\$295,448.66
12	3.32	\$123,598.00	0.70	\$287,241.75
13	3.32	\$123,598.00	0.68	\$279,034.84
14	3.32	\$123,598.00	0.66	\$270,827.94
15	3.32	\$123,598.00	0.64	\$262,621.03

**Total Present Value**

**Benefit**

\$4,895,420.14

**Cost**

\$606,748.95

**Net Present Value**

**\$4,288,671.19**

**Benefit-Cost Analysis**

District: **One** County: **16 - Polk** Date Prepared: **09/14/20**

Location: **SR 544 at 42nd Street/Charlotte Road**

Section : **16140000** Beg. Milepost : **0.517** End Milepost : **0.517**

Rdway Type: **6+ Lanes Urban Divided**

Control Element: **Other (describe in box below)**

Install advanced street name signs, install reflective signal backplates, install lighting, increase all-red clearance interval, convert LT phasing from prot-perm to prot only

**ANNUAL COST OF IMPROVEMENTS**

Type	Cost	Service Life	Capital Recovery Factor	Total
ROW		15	0.0899	\$ -
P.E.C.E.I.	\$ 79,141.17	15	0.0899	\$ 7,114.79
Structure		15	0.0899	\$ -
Roadway		15	0.0899	\$ -
Drainage		15	0.0899	\$ -
Signal		15	0.0899	\$ -
Other	\$ 527,607.78	15	0.0899	\$ 47,431.94
Sub-Total	\$ 606,748.95			\$ 54,546.73
Annual Cost =				\$ 54,546.73

Total number of crashes =	183	Primary crash reduction factor (%):	20.2, 99
# of correctable crashes, PC =	30	Increase all-red clearance interval and prot-perm to prot only	
# of years of crash data, YD =	5	Additional crash reduction factor:	1.6, 9.9
PC/YD =	6.00	Install advanced street name signs and reflective signal backplates	
Crash reduction factor, CRF =	88.03%	Additional crash reduction factor:	50
CRF x (PC/YD) =	3.32	Install lighting	
Cost per crash, CPC =	\$123,598.00		
Benefit =	\$410,345		

**BENEFIT/COST RATIO**

$$\frac{\text{Benefit}}{\text{Cost}} = \frac{\$410,345.36}{\$54,546.73} = \mathbf{7.52}$$

Prepared by: **JMT**

### **Assumption for Cost associated with Lighting Recommendation**

**Recommendation:** At least 2 more light poles along Charlotte Road (assuming 2 per corner of the intersection)

**Cost Assumption:** The initial construction cost (IC) per pole was assumed at \$15,820 (including pole, luminaire, conduit, and conductors), based on averages of previous construction projects. The electrical cost (PVEC) used in the analysis is the average in Florida at \$0.10/KWH. The maintenance cost (PVMC) per luminaire was estimated at \$100 per year.

**Service life:** 15 years



SR 544 at Charlotte Road, Polk County, Florida

Life of Project (years)  
15

	LIGHT POLE COMP	EA	2.00	\$15,820.00	\$ 31,640.00

Maintenance Costs	\$ 3,000.00
Energy Cost	\$ 1,095.00
	\$ 35,735.00



## CMF / CRF Details

CMF ID: 2449

### Advance street name signs

**Description:** Install advance street name signs at signalized intersections to indicate the name of the next signalized cross street.

**Prior Condition:** No advance signs at a signalized intersection

**Category:** Signs

**Study:** [Safety Effectiveness of Advance Street Name Signs, Gross, Lefler, Lyon, and Eccles, 2010](#)

Star Quality Rating:



[\[View score details\]](#)

### Crash Modification Factor (CMF)

**Value:** 0.984

**Adjusted Standard Error:**

**Unadjusted Standard Error:** 0.018

### Crash Reduction Factor (CRF)

**Value:** 1.6 (This value indicates a **decrease** in crashes)

**Adjusted Standard Error:**

<b>Unadjusted Standard Error:</b>	1.8
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<b>Applicability</b>	
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<b>Crash Type:</b>	All
<b>Crash Severity:</b>	All
<b>Roadway Types:</b>	Not Specified
<b>Number of Lanes:</b>	
<b>Road Division Type:</b>	
<b>Speed Limit:</b>	
<b>Area Type:</b>	All
<b>Traffic Volume:</b>	
<b>Time of Day:</b>	All

<i><b>If countermeasure is intersection-based</b></i>	
-------------------------------------------------------	--

<b>Intersection Type:</b>	Roadway/roadway (not interchange related)
<b>Intersection Geometry:</b>	3-leg,4-leg
<b>Traffic Control:</b>	Signalized
<b>Major Road Traffic Volume:</b>	
<b>Minor Road Traffic Volume:</b>	

<b>Development Details</b>	
----------------------------	--

<b>Date Range of Data Used:</b>	1994 to 2006
<b>Municipality:</b>	
<b>State:</b>	AZ, MA, WI

<b>Country:</b>	
<b>Type of Methodology Used:</b>	Before/after using empirical Bayes or full Bayes
<b>Sample Size Used:</b>	Crashes
<b>After Sample Size Used:</b>	8922 Crashes

<b>Other Details</b>	
<b>Included in Highway Safety Manual?</b>	No
<b>Date Added to Clearinghouse:</b>	
<b>Comments:</b>	

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## CMF / CRF Details

CMF ID: 4112

**Improve signal visibility, including signal lens size upgrade, installation of new back-plates, addition of reflective tapes to existing back-plates, and installation of additional signal heads**

**Description: 4-leg intersections with 3 or 4 lanes on each approach and 50 km/h posted speed**

**Prior Condition: Smaller signal lens size, old back-plates, no reflective tapes on existing back-plates, and less number of signal heads**

**Category: Intersection traffic control**

**Study: [Investigating Effect of Collision Aggregation on Safety Evaluations Using Multivariate Linear Intervention Models: Case Study of Signal Head Upgrade Program, El-Basyouny et al., 2012](#)**

Star Quality Rating:



[\[View score details\]](#)

### Crash Modification Factor (CMF)

**Value:** 0.901

**Adjusted Standard Error:**

**Unadjusted Standard Error:** 0.029

### Crash Reduction Factor (CRF)

<b>Value:</b>	9.9 ( <i>This value indicates a <b>decrease</b> in crashes</i> )
<b>Adjusted Standard Error:</b>	
<b>Unadjusted Standard Error:</b>	2.9

### Applicability

<b>Crash Type:</b>	Day time
<b>Crash Severity:</b>	0 (property damage only)
<b>Roadway Types:</b>	Not Specified
<b>Number of Lanes:</b>	3 to 4
<b>Road Division Type:</b>	
<b>Speed Limit:</b>	50 km/h
<b>Area Type:</b>	Urban
<b>Traffic Volume:</b>	
<b>Time of Day:</b>	Day

### *If countermeasure is intersection-based*

<b>Intersection Type:</b>	Roadway/roadway (not interchange related)
<b>Intersection Geometry:</b>	4-leg
<b>Traffic Control:</b>	Signalized
<b>Major Road Traffic Volume:</b>	4637 to 51743 Average Daily Traffic (ADT)
<b>Minor Road Traffic Volume:</b>	134 to 48906 Average Daily Traffic (ADT)

### Development Details

<b>Date Range of Data Used:</b>	1999 to 2004
---------------------------------	--------------

<b>Municipality:</b>	British Columbia
<b>State:</b>	
<b>Country:</b>	Canada
<b>Type of Methodology Used:</b>	Before/after using empirical Bayes or full Bayes
<b>Sample Size Used:</b>	Crashes
<b>Before Sample Size Used:</b>	4690 Crashes
<b>After Sample Size Used:</b>	2460 Crashes

<b>Other Details</b>	
<b>Included in Highway Safety Manual?</b>	No
<b>Date Added to Clearinghouse:</b>	Nov-01-2012
<b>Comments:</b>	3 CMF sets are presented: crash severity only, time of day only, severity and time of day. Only disaggregate set (severity and time of day) is reported

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## CMF / CRF Details

CMF ID: 4211

### Increase all red clearance interval

**Description:** The average increase in the all red time was 1.1 seconds (minimum of 1.0 second and maximum of 2.0 seconds).

**Prior Condition:** Signalized intersection with yellow interval and most sites did not have an all red interval. The average increase in the all red time was 1.1 seconds (minimum of 1.0 second and maximum of 2.0 seconds).

**Category:** Intersection traffic control

**Study:** [Evaluation of Safety Strategies at Signalized Intersections, Srinivasan, et al., 2011](#)

Star Quality Rating:



[\[View score details\]](#)

### Crash Modification Factor (CMF)

**Value:** 0.798

**Adjusted Standard Error:**

**Unadjusted Standard Error:** 0.074

### Crash Reduction Factor (CRF)

**Value:** 20.2 (This value indicates a **decrease** in crashes)



<b>Adjusted Standard Error:</b>	
<b>Unadjusted Standard Error:</b>	7.4

<b>Applicability</b>	
<b>Crash Type:</b>	All
<b>Crash Severity:</b>	All
<b>Roadway Types:</b>	Not Specified
<b>Number of Lanes:</b>	
<b>Road Division Type:</b>	
<b>Speed Limit:</b>	
<b>Area Type:</b>	Urban
<b>Traffic Volume:</b>	
<b>Time of Day:</b>	All

<b><i>If countermeasure is intersection-based</i></b>	
<b>Intersection Type:</b>	Roadway/roadway (not interchange related)
<b>Intersection Geometry:</b>	3-leg,4-leg
<b>Traffic Control:</b>	Signalized
<b>Major Road Traffic Volume:</b>	5950 to 31600 Annual Average Daily Traffic (AADT)
<b>Minor Road Traffic Volume:</b>	2650 to 20225 Annual Average Daily Traffic (AADT)

<b>Development Details</b>	
<b>Date Range of Data Used:</b>	1992 to 2002
<b>Municipality:</b>	San Diego, San Francisco, Howard County, and Montgomery County

<b>State:</b>	CA, MD
<b>Country:</b>	USA
<b>Type of Methodology Used:</b>	Before/after using empirical Bayes or full Bayes
<b>Sample Size Used:</b>	Sites
<b>Before Sample Size Used:</b>	14 Sites
<b>After Sample Size Used:</b>	14 Sites

<b>Other Details</b>	
<b>Included in Highway Safety Manual?</b>	No
<b>Date Added to Clearinghouse:</b>	Dec-06-2012
<b>Comments:</b>	Assumed 2 crashes per site for both the before and after periods to estimate sample size.

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## CMF / CRF Details

**CMF ID: 4576**

**Change left-turn phase to protected phasing on one or more approaches**

**Description: Change from permissive, permissive/protected, or protected/permissive to protected phasing on one or more approaches at urban signalized intersection**

**Prior Condition: Permissive, permissive/protected, or protected/permissive phasing.**

**Category: Intersection traffic control**

**Study: [Highway Safety Manual, 1st Edition, Various, 2010](#)**

**Star Quality Rating:**



### Crash Modification Factor (CMF)

**Value:** 0.01

**Adjusted Standard Error:**

**Unadjusted Standard Error:** 0.01

### Crash Reduction Factor (CRF)

**Value:** 99 (This value indicates a **decrease** in crashes)

<b>Adjusted Standard Error:</b>	
<b>Unadjusted Standard Error:</b>	1

### Applicability

<b>Crash Type:</b>	Left turn
<b>Crash Severity:</b>	All
<b>Roadway Types:</b>	Not specified
<b>Number of Lanes:</b>	
<b>Road Division Type:</b>	
<b>Speed Limit:</b>	
<b>Area Type:</b>	Urban
<b>Traffic Volume:</b>	
<b>Time of Day:</b>	

#### *If countermeasure is intersection-based*

<b>Intersection Type:</b>	Roadway/roadway (not interchange related)
<b>Intersection Geometry:</b>	3-leg,4-leg
<b>Traffic Control:</b>	Signalized
<b>Major Road Traffic Volume:</b>	
<b>Minor Road Traffic Volume:</b>	

### Development Details

<b>Date Range of Data Used:</b>	
<b>Municipality:</b>	

<b>State:</b>	
<b>Country:</b>	
<b>Type of Methodology Used:</b>	Before/after using empirical Bayes or full Bayes
<b>Sample Size Used:</b>	

<b>Other Details</b>	
<b>Included in Highway Safety Manual?</b>	
<b>Date Added to Clearinghouse:</b>	
<b>Comments:</b>	Crash type is for left-turn crashes on treated approaches.

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## CMF / CRF Details

**CMF ID: 2848**

**Install lighting**

**Description:**

**Prior Condition: Unlit roads**

**Category: Highway lighting**

**Study:** [\*Effects of road lighting: An analysis based on Dutch accident statistics 1987-2006, Wanvik, 2009\*](#)

**Star Quality Rating:**



[\[View score details\]](#)

### Crash Modification Factor (CMF)

**Value:** 0.5

**Adjusted Standard Error:**

**Unadjusted Standard Error:** 0.01531

### Crash Reduction Factor (CRF)

**Value:** 50 (This value indicates a **decrease** in crashes)

**Adjusted Standard Error:**

**Unadjusted Standard Error:** 1.531

### Applicability

**Crash Type:** Nighttime

**Crash Severity:** A (serious injury),B (minor injury),C (possible injury)

**Roadway Types:** All

**Number of Lanes:**

**Road Division Type:** All

**Speed Limit:**

**Area Type:** All

**Traffic Volume:**

**Time of Day:** Night

### *If countermeasure is intersection-based*

**Intersection Type:**

**Intersection Geometry:**

**Traffic Control:**

**Major Road Traffic Volume:**

**Minor Road Traffic Volume:**

### Development Details

**Date Range of Data Used:** 1987 to 2006

**Municipality:**

**State:**

<b>Country:</b>	Netherlands
<b>Type of Methodology Used:</b>	Meta-analysis
<b>Sample Size Used:</b>	223068 Crashes

<b>Other Details</b>	
<b>Included in Highway Safety Manual?</b>	No
<b>Date Added to Clearinghouse:</b>	Mar-21-2011
<b>Comments:</b>	The authors of this study also experimented with producing additional CMFs from the same dataset using alternative, less reliable methods. Since this did not add new knowledge to this topic, these CMFs were not included in the Clearinghouse.

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