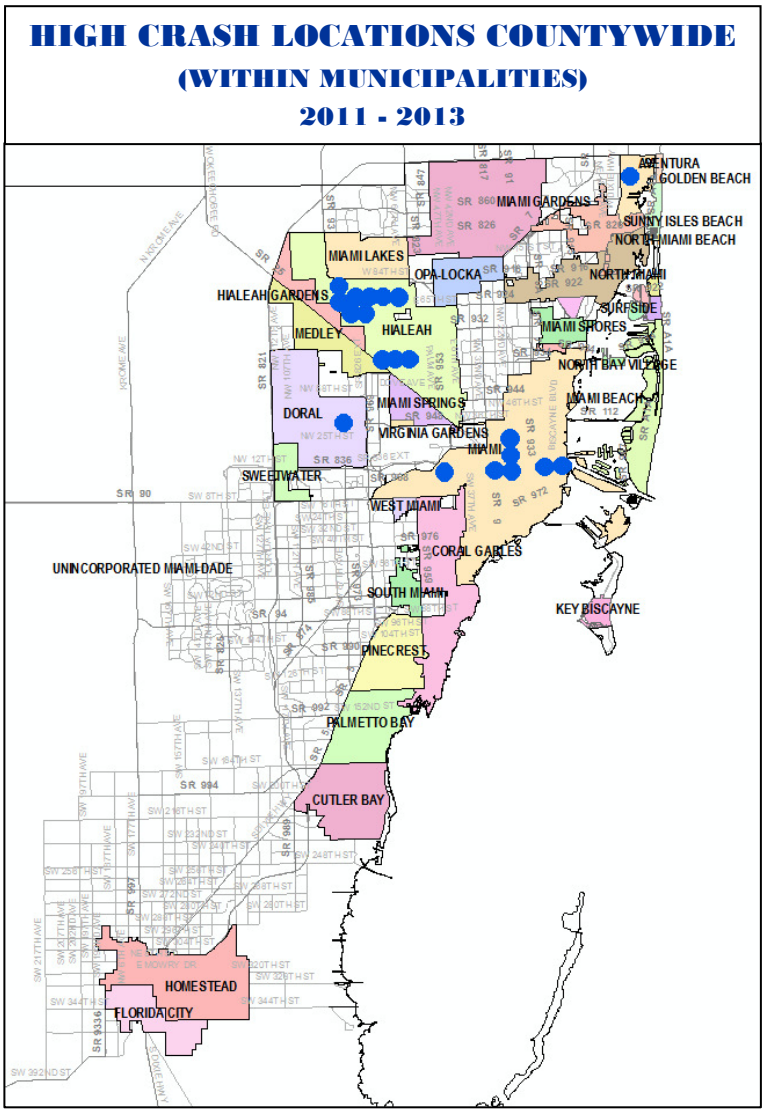
Miami Dade County

Public Works and Waste Management Department



SAFETY STUDIES AT HIGH CRASH LOCATIONS COUNTYWIDE (WITHIN MUNICIPALITIES)

Traffic Engineering Division

August 2014

TABLE OF CONTENTS

APPENDICES

EXECUTIVE SUMMARY

The Miami Dade County Public Works and Waste Management Department (PWWM) Traffic Engineering Division (TED) undertook this traffic safety study based on a contract with the Metropolitan Planning Organization (MPO). The objective of this study is to identify traffic safety concerns and to recommend countermeasures to improve the operational safety of twenty (20) high-crash locations within municipalities countywide. The following tasks have been performed to achieve the objective:

1. Acquiring and Processing of Crash Data
2. Identifying High Crash Locations
3. Conducting Field Studies
4. Intersection Safety Assessment
5. Countermeasures and Potential Improvements
6. Preparation and Submission of Final Report

After conducting the safety analysis, the 20 locations as identified in the study are ranked in the following table:

Loc. No.	Address	COM. Dist.	RIF Dist.	Local Jurisdiction	Crashes Frequency		Safety Ratio		Crash Severity(EPDO)		Composite Rank (R1+R2+R3)	FINAL RANK
					Value	Rank (R1)	Value	Rank (R2)	Value	Rank (R3)		
15	W 20 AVE / W 60 ST	12	9	Hialeah	93	2	1.717	3	1.645	3	8	**1**
18	W 24 AVE / W 60 ST	12	9	Hialeah	89	5	1.455	4	1.506	6	15	**2**
3	NW 17 AVE / NW SOUTH RIVER DR	5	2	Miami	92	3	1.858	1	1.293	13	17	**3**
1	NE 1 AVE / NE 6 ST	3	2	Miami	85	6	1.807	2	1.459	9	17	**4**
9	NW 87 AVE / NW 36 ST	12	1	Doral	100	1	1.371	5	1.120	20	26	**5**
2	NE 29 PL / AVENTURA BLVD	4	3	Aventura	52	18	1.229	8	2.077	1	27	**6**
12	W 12 AVE / W 68 ST	12,13	9	Hialeah	90	4	1.084	14	1.433	10	28	**7**
5	NW 17 AVE / NW 20 ST	3	2	Miami	82	8	1.247	7	1.293	14	29	**8**
6	NW 22 AVE / NW 7 ST	5	2	Miami	80	9	1.060	15	1.525	5	29	**9**
7	NW 3 AVE / NW 5 ST	3	2	Miami	54	17	1.145	11	2.000	2	30	**10**
20	W 28 AVE / W 76 ST	12	9	Hialeah	68	15	1.127	12	1.485	7	34	**11**
10	W 8 AVE / W 29 ST	13	9	Hialeah	60	16	1.055	16	1.600	4	36	**12**
11	W 12 AVE / W 29 ST	13	9	Hialeah	69	14	1.097	13	1.348	12	39	**13**
17	W 21 CT / W 68 ST	12	9	Hialeah	76	11	1.158	10	1.197	18	39	**14**
4	NW 17 AVE / NW 7 ST	5	2	Miami	75	12	0.867	20	1.480	8	40	**15**
8	NW 45 AVE / NW 7 ST	6	2	Miami	51	19	1.316	6	1.235	15	40	**16**
13	W 14 AVE / W 29 ST	13	9	Hialeah	40	20	1.180	9	1.375	11	40	**17**
19	W 28 AVE / W 68 ST	12	9	Hialeah/H. Gardens	85	7	1.054	17	1.212	16	40	**18**
14	W 16 AVE / W 68 ST	12	9	Hialeah	79	10	1.022	18	1.200	17	45	**19**
16	W 20 AVE / W 68 ST	12	9	Hialeah	74	13	0.868	19	1.162	19	51	**20**

Based on the safety concerns found during the development of this report, the field investigation, the collected traffic data and the traffic analysis performed, the following is a summary of the intersections safety/operational analysis and recommendations.

Summary of the Intersections Safety/Operational Analysis and Recommendations

Rank	Location	Signal ID	Com. Dist.	RIF Dist.	Local Jurisdiction	Abnormal Crash Types	Probable Causes	Recommended Countermeasures
1	**W 20 AVE and W 60 ST**	5913	12	9	Hialeah	- Rear End - Angel - Righ Turn - Sideswipe	- Restricted sight distance - Presence/Location of Driveways - Inadequate roadway lighting	• Lengthen southbound left-turn lane to 220 ft. • Add pedestrian crosswalk on the east leg. • Install pedestrian signals and push buttons. • Provide street light on south leg.
2	**W 24 AVE and W 60 ST**	4908	12	9	Hialeah	- Rear End - Angle - Sideswipe - Pedestrian	- Restricted sight distance - Presence/Location of Driveways - Inadequate roadway lighting - Poor pavement markings	• Provide painted island on southeast corner to better channelize exclusive right turn lane. • Resolve drainage issue on North leg (west side) by sodding swale and possibly delineating it with curb and gutter. • Relocate bus stops along West 60th Street from the near side to the far side. • Provide lighting on north leg specifically the east side of W 24 Avenue.
3	**NW 17 AVE and NW South River DR**	5189	5	2	Miami	- Rear End - Sideswipe - Fixed Object	- Large turning volumes - Restricted sight distance - Poor visibility of signal - Presence/Location of Driveways	• Provide a raised median for the intersection north leg. • Provide speed limit feedback signs for SB and NB traffic. • Improve signage at the intersection. • Provide street lights at the intersection and all approaches. • Resurfacing the intersection and refurbishing of pavement markings.
4	**NE 1 AVE and NW 6 ST**	3336	3	2	Miami	- Angle - Sideswipe	- Large turning volumes - Restricted sight distance - Poor visibility of signal - Presence/Location of Driveways	• Provide guideline for the westbound double right-turn lanes. • Provide "No Right Turn On Red" sign for westbound traffic. • Provide ADA ramps for south leg . • Resurfacing the intersection and refurbishing of pavement markings.
5	**NW 87 AVE and NW 36 ST**	4477	12	1	Doral	- Rear End - Sideswipe	- Large turning volumes - Presence/Location of Driveways - Inadequate channelization - Pedestrian activity	• Close the median opening on the west leg to improve safety operation; and extend the left-turn bay length to about 300 feet. • Provide a painted island between the exclusive right turn bay and the adjacent thru lane on the south leg to improve channelization. • Install high visibility ladder crosswalks on all legs. • Resurfacing the intersection and refurbishing of pavement markings. • Extend WB left-turn bay length by reducing the median width.
6	**NE 29 PL and Aventura BLVD**	4299	4	3	Aventura	- Pedestrian - Bicycle - Fixed Object	- Large turning volumes - Inadequate signage - Inadequate signal timing - Inadequate pavement markings	• Add additional left-turn arrows and only messages pavement markings for the exclusive NBLT lane on the south leg. Also, install lane use signs. • Push the exclusive right-turn bay inside next to the thru lane on the south leg NB direction. • Re-grade swale at east end of curb and gutter. • Provide a concrete island on the northeast corner to eliminate the diagonal long crossing.
7	**W 12 AVE and W 68 ST**	3332	12, 13	9	Hialeah	- Rear End - Left Turn - Right Turn - Sideswipe	- Large turning volumes - Excessive speed on approach - Presence/Location of Driveways - Inadequate signal timing	• Update to countdown pedestrian signals for west and south crossing. • Resurfacing the intersection and refurbishing of pavement markings. • Provide high visibility ladder crosswalks on all legs. • Install "right Turn Only" signs at the gas station driveways. • Update pushbuttons for east ramp.
8	**NW 17 AVE and NW 20 ST**	2402	3	2	Miami	- Rear End - Angle - Sideswipe	- Poor visibility of signal - Large turning volumes - Presence/Location of Driveways - Restricted sight distance	• Relocate north leg crosswalk closer to the intersection away from the gas station driveway, and update ADA ramps at northwest corner. • Update span wire traffic signal to mast arm suspension signal. • Lengthen the eastbound left-turn lane to 200 ft. • Provide Turning Vehicles Yield to Pedestrians signs for all directions. • Resurfacing the intersection and refurbishing of pavement markings.
9	**NW 22 AVE and NW 7 ST**	2332	5	2	Miami	- Rear End - Left Turn - Fixed Object	- Presence/Location of Driveways - Large turning volumes - Restricted sight distance - Crossing pedestrians	• Update span wire traffic signal to mast arm suspension signal. • Lengthen SBLT lane to approximately 350 ft and NBLT lane to approximately 150 ft. • Install reflective back plates for all signals heads. • Provide Turning Vehicles Yield to Pedestrians signs for all direction. • Resurface the intersection and refurbish pavement markings.
10	**NW 3 AVE and NW 5 ST**	3425	3	2	Miami	- Angle - Sideswipe - Bicycle	- Large turning volumes - Crossing pedestrians - Restricted sight distance - Poor signal timing	• Provide signal ahead warning signs on both sides of NW 5 Street for eastbound traffic. • Provide "No Right Turn On Red" sign for northbound traffic. • Resurfacing the intersection and refurbishing of pavement markings. • Update ADA ramps at all corners.
11	**W 28 AVE and W 76 ST**	4977	12	9	Hialeah	- Rear End - Left Turn - Right Turn - Sideswipe	- Restricted sight distance - Poor visibilty of signal - Large turning volumes - Inadequate road design - Poor pavement/markings conditions - Inadequate road lighting	• Extend curbing to discourage parking along south side of east leg. • Provide painted channelization for the exclusive right turn bays on the east and west legs. • Provide exclusive westbound right turn bay. *City of Hialeah has a project that will implement several improvements, most of which coincide with the proposed recommendations.*
12	**W 8 AVE and W 29 ST**	3331	13	9	Hialeah	- Left Turn - Fixed Object	- Large turning volumes - Presence/Location of Driveways - No left-turn phase - Restricted sight distance	• Upgrade span wire intersection to mast arm. • Install directional arrow markings for all approaches along West 29 St. • Relocate bus stops along West 29 Street from near to the far side of the intersection. • Resurfacing the intersection and refurbishing of pavement markings.

Summary of the Intersections Safety/Operational Analysis and Recommendations

Rank	Location	Signal ID	Com. Dist.	RIF Dist.	Local Jurisdiction	Abnormal Crash Types	Probable Causes	Recommended Countermeasures
13	**W 12 AVE and W 29 ST**	3253	13	9	Hialeah	- Angle - Left Turn	- Large turning volumes - Restricted sight distance - No left-turn phase	• Change the span wire to mast arm with illuminated street signs. • Upgrade push button on northeast corner. • Install high visibility ladder crosswalks on all approaches. • Add "Right turn yield to pedestrian" sign on all approaches. • Mill and Resurface north and south legs. • Upgrade all pedestrian signal heads to countdown.
14	**W 21 Court and W 68 ST**	4665	12	9	Hialeah	- Rear End - Left Turn - Sideswipe	- Large turning volumes - Presence/Location of Driveways - Inadequate channelization - Restricted sight distance - Inadequate pavement markings	• Modify the pavement markings to restrict movements at the intersection of W 21 Court and W 67 Place. • Restripe the south leg of the intersection to provide one LT lane, one thru lane and one RT lane for NB movement. • Provide sidewalk along the west side of W 21 Court (north leg) by possibly reducing lane widths. • Improve alignment of west leg to soften curves & provide a bus bay. • Provide Pavement messages on west and east legs of the intersection.
15	**NW 17 AVE and NW 7 ST**	2330	5	2	Miami	- Rear End - Sideswipe	- Large turning volumes - Inadequate signal timing - Crossing pedestrian	• Lengthen the southbound left-turn lane to approximately 300 feet • Provide Turning Vehicles Yield to Pedestrians (R10-15) signs for all directions. • Provide push button to cross NW 17 Avenue.
16	**NW 45 AVE and NW 7 ST**	3999	6	2	Miami	- Rear End - Left Turn - Right Turn - Sideswipe	- Large turning volumes - Inadequate signal timing - Crossing pedestrians - Inadequate road design - Restricted sight distance	• Update span wire traffic signal to mast arm. • Provide crosswalk on south leg. • Provide countdown pedestrian signal heads for all directions. • Provide ADA ramps for east-west directions on north and south legs. • Provide solar powered speed limit feedback signs for east and westbound traffic.
17	**W 14 AVE and W 29 ST**	5800	13	9	Hialeah	- Left Turn - Sideswipe	- Large turning volumes - Inadequate signal timing - Presence/Location of Driveways - No left turn phase	• Refurbish pavement markings including crosswalks at the south leg. • Add Yellow Pedestrian ramps for NW and NE corners. • Add pedestrian signal heads for all directions. • Upgrade the crosswalks to high visibility ladder crosswalks. • Add lane designation marking arrows for east/west approaches.
18	**W 28 AVE and W 68 ST**	4979	12	9	Hialeah/ H. Gardens	- Rear End - Right Turn - Sideswipe - Fixed Object	- Large turning volumes - Presence/Location of Driveways - Excessive speed - Restricted sight distance	• Lengthen the northbound left-turn lanes to 250 feet each. • Upgrade pedestrian pushbuttons and add detectable warning devices. • Upgrade crosswalks to high visibility ladder type crosswalks. • Resurfacing the intersection and refurbishing of pavement markings. • Add sidewalk connection to existing bus stop on the south leg of the intersection (west side).
19	**W 16 AVE and W 68 ST**	3870	12	9	Hialeah	- Rear End - Angle - Right Turn - Sideswipe	- Large turning volumes - Excessive speed - Presence/Location of Driveways - Inadequate roadway design - Restricted sight distance	• Install "Turning Vehicles Yield to Pedestrians" sign on all approaches. • Install pedestrian ramp on northeast corner for north crossing. • Install pedestrian signals and upgrade push buttons. • Straighten road alignment on the west side. • Add painted islands on northeast and southwest corners.
20	**W 20 AVE and W 68 ST**	6220	12	9	Hialeah	- Angle - Sideswipe - Fixed Object	- Poor visibility of signal - Excessive speed - Inadequate pavement markings - Inadequate channelization	• Improve pavement markings on the NE corner to better delineate the WB traffic emerging from the SR 826 S. Off-Ramp. • Lengthen merge lane on NW side to approximately 270 ft. • Add R10-11 sign on the mast arm for EB traffic. • Add tubular delineators on the right lane of the EB approach.

1. INTRODUCTION

The Miami Dade County Public Works and Waste Management Department (PWWM) Traffic Engineering Division (TED) undertook this traffic safety study based on a contract with the Metropolitan Planning Organization (MPO). The objective of this study is to identify traffic safety concerns and to recommend countermeasures to improve the operational safety of twenty (20) high-crash locations within municipalities countywide. The top 20 crash locations countywide were identified for the study period from 2011 through 2013. A list of the 20 locations and their associated jurisdictions is presented in *Table 1*.

PWWM-TED has evaluated the crash data for the years 2011 through 2013; as such, a review of the police reports was performed, and collision diagrams were prepared. Furthermore, a comprehensive traffic safety analysis was performed for all locations in order to identify the abnormal crash patterns. In addition, field reviews were conducted within the project limits. In some cases, Synchro/Simtraffic simulation was performed. As such, traffic data was also collected at these intersections. Based on these criteria, findings, and conclusions recommendations are presented. The improvements have been developed and sketched to clearly identify the modifications required. Finally, these efforts have been documented and presented in a report format. *Figure 1* presents the study intersection locations.

This report follows the procedures outlined in the Manual on Uniform Traffic Studies (MUTS), the Highway Capacity Manual – 2000 Update (HCM2000), the Manual of Uniform Traffic Control Devices (MUTCD), and the National Highway Institute (NHI) Safety Analysis guidelines. The report evaluates the following for each intersection:

- Site Description
- Safety Conditions and Analysis
- Traffic Operation Conditions and Analysis
- Recommendations
- Conceptual plan

2. METHODOLOGY

In order to determine high crash locations it is necessary to look at crash data collected throughout the county. First, a list of locations of 15 or more crashes per year during the last three years (2011, 2012 and 2013) was obtained using two database systems: *FIRES* (Florida's Integrated Report Exchange System) and Florida *Signal Four Analytics*. This data needed to be filtered and arranged so we can identify the highest 20 crash locations.

Once the candidate locations were determined, review of the police reports was performed, and collision diagrams was prepared for the 20 locations. They were categorized by as many of the following features as possible: time of day, traffic control, alcohol involvement, weather conditions, etc. Additionally, 24-hour traffic volumes, turning movement volumes and signal timing data were collected for all locations. Also, field visits and evaluations were conducted for all locations.

Table 1 – Study Locations

(In alphabetical order)

Loc. No.	Address	Signal ID	Local Jurisdiction	Road Jurisdiction	Comm. District	RIF District
1	AVENTURA BLVD / NE 29 PL	4299	Aventura	City	4	3
2	**NE 1 AVE** / NE 6 ST	3336	Miami	County	3	2
3	**NW 17 AVE / NW 20 ST**	2402	Miami	County	3	2
4	**NW 17 AVE / NW 7 ST**	2330	Miami	County	5	2
5	**NW 17 AVE** / NW SOUTH RIVER DR	5189	Miami	County	5	2
6	**NW 22 AVE / NW 7 ST**	2332	Miami	County	5	2
7	NW 3 AVE / NW 5 ST	3425	Miami	City	3	2
8	NW 45 AVE / **NW 7 ST**	3999	Miami	County	6	2
9	**NW 87 AVE / NW 36 ST**	4477	Doral	County	12	1
10	**W 12 AVE** / W 29 ST	3253	Hialeah	County	13	9
11	**W 12 AVE / W 68 ST**	3332	Hialeah	County	12/13	9
12	W 14 AVE / W 29 ST	5800	Hialeah	City	13	9
13	W 16 AVE / **W 68 ST**	3870	Hialeah	County	12/13	9
14	W 20 AVE / W 60 ST	5913	Hialeah	City	12	9
15	W 20 AVE / W 68 ST	6220	Hialeah	City	12	9
16	W 21 CT / W 68 ST	4665	Hialeah	City	12	9
17	W 24 AVE / W 60 ST	4908	Hialeah	City	12	9
18	W 28 AVE / W 68 ST	4979	Hialeah / H. Gardens	City	12	9
19	W 28 AVE / W 76 ST	4977	Hialeah	City	12	9
20	W 8 AVE / W 29 ST	3331	Hialeah	City	13	9

*** County Maintained Roadway**

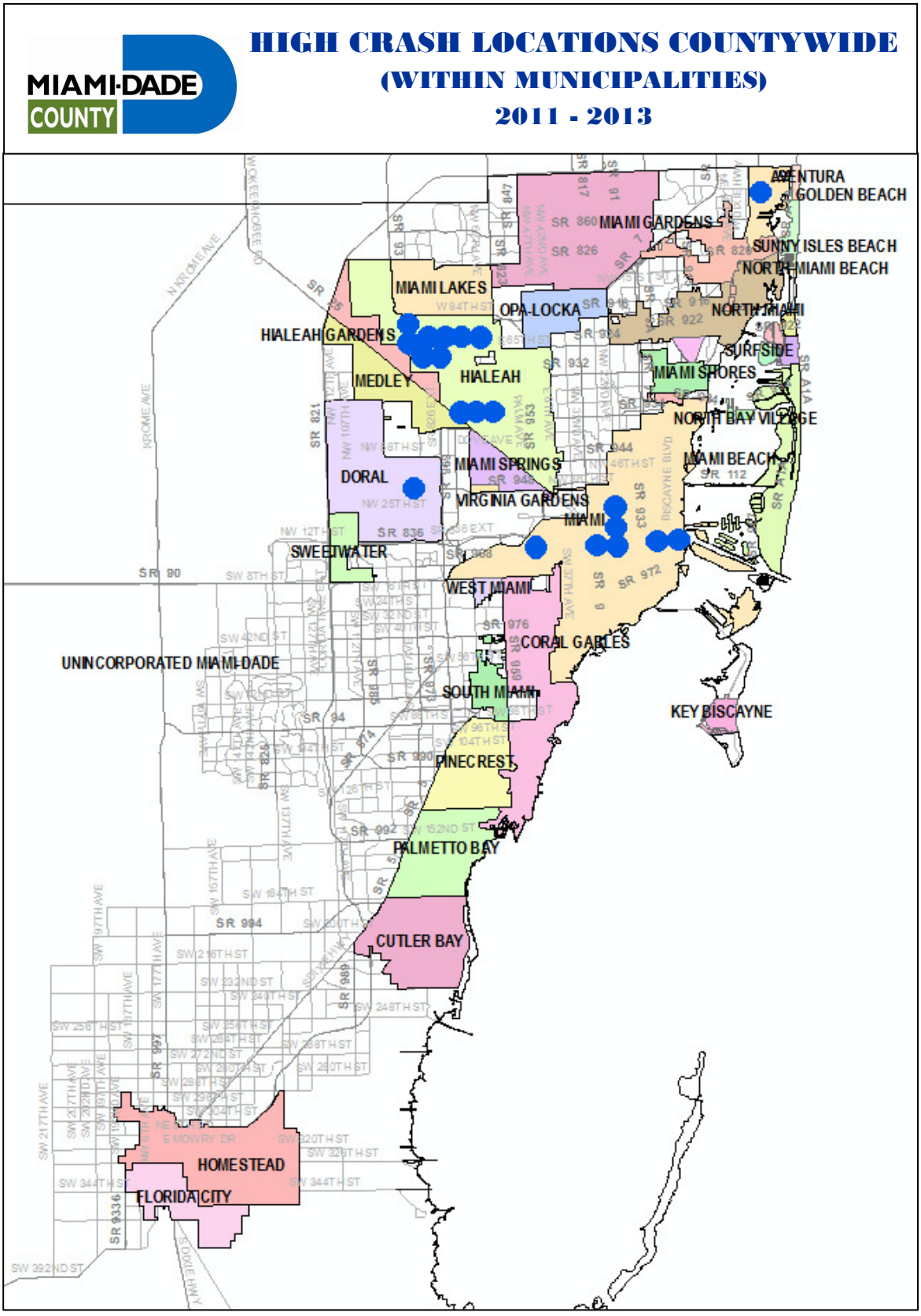


Figure 1: Study Locations Map

A three-phased ranking scheme is used as the basis to determine the high crash locations. Intersections are then ranked by the total number of crashes (Crash Frequency), crash rate (Safety Ratio), and crash severity index (Equivalent Property Damage Only – EPDO) methods. Finally, these intersections are ranked by a combination of these factors. The summary of the 20 high crash locations safety analysis is shown in *Table 2*.

2.1. Number of Crashes/Crash Frequency Method

In this method, we rank locations by the number (or frequency) of average annual relevant crashes for the three year study period. The location with the highest number of crashes ranks as number 1, the location with the next highest number of crashes ranks as number 2 and so on.

2.2. Crash Rate/Safety Ratio Method

The Crash Rate Method compares the number of crashes to the volume of traffic, with the later measured as the number of vehicles entering a spot in a given time period. The steps involved in this method are as follows.

1. Determine the location's actual crash rate. The actual spot crash rate is found as annual average number of crashes during the study period divided by the average daily traffic volume (AADT) during the study period in crashes per million vehicles.

$$Actual\ Crash\ Rate\ (RMEV) = \frac{Number\ of\ Crashes}{AADT} \times \frac{1{,}000{,}000}{365}$$

2. Find the critical crash rate for similar spot locations throughout the state

$$Critical\ Crash\ Rate = Avg.StateCrashRate + \frac{0.5}{TrafficBase} + 1.96\sqrt{\frac{Avg.StateCrashRate}{TrafficBase}}$$

Where:

$$Traffic\ Base = \frac{Years * AADT * 365}{1{,}000{,}000}$$

3. Calculate the safety ratio by dividing the actual crash rate by the critical crash rate.

$$Safety\ Ratio = \frac{\text{Actual Crash Rate}}{\text{Critical Crash Rate}}$$

4. Rank locations by the safety ratio. The location with the highest safety ratio ranks as 1, the location with the next highest safety ratio ranks as 2 and so on.

Using the crash rate method in comparing the crash experience between different time periods or between locations provides a basis for more accurate and meaningful conclusions since it accounts for the numbers of vehicles "exposed" to the hazards of driving within a given time period. It also prevents the potentially misleading classification of a relatively safe high-volume location as "high-crash" simply because it has experienced a relatively large number of crashes. However, it tends to unfairly identify low-volume locations having relatively few crashes as high-crash locations.

2.3. Crash Severity Index/Equivalent Property Damage Only (EPDO) Method

Each site is ranked according to the financial loss from the crashes. This is determined by using values based on the injuries sustained in each crash type as found in the data provided. The crash severity index is calculated by the following formula based on the values obtained from FDOT:

$$Crash\ Severity\ Index = \frac{(12 \times FatalCrash\,Count) + (4 \times InjuryCrash\,Count) + (\mathrm{Pr}\,opertyDamageOnlyCrash\,Count)}{(TotalCrash\,Count)}$$

Then the location with the highest cost ranks as 1, the location with the next highest cost ranks as 2 and so on.

2.4. Composite Ranking

Each intersection was given a score based on its ranking of the crash frequency, safety ratio, and EPDO. For example, the intersection with the highest number of crashes was given a score of 1; the intersection with the next highest number of crashes was given a score of 2 and so on. The same scoring procedure was done with safety ratio and EPDO for each intersection. The sum of these individual scores represented the intersection's composite score. Accordingly, the highest rank (1) is given to the location with the lowest combined score and so on. In case of a tie, each location gets the same rank and the following ranking is skipped. *Table 3* provides complete details of the ranking methodology.

Table 2 – Summary of Safety Analysis

Loc. #	Address	Crashes Frequency												AADT	FL Avg. Crash Rate-*3 year Avg.* (*)	Traffic Base	Actual Crash Rate (*)	Critical Crash Rate (*)	Safety Ratio	Crash Severity & EPDO
		2011 Total			2012 Total			2013 Total			Total 3 Years (2011 to 2013)			Average Annual (2011 to 2013)							
		PDO	Injury	Fatal	PDO	Injury	Fatal	PDO	Injury	Fatal	PDO	Injury	Fatal	PDO	Injury	Fatal					
1	NE 1 AVE / NE 6 ST	25	7	0	25	4	0	22	2	0	72	13	0	24	4	0	17233	1.062	6.290	4.505	2.493	1.807	1.459
		32			29			24			85			28									
2	NE 29 PL / AVENTURA BLVD	11	7	1	14	5	0	11	3	0	36	15	1	12	5	0	26376	0.595	9.627	1.800	1.465	1.229	2.077
		19			19			14			52			17									
3	NW 17 AVE / NW SOUTH RIVER DR	23	4	0	27	2	0	33	3	0	83	9	0	28	3	0	33099	0.595	12.081	2.538	1.367	1.858	1.293
		27			29			36			92			31									
4	NW 17 AVE / NW 7 ST	28	7	0	15	5	0	20	0	0	63	12	0	21	4	0	46339	0.911	16.914	1.478	1.704	0.867	1.480
		35			20			20			75			25									
5	NW 17 AVE / NW 20 ST	25	4	0	26	3	0	23	1	0	74	8	0	25	3	0	38626	0.757	14.098	1.939	1.555	1.247	1.293
		29			29			24			82			27									
6	NW 22 AVE / NW 7 ST	22	8	0	25	4	0	19	2	0	66	14	0	22	5	0	46522	0.757	16.980	1.570	1.481	1.060	1.525
		30			29			21			80			27									
7	NW 3 AVE / NW 5 ST	6	5	0	21	8	0	9	5	0	36	18	0	12	6	0	17295	1.062	6.313	2.851	2.491	1.145	2.000
		11			29			14			54			18									
8	NW 45 AVE / NW 7 ST	26	1	0	15	3	0	6	0	0	47	4	0	16	1	0	18224	0.757	6.652	2.556	1.942	1.316	1.235
		27			18			6			51			17									
9	NW 87 AVE / NW 36 ST	28	0	0	35	2	0	33	2	0	96	4	0	32	1	0	58501	0.575	21.353	1.561	1.138	1.371	1.120
		28			37			35			100			33									
10	W 8 AVE / W 29 ST	16	4	0	16	3	0	16	5	0	48	12	0	16	4	0	31606	0.757	11.536	1.734	1.643	1.055	1.600
		20			19			21			60			20									
11	W 12 AVE / W 29 ST	17	4	0	22	2	0	22	2	0	61	8	0	20	3	0	36357	0.757	13.270	1.733	1.580	1.097	1.348
		21			24			24			69			23									
12	W 12 AVE / W 68 ST	25	4	0	25	5	0	27	4	0	77	13	0	26	4	0	52867	0.757	19.296	1.555	1.435	1.084	1.433
		29			30			31			90			30									
13	W 14 AVE / W 29 ST	15	0	0	9	4	0	11	1	0	35	5	0	12	2	0	14907	0.757	5.441	2.450	2.076	1.180	1.375
		15			13			12			40			13									
14	W 16 AVE / W 68 ST	28	2	0	22	1	0	23	3	0	73	6	0	24	2	0	49537	0.757	18.081	1.490	1.458	1.022	1.200
		30			23			26			79			27									
15	W 20 AVE / W 60 ST	30	10	0	21	6	0	22	4	0	73	20	0	24	7	0	29517	0.757	10.774	2.877	1.675	1.717	1.645
		40			27			26			93			31									
16	W 20 AVE / W 68 ST	21	1	0	27	1	0	23	2	0	70	4	0	23	1	0	45472	0.911	16.597	1.486	1.712	0.868	1.162
		22			28			25			74			25									
17	W 21 CT / W 68 ST	27	2	0	24	2	0	20	1	0	71	5	0	24	2	0	50717	0.575	18.512	1.369	1.182	1.158	1.197
		29			26			21			76			25									
18	W 24 AVE / W 60 ST	21	4	0	28	3	0	25	8	0	74	15	0	25	5	0	34987	0.757	12.770	2.323	1.597	1.455	1.506
		25			31			33			89			30									
19	W 28 AVE / W 68 ST	28	0	0	29	2	0	22	4	0	79	6	0	26	2	0	50874	0.757	18.569	1.526	1.448	1.054	1.212
		28			31			26			85			28									
20	W 28 AVE / W 76 ST	13	4	0	24	4	0	20	3	0	57	11	0	19	4	0	34298	0.757	12.519	1.811	1.606	1.127	1.485
		17			28			23			68			23									

** Crashes per Million Entering Vehicles*

Table 3 – Ranking of Locations

Loc. No.	Address	COM. Dist.	RIF Dist.	Local Jurisdiction	Crashes Frequency		Safety Ratio		Crash Severity(EPDO)		Composite Rank (R1+R2+R3)	FINAL RANK
					Value	Rank (R1)	Value	Rank (R2)	Value	Rank (R3)		
15	W 20 AVE / W 60 ST	12	9	Hialeah	93	2	1.717	3	1.645	3	8	**1**
18	W 24 AVE / W 60 ST	12	9	Hialeah	89	5	1.455	4	1.506	6	15	**2**
3	NW 17 AVE / NW SOUTH RIVER DR	5	2	Miami	92	3	1.858	1	1.293	13	17	**3**
1	NE 1 AVE / NE 6 ST	3	2	Miami	85	6	1.807	2	1.459	9	17	**4**
9	NW 87 AVE / NW 36 ST	12	1	Doral	100	1	1.371	5	1.120	20	26	**5**
2	NE 29 PL / AVENTURA BLVD	4	3	Aventura	52	18	1.229	8	2.077	1	27	**6**
12	W 12 AVE / W 68 ST	12,13	9	Hialeah	90	4	1.084	14	1.433	10	28	**7**
5	NW 17 AVE / NW 20 ST	3	2	Miami	82	8	1.247	7	1.293	14	29	**8**
6	NW 22 AVE / NW 7 ST	5	2	Miami	80	9	1.060	15	1.525	5	29	**9**
7	NW 3 AVE / NW 5 ST	3	2	Miami	54	17	1.145	11	2.000	2	30	**10**
20	W 28 AVE / W 76 ST	12	9	Hialeah	68	15	1.127	12	1.485	7	34	**11**
10	W 8 AVE / W 29 ST	13	9	Hialeah	60	16	1.055	16	1.600	4	36	**12**
11	W 12 AVE / W 29 ST	13	9	Hialeah	69	14	1.097	13	1.348	12	39	**13**
17	W 21 CT / W 68 ST	12	9	Hialeah	76	11	1.158	10	1.197	18	39	**14**
4	NW 17 AVE / NW 7 ST	5	2	Miami	75	12	0.867	20	1.480	8	40	**15**
8	NW 45 AVE / NW 7 ST	6	2	Miami	51	19	1.316	6	1.235	15	40	**16**
13	W 14 AVE / W 29 ST	13	9	Hialeah	40	20	1.180	9	1.375	11	40	**17**
19	W 28 AVE / W 68 ST	12	9	Hialeah/H. Gardens	85	7	1.054	17	1.212	16	40	**18**
14	W 16 AVE / W 68 ST	12	9	Hialeah	79	10	1.022	18	1.200	17	45	**19**
16	W 20 AVE / W 68 ST	12	9	Hialeah	74	13	0.868	19	1.162	19	51	**20**

2.5. Possible Crash Causes and Probable Countermeasures

In this section, a description of possible cause(s) for each type of crash along with suggested countermeasure(s) is provided in *Table 4*.

Table 4 – General Crash Causes and Countermeasures

Collision Type	Possible Causes	Probable Countermeasures
Rear End	(1) Large number of turning vehicles (2) Slippery surface (3) Poor visibility of signal (4) Inadequate signal timing (5) Lack of signal coordination (6) Inadequate roadway lighting (7) Crossing pedestrians (8) Presence/Location of driveways	1. Prohibit turns 2. Improve turn storage capacity 3. Reduce speed limits 4. Install or improve signs 5. Improve pavement conditions 6. Improve signal timing/coordination 7. Improve pedestrian crossing 8. Improve driveway design/location
Angle	(9) Restricted sight distance (10) Excessive speed on approach (11) Inadequate advanced warning (12) Large total intersection volume In addition to #(3), #(4), #(6) and #(8)	9. Improve sight distance 10. Adjust amber phase 11. Install all red clearance phase 12. Improve roadway lighting In addition to #3, #4, #6 and #8
Left Turn	(13) Large volume of left-turns (14) Too short amber phase (15) Absence of left-turning phase In addition to #(4), #(6), #(8), #(9) and #(10)	13. Provide/lengthen/add modify turn lanes 14. Provide protected phase if justified 15. Provide turning guidelines for multiple turn lanes 16. Reduce the offset between opposing left turn lanes 17. Install or improve warning signs In addition to #6, #9, #11 and #12
Sideswipe	(16) Inadequate roadway design (17) Excessive vehicle Speed (18) Inadequate pavement markings (19) Inadequate channelization (20) Inadequate signing (21) Improper road maintenance In addition to #(8)	18. Provide wider lanes 19. Improve pavement markings 20. Improve alignment and grade 21. Install/improve channelization 22. Install direction/warning signs In addition to #3 and #4
Pedestrian with Vehicle	(22) Inadequate protection for pedestrians (23) Inadequate Signals (24) Inadequate Phasing Signal In addition to #(6), #(9), #(17) and #(18)	23. Provide/improve sidewalks 24. Provide improve crosswalks 25. Provide pedestrian signal 26. Improve pedestrian phase 27. Provide raised median as refuge In addition to #3, #4 and #11
Fixed Object	(25) Obstruction in/too close to roadway In addition to #(2), #(6), #(11), #(16), #(17), #(18), and #(20)	28. Remove/relocate fixed object In addition to #3, #5, #12, #17, #18, #19 and #20

3. STUDY LOCATIONS

This section provides a crash analysis at each of the study intersections. Furthermore, this section includes field observation reports for each of the study intersections. The field observation reports are used to verify if field conditions such as signal operation, pavement markings, geometry of the intersection or any other existing condition supports the probable cause developed through the study.

3.1. W 20 Avenue and W 60 Street

3.1.1. Site Description

This intersection is a signalized four legged intersection located in the City of Hialeah in the area of Northwest Miami-Dade County. W 20 Avenue is a two lane undivided local roadway and W 60 Street is a four lane divided arterial that runs east-west.

3.1.2. Safety Conditions and Analysis

The intersection of W 20 Avenue and W 60 Street is ranked number 1 in our high crash locations list. A review of the hard copy police reports for the years 2011 through 2013 was performed. During the three-year analysis period, 93 relevant crashes occurred at the intersection. The analysis indicated that the average number of crashes per year is 31. The crash summaries, crash statistics and collision diagrams for the intersection are documented in *Appendix A*.

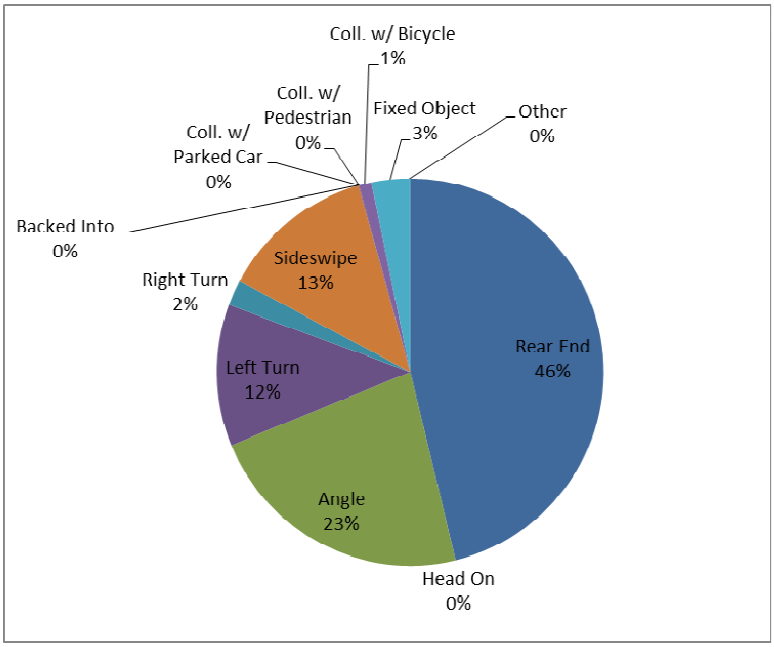


Figure 2 Predominant Crash Types
W 20 AVE & W 60 ST

Based on the analysis of crash records for this intersection, the predominant types of crashes are shown in *Figure 2*.

Calculated intersection mean crash per year were compared to the average Miami-Dade Crash Rate for County corridors to assess the safety conditions at the study intersection in relation to other roadways with similar traffic and geometric characteristics. This study is based on the 2007 FDOT's "Expected Value Analysis." *Table 5* illustrates the expected accident volume analysis of this intersection as well as the safety ratios and the confidence levels during the analysis period.

Table 5 – Crash Analysis – W 20 Avenue and W 60 Street

W 20 Avenue & W 60 Street

(4 Lane x 2 Lane, Signalized, With Turn Lanes, 4 Leg Intersection - Table 22) - URBAN Spot

	TYPE OF CRASH	NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	EXPECTED ANNUAL CRASH VALUE			ABNORMALLY HIGH CRASHES		
		2011	2012	2013				MEAN	90th Percentile	95th Percentile	Mean	90th Percentil	95th Percentil
COLLISION TYPE	Rear End	19	12	12	43	46%	14.33	2.76	6.48	7.20	X	X	X
	Head On	0	0	0	0	0%	0.00	0.24	0.85	0.97			
	Angle	10	6	5	21	23%	7.00	2.36	6.25	6.99	X	X	X
	Left Turn	5	5	1	11	12%	3.67	1.53	4.51	5.08	X		
	Right Turn	1	0	1	2	2%	0.67	0.09	0.44	0.51	X	X	X
	Sideswipe	5	3	4	12	13%	4.00	1.01	2.67	2.99	X	X	X
	Backed Into	0	0	0	0	0%	0.00	0.13	0.53	0.61			
	Coll. w/ Parked Car	0	0	0	0	0%	0.00	0.03	0.25	0.30			
	Coll. w/ Pedestrian	0	0	0	0	0%	0.00	0.20	0.67	0.76			
	Coll. w/ Bicycle	0	0	1	1	1%	0.33	0.07	0.33	0.38	X	X	
	Fixed Object	0	1	2	3	3%	1.00	0.40	1.22	1.37	X		
	Ran Off Road	0	0	0	0	0%	0.00	0.02	0.16	0.19			
	Overtuned	0	0	0	0	0%	0.00	0.04	0.23	0.27			
	Other	0	0	0	0	0%	0.00	2.78	7.62	8.55			
	Total Crashes	40	27	26	93	100%	31.00	11.67	25.59	28.26	X	X	X
SEVERITY	PDO crashes	30	21	22	73	78%	24.33	6.22	15.03	16.72	X	X	X
	Fatal crashes	0	0	0	0	0%	0.00	0.08	0.35	0.41			
	Injury crashes	10	6	4	20	22%	6.67	9.77	23.15	25.72			
LIGHT CONDITIONS	Day Light	29	23	19	71	76%	23.67	7.66	16.74	18.47	X	X	X
	Dusk	1	0	1	2	2%	0.67	0.32	0.99	1.12	X		
	Dawn	0	1	0	1	1%	0.33	0.15	0.55	0.63	X		
	Dark	10	3	5	18	19%	6.00	3.39	8.73	9.76	X		
	Unknown	0	0	1	1	1%	0.33	0.14	0.70	0.80	X		
SURFACE CONDITIONS	Dry	35	23	24	82	88%	27.33	9.86	21.75	24.03	X	X	X
	Wet	5	4	1	10	11%	3.33	1.59	3.55	3.93	X		
	Others	0	0	1	1	1%	0.33	0.22	0.80	0.92	X		
MONTH OF A YEAR	January	4	2	3	9	10%	3.00	0.82	2.23	2.49	X	X	X
	February	4	3	0	7	8%	2.33	0.81	2.03	2.26	X	X	X
	March	2	0	2	4	4%	1.33	1.13	2.67	2.97	X		
	April	5	2	1	8	9%	2.67	1.07	2.70	3.01	X		
	May	4	4	2	10	11%	3.33	1.20	3.01	3.35	X	X	
	June	2	1	3	6	6%	2.00	1.03	2.57	2.86	X		
	July	5	3	1	9	10%	3.00	0.87	2.10	2.34	X	X	X
	August	7	3	2	12	13%	4.00	0.89	2.26	2.52	X	X	X
	September	2	4	2	8	9%	2.67	0.88	2.03	2.25	X	X	X
	October	2	2	3	7	8%	2.33	1.02	2.45	2.72	X		
	November	3	1	4	8	9%	2.67	0.92	2.43	2.72	X	X	
	December	0	2	3	5	5%	1.67	1.02	2.67	2.99	X		
DAY OF THE WEEK	Sunday	1	5	2	8	9%	2.67	1.78	3.77	4.15	X		
	Monday	6	5	2	13	14%	4.33	1.51	3.56	3.95	X	X	X
	Tuesday	10	3	6	19	21%	6.33	1.73	4.18	4.65	X	X	X
	Wednesday	9	6	5	20	22%	6.67	1.58	3.29	3.62	X	X	X
	Thursday	7	2	5	14	15%	4.67	2.01	4.75	5.28	X		
	Friday	3	2	4	9	10%	3.00	1.61	4.11	4.58	X		
	Saturday	3	4	2	9	10%	3.00	1.44	3.92	4.39	X		
HOUR OF THE DAY	00:00-06:00	2	1	3	6	6%	2.00	1.06	3.35	3.79	X		
	06:00-09:00	3	1	2	6	6%	2.00	1.41	3.71	4.16	X		
	09:00-11:00	3	5	1	9	10%	3.00	1.21	2.70	2.99	X	X	X
	11:00-13:00	5	3	2	10	11%	3.33	1.14	3.11	3.49	X	X	
	13:00-15:00	4	4	7	15	16%	5.00	1.26	3.18	3.55	X	X	X
	15:00-18:00	11	6	8	25	27%	8.33	2.24	5.01	5.54	X	X	X
	18:00-24:00	12	7	3	22	24%	7.33	3.35	7.67	8.50	X		

	YEAR			3-Year
	1	2	3	Average
Average Daily Traffic ADT *(Vehicles per Day)*	27,093	29,449	32,010	29,517
Florida Average Crash rate *(Crashes per Million Entering Vehicles)*	0.757	0.757	0.757	0.757
Traffic Base	9.889	10.749	11.683	10.774
Actual Crash Rate *(Crashes per Million Entering Vehicles)*	4.045	2.512	2.225	2.927
Critical Crash Rate *(Crashes per Million Entering Vehicles)*	1.718	1.677	1.637	1.677
Safety Ratio	**2.355**	**1.498**	**1.359**	**1.737**
High Crash Location??	***YES***	***YES***	***YES***	***YES***

$$Actual\ \ Crash\ \ Rate\ = \frac{A \times 1{,}000\ ,000}{V}$$

Where:
A = Total number of crashes or number of crashes by type occurring in a 1 year period.
V = Average Annual Daily Traffic X 365

$$CriticalCrashRate = AVR + \frac{0.5}{TB} + TF\sqrt{\frac{AVR}{TB}}$$

Where:
AVR = Average Statewide Crash Rate for a particular type of intersection or roadway segment.
TB = Traffic Base
TF = Test Factor (z-value)
= *1.96 (assume 95% Confidence Level for RURAL areas)*
= *3.29 (assume 99.95% Confidence Level for URBAN areas)*

$$Traffic\ Base = \frac{Years \times ADT \times 365}{1{,}000{,}000}$$

$$Safety\ \ Ratio\ = \frac{Actual\ \ Crash\ \ Rate}{Critical\ \ Crash\ \ Rate}$$

Confidence Level (%)	Constant Z
68.30	1.00
86.60	1.50
90.00	1.64
95.00	1.96
95.50	2.00
98.80	2.50
99.00	2.58
99.70	3.00
99.95	3.29

Table 6 – Abnormal Crash Details & Countermeasures
W 20 Avenue and W 60 Street

W 20 Avenue & W 60 Street

(4 Lane x 2 Lane, Signalized, With Turn Lanes, 4 Leg Intersection - Table 22) - URBAN Spot

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Rear End	Total Rear End Crashes		**19**	**12**	**12**	**43**	**100%**	**14.33**	(6)	8
	Lighting Conditions	Day Light	15	9	11	35	81%	11.67	(8)	10
		Dawn/Dusk	0	1	0	1	2%	0.33		11
		Dark	4	2	1	7	16%	2.33		12
	Hours of Day	00:00 - 06:00	0	1	1	2	5%	0.67		
		06:00 - 09:00	2	1	1	4	10%	1.33		
		09:00 - 11:00	2	1	1	4	10%	1.33		
		11:00 - 13:00	2	1	0	3	7%	1.00		
		13:00 - 15:00	1	2	3	6	14%	2.00		
		15:00 - 18:00	4	2	5	11	26%	3.67		
		18:00 - 24:00	8	4	0	12	29%	4.00		
	Direction	North	8	2	2	12	28%	4.00		
		South	1	2	1	4	9%	1.33		
		East	6	5	4	15	35%	5.00		
		West	4	3	5	12	28%	4.00		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Angle	Total Angle Crashes		**10**	**6**	**5**	**21**	**100%**	**7.00**	(6)	8
	Lighting Conditions	Day Light	6	6	3	15	71%	5.00	(8)	10
		Dawn	0	0	0	0	0%	0.00	(9)	11
		Dark	4	0	2	6	29%	2.00		12
	Hours of Day	00:00 - 06:00	2	0	2	4	19%	1.33		
		06:00 - 09:00	0	0	1	1	5%	0.33		
		09:00 - 11:00	1	3	0	4	19%	1.33		
		11:00 - 13:00	2	0	0	2	10%	0.67		
		13:00 - 15:00	2	1	2	5	24%	1.67		
		15:00 - 18:00	1	2	0	3	14%	1.00		
		18:00 - 24:00	2	0	0	2	10%	0.67		
	Direction	NB + EB	2	1	0	3	14%	1.00		
		NB + WB	3	1	4	8	38%	2.67		
		SB + EB	1	0	0	1	5%	0.33		
		SB + WB	4	4	1	9	43%	3.00		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Left Turn	Total Left Turn Crashes		**5**	**5**	**1**	**11**	**100%**	**3.67**	(8)	11
	Lighting Conditions	Day Light	5	4	1	10	91%	3.33	(14)	14
		Dawn	0	0	0	0	0%	0.00		16
		Dark	0	1	0	1	9%	0.33		
	Hours of Day	00:00 - 06:00	0	0	0	0	0%	0.00		
		06:00 - 09:00	1	0	0	1	9%	0.33		
		09:00 - 11:00	0	0	0	0	0%	0.00		
		11:00 - 13:00	0	1	1	2	18%	0.67		
		13:00 - 15:00	2	0	0	2	18%	0.67		
		15:00 - 18:00	2	3	0	5	45%	1.67		
		18:00 - 24:00	0	1	0	1	9%	0.33		
	Direction	NB → WB	0	2	1	3	27%	1.00		
		WB → SB	4	1	0	5	45%	1.67		
		SB → EB	1	0	0	1	9%	0.33		
		EB → NB	0	2	0	2	18%	0.67		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Right Turn	Total Right Turn Crashes		**1**	**0**	**1**	**2**	**100%**	**0.67**	(9)	9
	Lighting Conditions	Day Light	0	0	1	1	50%	0.33		
		Dawn	0	0	0	0	0%	0.00		
		Dark	1	0	0	1	50%	0.33		
	Hours of Day	00:00 - 06:00	0	0	0	0	0%	0.00		
		06:00 - 09:00	0	0	0	0	0%	0.00		
		09:00 - 11:00	0	0	0	0	0%	0.00		
		11:00 - 13:00	0	0	0	0	0%	0.00		
		13:00 - 15:00	0	0	1	1	50%	0.33		
		15:00 - 18:00	0	0	0	0	0%	0.00		
		18:00 - 24:00	1	0	0	1	50%	0.33		
	Direction	NB→EB	1	0	1	2	100%	0.67		
		EB→SB	0	0	0	0	0%	0.00		
		WB→NB	0	0	0	0	0%	0.00		
		SB→WB	0	0	0	0	0%	0.00		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Sideswipe (Overtake)	Total Sideswipe Crashes		**5**	**3**	**4**	**12**	**100%**	**4.00**	(8)	8
	Lighting Conditions	Day Light	4	3	4	11	92%	3.67		19
		Dawn/Dusk	0	0	0	0	0%	0.00		
		Dark	1	0	0	1	8%	0.33		
	Hours of Day	00:00 - 06:00	0	0	0	0	0%	0.00		
		06:00 - 09:00	0	0	0	0	0%	0.00		
		09:00 - 11:00	0	1	0	1	8%	0.33		
		11:00 - 13:00	1	1	1	3	25%	1.00		
		13:00 - 15:00	0	0	1	1	8%	0.33		
		15:00 - 18:00	3	0	1	4	33%	1.33		
		18:00 - 24:00	1	1	1	3	25%	1.00		
	Direction	North	2	2	0	4	33%	1.33		
		South	0	0	1	1	8%	0.33		
		East	1	0	1	2	17%	0.67		
		West	2	1	2	5	42%	1.67		
		Unknown	0	0	0	0	0%	0.00		

Based on a regression growth of 8% from the 2014 entering volume, the calculated safety ratios for the years 2011, 2012, and 2013 were 2.355, 1.498, and 1.359, respectively. The safety ratio for the three years averaged 1.737. Also, results of confidence level indicated that this intersection has been a high crash location during the three years with a confidence level higher than 99.95%.

From this analysis it was determined that rear end, angle, right-turn, and sideswipe collisions presented abnormal crash patterns that exceed the threshold limits for the 95th percentile confidence level. Those results indicate that these types of collisions were abnormally high during the period of 2011 through 2013. A detailed review of the abnormal crashes as well as probable countermeasures is presented in *Table 6*.

3.1.3. Traffic Operation Conditions and Analysis

In order to identify the traffic operation characteristics and safety relevant conflicts, field observations at W 20 Avenue & W 60 Street were performed on a typical weekday on May 20, 2014. A summary of the traffic data is presented in *Figure 3*, and the field review is presented in *Figure 4*.

This intersection has single left-turn bays for all approaches. The signal operation is protected/permissive for east/west approaches, and permissive for north/south left-turn traffic. Retro-reflective backplates are installed on the left-turn signals on the north and south mast arms. Queue was noticed for southbound left-turn vehicles.

A strip mall is present at this intersection with driveways located very close that generate potential conflicts with the other movements. Pavement markings at all four legs are faded. Lot of Impatient drivers and red light running was observed at the intersection.

3.1.4. Recommendations

Based on the safety analysis, field observations and traffic operations for the intersection of W 20 Avenue & W 60 Street, the following is recommended:

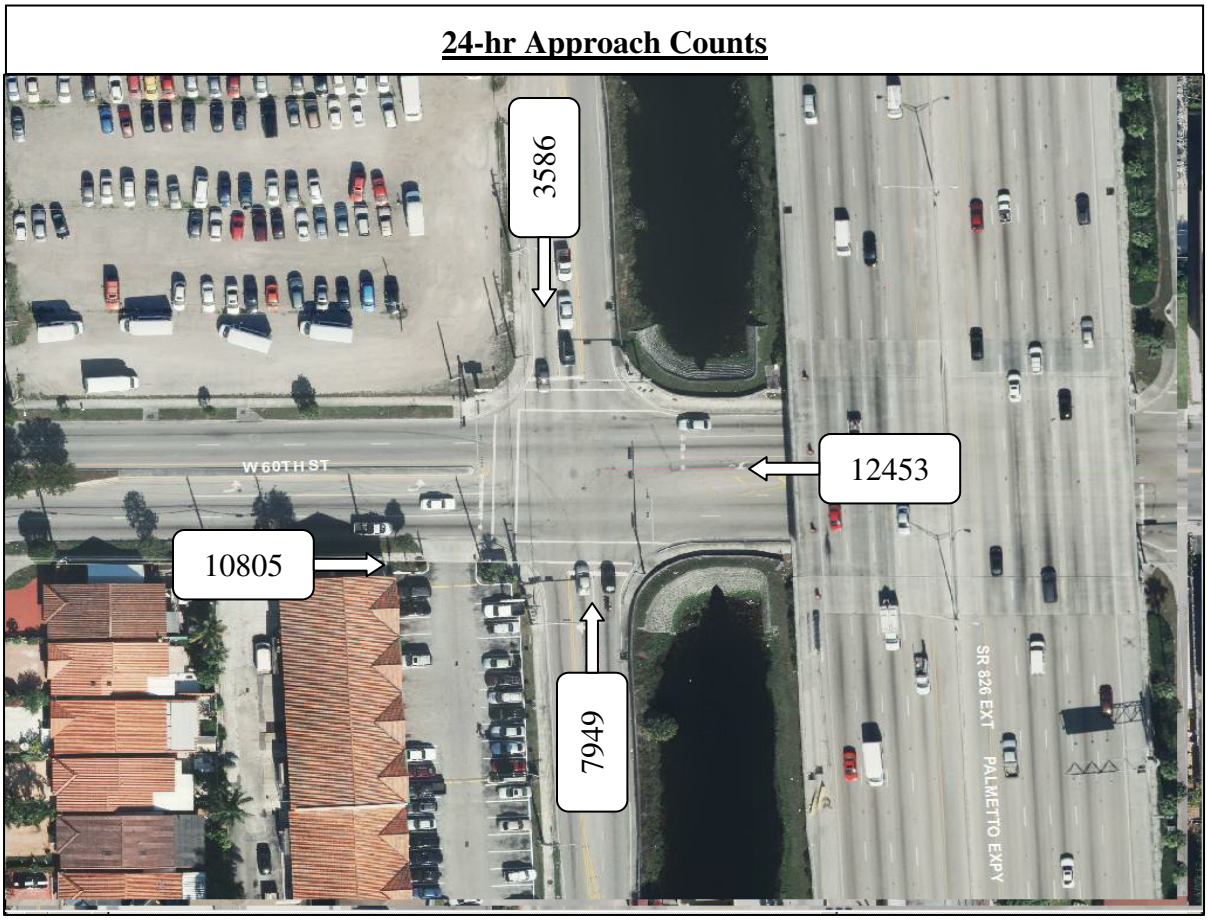
- Refurbishing of pavement markings including crosswalks using thermoplastic painting at all four legs.
- Providing ADA approved pedestrian ramps at all corners.
- Provide high visibility ladder crosswalks.
- Add pedestrian crosswalk on the east leg.
- Install pedestrian signals and push buttons.
- Paint the nose of the concrete separator on the west leg yellow.
- Provide street light on the south leg.
- Lengthen the southbound left-turn lane to about 220 feet.

A conceptual vision of the proposed roadway improvements is exhibited in *Figure 5*.

3.1.5. Cost Estimate

Based on the recommended improvements and the Conceptual Plan, the estimated cost for this project is approximately $155,064. The details of the preliminary project costs are presented in *Appendix D*.

Construction costs were obtained from items cost on the latest pay item Average Unit Cost Report for the Area 13 (Miami-Dade County), and the Miami-Dade Traffic Signal Division price list.



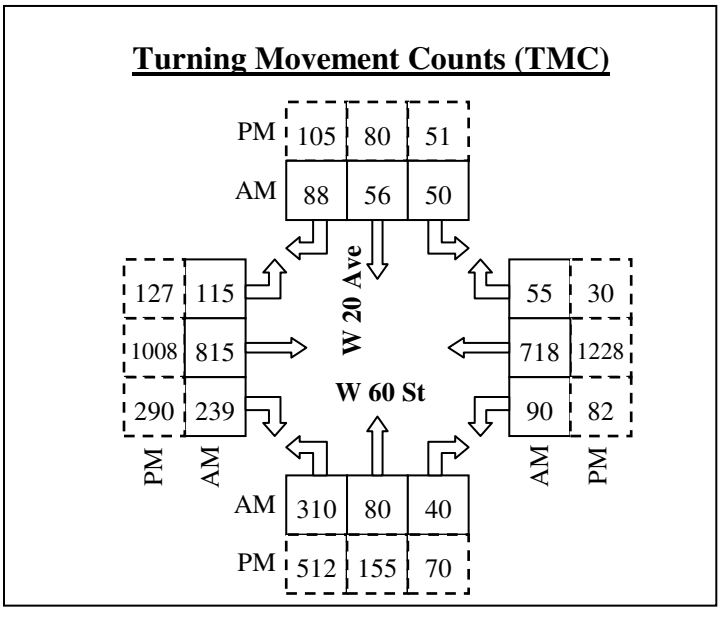
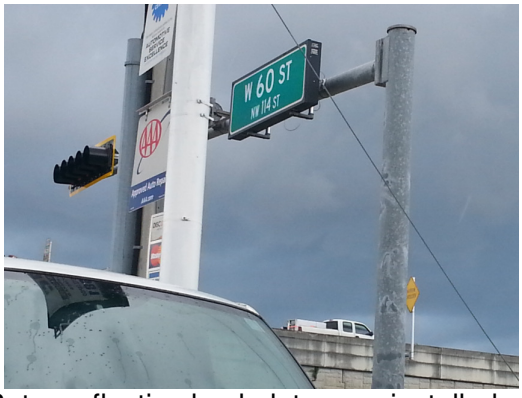


Figure 3: Traffic Data – *W 20 Avenue and W 60 Street*



Retro-reflective backplates are installed on the north/south left-turn signals.

Westbound approach: Faded pavement markings.

East Leg: Pedestrian crosswalks do not exist.

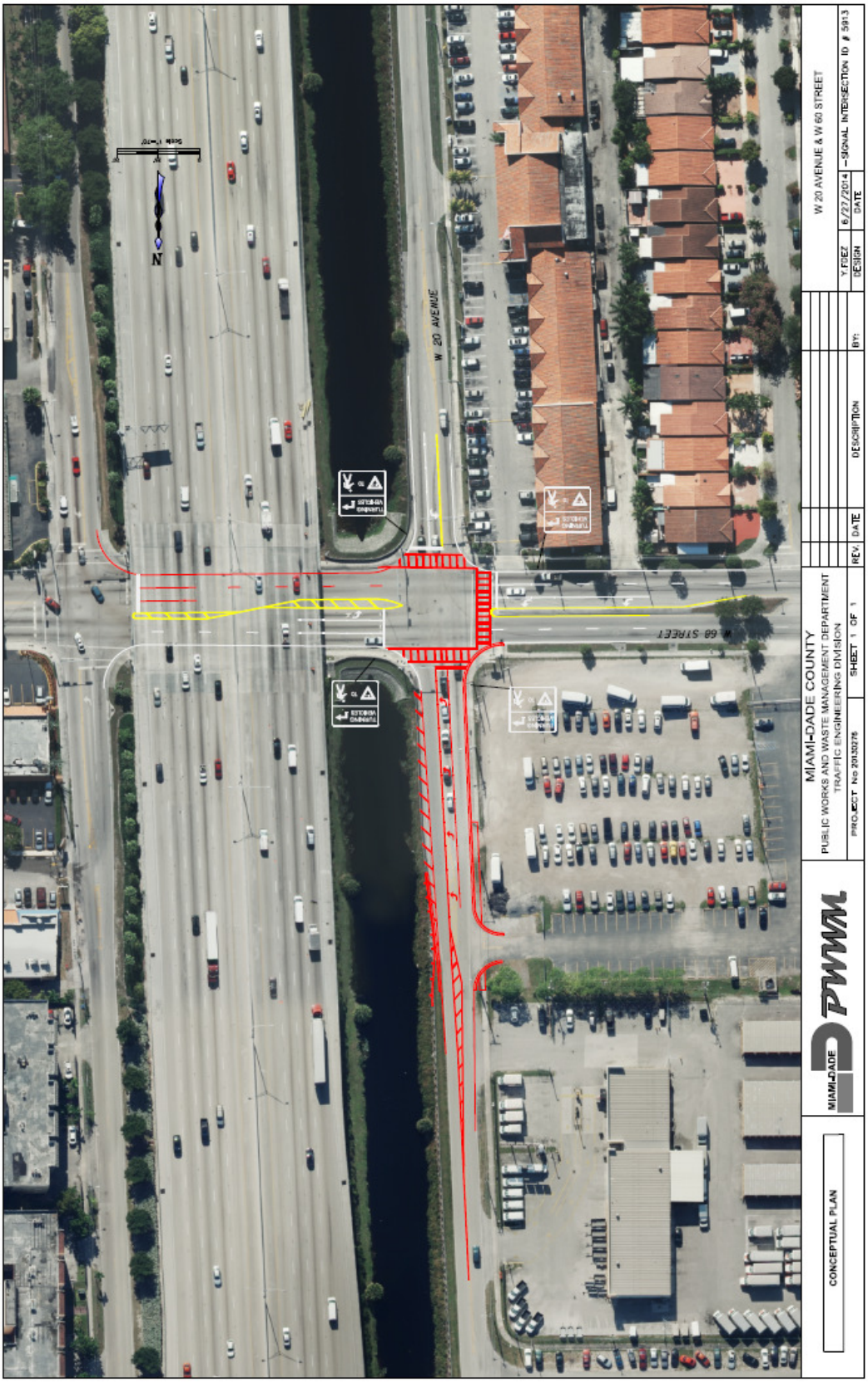
Eastbound approach: Driveway is very close to the intersection.

Pedestrian signals do not exist at all corners.

Pedestrian ramps are not ADA compliant at all corners.

Figure 4: Field Review – *W 20 Avenue and W 60 Street*

Figure 5: Conceptual Plan – *W 20 Avenue and W 60 Street*



3.2. W 24 Avenue and W 60 Street

3.2.1. Site Description

This intersection is a signalized four legged intersection located within the City of Hialeah in the northwest area of Miami Dade County. West 24 Avenue is mostly a two lane urban local road that runs north-south from West 52 Street to West 84 Street. West 60 Street is an east-west road that varies in lane configuration but at the studied intersection exhibits four lanes with a raised center median.

3.2.2. Safety Conditions and Analysis

The intersection of W 24 Avenue and W 60 Street is ranked number 2 in our high crash locations list. A review of the hard copy police reports for the years 2011 through 2013 was performed. During the three-year analysis period, 89 relevant crashes occurred at the intersection. The analysis indicated that the average number of crashes per year is 30. The crash summaries, crash statistics and collision diagrams for the intersection are documented in *Appendix A*.

Based on the analysis of crash records for this intersection, the predominant types of crashes are shown in *Figure 6.*

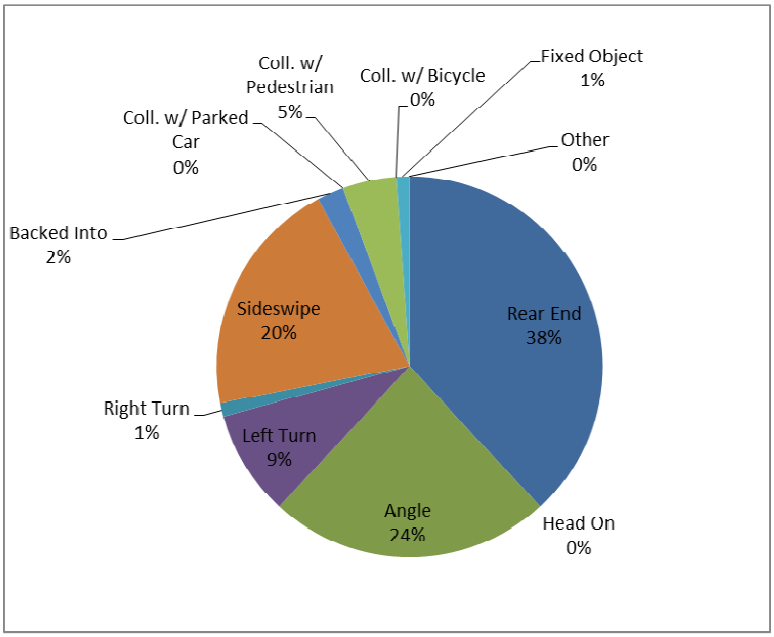


Figure 6 Predominant Crash Types
W 24 AVE & W 60 ST

Calculated intersection mean crash per year were compared to the average Miami-Dade Crash Rate for County corridors to assess the safety conditions at the study intersection in relation to other roadways with similar traffic and geometric characteristics. This study is based on the 2007 FDOT's "Expected Value Analysis." *Table 7* illustrates the expected accident volume analysis of this intersection as well as the safety ratios and the confidence levels during the analysis period.

Based on a regression growth of 8% from the 2014 entering volume, the calculated safety ratios for the years 2011, 2012, and 2013 were 1.304, 1.522, and 1.525, respectively. The safety ratio for the three years averaged 1.451. Also, results of confidence level indicated that this intersection has been a high crash location during the three years with a confidence level higher than 99.95%.

Table 7 – Crash Analysis – W 24 Avenue and W 60 Street

W 24 Avenue & W 60 Street

(4 Lane x 2 Lane, Signalized, With Turn Lanes, 4 Leg Intersection - Table 22) - URBAN Spot

	TYPE OF CRASH	NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	EXPECTED ANNUAL CRASH VALUE			ABNORMALLY HIGH CRASHES		
		2011	2012	2013				MEAN	90th Percentile	95th Percentile	Mean	90th Percentil	95th Percentil
COLLISION TYPE	Rear End	6	14	14	34	38%	11.33	2.76	6.48	7.20	X	X	X
	Head On	0	0	0	0	0%	0.00	0.24	0.85	0.97			
	Angle	5	10	6	21	24%	7.00	2.36	6.25	6.99	X	X	X
	Left Turn	5	0	3	8	9%	2.67	1.53	4.51	5.08	X		
	Right Turn	0	0	1	1	1%	0.33	0.09	0.44	0.51	X		
	Sideswipe	7	6	5	18	20%	6.00	1.01	2.67	2.99	X	X	X
	Backed Into	0	1	1	2	2%	0.67	0.13	0.53	0.61	X	X	X
	Coll. w/ Parked Car	0	0	0	0	0%	0.00	0.03	0.25	0.30			
	Coll. w/ Pedestrian	2	0	2	4	4%	1.33	0.20	0.67	0.76	X	X	X
	Coll. w/ Bicycle	0	0	0	0	0%	0.00	0.07	0.33	0.38			
	Fixed Object	0	0	1	1	1%	0.33	0.40	1.22	1.37			
	Ran Off Road	0	0	0	0	0%	0.00	0.02	0.16	0.19			
	Overtuned	0	0	0	0	0%	0.00	0.04	0.23	0.27			
	Other	0	0	0	0	0%	0.00	2.78	7.62	8.55			
	Total Crashes	25	31	33	89	100%	29.67	11.67	25.59	28.26	X	X	X
SEVERITY	PDO crashes	21	28	25	74	83%	24.67	6.22	15.03	16.72	X	X	X
	Fatal crashes	0	0	0	0	0%	0.00	0.08	0.35	0.41			
	Injury crashes	4	3	8	15	17%	5.00	9.77	23.15	25.72			
LIGHT CONDITIONS	Day Light	17	26	23	66	74%	22.00	7.66	16.74	18.47	X	X	X
	Dusk	0	0	0	0	0%	0.00	0.32	0.99	1.12			
	Dawn	1	0	0	1	1%	0.33	0.15	0.55	0.63	X		
	Dark	7	5	10	22	25%	7.33	3.39	8.73	9.76	X		
	Unknown	0	0	0	0	0%	0.00	0.14	0.70	0.80			
SURFACE CONDITIONS	Dry	24	28	26	78	88%	26.00	9.86	21.75	24.03	X	X	X
	Wet	1	3	7	11	12%	3.67	1.59	3.55	3.93	X	X	
	Others	0	0	0	0	0%	0.00	0.22	0.80	0.92			
MONTH OF A YEAR	January	6	2	1	9	10%	3.00	0.82	2.23	2.49	X	X	X
	February	1	1	7	9	10%	3.00	0.81	2.03	2.26	X	X	X
	March	2	6	4	12	13%	4.00	1.13	2.67	2.97	X	X	X
	April	3	1	1	5	6%	1.67	1.07	2.70	3.01	X		
	May	4	2	2	8	9%	2.67	1.20	3.01	3.35	X		
	June	3	2	2	7	8%	2.33	1.03	2.57	2.86	X		
	July	0	2	1	3	3%	1.00	0.87	2.10	2.34	X		
	August	1	3	2	6	7%	2.00	0.89	2.26	2.52	X		
	September	1	5	2	8	9%	2.67	0.88	2.03	2.25	X	X	X
	October	1	2	3	6	7%	2.00	1.02	2.45	2.72	X		
	November	2	2	5	9	10%	3.00	0.92	2.43	2.72	X	X	X
	December	1	3	3	7	8%	2.33	1.02	2.67	2.99	X		
DAY OF THE WEEK	Sunday	3	2	5	10	11%	3.33	1.78	3.77	4.15	X		
	Monday	2	2	5	9	10%	3.00	1.51	3.56	3.95	X		
	Tuesday	1	3	4	8	9%	2.67	1.73	4.18	4.65	X		
	Wednesday	1	7	7	15	17%	5.00	1.58	3.29	3.62	X	X	X
	Thursday	1	8	3	12	13%	4.00	2.01	4.75	5.28	X		
	Friday	10	4	5	19	21%	6.33	1.61	4.11	4.58	X	X	X
	Saturday	7	5	4	16	18%	5.33	1.44	3.92	4.39	X	X	X
HOUR OF THE DAY	00:00-06:00	3	2	1	6	7%	2.00	1.06	3.35	3.79	X		
	06:00-09:00	5	2	4	11	13%	3.67	1.41	3.71	4.16	X		
	09:00-11:00	1	2	3	6	7%	2.00	1.21	2.70	2.99	X		
	11:00-13:00	2	8	4	14	16%	4.67	1.14	3.11	3.49	X	X	X
	13:00-15:00	4	3	0	7	8%	2.33	1.26	3.18	3.55	X		
	15:00-18:00	5	9	14	28	32%	9.33	2.24	5.01	5.54	X	X	X
	18:00-24:00	5	4	7	16	18%	5.33	3.35	7.67	8.50	X		

	YEAR			3-Year Average
	1	2	3	
Average Daily Traffic ADT *(Vehicles per Day)*	32,114	34,906	37,942	34,987
Florida Average Crash rate *(Crashes per Million Entering Vehicles)*	0.757	0.757	0.757	0.757
Traffic Base	11.722	12.741	13.849	12.770
Actual Crash Rate *(Crashes per Million Entering Vehicles)*	2.133	2.433	2.383	2.316
Critical Crash Rate *(Crashes per Million Entering Vehicles)*	1.636	1.598	1.562	1.599
Safety Ratio	**1.304**	**1.522**	**1.525**	**1.451**
High Crash Location??	***YES***	***YES***	***YES***	***YES***

$$Actual\ \ Crash\ \ Rate\ \ =\ \ \frac{A \times 1{,}000{,}000}{V}$$

Where:
A = Total number of crashes or number of crashes by type occurring in a 1 year period.
V = Average Annual Daily Traffic X 365

$$CriticalCrashRate = AVR + \frac{0.5}{TB} + TF\sqrt{\frac{AVR}{TB}}$$

Where:
AVR = Average Statewide Crash Rate for a particular type of intersection or roadway segment.
TB = Traffic Base
TF = Test Factor (z-value)
= *1.96 (assume 95% Confidence Level for RURAL areas)*
= *3.29 (assume 99.95% Confidence Level for URBAN areas)*

$$Traffic\ Base = \frac{Years \times ADT \times 365}{1{,}000{,}000}$$

$$Safety\ \ Ratio\ \ =\ \ \frac{Actual\ \ Crash\ \ Rate}{Critical\ \ Crash\ \ Rate}$$

Confidence Level (%)	Constant Z
68.30	1.00
86.60	1.50
90.00	1.64
95.00	1.96
95.50	2.00
98.80	2.50
99.00	2.58
99.70	3.00
99.95	3.29

Table 8 – Abnormal Crash Details & Countermeasures
W 24 Avenue and W 60 Street

W 24 Avenue & W 60 Street

(4 Lane x 2 Lane, Signalized, With Turn Lanes, 4 Leg Intersection - Table 22) - URBAN Spot

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Rear End	Total Rear End Crashes		**6**	**14**	**14**	**34**	**100%**	**11.33**	(2)	5
	Lighting Conditions	Day Light	4	10	10	24	71%	8.00	(6)	7
		Dawn	0	0	0	0	0%	0.00	(8)	8
		Dark	2	4	4	10	29%	3.33		12
	Hours of Day	00:00 - 06:00	0	0	0	0	0%	0.00		19
		06:00 - 09:00	2	0	0	2	6%	0.67		21
		09:00 - 11:00	0	1	2	3	9%	1.00		24
		11:00 - 13:00	1	4	1	6	18%	2.00		
		13:00 - 15:00	1	1	0	2	6%	0.67		
		15:00 - 18:00	1	4	7	12	35%	4.00		
		18:00 - 24:00	1	4	4	9	26%	3.00		
	Direction	North	0	2	6	8	24%	2.67		
		South	1	1	0	2	6%	0.67		
		East	4	5	4	13	38%	4.33		
		West	1	6	4	11	32%	3.67		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Angle	Total Angle Crashes		**5**	**10**	**6**	**21**	**100%**	**7.00**	(6)	10
	Lighting Conditions	Day Light	2	8	2	12	52%	4.00	(8)	11
		Dawn	1	0	0	1	4%	0.33	(9)	12
		Dark	2	2	6	10	43%	3.33		14
	Hours of Day	00:00 - 06:00	2	2	1	5	25%	1.67		
		06:00 - 09:00	2	0	0	2	10%	0.67		
		09:00 - 11:00	0	1	1	2	10%	0.67		
		11:00 - 13:00	1	2	0	3	15%	1.00		
		13:00 - 15:00	0	2	0	2	10%	0.67		
		15:00 - 18:00	0	2	3	5	25%	1.67		
		18:00 - 24:00	0	0	1	1	5%	0.33		
	Direction	NB + EB	1	3	3	7	33%	2.33		
		NB + WB	2	3	2	7	33%	2.33		
		SB + EB	1	3	1	5	24%	1.67		
		SB + WB	1	1	0	2	10%	0.67		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Sideswipe (Overtake)	Total Sideswipe Crashes		**7**	**6**	**5**	**18**	**100%**	**6.00**	(8)	8
	Lighting Conditions	Day Light	6	6	4	16	89%	5.33		19
		Dawn	0	0	0	0	0%	0.00		
		Dark	1	0	1	2	11%	0.67		
	Hours of Day	00:00 - 06:00	0	0	0	0	0%	0.00		
		06:00 - 09:00	1	2	1	4	22%	1.33		
		09:00 - 11:00	0	0	0	0	0%	0.00		
		11:00 - 13:00	0	1	3	4	22%	1.33		
		13:00 - 15:00	2	0	0	2	11%	0.67		
		15:00 - 18:00	2	3	0	5	28%	1.67		
		18:00 - 24:00	2	0	1	3	17%	1.00		
	Direction	North	0	3	1	4	22%	1.33		
		South	3	1	2	6	33%	2.00		
		East	1	0	1	2	11%	0.67		
		West	3	2	1	6	33%	2.00		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Coll. w/ Pedestrian	Total Coll. w/ Pedestrian Crashes		**2**	**0**	**2**	**4**	**100%**	**1.33**	(6)	4
	Lighting Conditions	Day Light	2	0	2	4	100%	1.33	(18)	24
		Dawn	0	0	0	0	0%	0.00		
		Dark	0	0	0	0	0%	0.00		
	Hours of Day	00:00 - 06:00	0	0	0	0	0%	0.00		
		06:00 - 09:00	0	0	1	1	25%	0.33		
		09:00 - 11:00	0	0	0	0	0%	0.00		
		11:00 - 13:00	0	0	0	0	0%	0.00		
		13:00 - 15:00	1	0	0	1	25%	0.33		
		15:00 - 18:00	1	0	1	2	50%	0.67		
		18:00 - 24:00	0	0	0	0	0%	0.00		
	Direction	North	0	0	2	2	50%	0.67		
		South	0	0	0	0	0%	0.00		
		East	1	0	0	1	25%	0.33		
		West	1	0	0	1	25%	0.33		
		Unknown	0	0	0	0	0%	0.00		

From this analysis, it was determined that rear end, angle, collision with pedestrian, and sideswipe collisions presented abnormal crash patterns that exceed the threshold limits for the 95th percentile and 90th percentile confidence level. Those results indicate that these types of collisions were abnormally high during the period of 2011 through 2013. A detailed review of the abnormal crashes as well as probable countermeasures is presented in *Table 8*.

3.2.3. Traffic Operation Conditions and Analysis

In order to identify the traffic operation characteristics and safety relevant conflicts, field observations at West 24 Avenue and West 60 Street were performed on a typical weekday on May 15, 2014. A summary of the traffic data is presented in *Figure 7*, and the field review is presented in *Figure 8*.

This intersection has single left-turn bays on all approaches with a protected/permissive left-turn signal operation. There is not adequate lighting on the north leg of West 24 Avenue. Drainage issue exists on the north leg on the intersection (west side). Visibility of vehicle turning right from west leg of West 60 Street is restricted by condominium wall on northwest corner. North leg crosswalk is faded and all ramps are missing the detectable warning device.

Driveway on the East leg (south side) is too close to the intersection. Bus stop is located on the near side of the intersection along West 60 Street westbound. Teenagers were observed irresponsibly crossing the road without using pedestrian signals.

Extra pavement is hatch-marked on the north leg (east side of the intersection). This area is sometimes used as parking and it is wrongly demarcated because it's closing off an active entrance/exist to the condominium. Red light running was observed at the intersection as well as a failure of right turning vehicles from yielding the right-of-way.

3.2.4. Recommendations

Based on the safety analysis, field observations and traffic operations for the intersection of West 24 Avenue and West 60 Street, the following is recommended:

- Paint the existing concrete median noses yellow.
- Restripe all pedestrian crossings with high visibility ladder markings.
- Upgrade existing pedestrian signals to countdown.
- Provide detectable warning devices on all ramps.
- Provide painted island on southeast corner to better channelize exclusive right turn lane.
- Provide retro-flectorized backplates on all signal heads.
- Provide lighting on north leg specifically the east side of W 24 Avenue.
- Emphasize hatch-marked area on north leg east side by adding RPMs along the edge line and remove the marking at driveway to provide access to the condominium.

- Install "Right Turn Only" sign at the driveway on north leg east side.
- Coordinate with Miami-Dade Transit (MDT) to relocate bus stops along West 60th Street from the near to the far side of the intersection.
- Resolve drainage issue on North leg (west side) by sodding swale and possibly delineating it with curb and gutter. Clean drainage structure.
- Remove the closest McDonald driveway on East leg (south side)

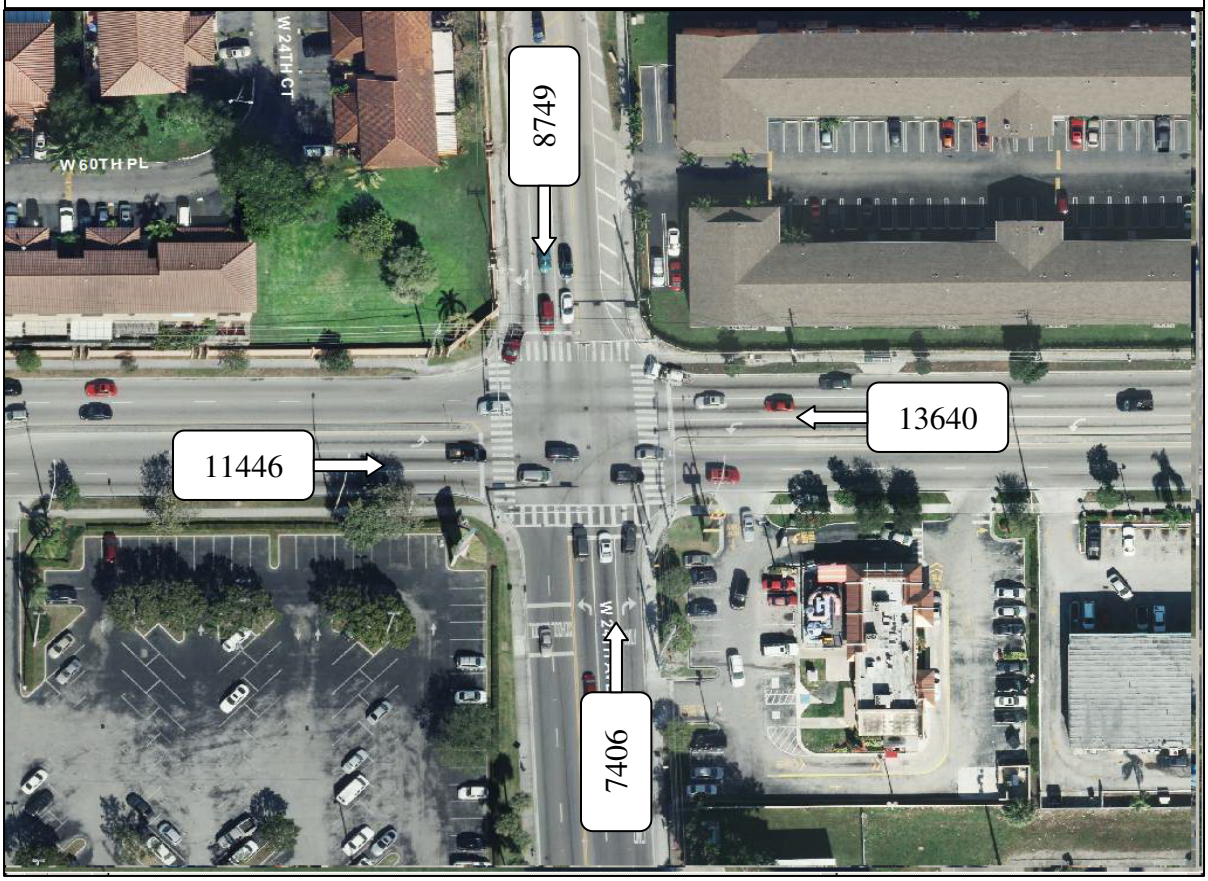
A conceptual vision of the proposed roadway improvements is exhibited in *Figure 9*.

3.2.5. Cost Estimate

Based on the recommended improvements and the Conceptual Plan, the estimated cost for this project is approximately $97,448. The details of the preliminary project costs are presented in *Appendix D*.

Construction costs were obtained from items cost on the latest pay item Average Unit Cost Report for the Area 13 (Miami-Dade County), and the Miami-Dade Traffic Signal Division price list.

24-hr Approach Counts



Turning Movement Counts (TMC)

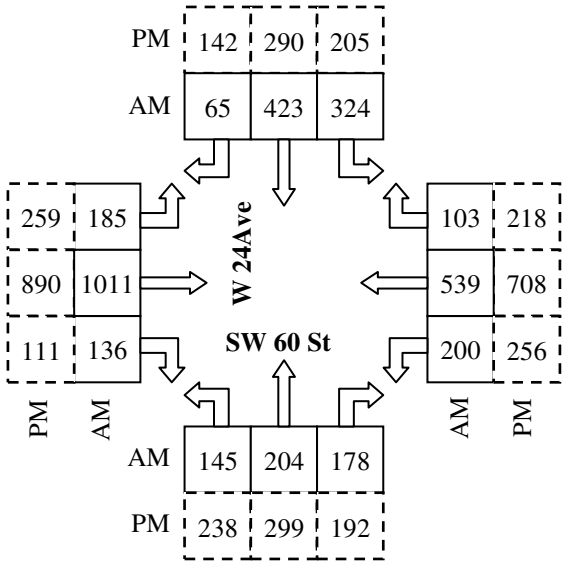


Figure 7: Traffic Data – *W 24 Avenue and W 60 Street*

W 24 Ave Northbound: Drainage issue; sand is visible all the way up to the NW return of the intersection.

Eastbound approach: Restricted visibility.

W 24 Ave Northbound: Faded north crosswalk

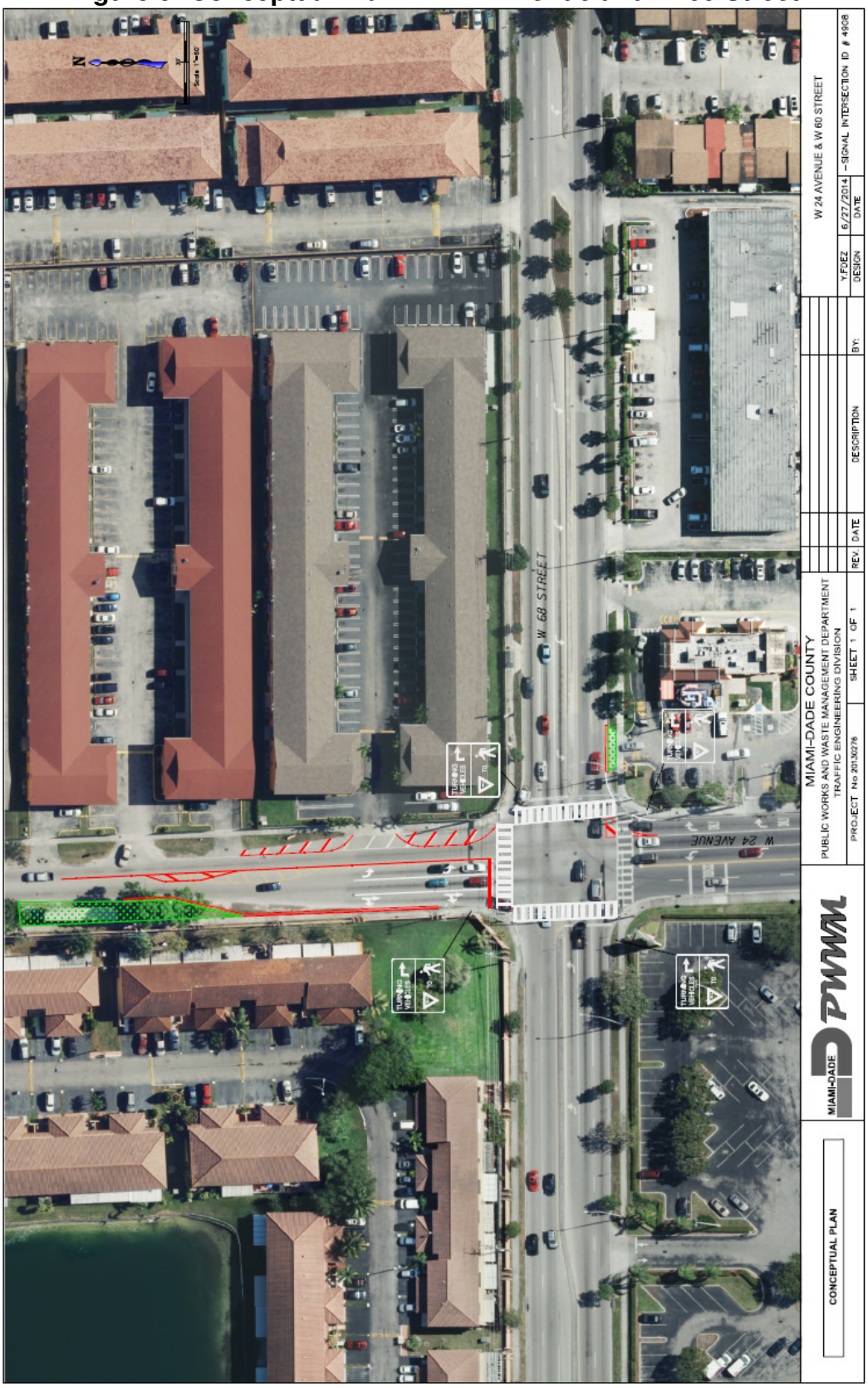
Westbound approach: Bus stop on near side of construction.

W 24 Ave Northbound: Inadequate lighting on north leg east side.

W 60 St Eastbound: McDonald's driveway too close to intersection

Figure 8: Field Review – *W 24 Avenue and W 60 Street*

Figure 9: Conceptual Plan – *W 24 Avenue and W 60 Street*



3.3. NW 17 Avenue and NW South River Drive

3.3.1. Site Description

This intersection is a signalized four legged intersection located in the City of Miami. NW 17 Avenue is a four lane north-south urban arterial; divided by a raised median to the south of the studied intersection and undivided to the north. NW South River Drive is a two lane local street that runs east-west with the unique characteristic of having a junction with the eastbound Dolphin Expressway off-ramp approximately 580 feet to the east of the studied intersection. NW South River Drive is a two-way road to the west of NW 17 Avenue and one-way westbound only road to the east of NW 17 Avenue. S Miami River Bridge is located approximately 675 feet north of the intersection.

3.3.2. Safety Conditions and Analysis

The intersection of NW 17 Avenue and NW South River Drive is ranked number 3 in our high crash locations list. A review of the hard copy police reports for the years 2011 through 2013 was performed. During the three-year analysis period, 92 relevant crashes occurred at the intersection. The analysis indicated that the average number of crashes per year is 31. The crash summaries, crash statistics and collision diagrams for the intersection are documented in *Appendix A*.

Based on the analysis of crash records for this intersection, the predominant types of crashes are shown in *Figure 10*.

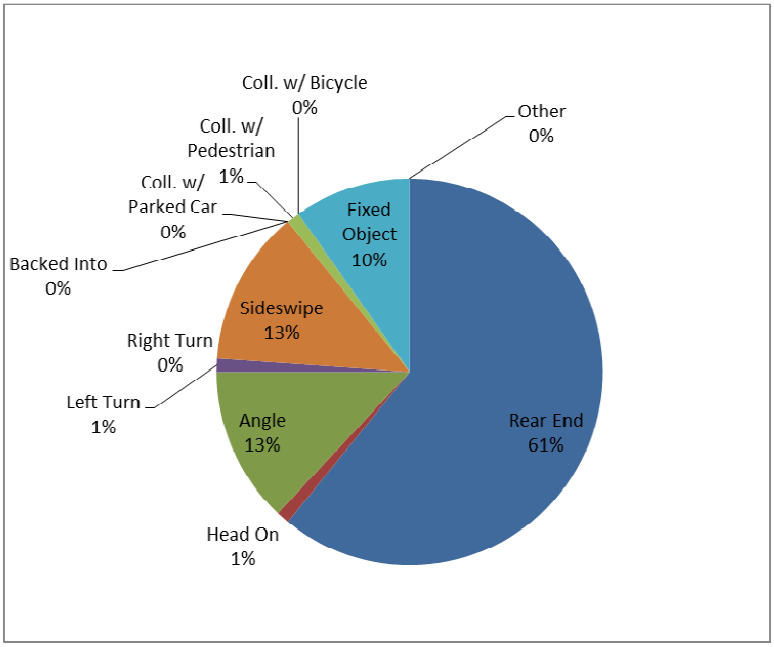


Figure 10 Predominant Crash Types
NW 17 AVE & NW SOUTH RIVER DR

Calculated intersection mean crash per year were compared to the average Miami-Dade Crash Rate for County corridors to assess the safety conditions at the study intersection in relation to other roadways with similar traffic and geometric characteristics. This study is based on the 2007 FDOT's "Expected Value Analysis." *Table 9* illustrates the expected accident volume analysis of this intersection as well as the safety ratios and the confidence levels during the analysis period.

Based on a regression growth of 8% from the 2014 entering volume, the calculated safety ratios for the years 2011, 2012, and 2013 were 1.736, 1.759, and 2.059, respectively. The safety ratio for the three years averaged 1.852. Also, results of confidence level indicated that this intersection has been a high crash location during the three years with a confidence level higher than 99.95%.

Table 9 – Crash Analysis – NW 17 Avenue and NW South River Drive

NW 17 Avenue & NW South River Dr

(4 Lane x 2 Lane, Signalized, With Turn Lanes, 4 Leg Intersection - Table 22) - URBAN Spot

	TYPE OF CRASH	NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	EXPECTED ANNUAL CRASH VALUE			ABNORMALLY HIGH CRASHES		
		2011	2012	2013				MEAN	90th Percentile	95th Percentile	Mean	90th Percentil	95th Percentil
COLLISION TYPE	Rear End	12	15	29	56	61%	18.67	2.76	6.48	7.20	X	X	X
	Head On	0	0	1	1	1%	0.33	0.24	0.85	0.97	X		
	Angle	4	7	1	12	13%	4.00	2.36	6.25	6.99	X		
	Left Turn	0	1	0	1	1%	0.33	1.53	4.51	5.08			
	Right Turn	0	0	0	0	0%	0.00	0.09	0.44	0.51			
	Sideswipe	7	4	1	12	13%	4.00	1.01	2.67	2.99	X	X	X
	Backed Into	0	0	0	0	0%	0.00	0.13	0.53	0.61			
	Coll. w/ Parked Car	0	0	0	0	0%	0.00	0.03	0.25	0.30			
	Coll. w/ Pedestrian	0	0	1	1	1%	0.33	0.20	0.67	0.76	X		
	Coll. w/ Bicycle	0	0	0	0	0%	0.00	0.07	0.33	0.38			
	Fixed Object	4	2	3	9	10%	3.00	0.40	1.22	1.37	X	X	X
	Ran Off Road	0	0	0	0	0%	0.00	0.02	0.16	0.19			
	Overtuned	0	0	0	0	0%	0.00	0.04	0.23	0.27			
	Other	0	0	0	0	0%	0.00	2.78	7.62	8.55			
	Total Crashes	27	29	36	92	100%	30.67	11.67	25.59	28.26	X	X	X
SEVERITY	PDO crashes	23	27	33	83	90%	27.67	6.22	15.03	16.72	X	X	X
	Fatal crashes	0	0	0	0	0%	0.00	0.08	0.35	0.41			
	Injury crashes	4	2	3	9	10%	3.00	9.77	23.15	25.72			
LIGHT CONDITIONS	Day Light	22	28	31	81	88%	27.00	7.66	16.74	18.47	X	X	X
	Dusk	1	0	1	2	2%	0.67	0.32	0.99	1.12	X		
	Dawn	0	0	0	0	0%	0.00	0.15	0.55	0.63			
	Dark	4	1	4	9	10%	3.00	3.39	8.73	9.76			
	Unknown	0	0	0	0	0%	0.00	0.14	0.70	0.80			
SURFACE CONDITIONS	Dry	20	21	27	68	74%	22.67	9.86	21.75	24.03	X	X	
	Wet	7	8	9	24	26%	8.00	1.59	3.55	3.93	X	X	X
	Others	0	0	0	0	0%	0.00	0.22	0.80	0.92			
MONTH OF A YEAR	January	0	4	1	5	5%	1.67	0.82	2.23	2.49	X		
	February	0	2	1	3	3%	1.00	0.81	2.03	2.26	X		
	March	1	3	0	4	4%	1.33	1.13	2.67	2.97	X		
	April	3	2	4	9	10%	3.00	1.07	2.70	3.01	X	X	
	May	1	1	5	7	8%	2.33	1.20	3.01	3.35	X		
	June	3	2	5	10	11%	3.33	1.03	2.57	2.86	X	X	X
	July	2	3	5	10	11%	3.33	0.87	2.10	2.34	X	X	X
	August	3	2	3	8	9%	2.67	0.89	2.26	2.52	X	X	X
	September	3	4	1	8	9%	2.67	0.88	2.03	2.25	X	X	X
	October	3	4	3	10	11%	3.33	1.02	2.45	2.72	X	X	X
	November	5	1	4	10	11%	3.33	0.92	2.43	2.72	X	X	X
	December	3	1	4	8	9%	2.67	1.02	2.67	2.99	X		
DAY OF THE WEEK	Sunday	3	1	2	6	7%	2.00	1.78	3.77	4.15	X		
	Monday	3	4	9	16	17%	5.33	1.51	3.56	3.95	X	X	X
	Tuesday	3	2	6	11	12%	3.67	1.73	4.18	4.65	X		
	Wednesday	1	8	7	16	17%	5.33	1.58	3.29	3.62	X	X	X
	Thursday	8	4	6	18	20%	6.00	2.01	4.75	5.28	X	X	X
	Friday	6	8	4	18	20%	6.00	1.61	4.11	4.58	X	X	X
	Saturday	3	2	2	7	8%	2.33	1.44	3.92	4.39	X		
HOUR OF THE DAY	00:00-06:00	2	1	2	5	5%	1.67	1.06	3.35	3.79	X		
	06:00-09:00	2	9	5	16	17%	5.33	1.41	3.71	4.16	X	X	X
	09:00-11:00	6	4	7	17	18%	5.67	1.21	2.70	2.99	X	X	X
	11:00-13:00	3	9	8	20	22%	6.67	1.14	3.11	3.49	X	X	X
	13:00-15:00	4	3	5	12	13%	4.00	1.26	3.18	3.55	X	X	X
	15:00-18:00	7	2	6	15	16%	5.00	2.24	5.01	5.54	X		
	18:00-24:00	3	1	3	7	8%	2.33	3.35	7.67	8.50			

	YEAR			3-Year Average
	1	2	3	
Average Daily Traffic ADT *(Vehicles per Day)*	30,381	33,022	35,894	33,099
Florida Average Crash rate *(Crashes per Million Entering Vehicles)*	0.595	0.595	0.595	0.595
Traffic Base	11.089	12.053	13.101	12.081
Actual Crash Rate *(Crashes per Million Entering Vehicles)*	2.435	2.406	2.748	2.530
Critical Crash Rate *(Crashes per Million Entering Vehicles)*	1.402	1.367	1.334	1.368
Safety Ratio	**1.736**	**1.759**	**2.059**	**1.852**
High Crash Location??	***YES***	***YES***	***YES***	***YES***

$$Actual\ \ Crash\ \ Rate\ \ =\ \ \frac{A \times 1{,}000{,}000}{V}$$

Where:
A = Total number of crashes or number of crashes by type occurring in a 1 year period.
V = Average Annual Daily Traffic X 365

$$CriticalCrashRate = AVR + \frac{0.5}{TB} + TF\sqrt{\frac{AVR}{TB}}$$

Where:
AVR = Average Statewide Crash Rate for a particular type of intersection or roadway segment.
TB = Traffic Base
TF = Test Factor (z-value)
= *1.96 (assume 95% Confidence Level for RURAL areas)*
= *3.29 (assume 99.95% Confidence Level for URBAN areas)*

Confidence Level (%)	Constant Z
68.30	1.00
86.60	1.50
90.00	1.64
95.00	1.96
95.50	2.00
98.80	2.50
99.00	2.58
99.70	3.00
99.95	3.29

$$Traffic\ Base = \frac{Years \times ADT \times 365}{1{,}000{,}000}$$

$$Safety\ \ Ratio\ \ =\ \ \frac{Actual\ \ Crash\ \ Rate}{Critical\ \ Crash\ \ Rate}$$

From this analysis, it was determined that rear end, fixed object, and sideswipe collisions presented abnormal crash patterns that exceed the threshold limits for the 95th percentile and 90th percentile confidence level. Those results indicate that these types of collisions were abnormally high during the period of 2011 through 2013. A detailed review of the abnormal crashes as well as probable countermeasures is presented in *Table 10*.

Table 10 – Abnormal Crash Details & Countermeasures
NW 17 Avenue and NW South River Drive

NW 17 Avenue & NW South River Dr

(4 Lane x 2 Lane, Signalized, With Turn Lanes, 4 Leg Intersection - Table 22) - URBAN Spot

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Rear End	Total Rear End Crashes		**12**	**15**	**29**	**56**	**100%**	**18.67**	(1)	2
	Lighting Conditions	Day Light	10	15	28	53	95%	17.67	(3)	4
		Dawn	0	0	0	0	0%	0.00	(7)	7
		Dark	2	0	1	3	5%	1.00	(12)	
	Hours of Day	00:00 - 06:00	0	0	0	0	0%	0.00		
		06:00 - 09:00	0	3	5	8	14%	2.67		
		09:00 - 11:00	2	3	6	11	20%	3.67		
		11:00 - 13:00	0	8	7	15	27%	5.00		
		13:00 - 15:00	3	0	4	7	13%	2.33		
		15:00 - 18:00	5	1	5	11	20%	3.67		
		18:00 - 24:00	2	0	2	4	7%	1.33		
	Direction	North	1	7	16	24	43%	8.00		
		South	11	7	10	28	50%	9.33		
		East	0	1	1	2	4%	0.67		
		West	0	0	2	2	4%	0.67		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Fixed Object	Total Fixed Object Crashes		**4**	**2**	**3**	**9**	**100%**	**3.00**	(9)	13
	Lighting Conditions	Day Light	1	2	1	4	44%	1.33	(13)	17
		Dawn	0	0	0	0	0%	0.00		
		Dark	3	0	2	5	56%	1.67		
	Hours of Day	00:00 - 06:00	2	0	2	4	44%	1.33		
		06:00 - 09:00	0	1	0	1	11%	0.33		
		09:00 - 11:00	0	0	1	1	11%	0.33		
		11:00 - 13:00	0	1	0	1	11%	0.33		
		13:00 - 15:00	1	0	0	1	11%	0.33		
		15:00 - 18:00	0	0	0	0	0%	0.00		
		18:00 - 24:00	1	0	0	1	11%	0.33		
	Direction	North	0	1	1	2	22%	0.67		
		South	4	1	2	7	78%	2.33		
		East	0	0	0	0	0%	0.00		
		West	0	0	0	0	0%	0.00		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Sideswipe (Overtake)	Total Sideswipe Crashes		**7**	**4**	**1**	**12**	**100%**	**4.00**	(8)	9
	Lighting Conditions	Day Light	7	4	1	12	100%	4.00	(9)	21
		Dawn	0	0	0	0	0%	0.00	(12)	
		Dark	0	0	0	0	0%	0.00		
	Hours of Day	00:00 - 06:00	0	0	0	0	0%	0.00		
		06:00 - 09:00	1	2	0	3	25%	1.00		
		09:00 - 11:00	2	0	0	2	17%	0.67		
		11:00 - 13:00	2	1	0	3	25%	1.00		
		13:00 - 15:00	0	0	1	1	8%	0.33		
		15:00 - 18:00	2	0	0	2	17%	0.67		
		18:00 - 24:00	0	1	0	1	8%	0.33		
	Direction	North	3	1	0	4	33%	1.33		
		South	4	2	1	7	58%	2.33		
		East	0	1	0	1	8%	0.33		
		West	0	0	0	0	0%	0.00		
		Unknown	0	0	0	0	0%	0.00		

3.3.3. Traffic Operation Conditions and Analysis

In order to identify the traffic operation characteristics and safety relevant conflicts, field observations at NW 17 Avenue and NW South River Drive were performed on a typical weekday on May 13, 2014. A summary of the traffic data is presented in *Figure 11*, and the field review is presented in *Figure 12*.

This intersection has left-turn lanes for north and westbound approaches only and the signal operation is protected-permissive for the northbound and permissive for westbound approach. Westbound right-turn movement was heavy mainly during the am period. This movement is controlled by a yield sign. Heavy vehicles were observed delayed and having difficulties trying to find adequate gaps to proceed north on NW 17 Avenue.

Right turn movement is prohibited for northbound traffic while left turn movement is prohibited for southbound. Eastbound traffic is limited to right or left turn only. Pedestrian crosswalks exist in east and west legs only. Pavement and marking conditions were fair at the intersection with the exception of the east leg.

This intersection handles large number of heavy vehicles and trucks for north and south traffic but mainly westbound right turns. Pedestrian activity was low during field inspection mainly along NW 17 Avenue. Speeding was observed for south and northbound. The north leg east side guard rail was damaged at the time of the field review. Deficient pavement conditions were observed.

3.3.4. Recommendations

Based on the safety analysis, field observations and traffic operations for the intersection of NW 17 Avenue and NW South River Drive, the following is recommended:

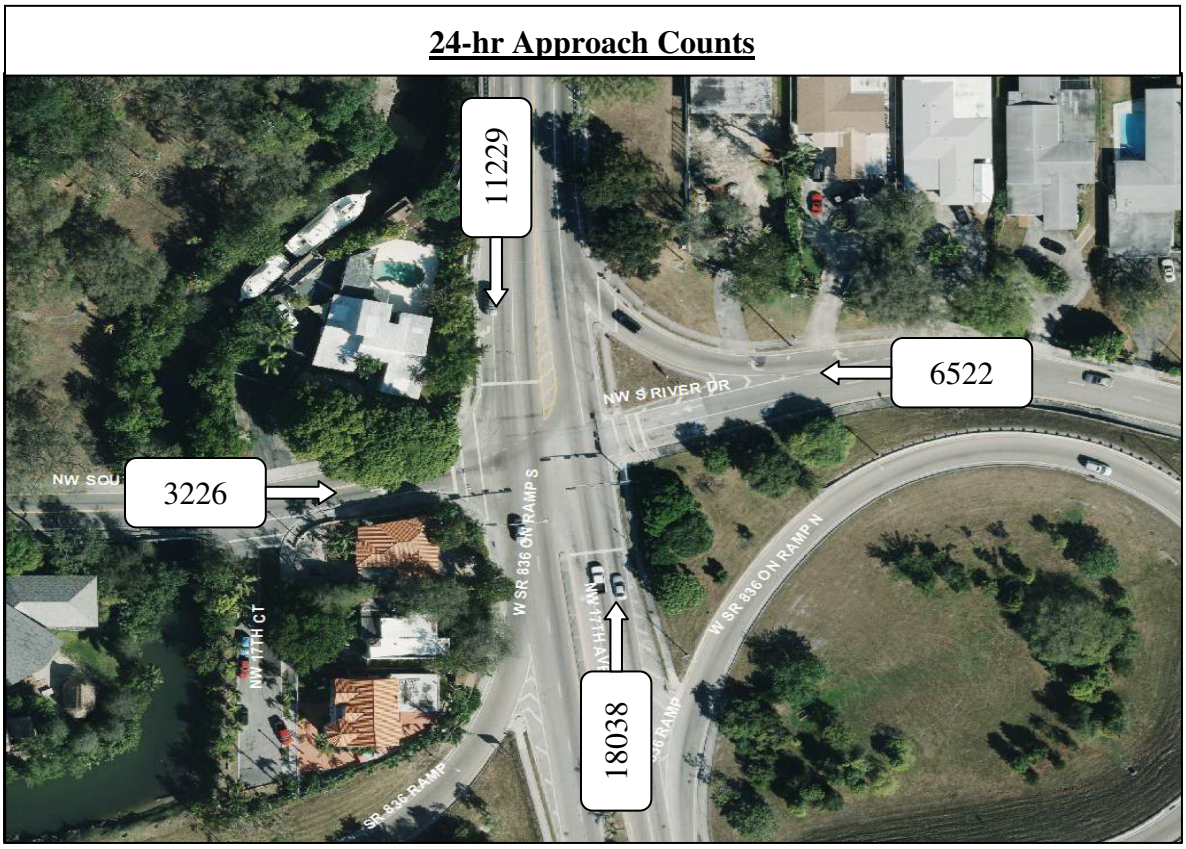
- Provide Signal Ahead warning sign for southbound traffic
- Installing reflective back plates for all signals heads
- Provide a raised median for the intersection north leg and install on it a No Left Turn sign for southbound traffic and thru arrow pavement marking for southbound outside lane
- Provide No Right Turn sign ground mounted for northbound traffic and thru arrow pavement marking for northbound inside lane
- Provide lane distribution sign and arrow (left and right) pavement marking arrow for eastbound traffic
- Provide street lights at the intersection and all approaches
- Provide solar powered speed limit feedback signs on NW 17 Avenue for south and northbound traffic.
- Resurfacing the intersection and refurbishing of pavement markings using thermoplastic painting.

A conceptual vision of the proposed roadway improvements is exhibited in *Figure 13.*

3.3.5. Cost Estimate

Based on the recommended improvements and the Conceptual Plan, the estimated cost for this project is approximately $122,532. The details of the preliminary project costs are presented in *Appendix D*.

Construction costs were obtained from items cost on the latest pay item Average Unit Cost Report for the Area 13 (Miami-Dade County), and the Miami-Dade Traffic Signal Division price list.



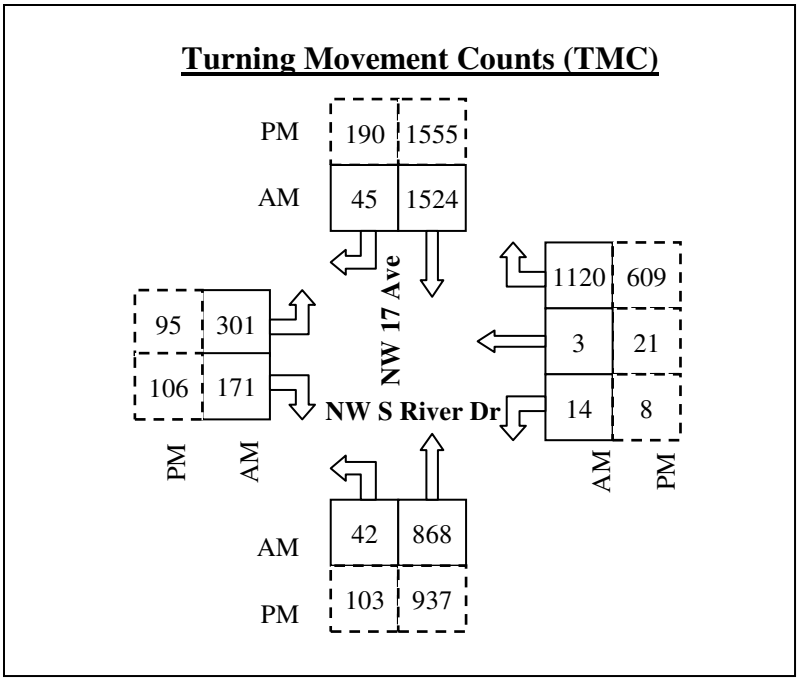


Figure 11: Traffic Data – NW 17 Avenue and NW South River Drive

Northbound/Southbound: Cars were observed speeding.

East leg: Westbound direction only.

Westbound approach: High demand of heavy vehicles turning right.

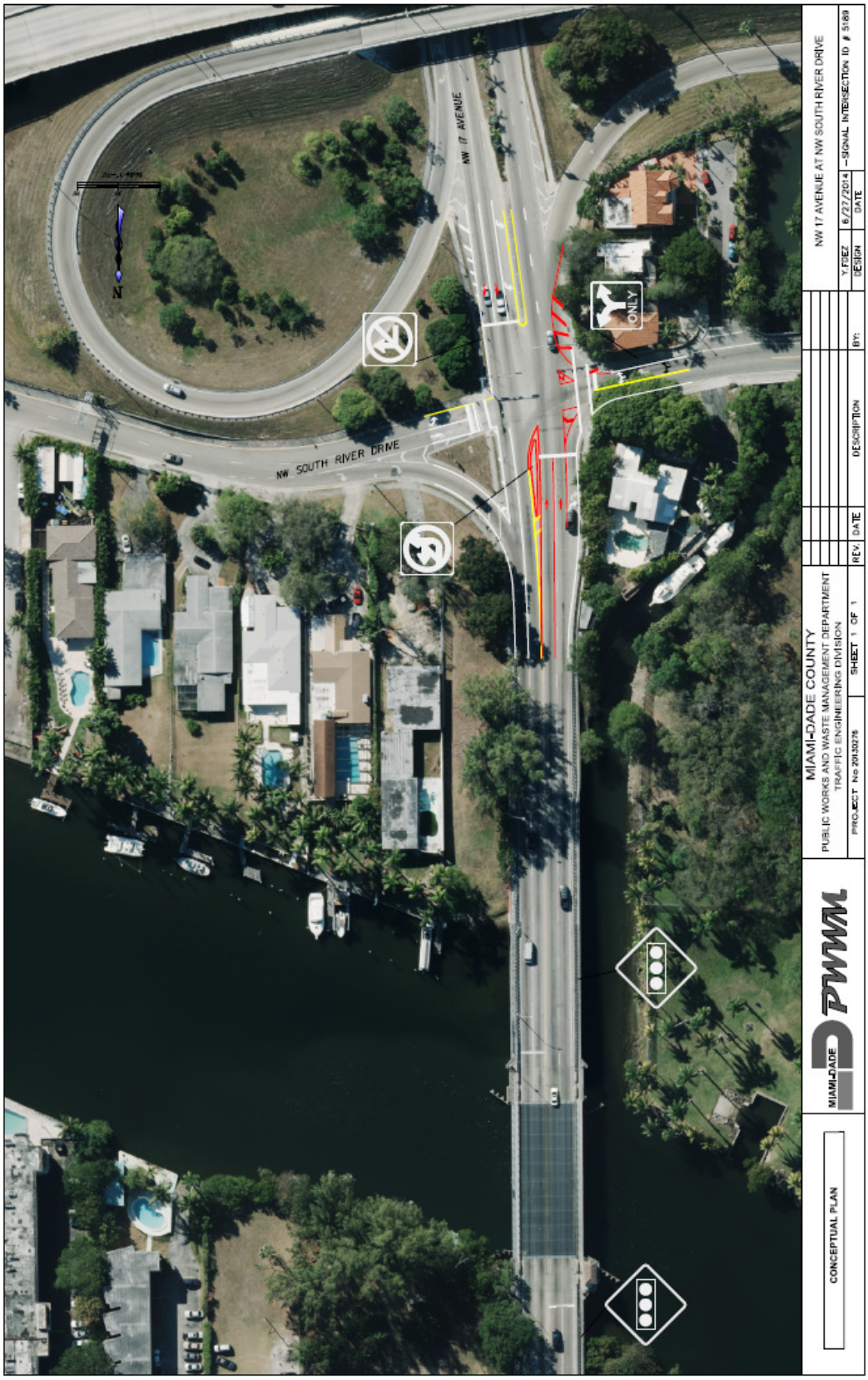
North leg: Painted median.

Damaged guardrail

Deficient pavement conditions.

Figure 12: Field Review – *NW 17 Avenue and NW South River Drive*

Figure 13: Conceptual Plan – *NW 17 Avenue and NW South River Drive*



3.4. NE 1 Avenue and NE 6 Street

3.4.1. Site Description

This intersection is a signalized four legged intersection located in the City of Miami. NE 1 Avenue is a one-way northbound three lane urban collector with that runs north-south, and NE 6 Street is a one-way westbound three lane urban collector that runs east-west.

3.4.2. Safety Conditions and Analysis

The intersection of NE 1 Avenue and NE 6 Street is ranked number 4 in our high crash locations list. A review of the hard copy police reports for the years 2011 through 2013 was performed. During the three-year analysis period, 85 relevant crashes occurred at the intersection. The analysis indicated that the average number of crashes per year is 28. The crash summaries, crash statistics and collision diagrams for the intersection are documented in *Appendix A*.

Based on the analysis of crash records for this intersection, the predominant types of crashes are shown in *Figure 14*.

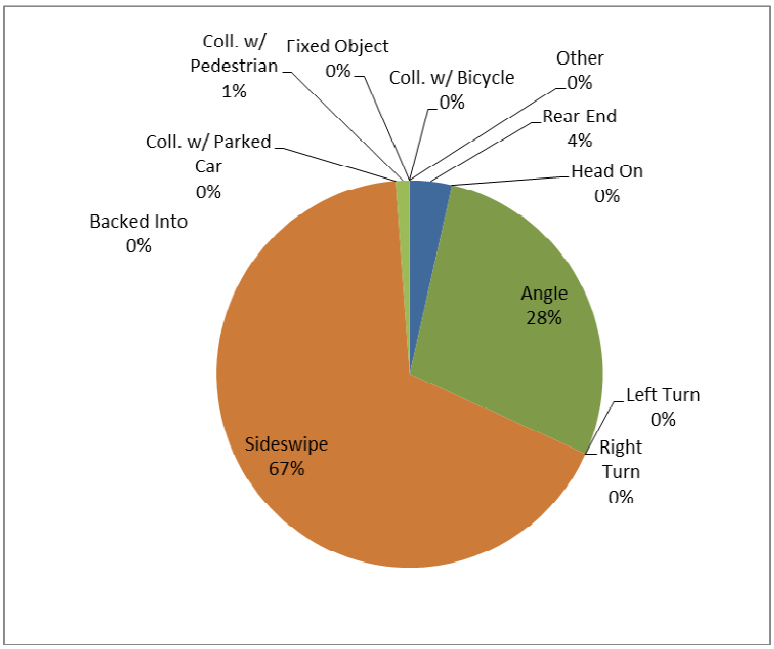


Figure 14 Predominant Crash Types
NE 1 AVE & NE 6 ST

Calculated intersection mean crash per year were compared to the average Miami-Dade Crash Rate for County corridors to assess the safety conditions at the study intersection in relation to other roadways with similar traffic and geometric characteristics. This study is based on the 2007 FDOT's "Expected Value Analysis." *Table 11* illustrates the expected accident volume analysis of this intersection as well as the safety ratios and the confidence levels during the analysis period.

Based on a regression growth of 8% from the 2014 entering volume, the calculated safety ratios for the years 2011, 2012, and 2013 were 2.165, 1.852, and 1.446, respectively. The safety ratio for the three years averaged 1.821. Also, results of confidence level indicated that this intersection has been a high crash location during the three years with a confidence level higher than 99.95%.

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Table 11 – Crash Analysis – NE 1 Avenue and NE 6 Street

NE 1 Avenue & NE 6 Street

(4 Lane x 4 Lane, Signalized, With Turn Lanes, 4 Leg Intersection -Table 28) - URBAN Spot

	TYPE OF CRASH	NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	EXPECTED ANNUAL CRASH VALUE			ABNORMALLY HIGH CRASHES		
		2011	2012	2013				MEAN	90th Percentile	95th Percentile	Mean	90th Percentil	95th Percentil
COLLISION TYPE	Rear End	2	0	1	3	4%	1.00	5.70	16.96	19.12			
	Head On	0	0	0	0	0%	0.00	0.33	1.02	1.15			
	Angle	8	9	7	24	28%	8.00	3.05	7.08	7.85	X	X	X
	Left Turn	0	0	0	0	0%	0.00	1.67	4.02	4.47			
	Right Turn	0	0	0	0	0%	0.00	0.33	1.25	1.42			
	Sideswipe	22	20	15	57	67%	19.00	1.60	4.64	5.22	X	X	X
	Backed Into	0	0	0	0	0%	0.00	0.17	0.56	0.63			
	Coll. w/ Parked Car	0	0	0	0	0%	0.00	0.10	0.51	0.59			
	Coll. w/ Pedestrian	0	0	1	1	1%	0.33	0.28	1.04	1.19	X		
	Coll. w/ Bicycle	0	0	0	0	0%	0.00	0.09	0.33	0.38			
	Fixed Object	0	0	0	0	0%	0.00	0.03	0.21	0.24			
	Ran Off Road	0	0	0	0	0%	0.00	0.00	0.00	0.00			
	Overtuned	0	0	0	0	0%	0.00	0.03	0.21	0.24			
	Other	0	0	0	0	0%	0.00	3.70	8.83	9.82			
	Total Crashes	32	29	24	85	100%	28.33	17.77	40.96	45.39	X		
SEVERITY	PDO crashes	25	25	22	72	85%	24.00	9.93	22.30	24.67	X	X	
	Fatal crashes	0	0	0	0	0%	0.00	0.05	0.26	0.29			
	Injury crashes	7	4	2	13	15%	4.33	13.14	33.08	36.90			
LIGHT CONDITIONS	Day Light	23	22	17	62	73%	20.67	12.40	29.18	32.39	X		
	Dusk	1	1	0	2	2%	0.67	0.28	0.87	0.98	X		
	Dawn	0	0	0	0	0%	0.00	0.17	0.56	0.63			
	Dark	8	6	7	21	25%	7.00	4.56	10.53	11.68	X		
	Unknown	0	0	0	0	0%	0.00	0.35	1.05	1.18			
SURFACE CONDITIONS	Dry	32	27	22	81	95%	27.00	15.30	34.45	38.12	X		
	Wet	0	2	2	4	5%	1.33	2.10	6.02	6.76			
	Others	0	0	0	0	0%	0.00	0.37	1.10	1.24			
MONTH OF A YEAR	January	1	2	1	4	5%	1.33	1.42	3.33	3.69			
	February	3	4	1	8	9%	2.67	1.42	3.53	3.93	X		
	March	4	2	1	7	8%	2.33	1.67	4.12	4.59	X		
	April	2	5	1	8	9%	2.67	1.30	3.21	3.57	X		
	May	5	2	2	9	11%	3.00	1.74	4.46	4.99	X		
	June	4	5	1	10	12%	3.33	1.38	3.49	3.90	X		
	July	1	2	3	6	7%	2.00	1.35	3.22	3.58	X		
	August	2	0	2	4	5%	1.33	1.56	3.99	4.46			
	September	2	1	4	7	8%	2.33	1.46	3.73	4.16	X		
	October	1	1	2	4	5%	1.33	1.47	3.59	4.00			
	November	4	4	1	9	11%	3.00	1.39	3.53	3.94	X		
	December	3	1	5	9	11%	3.00	1.61	4.43	4.97	X		
DAY OF THE WEEK	Sunday	4	5	6	15	18%	5.00	2.70	6.42	7.13	X		
	Monday	5	1	4	10	12%	3.33	2.49	6.18	6.88	X		
	Tuesday	3	3	1	7	8%	2.33	2.56	5.84	6.47			
	Wednesday	5	5	2	12	14%	4.00	2.88	7.20	8.03	X		
	Thursday	5	6	2	13	15%	4.33	3.07	7.50	8.35	X		
	Friday	6	5	8	19	22%	6.33	2.61	6.40	7.13	X		
	Saturday	4	4	1	9	11%	3.00	1.46	3.47	3.85	X		
HOUR OF THE DAY	00:00-06:00	4	2	5	11	13%	3.67	1.70	3.39	3.71	X	X	
	06:00-09:00	1	0	3	4	5%	1.33	1.98	5.12	5.72			
	09:00-11:00	4	4	2	10	12%	3.33	1.72	4.23	4.71	X		
	11:00-13:00	4	0	4	8	9%	2.67	2.40	6.30	7.05	X		
	13:00-15:00	5	12	6	23	27%	7.67	1.95	5.32	5.96	X	X	X
	15:00-18:00	8	6	3	17	20%	5.67	3.58	7.81	8.62	X		
	18:00-24:00	6	5	1	12	14%	4.00	4.42	10.63	11.82			

	YEAR			3-Year Average
	1	2	3	
Average Daily Traffic ADT *(Vehicles per Day)*	15,817	17,193	18,688	17,233
Florida Average Crash rate *(Crashes per Million Entering Vehicles)*	1.062	1.062	1.062	1.062
Traffic Base	5.773	6.275	6.821	6.290
Actual Crash Rate *(Crashes per Million Entering Vehicles)*	5.543	4.621	3.518	4.561
Critical Crash Rate *(Crashes per Million Entering Vehicles)*	2.560	2.495	2.433	2.496
Safety Ratio	**2.165**	**1.852**	**1.446**	**1.821**
High Crash Location??	***YES***	***YES***	***YES***	***YES***

$$Actual\ \ Crash\ \ Rate\ \ =\ \ \frac{A \times 1{,}000{,}000}{V}$$

Where:
A = Total number of crashes or number of crashes by type occurring in a 1 year period.
V = Average Annual Daily Traffic X 365

$$CriticalCrashRate = AVR + \frac{0.5}{TB} + TF\sqrt{\frac{AVR}{TB}}$$

Where:
AVR = Average Statewide Crash Rate for a particular type of intersection or roadway segment.
TB = Traffic Base
TF = Test Factor (z-value)
= *1.96 (assume 95% Confidence Level for RURAL areas)*
= *3.29 (assume 99.95% Confidence Level for URBAN areas)*

$$Traffic\ Base = \frac{Years \times ADT \times 365}{1{,}000{,}000}$$

$$Safety\ \ Ratio\ \ =\ \ \frac{Actual\ \ Crash\ \ Rate}{Critical\ \ Crash\ \ Rate}$$

Confidence Level (%)	Constant Z
68.30	1.00
86.60	1.50
90.00	1.64
95.00	1.96
95.50	2.00
98.80	2.50
99.00	2.58
99.70	3.00
99.95	3.29

From this analysis, it was determined that angle and sideswipe collisions presented abnormal crash patterns that exceed the threshold limits for the 95th percentile and 90th percentile confidence level. Those results indicate that these types of collisions were abnormally high during the period of 2011 through 2013. A detailed review of the abnormal crashes as well as probable countermeasures is presented in *Table 12*.

Table 12 – Abnormal Crash Details & Countermeasures
NE 1 Avenue and NE 6 Street

NE 1 Avenue & NE 6 Street (4 Lane x 4 Lane, Signalized, With Turn Lanes, 4 Leg Intersection -Table 28) - URBAN Spot			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHE	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Angle	Total Angle Crashes		8	9	7	24	100%	8.00	(1)	2
	Lighting Conditions	Day Light	4	7	2	13	54%	4.33	(3)	7
		Dawn	0	0	0	0	0%	0.00	(7)	
		Dark	4	2	5	11	46%	3.67	(12)	
	Hours of Day	00:00 - 06:00	3	1	4	8	33%	2.67		
		06:00 - 09:00	1	0	0	1	4%	0.33		
		09:00 - 11:00	0	0	0	0	0%	0.00		
		11:00 - 13:00	0	0	1	1	4%	0.33		
		13:00 - 15:00	1	6	2	9	38%	3.00		
		15:00 - 18:00	0	2	0	2	8%	0.67		
		18:00 - 24:00	3	0	0	3	13%	1.00		
	Direction	NB + EB	2	0	0	2	8%	0.67		
		NB + WB	6	9	7	22	92%	7.33		
		SB + EB	0	0	0	0	0%	0.00		
		SB + WB	0	0	0	0	0%	0.00		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHE	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Sideswipe (Overtake)	Total Sideswipe Crashes		22	20	15	57	100%	19.00	(9)	9
	Lighting Conditions	Day Light	18	15	13	46	81%	15.33	(13)	17
		Dawn	0	0	0	0	0%	0.00		
		Dark	4	5	2	11	19%	3.67		
	Hours of Day	00:00 - 06:00	1	1	1	3	5%	1.00		
		06:00 - 09:00	0	0	2	2	4%	0.67		
		09:00 - 11:00	4	4	2	10	18%	3.33		
		11:00 - 13:00	4	0	3	7	12%	2.33		
		13:00 - 15:00	3	6	3	12	21%	4.00		
		15:00 - 18:00	7	4	3	14	25%	4.67		
		18:00 - 24:00	3	5	1	9	16%	3.00		
	Direction	North	21	20	15	56	98%	18.67		
		South	0	0	0	0	0%	0.00		
		East	1	0	0	1	2%	0.33		
		West	0	0	0	0	0%	0.00		
		Unknown	0	0	0	0	0%	0.00		

3.4.3. Traffic Operation Conditions and Analysis

In order to identify the traffic operation characteristics and safety relevant conflicts, field observations at NE 1 Avenue and NE 6 Street were performed on a typical weekday on May 15, 2014. A summary of the traffic data is presented in *Figure 15*, and the field review is presented in *Figure 16*.

The westbound approach has one share right/thru lane and two thru lanes, while the northbound approach has one shared left/thru and two thru lanes. Obstructions to the sight distance exist at all corners; however, southeast corner is critical due to the unique characteristics of the intersection (one-way west and northbound). On-street parking exists at

the south leg on the west side of NE 1 Avenue and at west leg north side of NE 6 Street. A railroad crossing is located at approximately 150 feet north of the intersection.

Moderate pedestrian and bicycles activity takes place all day long. Crosswalks and push buttons are provided for all directions except on the north leg where pedestrian crossing is prohibited due to the high westbound right turn demand of heavy vehicles coming from the port of Miami going to the 836 Expressway and I-95 Interstate. ADA ramps are provided for all directions including the north leg where crossing is prohibited. However, no ADA ramps exist on the south leg.

The pavement is in substandard conditions and pavement markings are faded mainly caused by the high demand of heavy vehicles. Such demand is expected to decrease considerably once the tunnel connecting Watson Island with Dodge Island opens to the public. The opening of the tunnel is expected for the summer of this year.

3.4.4. Recommendations

Based on the safety analysis, field observations and traffic operations for the intersection of NE 1 Avenue and NE 6 Street, the following is recommended:

- Provide ADA ramps for south leg.
- Remove ADA ramps to cross NE 1 Avenue at north leg.
- Installing reflective back plates for all signals heads.
- Retiming/optimizing of the existing signal while maintaining cycle length for both the AM and PM peak hours pursuing to extend clearance timing for both directions.
- Provide “No Right Turn On Red” sign for westbound traffic.
- Provide guideline for the westbound double right-turn lanes.
- Resurfacing the intersection and refurbishing of pavement markings using thermoplastic painting.

A conceptual vision of the proposed roadway improvements is exhibited in *Figure 17*.

3.4.5. Cost Estimate

Based on the recommended improvements and the Conceptual Plan, the estimated cost for this project is approximately $39,337. The details of the preliminary project costs are presented in *Appendix D*.

Construction costs were obtained from items cost on the latest pay item Average Unit Cost Report for the Area 13 (Miami-Dade County), and the Miami-Dade Traffic Signal Division price list.

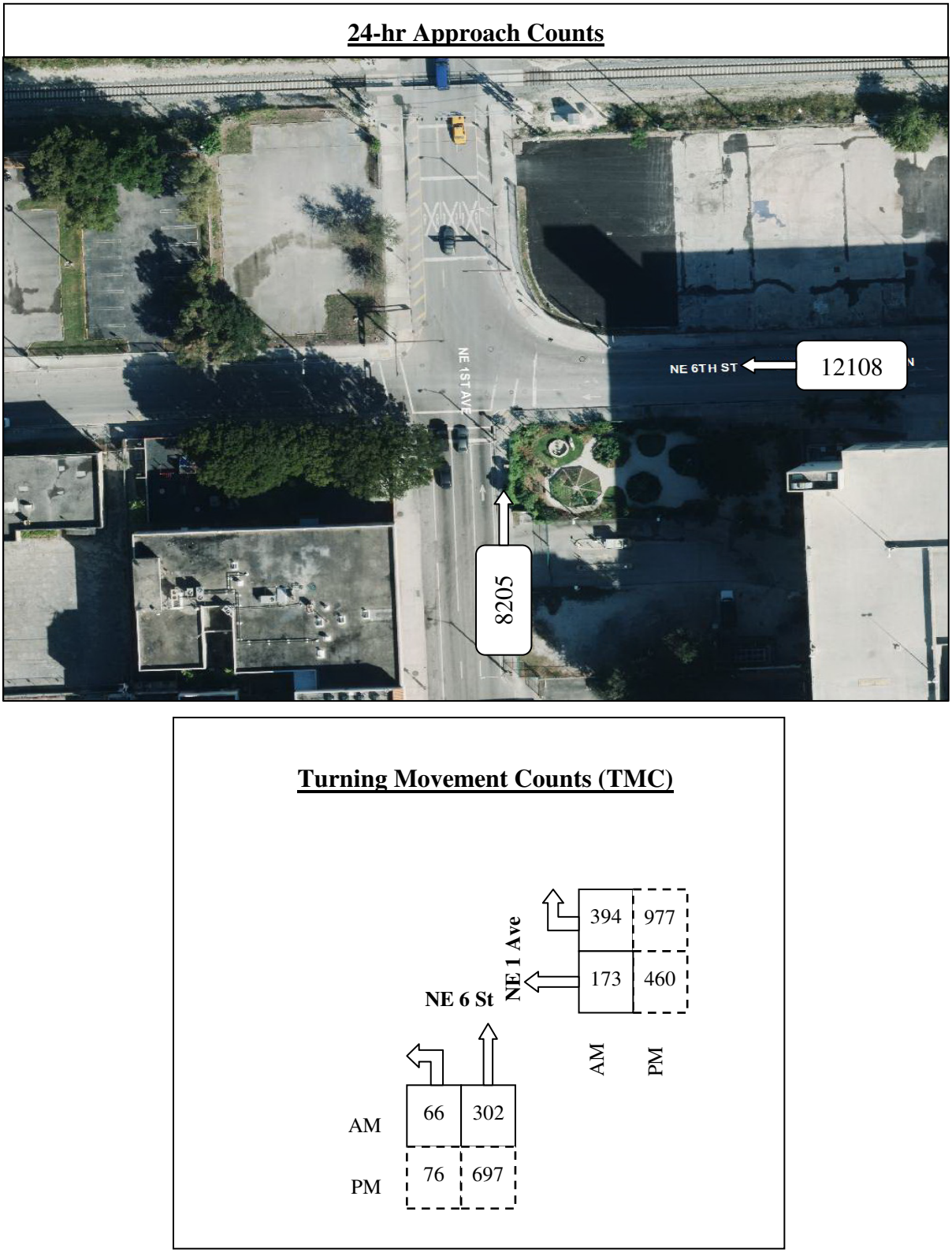


Figure 15: Traffic Data – *NE 1 Avenue and NE 6 Street*

Westbound approach

Northbound approach

On street parking on west side on NE 1 Avenue.

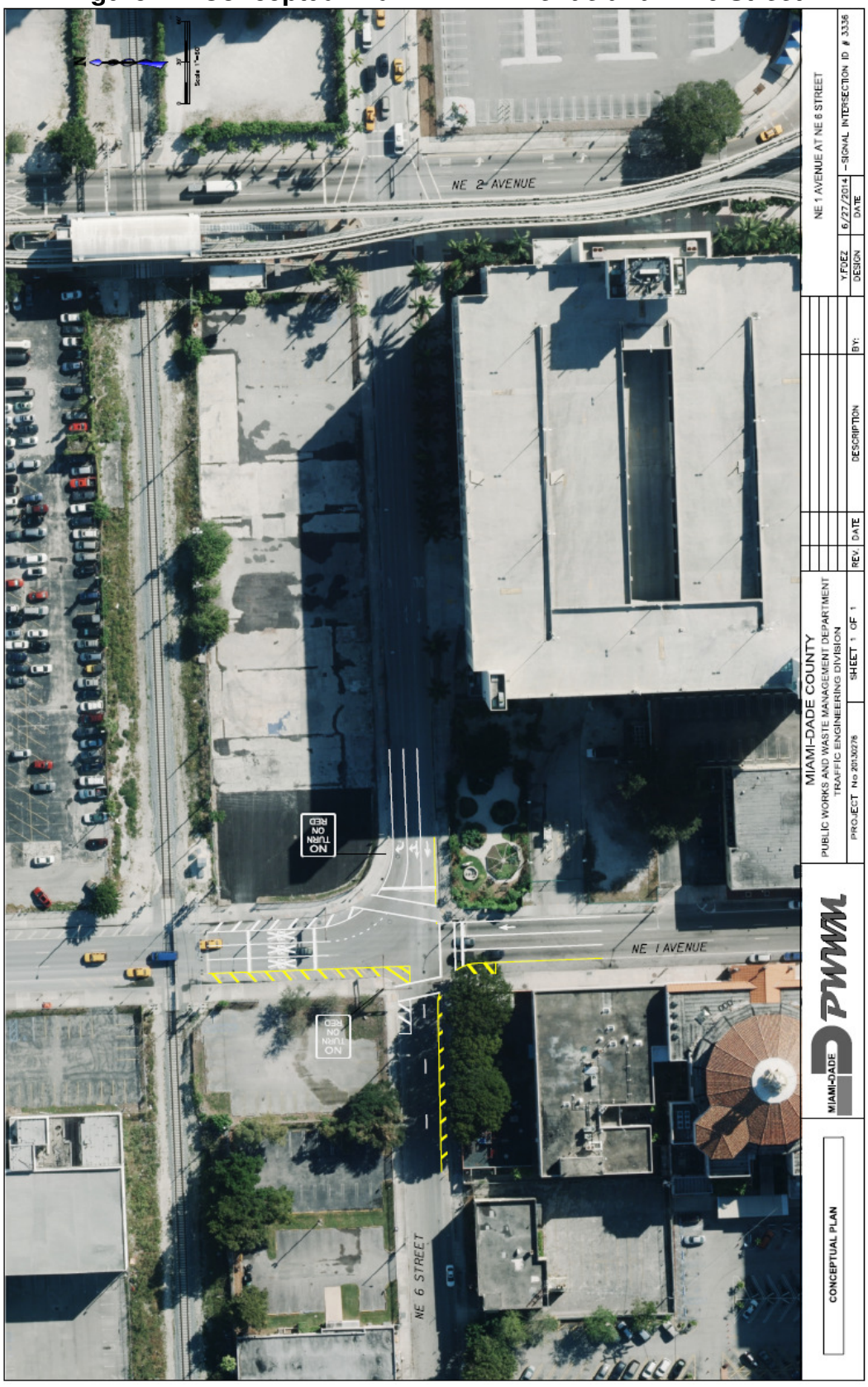
On-street parking on north side of NE 5 Street

South leg: Crosswalk.

North leg: There is no crosswalk.

Figure 16: Field Review – *NE 1 Avenue and NE 6 Street*

Figure 17: Conceptual Plan – *NE 1 Avenue and NE 6 Street*



3.5. NW 87 Avenue and NW 36 Street

3.5.1. Site Description

This intersection is a signalized four legged intersection located within the City of Doral in the Northwest area of Miami Dade County. NW 87 Avenue is a six lane divided urban arterial that runs north-south. At the intersection with NW 36 Street, 87 avenue gains two additional lanes that serve as exclusive left turn lanes. NW 36 Street is a six lane divided urban arterial that runs east-west. At the intersection with NW 87 Avenue, 36 Street gains two additional lanes that serve as exclusive left turn lanes.

3.5.2. Safety Conditions and Analysis

The intersection of NW 87 Avenue and NW 36 Street is ranked number 5 in our high crash locations list. A review of the hard copy police reports for the years 2011 through 2013 was performed. During the three-year analysis period 100 relevant crashes occurred at the intersection. The analysis indicated that the average number of crashes per year is 33. The crash summaries, crash statistics and collision diagrams for the intersection are documented in *Appendix A*.

Based on the analysis of crash records for this intersection, the predominant types of crashes are shown in *Figure 18.*

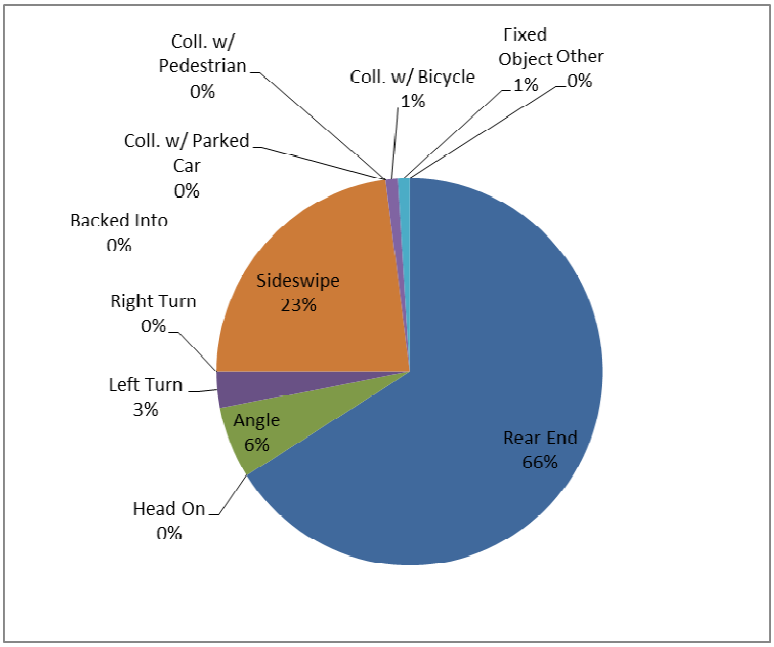


Figure 18 Predominant Crash Types
NW 87 AVE & NW 36 ST

Calculated intersection mean crash per year were compared to the average Miami-Dade Crash Rate for County corridors to assess the safety conditions at the study intersection in relation to other roadways with similar traffic and geometric characteristics. This study is based on the 2007 FDOT's "Expected Value Analysis." *Table 13* illustrates the expected accident volume analysis of this intersection as well as the safety ratios and the confidence levels during the analysis period.

Based on a regression growth of 8% from the 2014 entering volume, the calculated safety ratios for the years 2011, 2012, and 2013 were 1.227, 1.525, and 1.356, respectively. The safety ratio for the three years averaged 1.369. Also, results of confidence level indicated that this intersection has been a high crash location during the three years with a confidence level higher than 99.95%.

Table 13 – Crash Analysis – NW 87 Avenue and NW 36 Street

NW 87 Avenue & NW 36 Street

(6 Lane x 6 Lane, Signalized, With Turn Lanes, 4 Leg Intersection - Table 36) - URBAN Spot

	TYPE OF CRASH	NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	EXPECTED ANNUAL CRASH VALUE			ABNORMALLY HIGH CRASHES		
		2011	2012	2013				MEAN	90th Percentile	95th Percentile	Mean	90th Percentil	95th Percentil
COLLISION TYPE	Rear End	23	24	19	66	66%	22.00	7.80	17.12	18.90	X	X	X
	Head On	0	0	0	0	0%	0.00	0.31	0.91	1.03			
	Angle	0	1	5	6	6%	2.00	4.11	8.06	8.82			
	Left Turn	0	1	2	3	3%	1.00	3.20	6.52	7.16			
	Right Turn	0	0	0	0	0%	0.00	0.87	1.88	2.07			
	Sideswipe	4	10	9	23	23%	7.67	2.98	6.83	7.57	X	X	X
	Backed Into	0	0	0	0	0%	0.00	0.44	1.26	1.42			
	Coll. w/ Parked Car	0	0	0	0	0%	0.00	0.09	0.41	0.48			
	Coll. w/ Pedestrian	0	0	0	0	0%	0.00	0.44	1.34	1.51			
	Coll. w/ Bicycle	0	1	0	1	1%	0.33	0.22	0.67	0.76	X		
	Fixed Object	1	0	0	1	1%	0.33	0.62	1.52	1.69			
	Ran Off Road	0	0	0	0	0%	0.00	0.00	0.00	0.00			
	Overtuned	0	0	0	0	0%	0.00	0.07	0.29	0.34			
	Other	0	0	0	0	0%	0.00	5.09	11.59	12.84			
	Total Crashes	28	37	35	100	100%	33.33	26.24	47.45	51.51	X		
SEVERITY	PDO crashes	28	35	33	96	96%	32.00	14.33	26.64	28.99	X	X	X
	Fatal crashes	0	0	0	0	0%	0.00	0.20	0.85	0.97			
	Injury crashes	0	2	2	4	4%	1.33	19.22	40.94	45.10			
LIGHT CONDITIONS	Day Light	20	32	28	80	80%	26.67	17.36	32.17	35.01	X		
	Dusk	0	1	0	1	1%	0.33	0.64	1.46	1.62			
	Dawn	1	0	0	1	1%	0.33	0.18	0.59	0.66	X		
	Dark	7	4	7	18	18%	6.00	7.36	15.05	16.53			
	Unknown	0	0	0	0	0%	0.00	0.09	0.47	0.55			
SURFACE CONDITIONS	Dry	25	32	31	88	88%	29.33	22.04	41.61	45.35	X		
	Wet	3	5	4	12	12%	4.00	3.22	6.25	6.83	X		
	Others	0	0	0	0	0%	0.00	0.36	0.96	1.07			
MONTH OF A YEAR	January	2	2	1	5	5%	1.67	2.49	4.66	5.08			
	February	1	3	0	4	4%	1.33	1.91	4.01	4.41			
	March	3	4	5	12	12%	4.00	2.33	5.43	6.02	X		
	April	5	4	1	10	10%	3.33	1.89	4.46	4.95	X		
	May	0	3	3	6	6%	2.00	2.16	4.04	4.40			
	June	2	1	5	8	8%	2.67	1.93	4.00	4.39	X		
	July	4	3	2	9	9%	3.00	2.38	5.17	5.70	X		
	August	3	3	4	10	10%	3.33	2.51	4.97	5.44	X		
	September	1	5	4	10	10%	3.33	1.60	3.13	3.42	X	X	
	October	2	3	5	10	10%	3.33	2.13	4.00	4.35	X		
	November	1	1	4	6	6%	2.00	1.98	4.35	4.81	X		
	December	4	5	1	10	10%	3.33	2.31	4.78	5.26	X		
DAY OF THE WEEK	Sunday	1	1	3	5	5%	1.67	3.60	7.06	7.73			
	Monday	5	8	4	17	17%	5.67	3.42	6.95	7.63	X		
	Tuesday	3	6	8	17	17%	5.67	3.71	6.93	7.54	X		
	Wednesday	7	3	5	15	15%	5.00	4.02	7.66	8.35	X		
	Thursday	4	8	3	15	15%	5.00	4.36	8.22	8.97	X		
	Friday	7	9	8	24	24%	8.00	4.16	8.40	9.21	X		
	Saturday	1	2	4	7	7%	2.33	2.36	5.17	5.71			
HOUR OF THE DAY	00:00-06:00	1	1	2	4	4%	1.33	2.20	4.63	5.10			
	06:00-09:00	4	4	6	14	14%	4.67	3.64	7.22	7.91	X		
	09:00-11:00	2	5	1	8	8%	2.67	2.04	4.45	4.91	X		
	11:00-13:00	3	7	2	12	12%	4.00	2.56	5.59	6.17	X		
	13:00-15:00	4	3	8	15	15%	5.00	3.38	6.82	7.48	X		
	15:00-18:00	3	10	7	20	20%	6.67	5.09	9.37	10.19	X		
	18:00-24:00	11	7	9	27	27%	9.00	6.71	13.41	14.69	X		

	YEAR			3-Year Average
	1	2	3	
Average Daily Traffic ADT *(Vehicles per Day)*	53,697	58,366	63,441	58,501
Florida Average Crash rate *(Crashes per Million Entering Vehicles)*	0.575	0.575	0.575	0.575
Traffic Base	19.599	21.304	23.156	21.353
Actual Crash Rate *(Crashes per Million Entering Vehicles)*	1.429	1.737	1.511	1.559
Critical Crash Rate *(Crashes per Million Entering Vehicles)*	1.164	1.139	1.115	1.139
Safety Ratio	**1.227**	**1.525**	**1.356**	**1.369**
High Crash Location??	***YES***	***YES***	***YES***	***YES***

$$Actual\ \ Crash\ \ Rate\ = \frac{A \times 1{,}000{,}000}{V}$$

Where:
A = Total number of crashes or number of crashes by type occurring in a 1 year period.
V = Average Annual Daily Traffic X 365

$$CriticalCrashRate = AVR + \frac{0.5}{TB} + TF\sqrt{\frac{AVR}{TB}}$$

Where:
AVR = Average Statewide Crash Rate for a particular type of intersection or roadway segment.
TB = Traffic Base
TF = Test Factor (z-value)
= 1.96 (assume 95% Confidence Level for RURAL areas)
= 3.29 (assume 99.95% Confidence Level for URBAN areas)

$$Traffic\,Base = \frac{Years \times ADT \times 365}{1{,}000{,}000}$$

$$Safety\ \ Ratio\ = \frac{Actual\ \ Crash\ \ Rate}{Critical\ \ Crash\ \ Rate}$$

Confidence Level (%)	Constant Z
68.30	1.00
86.60	1.50
90.00	1.64
95.00	1.96
95.50	2.00
98.80	2.50
99.00	2.58
99.70	3.00
99.95	3.29

From this analysis, it was determined that rear end and sideswipe collisions presented abnormal crash patterns that exceed the threshold limits for the 95th percentile and 90th percentile confidence level. Those results indicate that these types of collisions were abnormally high during the period of 2011 through 2013. A detailed review of the abnormal crashes as well as probable countermeasures is presented in *Table 14*.

Table 14 – Abnormal Crash Details & Countermeasures NW 87 Avenue and NW 36 Street

NW 87 Avenue & NW 36 Street

(6 Lane x 6 Lane, Signalized, With Turn Lanes, 4 Leg Intersection - Table 36) - URBAN Spot

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Rear End	Total Rear End Crashes		**23**	**24**	**19**	**66**	**100%**	**22.00**	(1)	5
	Lighting Conditions	Day Light	16	21	15	52	79%	17.33	(7)	8
		Dawn	0	0	0	0	0%	0.00	(8)	10
		Dark	7	3	4	14	21%	4.67	(21)	11
	Hours of Day	00:00 - 06:00	1	1	0	2	3%	0.67		19
		06:00 - 09:00	3	2	3	8	12%	2.67		21
		09:00 - 11:00	1	4	1	6	9%	2.00		
		11:00 - 13:00	3	2	0	5	8%	1.67		
		13:00 - 15:00	4	3	5	12	18%	4.00		
		15:00 - 18:00	1	8	4	13	20%	4.33		
		18:00 - 24:00	10	4	6	20	30%	6.67		
	Direction	North	4	5	7	16	24%	5.33		
		South	1	1	2	4	6%	1.33		
		East	10	10	7	27	41%	9.00		
		West	8	8	3	19	29%	6.33		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Sideswipe (Overtake)	Total Sideswipe Crashes		**4**	**10**	**9**	**23**	**100%**	**7.67**	(8)	8
	Lighting Conditions	Day Light	3	10	8	21	91%	7.00	(19)	21
		Dawn	0	0	0	0	0%	0.00		
		Dark	1	0	1	2	9%	0.67		
	Hours of Day	00:00 - 06:00	0	0	0	0	0%	0.00		
		06:00 - 09:00	1	2	2	5	22%	1.67		
		09:00 - 11:00	1	0	0	1	4%	0.33		
		11:00 - 13:00	0	4	2	6	26%	2.00		
		13:00 - 15:00	0	0	2	2	9%	0.67		
		15:00 - 18:00	1	2	1	4	17%	1.33		
		18:00 - 24:00	1	2	2	5	22%	1.67		
	Direction	North	2	4	1	7	30%	2.33		
		South	0	2	1	3	13%	1.00		
		East	1	2	2	5	22%	1.67		
		West	1	2	5	8	35%	2.67		
		Unknown	0	0	0	0	0%	0.00		

3.5.3. Traffic Operation Conditions and Analysis

In order to identify the traffic operation characteristics and safety relevant conflicts, field observations at NW 87 Avenue at NW 36 Street were performed on a typical weekday on June 3, 2014. A summary of the traffic data is presented in *Figure 19*, and the field review is presented in *Figure 20*.

This intersection has double left-turn bays for all approaches. The signal operation is protected for all approaches left-turn traffic. The intersection is mast arm with standard overhead illuminated street signs. Red light cameras are present on east, west and south legs.

Large trucks use the intersection, and there is a "No Trucks" sign facing westbound traffic on NW 36th Street. There is a "No Stopping or Standing" Sign signs on the southwest corner facing eastbound traffic.

The volume of eastbound traffic observed on the afternoon peak created a long queue that accumulated up to the east leg of the intersection. As a result vehicles on the south leg northbound right-turn lane planning to head eastbound changed lanes to the adjacent thru lane I order to continue northbound and avoid the backup. Some driveways in the vicinity of the intersection are allowed to perform left turn movements.

The intersection has pavement markings for all crosswalks but pedestrian signals do not exist. Several pedestrians were observed using the crossings at the time of the field survey. The ramps at the northeast, northwest and southeast corners do not have detectable warning devices.

3.5.4. Recommendation

Based on the safety analysis, field observations and traffic operations for the intersection of NW 87 Avenue and NW 36 Street, the following are recommended:

- Paint median noses yellow.
- Mill and resurface and/or reconstruct pavement at intersection along with new signing and pavement markings.
- Install high visibility ladder crosswalks on all legs.
- Modify timing to provide enough time for pedestrian crossing.
- Add back plates to all signal heads.
- Provide a painted island between the exclusive right turn bay and the adjacent thru lane on the south leg to improve channelization.
- Relocate or rotate "No trucks" sign at the "American Welding Society" driveway so it's not visible to westbound vehicles traveling on NW 36 Street.
- Remove "No Stopping or Standing" sign on the southwest corner facing eastbound traffic.
- Consider posting the "Do not block intersection" sign on the mast arm.
- Reconstruct ramps to add detectable warning devices.
- Close the median opening on the west leg to improve safety operation; and extend the left-turn bay length to about 300 feet.
- Extend the westbound left-turn bay length by reducing the median width.

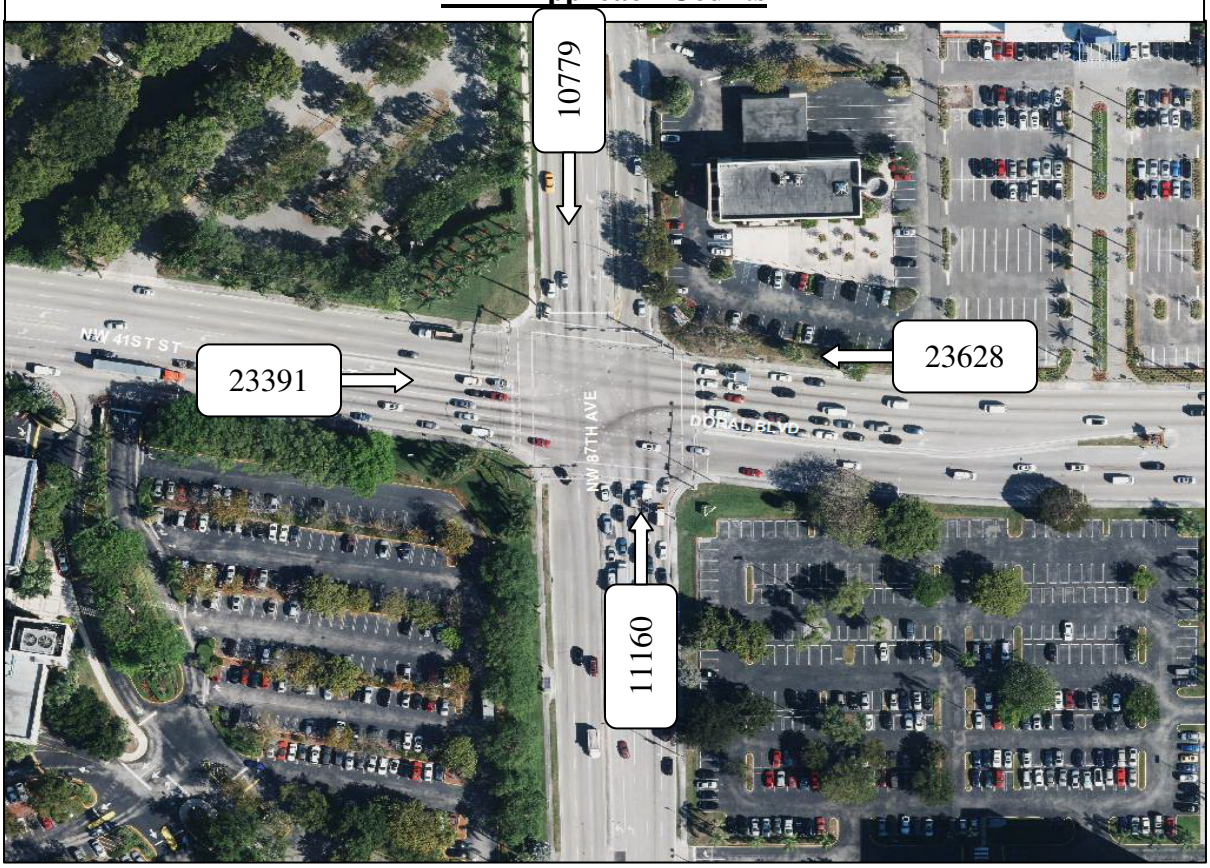
A conceptual vision of the proposed roadway improvements is exhibited in *Figure 21*.

3.5.5. Cost Estimate

Based on the recommended improvements and the Conceptual Plan, the estimated cost for this project is approximately $301,530. The details of the preliminary project costs are presented in *Appendix D*.

Construction costs were obtained from items cost on the latest pay item Average Unit Cost Report for the Area 13 (Miami-Dade County), and the Miami-Dade Traffic Signal Division price list.

24-hr Approach Counts



Turning Movement Counts (TMC)

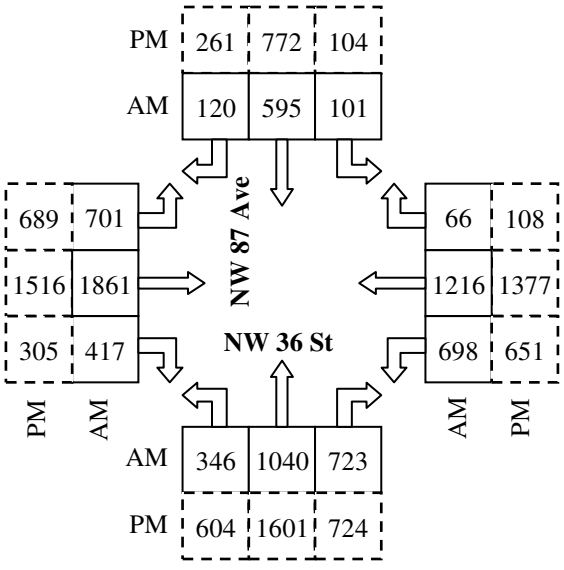


Figure 19: Traffic Data – *NW 87 Avenue and NW 36 Street*

NW 87 Ave Southbound: Deteriorated pavement.

NW 36 St Westbound: "No truck" sign facing westbound vehicles.

NW 36 St Westbound: No pedestrian signals.

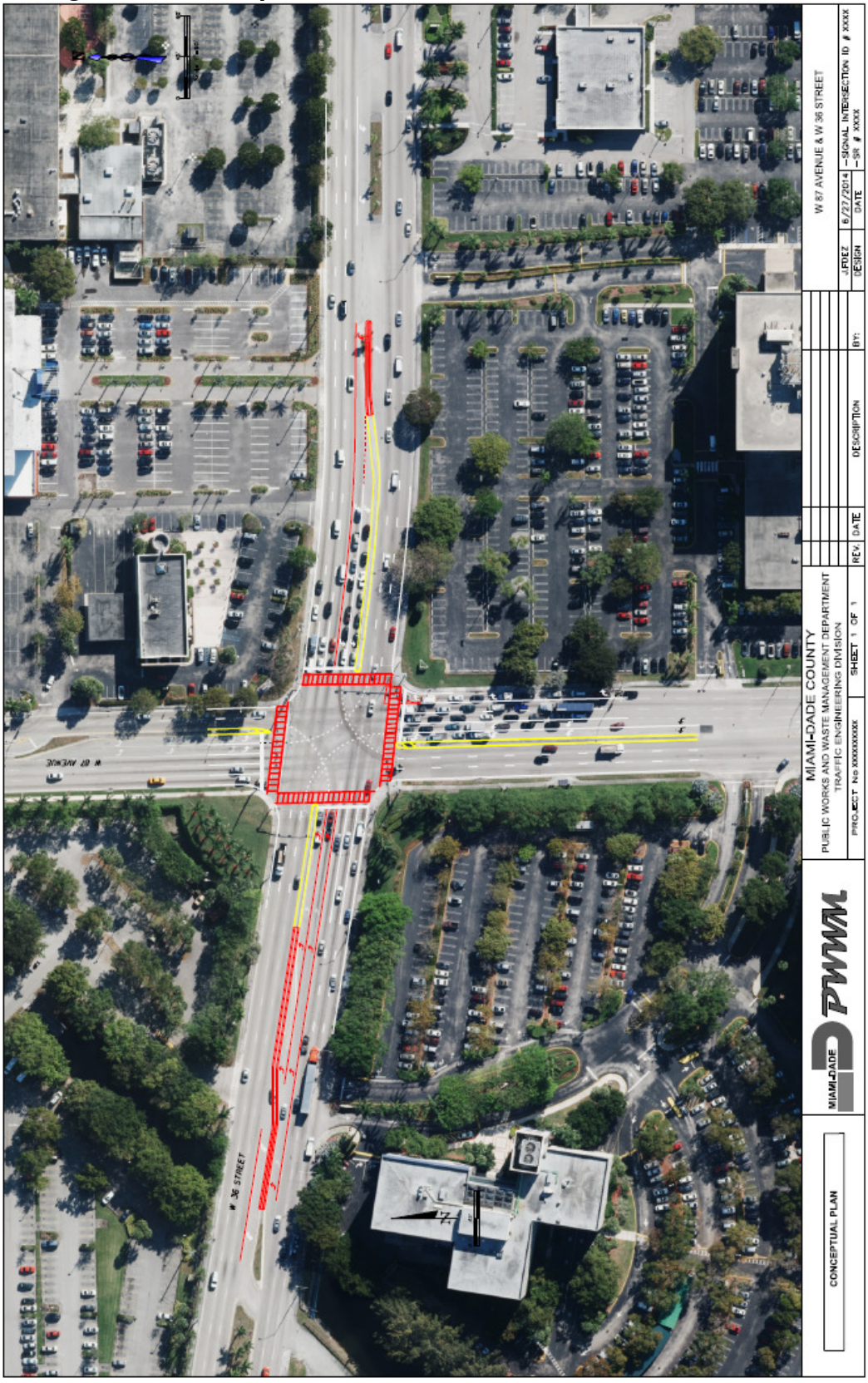
NW 36 St Eastbound: "No stopping or Standing" sign.

Queue on NW 36 St East leg

NW 36 St Eastbound: Left turn movements from driveways

Figure 20: Field Review – *NW 87 Avenue and NW 36 Street*

Figure 21: Conceptual Plan – *NW 87 Avenue and NW 36 Street*



3.6. NE 29 Place and Aventura Boulevard

3.6.1. Site Description

This intersection is a signalized four-legged intersection located within the City of Aventura in the northeast quadrant of Miami Dade County. Aventura Boulevard is a four lane urban collector divided by a raised median that runs east-west. In the area that includes the studied intersection Aventura Boulevard is contained between Biscayne Blvd and West Country Club Drive. NE 29 Place is a four lane divided local road that runs north-south from Abigail Road to NE 203 Street.

3.6.2. Safety Conditions and Analysis

The intersection of NE 29 Place and Aventura Boulevard is ranked number 6 in our high crash locations list. A review of the hard copy police reports for the year 2011 through 2013 was performed. During the three-year analysis period, 52 relevant crashes occurred at the intersection. The analysis indicated that the average number of crashes per year is 17. The crash summaries, crash statistics and collision diagrams for the intersection are documented in *Appendix A*.

Based on the analysis of crash records for this intersection, the predominant types of crashes are shown in *Figure 22.*

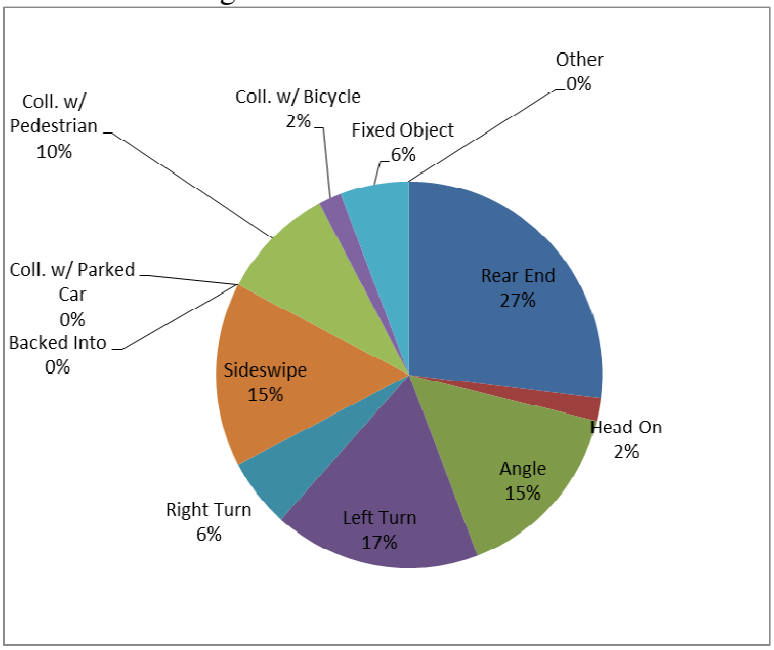


Figure 22 Predominant Crash Types
NE 29 PL & AVENTURA BLVD

Calculated intersection mean crash per year were compared to the average Miami-Dade Crash Rate for County corridors to assess the safety conditions at the study intersection in relation to other roadways with similar traffic and geometric characteristics. This study is based on the 2010 FDOT's "Expected Value Analysis." *Table 15* illustrates the expected accident volume analysis of this intersection as well as the safety ratios and the confidence levels during the analysis period.

Based on a regression growth of 8% from the 2014 entering volume, the calculated safety ratios for the years 2011, 2012, and 2013 were 1.428, 1.349, and 0.939, respectively. The safety ratio for the three years averaged 1.239. Also, results of confidence level indicated that this intersection has been a high crash location during the three years with a confidence level higher than 99.95%.

Table 15 – Crash Analysis – NE 29 Place and Aventura Boulevard

NE 29 Place & Aventura Blvd

(4 Lane x 4 Lane, Signalized, With Turn Lanes, 4 Leg Intersection - Table 28) - URBAN Spot

	TYPE OF CRASH	NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	EXPECTED ANNUAL CRASH VALUE			ABNORMALLY HIGH CRASHES		
		2011	2012	2013				MEAN	90th Percentile	95th Percentile	Mean	90th Percentil	95th Percentil
COLLISION TYPE	Rear End	3	6	5	14	27%	4.67	5.70	16.96	19.12			
	Head On	1	0	0	1	2%	0.33	0.33	1.02	1.15	X		
	Angle	2	3	3	8	15%	2.67	3.05	7.08	7.85			
	Left Turn	3	4	2	9	17%	3.00	1.67	4.02	4.47	X		
	Right Turn	1	1	1	3	6%	1.00	0.33	1.25	1.42	X		
	Sideswipe	3	3	2	8	15%	2.67	1.60	4.64	5.22	X		
	Backed Into	0	0	0	0	0%	0.00	0.17	0.56	0.63			
	Coll. w/ Parked Car	0	0	0	0	0%	0.00	0.10	0.51	0.59			
	Coll. w/ Pedestrian	3	1	1	5	10%	1.67	0.28	1.04	1.19	X	X	X
	Coll. w/ Bicycle	1	0	0	1	2%	0.33	0.09	0.33	0.38	X	X	
	Fixed Object	2	1	0	3	6%	1.00	0.03	0.21	0.24	X	X	X
	Ran Off Road	0	0	0	0	0%	0.00	0.00	0.00	0.00			
	Overtuned	0	0	0	0	0%	0.00	0.03	0.21	0.24			
	Other	0	0	0	0	0%	0.00	3.70	8.83	9.82			
	Total Crashes	19	19	14	52	100%	17.33	17.77	40.96	45.39			
SEVERITY	PDO crashes	11	14	11	36	69%	12.00	9.93	22.30	24.67	X		
	Fatal crashes	1	0	0	1	2%	0.33	0.05	0.26	0.29	X	X	X
	Injury crashes	7	5	3	15	29%	5.00	13.14	33.08	36.90			
LIGHT CONDITIONS	Day Light	11	11	11	33	63%	11.00	12.40	29.18	32.39			
	Dusk	2	0	0	2	4%	0.67	0.28	0.87	0.98	X		
	Dawn	0	1	0	1	2%	0.33	0.17	0.56	0.63	X		
	Dark	6	7	3	16	31%	5.33	4.56	10.53	11.68	X		
	Unknown	0	0	0	0	0%	0.00	0.35	1.05	1.18			
SURFACE CONDITIONS	Dry	19	13	5	37	71%	12.33	15.30	34.45	38.12			
	Wet	0	1	2	3	6%	1.00	2.10	6.02	6.76			
	Others	0	5	7	12	23%	4.00	0.37	1.10	1.24	X	X	X
MONTH OF A YEAR	January	6	0	1	7	13%	2.33	1.42	3.33	3.69	X		
	February	1	1	1	3	6%	1.00	1.42	3.53	3.93			
	March	1	2	0	3	6%	1.00	1.67	4.12	4.59			
	April	1	0	0	1	2%	0.33	1.30	3.21	3.57			
	May	2	0	0	2	4%	0.67	1.74	4.46	4.99			
	June	1	0	1	2	4%	0.67	1.38	3.49	3.90			
	July	0	2	0	2	4%	0.67	1.35	3.22	3.58			
	August	1	3	1	5	10%	1.67	1.56	3.99	4.46	X		
	September	0	1	3	4	8%	1.33	1.46	3.73	4.16			
	October	2	2	4	8	15%	2.67	1.47	3.59	4.00	X		
	November	2	4	1	7	13%	2.33	1.39	3.53	3.94	X		
	December	2	4	2	8	15%	2.67	1.61	4.43	4.97	X		
DAY OF THE WEEK	Sunday	2	2	1	5	10%	1.67	2.70	6.42	7.13			
	Monday	2	1	3	6	12%	2.00	2.49	6.18	6.88			
	Tuesday	4	3	7	14	27%	4.67	2.56	5.84	6.47	X		
	Wednesday	3	2	1	6	12%	2.00	2.88	7.20	8.03			
	Thursday	3	6	1	10	19%	3.33	3.07	7.50	8.35	X		
	Friday	1	3	0	4	8%	1.33	2.61	6.40	7.13			
	Saturday	4	2	1	7	13%	2.33	1.46	3.47	3.85	X		
HOUR OF THE DAY	00:00-06:00	5	2	3	10	19%	3.33	1.70	3.39	3.71	X		
	06:00-09:00	0	1	1	2	4%	0.67	1.98	5.12	5.72			
	09:00-11:00	1	2	3	6	12%	2.00	1.72	4.23	4.71	X		
	11:00-13:00	4	1	2	7	13%	2.33	2.40	6.30	7.05			
	13:00-15:00	3	1	1	5	10%	1.67	1.95	5.32	5.96			
	15:00-18:00	4	6	4	14	27%	4.67	3.58	7.81	8.62	X		
	18:00-24:00	2	6	0	8	15%	2.67	4.42	10.63	11.82			

	YEAR			3-Year Average
	1	2	3	
Average Daily Traffic ADT *(Vehicles per Day)*	24,210	26,315	28,604	26,376
Florida Average Crash rate *(Crashes per Million Entering Vehicles)*	0.595	0.595	0.595	0.595
Traffic Base	8.837	9.605	10.440	9.627
Actual Crash Rate *(Crashes per Million Entering Vehicles)*	2.150	1.978	1.341	1.823
Critical Crash Rate *(Crashes per Million Entering Vehicles)*	1.505	1.466	1.428	1.466
Safety Ratio	**1.428**	**1.349**	**0.939**	**1.239**
High Crash Location??	***YES***	***YES***	***NO***	***YES***

$$Actual\ \ Crash\ \ Rate\ \ =\ \ \frac{A \times 1{,}000{,}000}{V}$$

Where:
A = Total number of crashes or number of crashes by type occurring in a 1 year period.
V = Average Annual Daily Traffic X 365

$$CriticalCrashRate = AVR + \frac{0.5}{TB} + TF\sqrt{\frac{AVR}{TB}}$$

Where:
AVR = Average Statewide Crash Rate for a particular type of intersection or roadway segment.
TB = Traffic Base
TF = Test Factor (z-value)
= *1.96 (assume 95% Confidence Level for RURAL areas)*
= *3.29 (assume 99.95% Confidence Level for URBAN areas)*

$$Traffic\ Base = \frac{Years \times ADT \times 365}{1{,}000{,}000}$$

$$Safety\ \ Ratio\ \ =\ \ \frac{Actual\ \ Crash\ \ Rate}{Critical\ \ Crash\ \ Rate}$$

Confidence Level (%)	Constant Z
68.30	1.00
86.60	1.50
90.00	1.64
95.00	1.96
95.50	2.00
98.80	2.50
99.00	2.58
99.70	3.00
99.95	3.29

From this analysis, it was determined that collisions with pedestrian and fixed object collisions presented abnormal crash patterns that exceed the threshold limits for the 95th percentile and 90th percentile confidence level. Also, Collision with bicycle exceeded the 90th percentile. Those results indicate that these types of collisions were abnormally high during the period of 2011 through 2013. A detailed review of the abnormal crashes as well as probable countermeasures is presented in *Table 16*.

Table 16 – Abnormal Crash Details & Countermeasures
NE 29 Place and Aventura Boulevard

NE 29 Place & Aventura Blvd

(4 Lane x 4 Lane, Signalized, With Turn Lanes, 4 Leg Intersection - Table 28) - URBAN Spot

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Coll. w/ Pedestrian	Total Coll. w/ Pedestrian Crashes		**3**	**1**	**1**	**5**	**100%**	**1.67**	(1)	4
	Lighting Conditions	Day Light	2	0	1	3	60%	1.00	(4)	24
		Dawn	0	0	0	0	0%	0.00	(24)	
		Dark	1	1	0	2	40%	0.67		
	Hours of Day	00:00 - 06:00	0	0	0	0	0%	0.00		
		06:00 - 09:00	0	0	0	0	0%	0.00		
		09:00 - 11:00	0	0	0	0	0%	0.00		
		11:00 - 13:00	1	0	0	1	20%	0.33		
		13:00 - 15:00	1	0	0	1	20%	0.33		
		15:00 - 18:00	0	0	1	1	20%	0.33		
		18:00 - 24:00	1	1	0	2	40%	0.67		
	Direction	North	0	0	0	0	0%	0.00		
		South	0	0	0	0	0%	0.00		
		East	2	1	1	4	80%	1.33		
		West	1	0	0	1	20%	0.33		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Fixed Object	Total Coll. w/ Pedestrian Crashes		**2**	**1**	**0**	**3**	**100%**	**1.00**	(11)	17
	Lighting Conditions	Day Light	2	1	0	3	100%	1.00	(18)	19
		Dawn	0	0	0	0	0%	0.00	(20)	
		Dark	0	0	0	0	0%	0.00		
	Hours of Day	00:00 - 06:00	0	0	0	0	0%	0.00		
		06:00 - 09:00	0	0	0	0	0%	0.00		
		09:00 - 11:00	1	0	0	1	33%	0.33		
		11:00 - 13:00	0	0	0	0	0%	0.00		
		13:00 - 15:00	1	0	0	1	33%	0.33		
		15:00 - 18:00	0	1	0	1	33%	0.33		
		18:00 - 24:00	0	0	0	0	0%	0.00		
	Direction	North	0	0	0	0	0%	0.00		
		South	1	1	0	2	67%	0.67		
		East	1	0	0	1	33%	0.33		
		West	0	0	0	0	0%	0.00		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Left Turn	Total Left Turn Crashes		**3**	**4**	**2**	**9**	**100%**	**3.00**	(13)	9
	Lighting Conditions	Day Light	3	1	2	6	67%	2.00	(16)	16
		Dawn	0	0	0	0	0%	0.00		
		Dark	0	3	0	3	33%	1.00		
	Hours of Day	00:00 - 06:00	0	1	0	1	11%	0.33		
		06:00 - 09:00	0	0	0	0	0%	0.00		
		09:00 - 11:00	0	0	0	0	0%	0.00		
		11:00 - 13:00	1	0	1	2	22%	0.67		
		13:00 - 15:00	1	0	1	2	22%	0.67		
		15:00 - 18:00	1	1	0	2	22%	0.67		
		18:00 - 24:00	0	2	0	2	22%	0.67		
	Direction	NB → WB	0	0	0	0	0%	0.00		
		WB → SB	2	1	0	3	33%	1.00		
		SB → EB	0	1	2	3	33%	1.00		
		EB → NB	1	2	0	3	33%	1.00		
		Unknown	0	0	0	0	0%	0.00		

3.6.3. Traffic Operation Conditions and Analysis

In order to identify the traffic operation characteristics and safety relevant conflicts, field observations at Aventura Blvd and NE 29 Place were performed on a typical weekday on June 3, 2014. A summary of the traffic data is presented in *Figure 23*, and the field review is presented in *Figure 24*.

This intersection has single left-turn bays for all approaches. The signal operation is protected/permissive for all approaches left-turn traffic. The intersection is mast arm with standard overhead illuminated street signs. Tree canopy obstructs view of signal heads on the north leg.

Right-turn movements and left-turn movements do not always yield the way to pedestrians, this is most critical for pedestrian crossing on the east leg where the southbound left-turn vehicles are turning at a less than 90 degree angle. These roads do not cross at a perpendicular angle. Due this configuration, the most complex movement at this intersection is the southbound left-turn that has to turn on a tight angle and travels more than two lanes of traffic. During the field review, an elderly pedestrian reiterated the situation of left-turn movements and pedestrians on the east crosswalk.

There are pedestrian countdowns, high visibility ladder crosswalk as well as W11-2 with W16-7 signs on all crossing. Elderly pedestrians were observed using the intersection during the survey. A Publix supermarket is located on the southeast corner and a Walgreens on the northeast corner. The road exhibits ponding on the southeast corner that takes up most of the pedestrian ramp. Construction fence at the southwest corner development obstructs visibility of pedestrian walking northbound on the west sidewalk.

The left-turn bay on the south leg of the intersection gets confused with a thru and left lane. Cars were observed confusing the lane by a thru and having to change to the next adjacent thru lane before crossing Aventura Blvd.

3.6.4. Recommendations

Based on the safety analysis, field observations and traffic operations for the intersection of Aventura Blvd and NE 29 Place, the following is recommended:

- Add additional left turn arrows and only messages pavement markings for the exclusive northbound left-turn lane on the south leg. Also, install lane use signs.
- Push the exclusive right-turn bay inside next to the thru lane on the south leg northbound direction. By doing this, the crossing distance for NE 29 Place will be shorten, the vehicles approaching the intersection from the south will have a better visibility considering the curvy alignment and the left-turn vehicles on the north leg will have a shorter distance to drive and better visibility of the pedestrian crossing on the east leg which will be relocated as a result of this modification.

- Re-grade swale at east end of curb and gutter to alleviate water standing on southeast corner. If elevations create low point on the ramp, reconstruction of corner will be needed.
- Trim tree on south leg median to improve visibility of signals
- Install R10-15 signs to alert turning vehicles of the crossing pedestrians on all directions.
- Possibility increase the pedestrian crossing time.
- Provide a concrete island on the northeast corner to eliminate the diagonal long crossing and provide two perpendicular shorter crossing for pedestrians.

A conceptual vision of the proposed roadway improvements is exhibited in *Figure 25*.

3.6.5. Cost Estimate

Based on the recommended improvements and the Conceptual Plan, the estimated cost for this project is approximately $74,455. The details of the preliminary project costs are presented in *Appendix D*.

Construction costs were obtained from items cost on the latest pay item Average Unit Cost Report for the Area 13 (Miami-Dade County), and the Miami-Dade Traffic Signal Division price list.

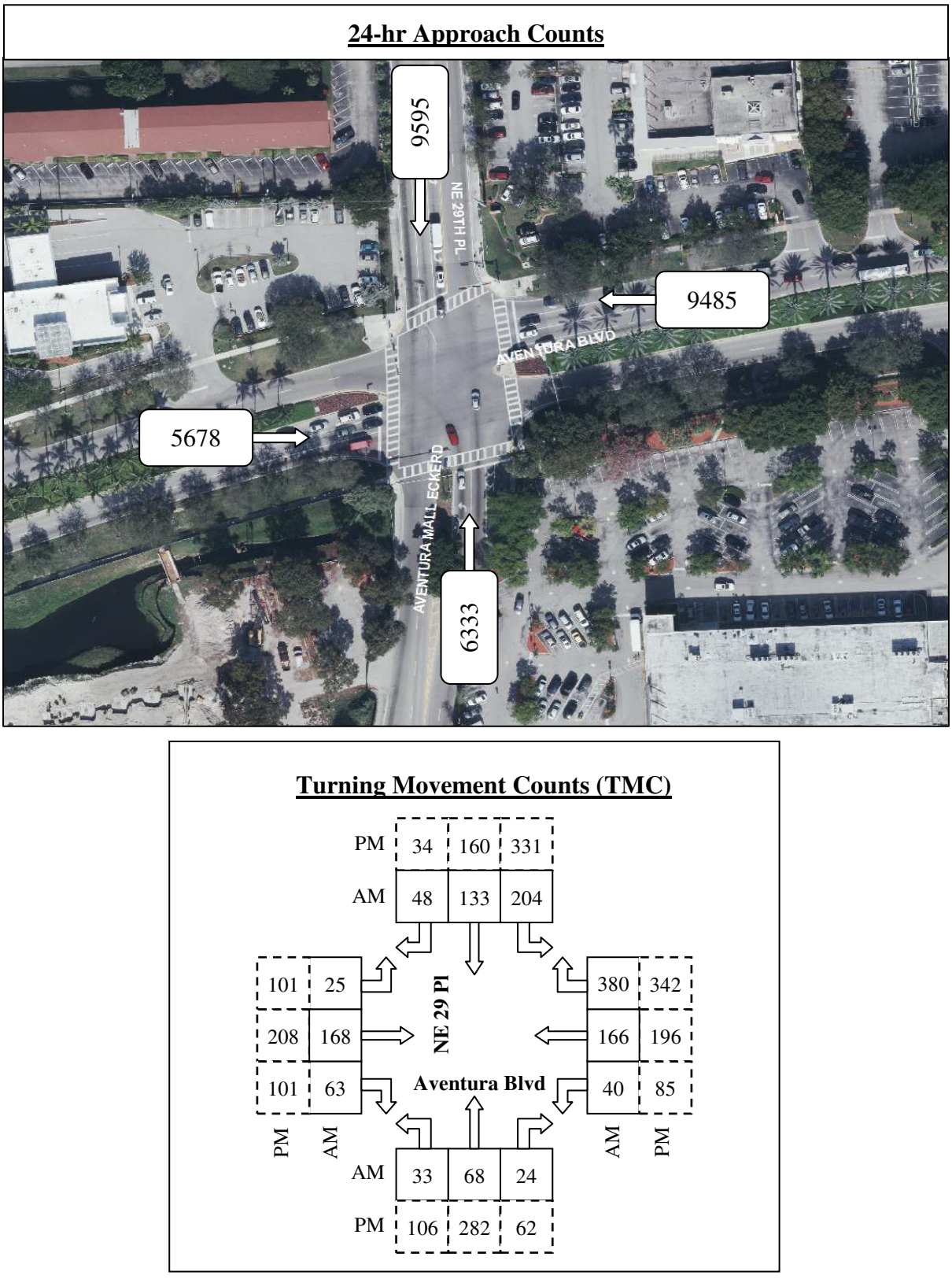


Figure 23: Traffic Data – *NE 29 Place and Aventura Boulevard*

Water ponding on SE corner in front of ramp.

NE 29 Pl south leg (northbound direction)
Left turn lane confused with thru lane.

NE 29 Pl south leg
Longer crossing distance due to separation between right turn and thru lane.

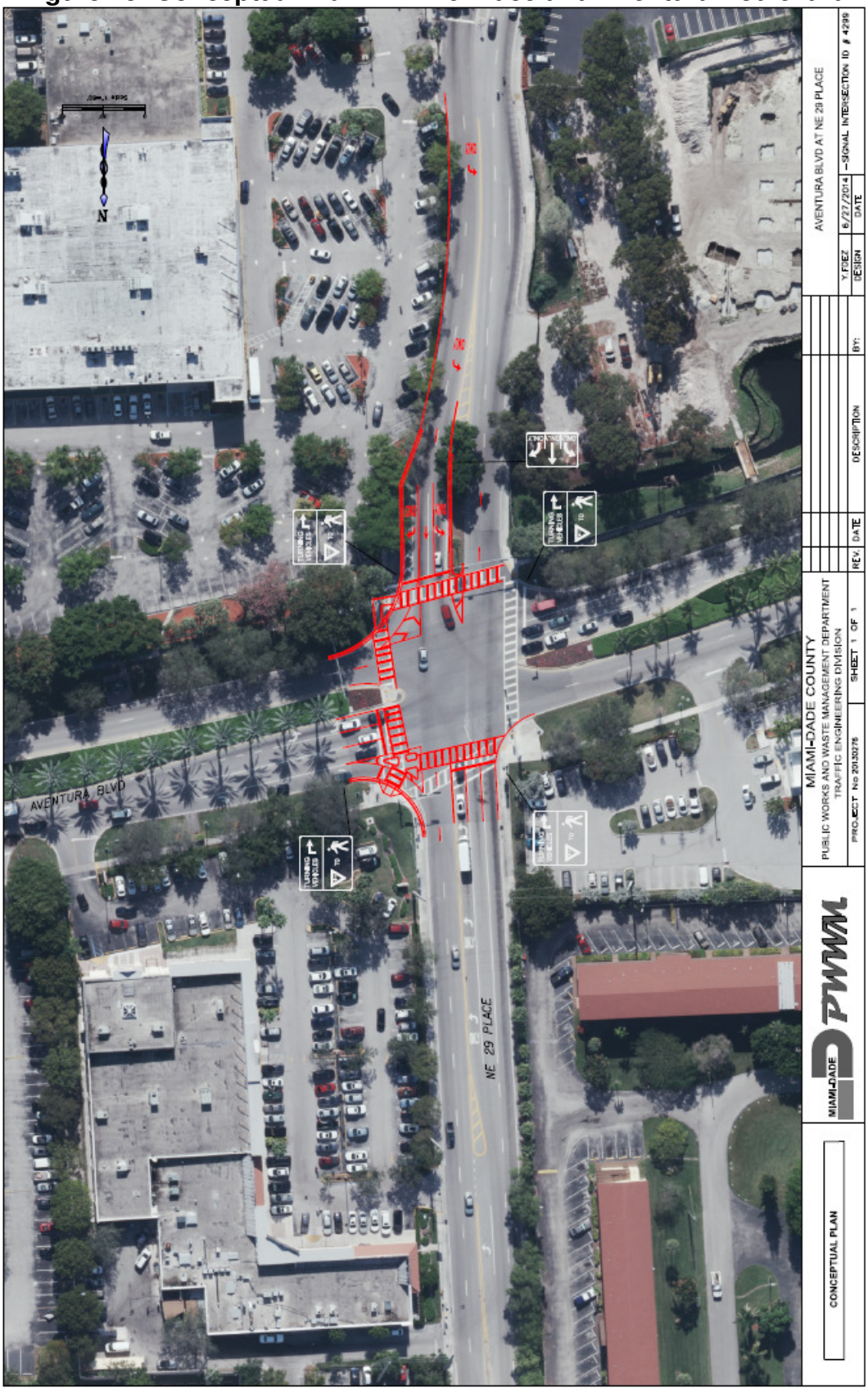
NE 29 Pl north leg
Roads do not intersect at a 90° angle.

North crosswalk is a long diagonal crossing.

About 300' of intersection south leg (looking northbound): Inside lane feels like a thru lane.

Figure 24: Field Review – *NE 29 Place and Aventura Boulevard*

Figure 25: Conceptual Plan – *NE 29 Place and Aventura Boulevard*



3.7. W 12 Avenue and W 68 Street

3.7.1. Site Description

This intersection is a signalized four legged intersection located in the City of Hialeah in the area of Northwest Miami Dade County. W 12 Avenue is a four lane undivided urban arterial, and W 68 Street is a four lane undivided urban collector that runs east-west.

3.7.2. Safety Conditions and Analysis

The intersection of W 12 Avenue and W 68 Street is ranked number 7 in our high crash locations list. A review of the hard copy police reports for the year 2011 through 2013 was performed. During the three-year analysis period, 90 relevant crashes occurred at the intersection. The analysis indicated that the average number of crashes per year is 30. The crash summaries, crash statistics and collision diagrams for the intersection are documented in *Appendix A*.

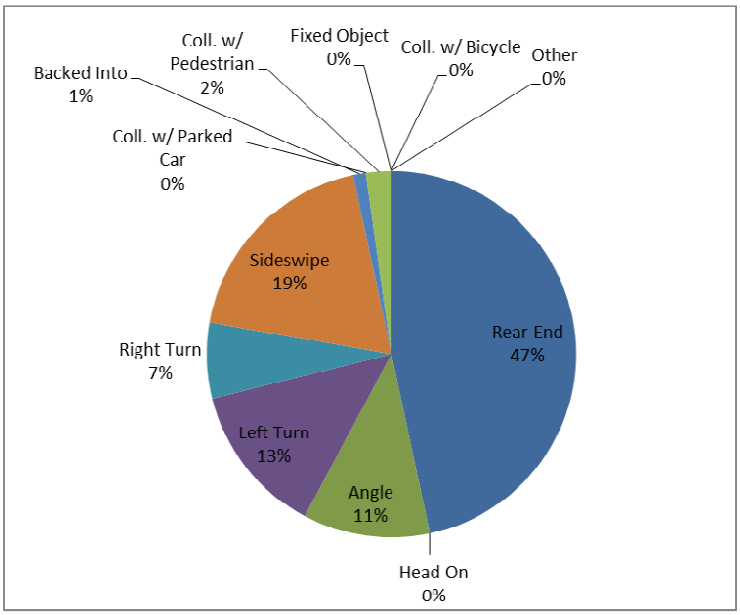


Figure 26 Predominant Crash Types
W 12 AVE & W 68 ST

Based on the analysis of crash records for this intersection, the predominant types of crashes are shown in *Figure 26.*

Calculated intersection mean crash per year were compared to the average Miami-Dade Crash Rate for County corridors to assess the safety conditions at the study intersection in relation to other roadways with similar traffic and geometric characteristics. This study is based on the 2010 FDOT's "Expected Value Analysis." *Table 17* illustrates the expected accident volume analysis of this intersection as well as the safety ratios and the confidence levels during the analysis period.

Based on a regression growth of 8% from the 2014 entering volume, the calculated safety ratios for the years 2011, 2012, and 2013 were 1.117, 1.086, and 1.053, respectively. The safety ratio for the three years averaged 1.085. Also, results of confidence level indicated that this intersection has been a high crash location during the three years with a confidence level higher than 99.95%.

From this analysis, it was determined that rear-end, left-turn, right-turn and sideswipe collisions presented abnormal crash patterns that exceed the threshold limits for the 95th percentile and 90th percentile confidence level. Those results indicate that these types of collisions were abnormally high during the period of 2011 through 2013. A detailed review of the abnormal crashes as well as probable countermeasures is presented in *Table 18*.

Table 17 – Crash Analysis – W 12 Avenue and W 68 Street

W 12 Avenue & W 68 Street

(4 Lane x 4 Lane, Signalized, With Turn Lanes, 4 Leg Intersection - Table 29) - URBAN Spot

	TYPE OF CRASH	NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	EXPECTED ANNUAL CRASH VALUE			ABNORMALLY HIGH CRASHES		
		2011	2012	2013				MEAN	90th Percentile	95th Percentile	Mean	90th Percentil	95th Percentil
COLLISION TYPE	Rear End	11	15	16	42	47%	14.00	3.43	8.08	8.97	X	X	X
	Head On	0	0	0	0	0%	0.00	0.51	1.15	1.28			
	Angle	4	3	3	10	11%	3.33	3.11	6.53	7.19	X		
	Left Turn	7	2	3	12	13%	4.00	1.44	3.22	3.56	X	X	X
	Right Turn	3	2	1	6	7%	2.00	0.34	1.07	1.21	X	X	X
	Sideswipe	4	6	7	17	19%	5.67	1.51	4.91	5.56	X	X	X
	Backed Into	0	1	0	1	1%	0.33	0.11	0.47	0.54	X		
	Coll. w/ Parked Car	0	0	0	0	0%	0.00	0.11	0.57	0.66			
	Coll. w/ Pedestrian	0	1	1	2	2%	0.67	0.47	1.35	1.52	X		
	Coll. w/ Bicycle	0	0	0	0	0%	0.00	0.12	0.49	0.56			
	Fixed Object	0	0	0	0	0%	0.00	0.04	0.23	0.27			
	Ran Off Road	0	0	0	0	0%	0.00	0.00	0.00	0.00			
	Overtuned	0	0	0	0	0%	0.00	0.01	0.10	0.13			
	Other	0	0	0	0	0%	0.00	5.26	12.78	14.22			
	Total Crashes	29	30	31	90	100%	30.00	17.31	37.75	41.66	X		
SEVERITY	PDO crashes	25	25	27	77	86%	25.67	8.79	24.57	27.59	X	X	
	Fatal crashes	0	0	0	0	0%	0.00	2.49	15.45	17.93			
	Injury crashes	4	5	4	13	14%	4.33	10.55	20.71	22.66			
LIGHT CONDITIONS	Day Light	20	23	24	67	74%	22.33	9.69	23.99	26.72	X		
	Dusk	0	1	1	2	2%	0.67	0.53	1.61	1.81	X		
	Dawn	0	0	2	2	2%	0.67	0.39	1.43	1.63	X		
	Dark	9	6	4	19	21%	6.33	4.30	9.57	10.57	X		
	Unknown	0	0	0	0	0%	0.00	0.61	2.23	2.54			
SURFACE CONDITIONS	Dry	27	29	24	80	89%	26.67	12.76	30.50	33.90	X		
	Wet	2	1	7	10	11%	3.33	1.91	4.43	4.92	X		
	Others	0	0	0	0	0%	0.00	0.68	2.09	2.36			
MONTH OF A YEAR	January	3	1	2	6	7%	2.00	1.24	2.67	2.94	X		
	February	2	2	4	8	9%	2.67	1.67	4.01	4.46	X		
	March	4	2	1	7	8%	2.33	1.64	4.07	4.53	X		
	April	4	1	3	8	9%	2.67	1.50	3.60	4.01	X		
	May	3	6	0	9	10%	3.00	1.51	3.24	3.57	X		
	June	1	1	2	4	4%	1.33	1.62	3.97	4.42			
	July	1	2	4	7	8%	2.33	1.67	3.82	4.24	X		
	August	2	1	3	6	7%	2.00	1.73	4.09	4.54	X		
	September	1	5	2	8	9%	2.67	1.63	4.31	4.83	X		
	October	3	4	4	11	12%	3.67	1.46	3.92	4.39	X		
	November	1	4	3	8	9%	2.67	1.40	3.97	4.46	X		
	December	4	1	3	8	9%	2.67	1.41	4.02	4.52	X		
DAY OF THE WEEK	Sunday	1	1	2	4	4%	1.33	2.67	7.18	8.04			
	Monday	6	6	4	16	18%	5.33	2.47	5.66	6.27	X		
	Tuesday	2	6	4	12	13%	4.00	2.47	5.61	6.21	X		
	Wednesday	5	7	2	14	16%	4.67	2.33	5.55	6.16	X		
	Thursday	5	3	6	14	16%	4.67	2.44	5.25	5.79	X		
	Friday	6	5	10	21	23%	7.00	2.46	5.51	6.10	X	X	X
	Saturday	4	2	3	9	10%	3.00	2.52	6.23	6.94	X		
HOUR OF THE DAY	00:00-06:00	1	1	1	3	3%	1.00	1.61	4.23	4.73			
	06:00-09:00	2	3	5	10	11%	3.33	1.36	3.39	3.78	X		
	09:00-11:00	3	1	5	9	10%	3.00	1.28	3.25	3.62	X		
	11:00-13:00	2	2	2	6	7%	2.00	1.70	4.20	4.68	X		
	13:00-15:00	5	3	4	12	13%	4.00	1.88	5.42	6.09	X		
	15:00-18:00	6	12	7	25	28%	8.33	2.99	7.98	8.94	X	X	
	18:00-24:00	10	8	7	25	28%	8.33	3.79	9.27	10.32	X		

	YEAR			3-Year Average
	1	2	3	
Average Daily Traffic ADT *(Vehicles per Day)*	48,525	52,744	57,331	52,867
Florida Average Crash rate *(Crashes per Million Entering Vehicles)*	0.757	0.757	0.757	0.757
Traffic Base	17.712	19.252	20.926	19.296
Actual Crash Rate *(Crashes per Million Entering Vehicles)*	1.637	1.558	1.481	1.559
Critical Crash Rate *(Crashes per Million Entering Vehicles)*	1.465	1.435	1.407	1.436
Safety Ratio	**1.117**	**1.086**	**1.053**	**1.085**
High Crash Location??	***YES***	***YES***	***YES***	***YES***

$$Actual\ \ Crash\ \ Rate\ \ =\ \ \frac{A \times 1{,}000{,}000}{V}$$

Where:
A = Total number of crashes or number of crashes by type occurring in a 1 year period.
V = Average Annual Daily Traffic X 365

$$CriticalCrashRate = AVR + \frac{0.5}{TB} + TF\sqrt{\frac{AVR}{TB}}$$

Where:
AVR = Average Statewide Crash Rate for a particular type of intersection or roadway segment.
TB = Traffic Base
TF = Test Factor (z-value)
= *1.96 (assume 95% Confidence Level for RURAL areas)*
= *3.29 (assume 99.95% Confidence Level for URBAN areas)*

Confidence Level (%)	Constant Z
68.30	1.00
86.60	1.50
90.00	1.64
95.00	1.96
95.50	2.00
98.80	2.50
99.00	2.58
99.70	3.00
99.95	3.29

$$Traffic\ Base = \frac{Years \times ADT \times 365}{1{,}000{,}000}$$

$$Safety\ \ Ratio\ \ =\ \ \frac{Actual\ \ Crash\ \ Rate}{Critical\ \ Crash\ \ Rate}$$

Table 18 – Abnormal Crash Details & Countermeasures
W 12 Avenue and W 68 Street

W 12 Avenue & W 68 Street

(4 Lane x 4 Lane, Signalized, With Turn Lanes, 4 Leg Intersection - Table 29) - URBAN Spot

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Rear End	Total Rear End Crashes		**11**	**15**	**16**	**42**	**100%**	**14.00**	(8)	5
	Lighting Conditions	Day Light	9	14	12	35	83%	11.67	(10)	8
		Dawn	0	0	1	1	2%	0.33		
		Dark	2	1	3	6	14%	2.00		
	Hours of Day	00:00 - 06:00	0	0	1	1	2%	0.33		
		06:00 - 09:00	0	2	2	4	10%	1.33		
		09:00 - 11:00	0	0	4	4	10%	1.33		
		11:00 - 13:00	2	1	0	3	7%	1.00		
		13:00 - 15:00	3	1	2	6	14%	2.00		
		15:00 - 18:00	2	8	4	14	33%	4.67		
		18:00 - 24:00	4	3	3	10	24%	3.33		
	Direction	North	2	4	4	10	24%	3.33		
		South	5	3	2	10	24%	3.33		
		East	2	6	6	14	33%	4.67		
		West	2	2	4	8	19%	2.67		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Left Turn	Total Left Turn Crashes		**7**	**2**	**3**	**12**	**100%**	**4.00**	(8)	3
	Lighting Conditions	Day Light	4	0	1	5	42%	1.67	(10)	8
		Dawn	0	0	1	1	8%	0.33		
		Dark	3	2	1	6	50%	2.00		
	Hours of Day	00:00 - 06:00	1	0	0	1	8%	0.33		
		06:00 - 09:00	1	0	1	2	17%	0.67		
		09:00 - 11:00	0	0	0	0	0%	0.00		
		11:00 - 13:00	0	0	0	0	0%	0.00		
		13:00 - 15:00	2	0	0	2	17%	0.67		
		15:00 - 18:00	1	0	1	2	17%	0.67		
		18:00 - 24:00	2	2	1	5	42%	1.67		
	Direction	NB → WB	0	0	1	1	9%	0.33		
		WB → SB	3	1	0	4	36%	1.33		
		SB → EB	2	0	0	2	18%	0.67		
		EB → NB	2	1	1	4	36%	1.33		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Right Turn	Total Rear End Crashes		**3**	**2**	**1**	**6**	**100%**	**2.00**	(1)	4
	Lighting Conditions	Day Light	2	2	0	4	67%	1.33	(12)	5
		Dawn	0	0	0	0	0%	0.00		6
		Dark	1	0	1	2	33%	0.67		
	Hours of Day	00:00 - 06:00	0	0	0	0	0%	0.00		
		06:00 - 09:00	0	0	0	0	0%	0.00		
		09:00 - 11:00	0	0	0	0	0%	0.00		
		11:00 - 13:00	0	1	0	1	17%	0.33		
		13:00 - 15:00	0	0	0	0	0%	0.00		
		15:00 - 18:00	1	1	0	2	33%	0.67		
		18:00 - 24:00	2	0	1	3	50%	1.00		
	Direction	NB→EB	0	0	0	0	0%	0.00		
		EB→SB	1	1	0	2	33%	0.67		
		WB→NB	1	0	0	1	17%	0.33		
		SB→WB	1	1	1	3	50%	1.00		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Sideswipe (Overtake)	Total Left Turn Crashes		**4**	**6**	**7**	**17**	**100%**	**5.67**	(4)	3
	Lighting Conditions	Day Light	3	4	7	14	82%	4.67	(8)	4
		Dawn	0	0	0	0	0%	0.00		
		Dark	1	2	0	3	18%	1.00		
	Hours of Day	00:00 - 06:00	0	0	0	0	0%	0.00		
		06:00 - 09:00	1	1	1	3	18%	1.00		
		09:00 - 11:00	0	1	0	1	6%	0.33		
		11:00 - 13:00	0	0	2	2	12%	0.67		
		13:00 - 15:00	0	1	1	2	12%	0.67		
		15:00 - 18:00	1	1	2	4	24%	1.33		
		18:00 - 24:00	2	2	1	5	29%	1.67		
	Direction	North	1	1	2	4	24%	1.33		
		South	0	1	1	2	12%	0.67		
		East	2	2	3	7	41%	2.33		
		West	1	2	1	4	24%	1.33		
		Unknown	0	0	0	0	0%	0.00		

3.7.3. Traffic Operation Conditions and Analysis

In order to identify the traffic operation characteristics and safety relevant conflicts, field observations at W 12 Avenue & W 68 Street were performed on a typical weekday on May 20, 2014. A summary of the traffic data is presented in *Figure 27*, and the field review is presented in *Figure 28*.

This intersection has single left-turn bays for all approaches. The signal operation is protected/permissive for all approaches left-turn traffic. Red light running was observed at the intersection.

The gas station, Walgreens and a strip mall present many consecutive driveways that generate potential conflicts with the other movements.

Pavement conditions are deteriorated, and pavement markings and pedestrian crosswalks at all four legs are faded.

3.7.4. Recommendations

Based on the safety analysis, field observations and traffic operations for the intersection of W 12 Avenue & W 68 Street, the following is recommended:

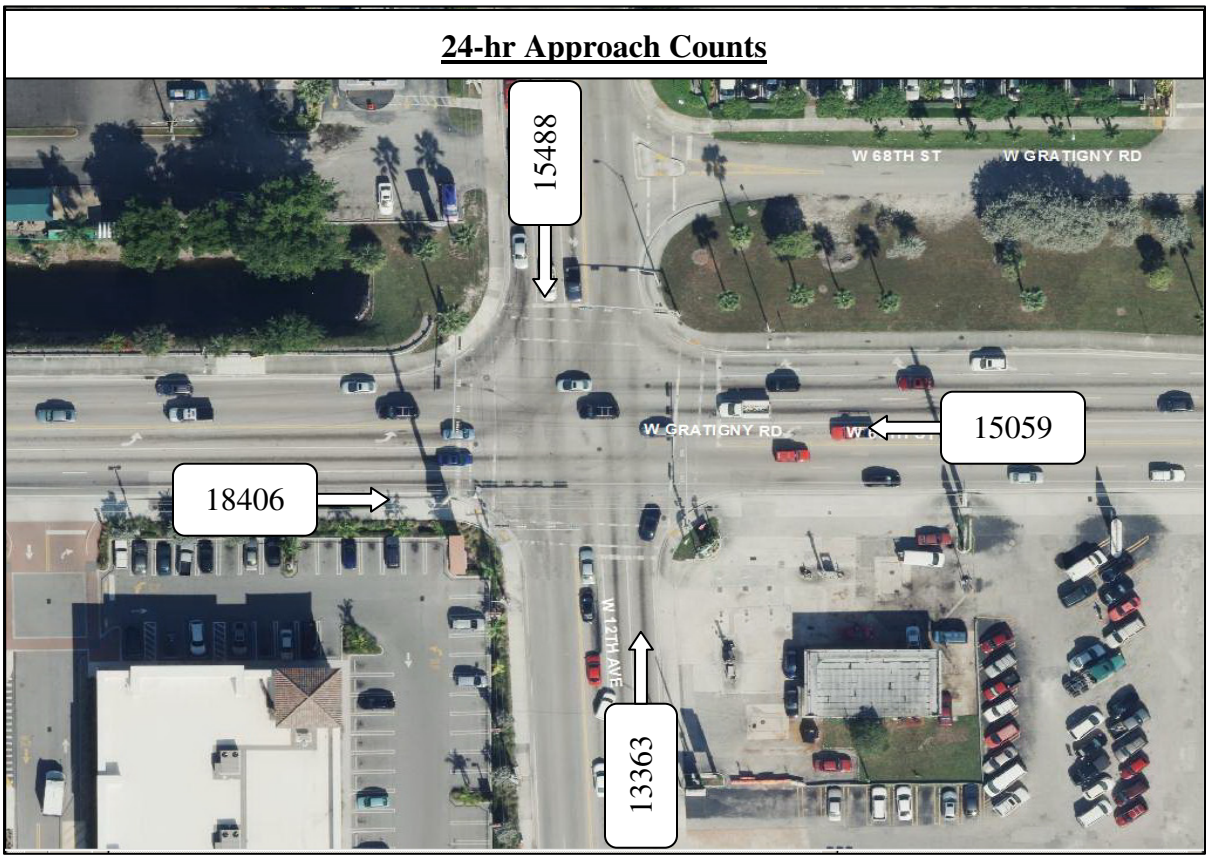
- Refurbishing of pavement markings including crosswalks using thermoplastic painting at all 4 legs.
- Provide high visibility ladder crosswalks on all legs.
- Mill and resurface intersection and reconstruct areas in need.
- Add painted island on northeast corner (see sketch).
- Update pedestrian signals to countdowns for the west and south crossing.
- Install retro-reflective backplates on signals.
- Install “right Turn Only” signs at the gas station driveways.
- Update pushbuttons for east ramp.

A conceptual vision of the proposed roadway improvements is exhibited in *Figure 29*.

3.7.5. Cost Estimate

Based on the recommended improvements and the Conceptual Plan, the estimated cost for this project is approximately $85,795. The details of the preliminary project costs are presented in *Appendix D*.

Construction costs were obtained from items cost on the latest pay item Average Unit Cost Report for the Area 13 (Miami-Dade County), and the Miami-Dade Traffic Signal Division price list.



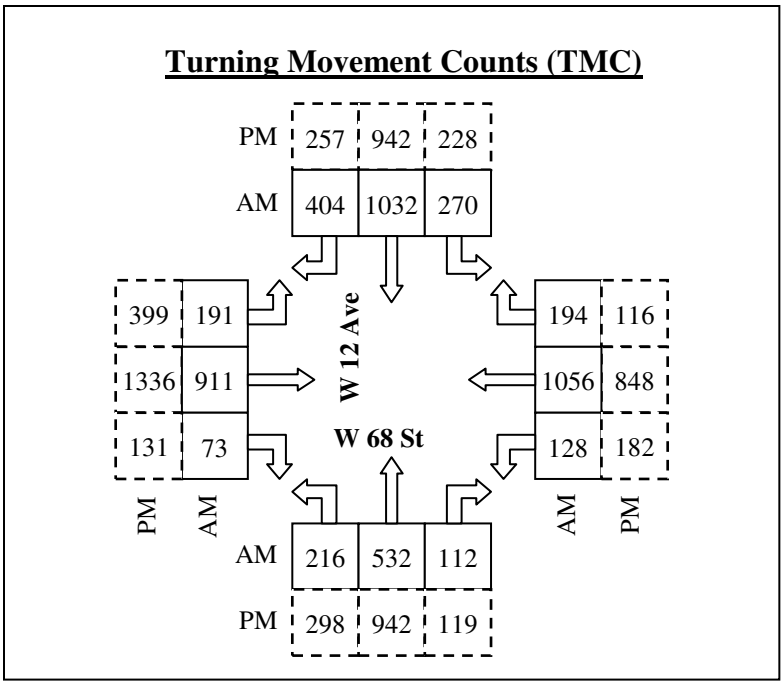


Figure 27: Traffic Data – *W 12 Avenue and W 68 Street*

Deteriorated pavement conditions.

Faded pavement markings and deteriorated pavement conditions.

Pedestrian countdown signal heads are not in all corners.

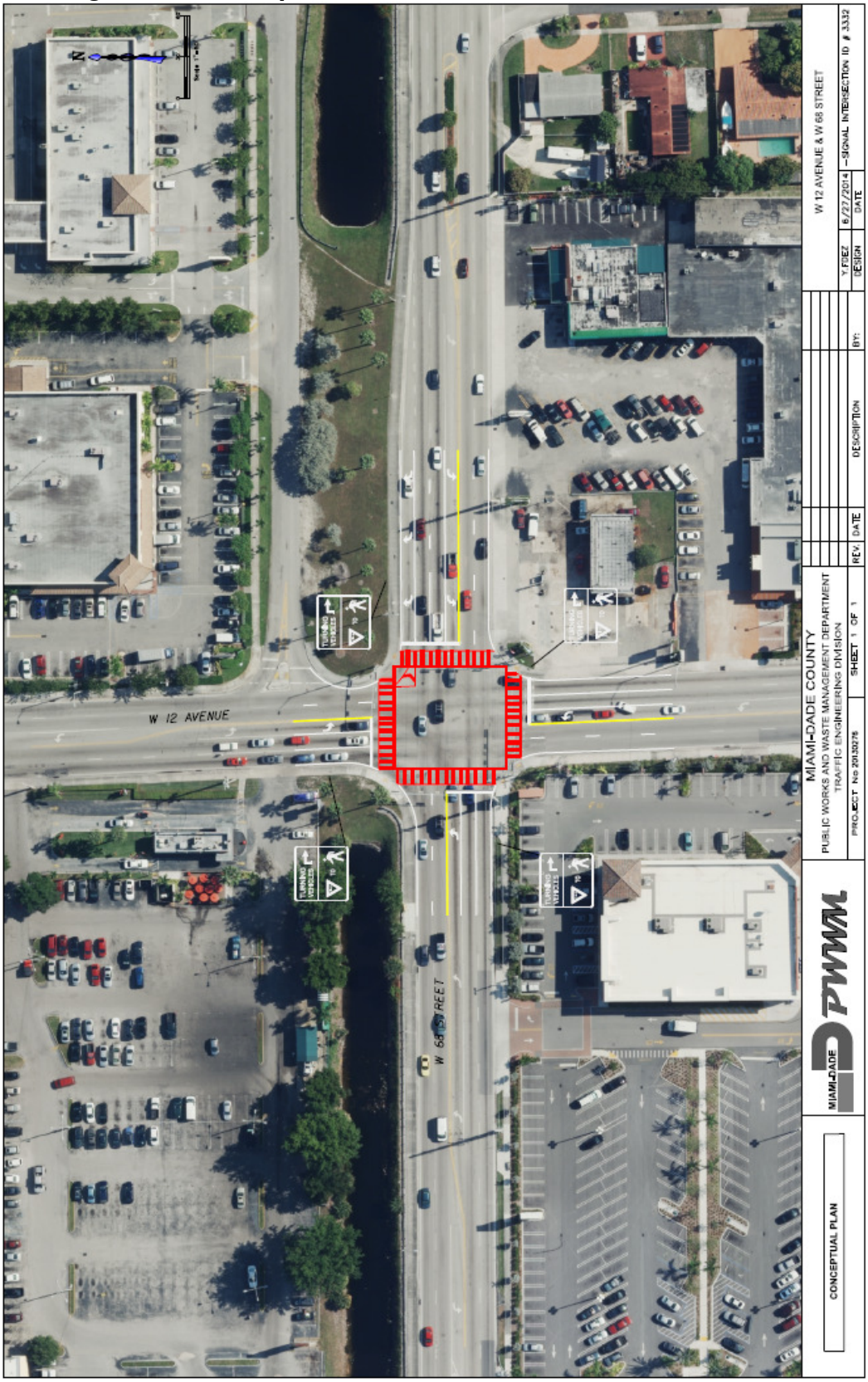
Pedestrian activity at the intersection.

Driveways are close to the intersection.

Heavy vehicles use the intersection.

Figure 28: Field Review – *W 12 Avenue and W 68 Street*

Figure 29: Conceptual Plan – *W 12 Avenue and W 68 Street*



3.8. NW 17 Avenue and NW 20 Street

3.8.1. Site Description

This intersection is a signalized four legged intersection located in the City of Miami. NW 17 Avenue is a two lane urban minor arterial with a two-way left-turn center lane that runs north-south, and NW 20 Street is a four lane urban minor arterial with a two-way left-turn center lane that runs east-west.

3.8.2. Safety Conditions and Analysis

The intersection of NW 17 Avenue and NW 20 Street is ranked number 8 in our high crash locations list. A review of the hard copy police reports for the year 2011 through 2013 was performed. During the three-year analysis period, 82 relevant crashes occurred at the intersection. The analysis indicated that the average number of crashes per year is 27. The crash summaries, crash statistics and collision diagrams for the intersection are documented in *Appendix A*.

Based on the analysis of crash records for this intersection, the predominant types of crashes are shown in *Figure 30.*

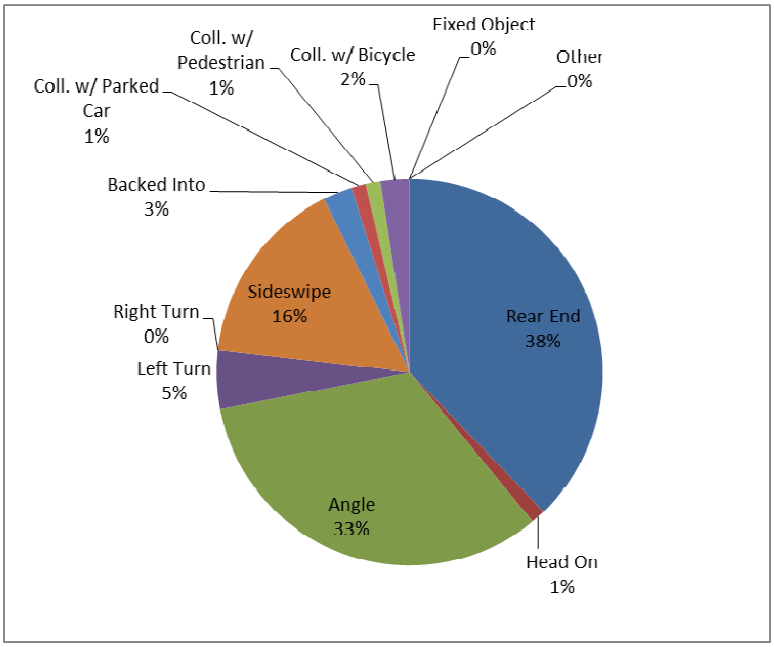


Figure 30 Predominant Crash Types
NW 17 AVE & NW 20 ST

Calculated intersection mean crash per year were compared to the average Miami-Dade Crash Rate for County corridors to assess the safety conditions at the study intersection in relation to other roadways with similar traffic and geometric characteristics. This study is based on the 2010 FDOT's "Expected Value Analysis." *Table 19* illustrates the expected accident volume analysis of this intersection as well as the safety ratios and the confidence levels during the analysis period.

Based on a regression growth of 8% from the 2014 entering volume, the calculated safety ratios for the years 2011, 2012, and 2013 were 1.408, 1.325, and 1.032, respectively. The safety ratio for the three years averaged 1.255. Also, results of confidence level indicated that this intersection has been a high crash location during the three years with a confidence level higher than 99.95%.

Table 19 – Crash Analysis – NW 17 Avenue and NW 20 Street

NW 17 Avenue & NW 20 Street

(4 Lane x 2 Lane, Signalized, With Turn Lanes, 4 Leg Intersection - Table 23) - URBAN Spot

	TYPE OF CRASH	NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	EXPECTED ANNUAL CRASH VALUE			ABNORMALLY HIGH CRASHES		
		2011	2012	2013				MEAN	90th Percentile	95th Percentile	Mean	90th Percentil	95th Percentil
COLLISION TYPE	Rear End	8	11	12	31	38%	10.33	1.62	4.09	4.56	X	X	X
	Head On	0	1	0	1	1%	0.33	0.16	0.58	0.66	X		
	Angle	14	9	4	27	33%	9.00	1.37	3.01	3.33	X	X	X
	Left Turn	0	2	2	4	5%	1.33	0.49	1.29	1.44	X	X	
	Right Turn	0	0	0	0	0%	0.00	0.10	0.39	0.45			
	Sideswipe	5	4	4	13	16%	4.33	0.56	1.40	1.56	X	X	X
	Backed Into	1	1	0	2	2%	0.67	0.07	0.40	0.46	X	X	X
	Coll. w/ Parked Car	1	0	0	1	1%	0.33	0.08	0.50	0.58	X		
	Coll. w/ Pedestrian	0	1	0	1	1%	0.33	0.16	0.56	0.63	X		
	Coll. w/ Bicycle	0	0	2	2	2%	0.67	0.00	0.00	0.00	X	X	X
	Fixed Object	0	0	0	0	0%	0.00	0.22	0.55	0.62			
	Ran Off Road	0	0	0	0	0%	0.00	0.00	0.00	0.00			
	Overtuned	0	0	0	0	0%	0.00	0.01	0.11	0.13			
	Other	0	0	0	0	0%	0.00	2.44	6.28	7.02			
	Total Crashes	29	29	24	82	100%	27.33	7.27	15.00	16.48	X	X	X
SEVERITY	PDO crashes	25	26	23	74	90%	24.67	3.99	9.34	10.36	X	X	X
	Fatal crashes	0	0	0	0	0%	0.00	0.00	0.00	0.00			
	Injury crashes	4	3	1	8	10%	2.67	5.10	11.25	12.43			
LIGHT CONDITIONS	Day Light	22	22	16	60	73%	20.00	4.76	9.80	10.76	X	X	X
	Dusk	0	0	1	1	1%	0.33	0.24	0.65	0.73	X		
	Dawn	0	0	0	0	0%	0.00	0.14	0.49	0.55			
	Dark	7	7	7	21	26%	7.00	2.00	4.57	5.06	X	X	X
	Unknown	0	0	0	0	0%	0.00	0.12	0.46	0.52			
SURFACE CONDITIONS	Dry	24	29	22	75	91%	25.00	0.63	13.06	14.37	X	X	X
	Wet	5	0	2	7	9%	2.33	0.87	1.92	2.12	X	X	X
	Others	0	0	0	0	0%	0.00	0.14	0.57	0.65			
MONTH OF A YEAR	January	3	4	2	9	11%	3.00	0.48	1.33	1.49	X	X	X
	February	4	2	2	8	10%	2.67	0.59	1.40	1.56	X	X	X
	March	3	2	1	6	7%	2.00	0.71	1.76	1.96	X	X	X
	April	4	3	4	11	13%	3.67	0.58	1.47	1.65	X	X	X
	May	0	1	1	2	2%	0.67	0.61	1.50	1.67	X		
	June	0	2	1	3	4%	1.00	0.52	1.32	1.47	X		
	July	3	2	1	6	7%	2.00	0.53	1.28	1.42	X	X	X
	August	1	2	2	5	6%	1.67	0.69	1.68	1.87	X		
	September	4	3	0	7	9%	2.33	0.73	1.96	2.19	X	X	X
	October	3	4	4	11	13%	3.67	0.74	1.92	2.14	X	X	X
	November	3	2	5	10	12%	3.33	0.53	1.49	1.68	X	X	X
	December	1	2	1	4	5%	1.33	0.54	1.33	1.48	X	X	
DAY OF THE WEEK	Sunday	3	1	3	7	9%	2.33	0.93	2.38	2.66	X		
	Monday	5	3	2	10	12%	3.33	0.96	1.99	2.19	X	X	X
	Tuesday	4	6	0	10	12%	3.33	1.16	2.90	3.23	X	X	X
	Wednesday	2	5	7	14	17%	4.67	1.11	2.43	2.68	X	X	X
	Thursday	7	6	5	18	22%	6.00	1.10	2.49	2.76	X	X	X
	Friday	5	5	6	16	20%	5.33	1.09	2.49	2.76	X	X	X
	Saturday	3	3	1	7	9%	2.33	0.92	2.25	2.50	X	X	
HOUR OF THE DAY	00:00-06:00	4	3	3	10	12%	3.33	0.71	2.04	2.29	X	X	X
	06:00-09:00	3	5	6	14	17%	4.67	0.78	2.23	2.50	X	X	X
	09:00-11:00	1	5	2	8	10%	2.67	0.63	1.67	1.86	X	X	X
	11:00-13:00	3	4	2	9	11%	3.00	0.69	1.60	1.77	X	X	X
	13:00-15:00	5	3	3	11	14%	3.67	0.79	1.96	2.18	X	X	X
	15:00-18:00	6	4	6	16	20%	5.33	1.53	3.50	3.88	X	X	X
	18:00-24:00	7	5	1	13	16%	4.33	2.13	4.38	4.81	X		

	YEAR			3-Year Average
	1	2	3	
Average Daily Traffic ADT *(Vehicles per Day)*	35,454	38,537	41,888	38,626
Florida Average Crash rate *(Crashes per Million Entering Vehicles)*	0.757	0.757	0.757	0.757
Traffic Base	12.941	14.066	15.289	14.098
Actual Crash Rate *(Crashes per Million Entering Vehicles)*	2.241	2.062	1.570	1.957
Critical Crash Rate *(Crashes per Million Entering Vehicles)*	1.591	1.556	1.522	1.556
Safety Ratio	**1.408**	**1.325**	**1.032**	**1.255**
High Crash Location??	***YES***	***YES***	***YES***	***YES***

$$Actual\ \ Crash\ \ Rate\ \ =\ \ \frac{A \times 1{,}000{,}000}{V}$$

Where:
A = Total number of crashes or number of crashes by type occurring in a 1 year period.
V = Average Annual Daily Traffic X 365

$$CriticalCrashRate = AVR + \frac{0.5}{TB} + TF\sqrt{\frac{AVR}{TB}}$$

Where:
AVR = Average Statewide Crash Rate for a particular type of intersection or roadway segment.
TB = Traffic Base
TF = Test Factor (z-value)
= *1.96 (assume 95% Confidence Level for RURAL areas)*
= *3.29 (assume 99.95% Confidence Level for URBAN areas)*

$$Traffic\,Base = \frac{Years \times ADT \times 365}{1{,}000{,}000}$$

$$Safety\ \ Ratio\ \ =\ \ \frac{Actual\ \ Crash\ \ Rate}{Critical\ \ Crash\ \ Rate}$$

Confidence Level (%)	Constant Z
68.30	1.00
86.60	1.50
90.00	1.64
95.00	1.96
95.50	2.00
98.80	2.50
99.00	2.58
99.70	3.00
99.95	3.29

From this analysis, it was determined that rear end, angle, sideswipe, Backing and Bicycle collisions presented abnormal crash patterns that exceed the threshold limits for the 95th percentile and 90th percentile confidence level. Those results indicate that these types of collisions were abnormally high during the period of 2011 through 2013. A detailed review of the abnormal crashes as well as probable countermeasures is presented in *Table 20*.

Table 20 – Abnormal Crash Details & Countermeasures
NW 17 Avenue and NW 20 Street

NW 17 Avenue & NW 20 Street

(4 Lane x 2 Lane, Signalized, With Turn Lanes, 4 Leg Intersection - Table 23) - URBAN Spot

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHE	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Rear End	Total Rear End Crashes		**8**	**11**	**12**	**31**	**100%**	**10.33**	(1)	2
	Lighting Conditions	Day Light	5	8	8	21	68%	7.00	(3)	4
		Dawn	0	0	0	0	0%	0.00	(7)	7
		Dark	3	3	4	10	32%	3.33	(12)	
	Hours of Day	00:00 - 06:00	2	0	2	4	13%	1.33		
		06:00 - 09:00	0	1	3	4	13%	1.33		
		09:00 - 11:00	1	1	1	3	10%	1.00		
		11:00 - 13:00	1	2	1	4	13%	1.33		
		13:00 - 15:00	0	2	2	4	13%	1.33		
		15:00 - 18:00	1	3	2	6	20%	2.00		
		18:00 - 24:00	3	2	0	5	17%	1.67		
	Direction	North	1	4	4	9	29%	3.00		
		South	4	1	3	8	26%	2.67		
		East	1	3	1	5	16%	1.67		
		West	2	3	4	9	29%	3.00		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHE	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Angle	Total Left Turn Crashes		**14**	**9**	**4**	**27**	**100%**	**9.00**	(9)	9
	Lighting Conditions	Day Light	11	5	2	18	67%	6.00	(13)	13
		Dawn	0	0	0	0	0%	0.00		17
		Dark	3	4	2	9	33%	3.00		
	Hours of Day	00:00 - 06:00	1	2	1	4	15%	1.33		
		06:00 - 09:00	3	2	2	7	26%	2.33		
		09:00 - 11:00	0	1	0	1	4%	0.33		
		11:00 - 13:00	1	1	0	2	7%	0.67		
		13:00 - 15:00	4	0	0	4	15%	1.33		
		15:00 - 18:00	3	1	1	5	19%	1.67		
		18:00 - 24:00	2	2	0	4	15%	1.33		
	Direction	NB + EB	2	2	0	4	15%	1.33		
		NB + WB	4	3	2	9	33%	3.00		
		SB + EB	5	1	0	6	22%	2.00		
		SB + WB	3	3	2	8	30%	2.67		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHE	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Sideswipe (Overtake)	Total Right Turn Crashes		**5**	**4**	**4**	**13**	**100%**	**4.33**	(8)	9
	Lighting Conditions	Day Light	4	4	4	12	92%	4.00	(9)	21
		Dawn	0	0	0	0	0%	0.00	(12)	
		Dark	1	0	0	1	8%	0.33		
	Hours of Day	00:00 - 06:00	0	0	0	0	0%	0.00		
		06:00 - 09:00	0	1	1	2	15%	0.67		
		09:00 - 11:00	0	3	0	3	23%	1.00		
		11:00 - 13:00	0	0	1	1	8%	0.33		
		13:00 - 15:00	1	0	1	2	15%	0.67		
		15:00 - 18:00	2	0	1	3	23%	1.00		
		18:00 - 24:00	2	0	0	2	15%	0.67		
	Direction	North	1	2	1	4	31%	1.33		
		South	1	1	0	2	15%	0.67		
		East	1	0	1	2	15%	0.67		
		West	2	1	2	5	38%	1.67		
		Unknown	0	0	0	0	0%	0.00		

3.8.3. Traffic Operation Conditions and Analysis

In order to identify the traffic operation characteristics and safety relevant conflicts, field observations at NW 17 Avenue and NW 20 Street were performed on a typical weekday on May 13, 2014. A summary of the traffic data is presented in *Figure 31*, and the field review is presented in *Figure 32*.

The intersection is controlled by a signal suspended in span wires. This intersection has left-turn lanes for all approaches and the signal operation is protected-permissive for all of them. North and southbound traffic is balanced throughout the entire day while the eastbound is heavier than westbound during the am period and vice versa during the pm period. Considerable weaving and careless driving was observed during field observations.

High pedestrian activity at the intersection and its approaches was observed as well as bikers at all directions. Conflicts exist with turning vehicles and pedestrians. Conflicts were also observed between cars exiting businesses driveways with thru traffic and pedestrians. Crosswalks are provided for all directions. Pedestrian countdown signals are also provided for all direction; however, the countdown signal at southwest corner is not in alignment for westbound crossing. Push buttons exist to cross NW 20 Street.

Pavement was observed in substantial conditions. Pavement markings were faded and skid marks were visible. There is high demand of heavy vehicles on all directions.

3.8.4. Recommendations

Based on the safety analysis, field observations and traffic operations for the intersection of NW 17 Avenue and NW 20 Street, the following is recommended:

- Update span wire traffic signal to mast arm suspension signal.
- Relocate north leg crosswalk closer to the intersection away from the gas station driveway, and update ADA ramps at northwest corner.
- Provide Turning Vehicles Yield to Pedestrians (R10-15) signs for all directions.
- Installing reflective back plates for all signals heads.
- Provide lane distribution signs (left, thru and right) for north and southbound traffic.
- Resurfacing the intersection and refurbishing of pavement markings using thermoplastic painting.
- Retiming/optimizing of the existing signal while maintaining cycle length for both the AM and PM peak hours pursuing to extend clearance timing for east-west directions.
- Lengthen the eastbound left-turn lane to 200’.
- Consider canceling the signal nighttime flashing mode and have the signal in standard operations 24-hrs.

A conceptual vision of the proposed roadway improvements is exhibited in *Figure 33*.

3.8.5. Cost Estimate

Based on the recommended improvements and the Conceptual Plan, the estimated cost for this project is approximately $611,117. The details of the preliminary project costs are presented in *Appendix D*.

Construction costs were obtained from items cost on the latest pay item Average Unit Cost Report for the Area 13 (Miami-Dade County), and the Miami-Dade Traffic Signal Division price list.

24-hr Approach Counts

Turning Movement Counts (TMC)

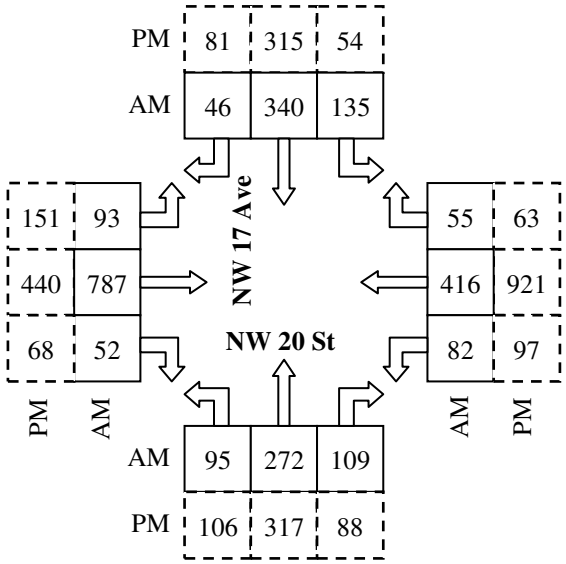


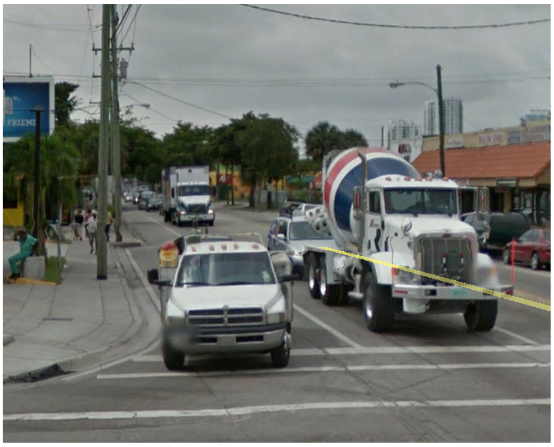
Figure 31: Traffic Data – *NW 17 Avenue and NW 20 Street*

High pedestrian activity in all directions.

SW Corner/South Leg: Count head is not facing pedestrian crossing direction.

Skid marks on pavement.

Deficient signal loop conditions.

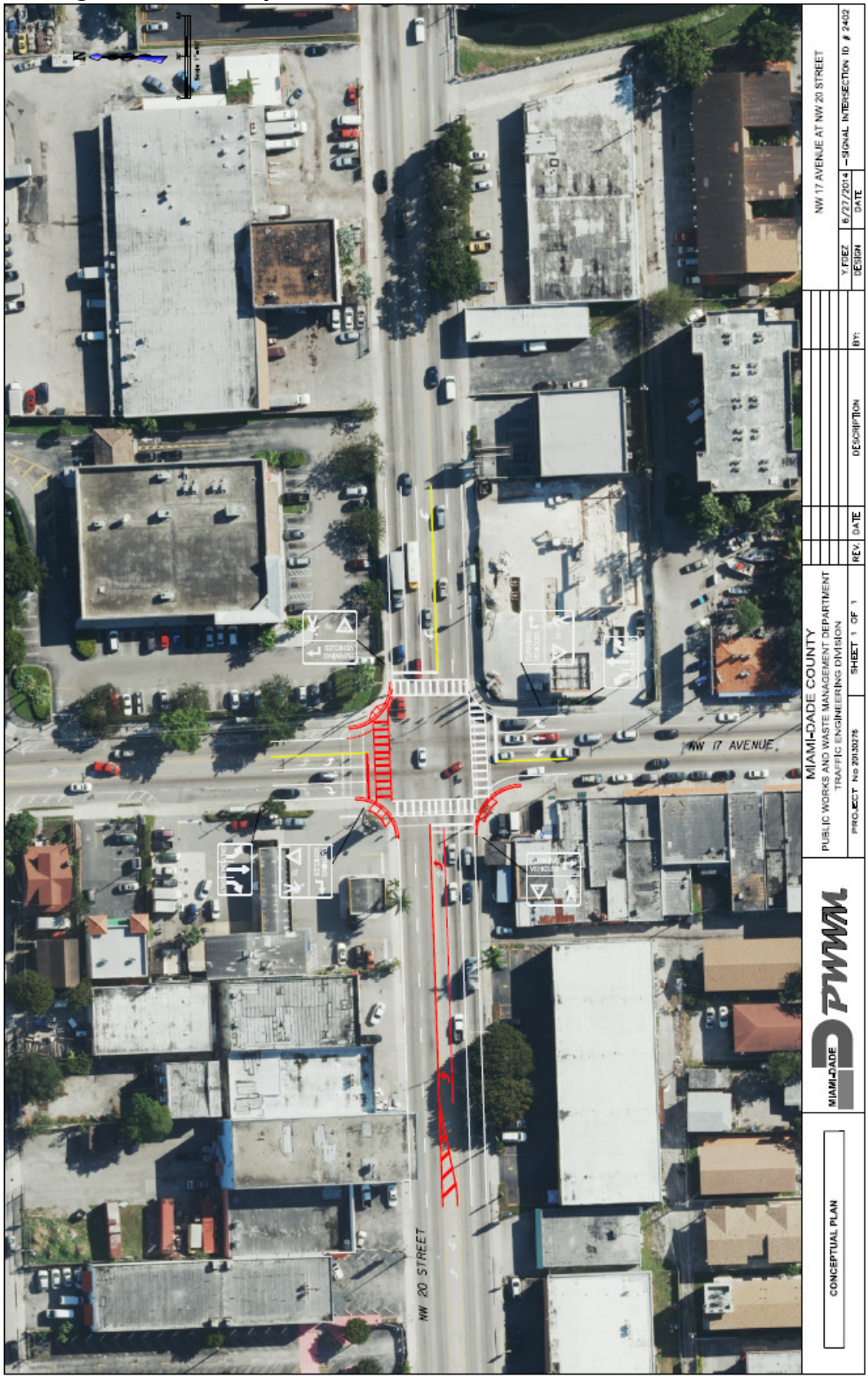


High demand of heavy vehicles.

North-West Corner: No ADA ramps.

Figure 32: Field Review – *NW 17 Avenue and NW 20 Street*

Figure 33: Conceptual Plan – *NW 17 Avenue and NW 20 Street*



3.9. NW 22 Avenue and NW 7 Street

3.8.1. Site Description

This intersection is a signalized four legged intersection located in the City of Miami. NW 22 Avenue is a four lane urban minor arterial with painted median that runs north-south, and NW 7 Street is a four lane undivided urban principal arterial that runs east-west.

3.9.2. Safety Conditions and Analysis

The intersection of NW 22 Avenue and NW 7 Street is ranked number 9 in our high crash locations list. A review of the hard copy police reports for the year 2011 through 2013 was performed. During the three-year analysis period, 80 relevant crashes occurred at the intersection. The analysis indicated that the average number of crashes per year is 27. The crash summaries, crash statistics and collision diagrams for the intersection are documented in *Appendix A*.

Based on the analysis of crash records for this intersection, the predominant types of crashes are shown in *Figure 34*.

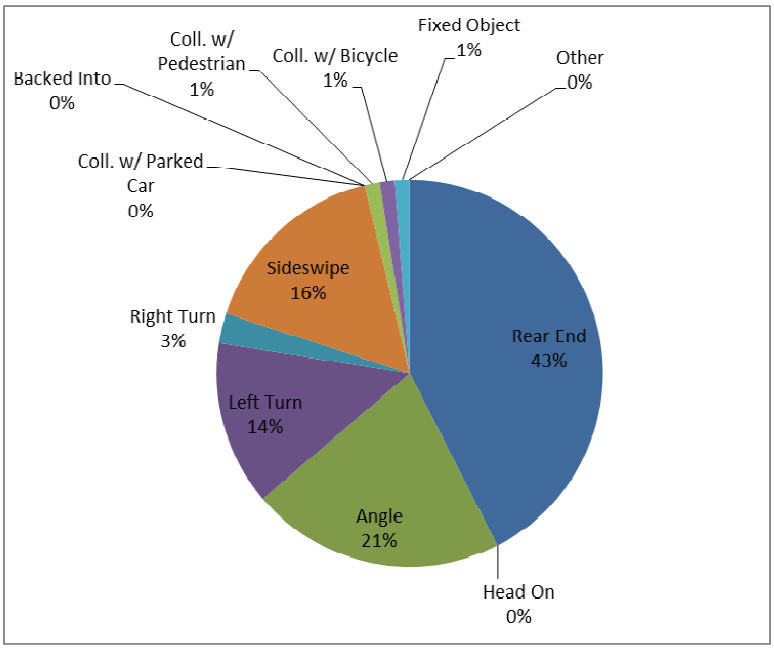


Figure 34 Predominant Crash Types
NW 22 AVE & NW 7 ST

Calculated intersection mean crash per year were compared to the average Miami-Dade Crash Rate for County corridors to assess the safety conditions at the study intersection in relation to other roadways with similar traffic and geometric characteristics. This study is based on the 2010 FDOT's "Expected Value Analysis." *Table 21* illustrates the expected accident volume analysis of this intersection as well as the safety ratios and the confidence levels during the analysis period.

Based on a regression growth of 8% from the 2014 entering volume, the calculated safety ratios for the years 2011, 2012, and 2013 were 1.271, 1.155, and 0.786, respectively. The safety ratio for the three years averaged 1.071. Also, results of confidence level indicated that this intersection has been a high crash location during the three years with a confidence level higher than 99.95%.

Table 21 – Crash Analysis – NW 22 Avenue and NW 7 Street

NW 22 Avenue & NW 7 Street

(4 Lane x 4 Lane, Signalized, With Turn Lanes, 4 Leg Intersection - Table 29) - URBAN Spot

	TYPE OF CRASH	NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	EXPECTED ANNUAL CRASH VALUE			ABNORMALLY HIGH CRASHES		
		2011	2012	2013				MEAN	90th Percentile	95th Percentile	Mean	90th Percentil	95th Percentil
COLLISION TYPE	Rear End	14	10	10	34	43%	11.33	3.43	8.08	8.97	X	X	X
	Head On	0	0	0	0	0%	0.00	0.51	1.15	1.28			
	Angle	9	4	4	17	21%	5.67	3.11	6.53	7.19	X		
	Left Turn	3	6	2	11	14%	3.67	1.44	3.22	3.56	X	X	X
	Right Turn	0	2	0	2	3%	0.67	0.34	1.07	1.21	X		
	Sideswipe	2	6	5	13	16%	4.33	1.51	4.91	5.56	X		
	Backed Into	0	0	0	0	0%	0.00	0.11	0.47	0.54			
	Coll. w/ Parked Car	0	0	0	0	0%	0.00	0.11	0.57	0.66			
	Coll. w/ Pedestrian	1	0	0	1	1%	0.33	0.47	1.35	1.52			
	Coll. w/ Bicycle	1	0	0	1	1%	0.33	0.12	0.49	0.56	X		
	Fixed Object	0	1	0	1	1%	0.33	0.04	0.23	0.27	X	X	X
	Ran Off Road	0	0	0	0	0%	0.00	0.00	0.00	0.00			
	Overtuned	0	0	0	0	0%	0.00	0.01	0.10	0.13			
	Other	0	0	0	0	0%	0.00	5.26	12.78	14.22			
	Total Crashes	30	29	21	80	100%	26.67	17.31	37.75	41.66	X		
SEVERITY	PDO crashes	22	25	19	66	83%	22.00	8.79	24.57	27.59	X		
	Fatal crashes	0	0	0	0	0%	0.00	2.49	15.45	17.93			
	Injury crashes	8	4	2	14	18%	4.67	10.55	20.71	22.66			
LIGHT CONDITIONS	Day Light	19	20	14	53	66%	17.67	9.69	23.99	26.72	X		
	Dusk	0	2	0	2	3%	0.67	0.53	1.61	1.81	X		
	Dawn	0	0	1	1	1%	0.33	0.39	1.43	1.63			
	Dark	10	7	5	22	28%	7.33	4.30	9.57	10.57	X		
	Unknown	1	0	1	2	3%	0.67	0.61	2.23	2.54	X		
SURFACE CONDITIONS	Dry	22	24	19	65	81%	21.67	12.76	30.50	33.90	X		
	Wet	7	5	1	13	16%	4.33	1.91	4.43	4.92	X		
	Others	1	0	1	2	3%	0.67	0.68	2.09	2.36			
MONTH OF A YEAR	January	2	2	1	5	6%	1.67	1.24	2.67	2.94	X		
	February	2	0	3	5	6%	1.67	1.67	4.01	4.46			
	March	4	3	1	8	10%	2.67	1.64	4.07	4.53	X		
	April	1	3	1	5	6%	1.67	1.50	3.60	4.01	X		
	May	0	2	1	3	4%	1.00	1.51	3.24	3.57			
	June	4	3	0	7	9%	2.33	1.62	3.97	4.42	X		
	July	3	3	2	8	10%	2.67	1.67	3.82	4.24	X		
	August	4	4	2	10	13%	3.33	1.73	4.09	4.54	X		
	September	4	3	1	8	10%	2.67	1.63	4.31	4.83	X		
	October	1	3	1	5	6%	1.67	1.46	3.92	4.39	X		
	November	2	2	5	9	11%	3.00	1.40	3.97	4.46	X		
	December	3	1	3	7	9%	2.33	1.41	4.02	4.52	X		
DAY OF THE WEEK	Sunday	9	4	1	14	18%	4.67	2.67	7.18	8.04	X		
	Monday	5	4	2	11	14%	3.67	2.47	5.66	6.27	X		
	Tuesday	4	4	1	9	11%	3.00	2.47	5.61	6.21	X		
	Wednesday	1	5	4	10	13%	3.33	2.33	5.55	6.16	X		
	Thursday	8	1	5	14	18%	4.67	2.44	5.25	5.79	X		
	Friday	2	5	3	10	13%	3.33	2.46	5.51	6.10	X		
	Saturday	1	6	5	12	15%	4.00	2.52	6.23	6.94	X		
HOUR OF THE DAY	00:00-06:00	4	3	3	10	13%	3.33	1.61	4.23	4.73	X		
	06:00-09:00	5	2	4	11	14%	3.67	1.36	3.39	3.78	X	X	
	09:00-11:00	4	3	3	10	13%	3.33	1.28	3.25	3.62	X	X	
	11:00-13:00	2	6	4	12	15%	4.00	1.70	4.20	4.68	X		
	13:00-15:00	2	3	1	6	8%	2.00	1.88	5.42	6.09	X		
	15:00-18:00	5	6	5	16	20%	5.33	2.99	7.98	8.94	X		
	18:00-24:00	8	6	1	15	19%	5.00	3.79	9.27	10.32	X		

	YEAR			3-Year Average
	1	2	3	
Average Daily Traffic ADT *(Vehicles per Day)*	42,701	46,414	50,450	46,522
Florida Average Crash rate *(Crashes per Million Entering Vehicles)*	0.757	0.757	0.757	0.757
Traffic Base	15.586	16.941	18.414	16.980
Actual Crash Rate *(Crashes per Million Entering Vehicles)*	1.925	1.712	1.140	1.592
Critical Crash Rate *(Crashes per Million Entering Vehicles)*	1.514	1.482	1.451	1.482
Safety Ratio	**1.271**	**1.155**	**0.786**	**1.071**
High Crash Location??	***YES***	***YES***	***NO***	***YES***

$$Actual\ \ Crash\ \ Rate\ \ =\ \ \frac{A \times 1{,}000{,}000}{V}$$

Where:
A = Total number of crashes or number of crashes by type occurring in a 1 year period.
V = Average Annual Daily Traffic X 365

$$CriticalCrashRate = AVR + \frac{0.5}{TB} + TF\sqrt{\frac{AVR}{TB}}$$

Where:
AVR = Average Statewide Crash Rate for a particular type of intersection or roadway segment.
TB = Traffic Base
TF = Test Factor (z-value)
= *1.96 (assume 95% Confidence Level for RURAL areas)*
= *3.29 (assume 99.95% Confidence Level for URBAN areas)*

$$Traffic\,Base = \frac{Years \times ADT \times 365}{1{,}000{,}000}$$

$$Safety\ \ Ratio\ \ =\ \ \frac{Actual\ \ Crash\ \ Rate}{Critical\ \ Crash\ \ Rate}$$

Confidence Level (%)	Constant Z
68.30	1.00
86.60	1.50
90.00	1.64
95.00	1.96
95.50	2.00
98.80	2.50
99.00	2.58
99.70	3.00
99.95	3.29

Table 22 – Abnormal Crash Details & Countermeasures
NW 22 Avenue and NW 7 Street

NW 22 Avenue & NW 7 Street

(4 Lane x 4 Lane, Signalized, With Turn Lanes, 4 Leg Intersection - Table 29) - URBAN Spot

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHE	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Rear End	Total Rear End Crashes		**14**	**10**	**10**	**34**	**100%**	**11.33**	(1)	5
	Lighting Conditions	Day Light	8	7	9	24	71%	8.00	(8)	8
		Dawn	0	1	0	1	3%	0.33	(9)	13
		Dark	6	2	1	9	26%	3.00		
	Hours of Day	00:00 - 06:00	2	1	0	3	9%	1.00		
		06:00 - 09:00	1	1	2	4	12%	1.33		
		09:00 - 11:00	1	1	2	4	12%	1.33		
		11:00 - 13:00	0	1	2	3	9%	1.00		
		13:00 - 15:00	2	2	1	5	15%	1.67		
		15:00 - 18:00	3	2	2	7	21%	2.33		
		18:00 - 24:00	5	2	1	8	24%	2.67		
	Direction	North	4	6	7	17	50%	5.67		
		South	2	0	2	4	12%	1.33		
		East	7	3	1	11	32%	3.67		
		West	1	1	0	2	6%	0.67		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHE	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Angle	Total Rear End Crashes		**9**	**4**	**4**	**17**	**100%**	**5.67**	(1)	2
	Lighting Conditions	Day Light	5	3	2	10	59%	3.33	(3)	4
		Dawn	0	0	1	1	6%	0.33	(7)	7
		Dark	4	1	1	6	35%	2.00	(12)	
	Hours of Day	00:00 - 06:00	3	1	1	5	31%	1.67		
		06:00 - 09:00	4	0	2	6	38%	2.00		
		09:00 - 11:00	2	0	0	2	13%	0.67		
		11:00 - 13:00	0	1	0	1	6%	0.33		
		13:00 - 15:00	0	1	0	1	6%	0.33		
		15:00 - 18:00	0	1	0	1	6%	0.33		
		18:00 - 24:00	0	0	0	0	0%	0.00		
	Direction	NB + EB	4	2	2	8	47%	2.67		
		NB + WB	3	1	0	4	24%	1.33		
		SB + EB	2	1	2	5	29%	1.67		
		SB + WB	0	0	0	0	0%	0.00		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHE	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Left Turn	Total Rear End Crashes		**3**	**6**	**2**	**11**	**100%**	**3.67**	(1)	2
	Lighting Conditions	Day Light	3	4	0	7	64%	2.33	(3)	4
		Dawn	0	0	0	0	0%	0.00	(7)	7
		Dark	0	2	2	4	36%	1.33	(12)	
	Hours of Day	00:00 - 06:00	0	1	2	3	27%	1.00		
		06:00 - 09:00	0	1	0	1	9%	0.33		
		09:00 - 11:00	0	0	0	0	0%	0.00		
		11:00 - 13:00	1	3	0	4	36%	1.33		
		13:00 - 15:00	0	0	0	0	0%	0.00		
		15:00 - 18:00	1	0	0	1	9%	0.33		
		18:00 - 24:00	1	1	0	2	18%	0.67		
	Direction	NB → WB	0	0	1	1	9%	0.33		
		WB → SB	0	1	1	2	18%	0.67		
		SB → EB	2	1	0	3	27%	1.00		
		EB → NB	1	4	0	5	45%	1.67		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHE	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Sideswipe (Overtake)	Total Rear End Crashes		**2**	**6**	**5**	**13**	**100%**	**4.33**	(1)	2
	Lighting Conditions	Day Light	2	4	4	10	77%	3.33	(3)	4
		Dawn	0	0	0	0	0%	0.00	(7)	7
		Dark	0	2	1	3	23%	1.00	(12)	
	Hours of Day	00:00 - 06:00	0	0	0	0	0%	0.00		
		06:00 - 09:00	0	0	0	0	0%	0.00		
		09:00 - 11:00	0	1	1	2	15%	0.67		
		11:00 - 13:00	0	1	2	3	23%	1.00		
		13:00 - 15:00	0	0	0	0	0%	0.00		
		15:00 - 18:00	1	2	2	5	38%	1.67		
		18:00 - 24:00	1	2	0	3	23%	1.00		
	Direction	North	0	2	2	4	31%	1.33		
		South	1	1	1	3	23%	1.00		
		East	0	2	1	3	23%	1.00		
		West	1	1	1	3	23%	1.00		
		Unknown	0	0	0	0	0%	0.00		

From this analysis, it was determined that rear end, left-turn and fixed object collisions exceed the threshold limits for the 95th percentile and 90th percentile confidence level. Also, angle, right-turn, sideswipe and bicycle collisions exceeded the mean. Those results indicate that these types of collisions were abnormally high during the period of 2011 through 2013. A detailed review of the abnormal crashes as well as probable countermeasures is presented in *Table 22*.

3.9.3. Traffic Operation Conditions and Analysis

In order to identify the traffic operation characteristics and safety relevant conflicts, field observations at NW 22 Avenue and NW 7 Street were performed on a typical weekday on May 13, 2014. A summary of the traffic data is presented in *Figure 35*, and the field review is presented in *Figure 36*.

The intersection is controlled by a signal suspended in span wires. This intersection has left-turn lanes for all approaches and the signal operation is protected-permissive for all of them. Obstructions to the sight distance are present at the southeast, southwest and northwest corners. Long queues were observed for southbound left-turn during am peak period with vehicles were spilling back and blocking the through lane. Same situation occurs for northbound left-turn during the pm peak period.

Immediately south of the intersection there is a school speed zone for Citrus Grove Elementary School. A mid-block pedestrian signal exists 350 feet west of the intersection. Moderate pedestrian activity was observed at all directions and the activity increases during school arrival and dismissal times. Crosswalks are provided for all directions. Also pedestrian head counts are provided for all direction, and push buttons exist to cross NW 7 Street. Conflicts exist with turning vehicles and pedestrians. Pavement was observed in substandard conditions. Pavement markings were faded.

3.9.4. Recommendations

Based on the safety analysis, field observations and traffic operations for the intersection of NW 22 Avenue and NW 7 Street, the following is recommended:

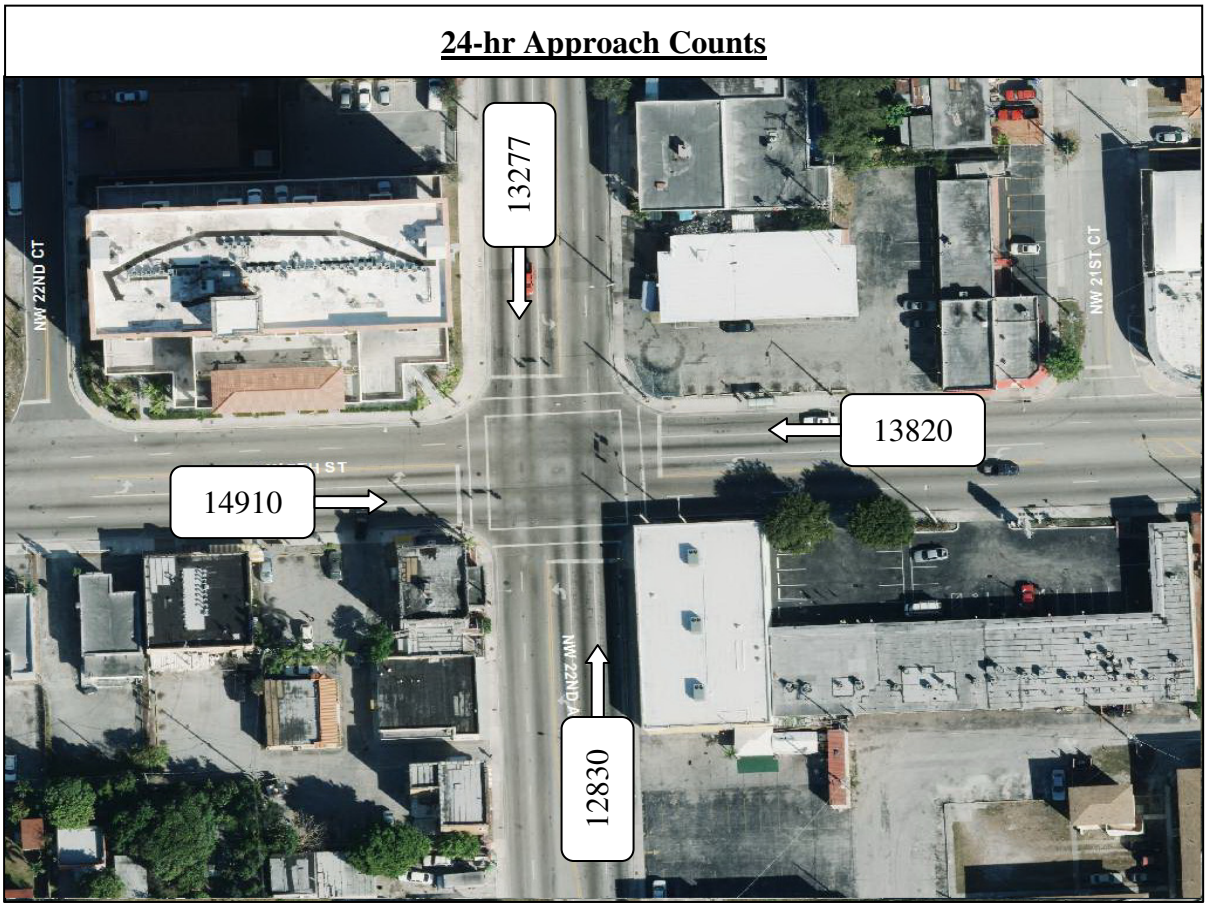
- Update span wire traffic signal to mast arm suspension signal
- Lengthen the southbound left-turn lane to approximately 350 feet and the northbound left-turn lane to approximately 150 feet
- Update ADA ramps at northeast corner
- Install reflective back plates for all signals heads
- Provide Turning Vehicles Yield to Pedestrians (R10-15) signs for all direction
- Resurface the intersection and refurbish pavement markings using thermoplastic painting.

A conceptual vision of the proposed roadway improvements is exhibited in *Figure 37*.

3.9.5. Cost Estimate

Based on the recommended improvements and the Conceptual Plan, the estimated cost for this project is approximately $425,814. The details of the preliminary project costs are presented in *Appendix D*.

Construction costs were obtained from items cost on the latest pay item Average Unit Cost Report for the Area 13 (Miami-Dade County), and the Miami-Dade Traffic Signal Division price list.



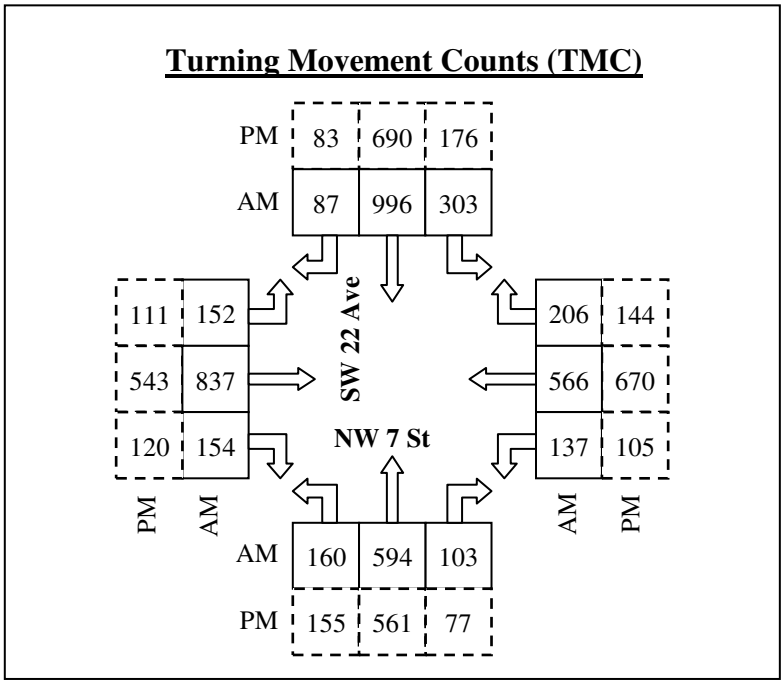


Figure 35: Traffic Data – *NW 22 Avenue and NW 7 Street*

North-East corner: No ADA ramps.

Substandard pavement conditions.

Cracked and faded paving markings.

Southbound approach

Northbound approach

Eastbound approach

Figure 36: Field Review – *NW 22 Avenue and NW 7 Street*

Figure 37: Conceptual Plan – *NW 22 Avenue and NW 7 Street*

3.10. NW 3 Avenue and NW 5 Street

3.10.1. Site Description

This intersection is a signalized four legged intersection located in the City of Miami. NW 3 Avenue is a one-way northbound three lane urban collector with that runs north-south, and NW 5 Street is a one-way eastbound three lane urban collector that runs east-west.

3.10.2. Safety Conditions and Analysis

The intersection of NW 3 Avenue and NW 5 Street is ranked number 10 in our high crash locations list. A review of the hard copy police reports for the year 2011 through 2013 was performed. During the three-year analysis period, 54 relevant crashes occurred at the intersection. The analysis indicated that the average number of crashes per year is 18. The crash summaries, crash statistics and collision diagrams for the intersection are documented in *Appendix A*.

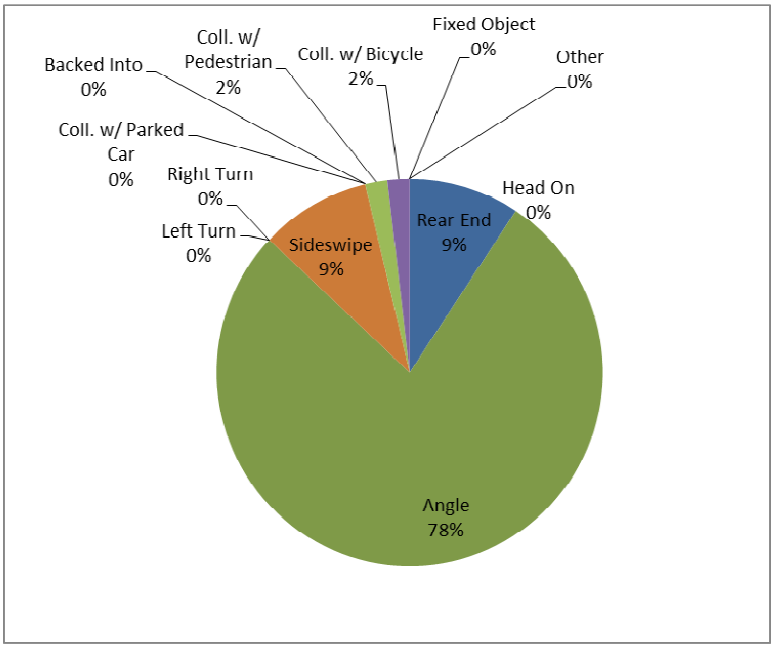


Figure 38 Predominant Crash Types
NW 3 AVE & NW 5 ST

Based on the analysis of crash records for this intersection, the predominant types of crashes are shown in *Figure 38.*

Calculated intersection mean crash per year were compared to the average Miami-Dade Crash Rate for County corridors to assess the safety conditions at the study intersection in relation to other roadways with similar traffic and geometric characteristics. This study is based on the 2010 FDOT's "Expected Value Analysis." *Table 23* illustrates the expected accident volume analysis of this intersection as well as the safety ratios and the confidence levels during the analysis period.

Based on a regression growth of 8% from the 2014 entering volume, the calculated safety ratios for the years 2011, 2012, and 2013 were 0.743, 1.847, and 0.841, respectively. The safety ratio for the three years averaged 1.144. Also, results of confidence level indicated that this intersection has been a high crash location during the three years with a confidence level higher than 99.95%.

Table 23 – Crash Analysis – NW 3 Avenue and NW 5 Street

NW 3 Avenue & NW 5 Street

(4 Lane x 2 Lane, Signalized, With Turn Lanes, 4 Leg Intersection -Table 23) - URBAN Spot

	TYPE OF CRASH	NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	EXPECTED ANNUAL CRASH VALUE			ABNORMALLY HIGH CRASHES		
		2011	2012	2013				MEAN	90th Percentile	95th Percentile	Mean	90th Percentil	95th Percentil
COLLISION TYPE	Rear End	1	3	1	5	9%	1.67	1.62	4.09	4.56	X		
	Head On	0	0	0	0	0%	0.00	0.16	0.58	0.66			
	Angle	8	25	9	42	78%	14.00	1.37	3.01	3.33	X	X	X
	Left Turn	0	0	0	0	0%	0.00	0.49	1.29	1.44			
	Right Turn	0	0	0	0	0%	0.00	0.10	0.39	0.45			
	Sideswipe	2	1	2	5	9%	1.67	0.56	1.40	1.56	X	X	X
	Backed Into	0	0	0	0	0%	0.00	0.07	0.40	0.46			
	Coll. w/ Parked Car	0	0	0	0	0%	0.00	0.08	0.50	0.58			
	Coll. w/ Pedestrian	0	0	1	1	2%	0.33	0.16	0.56	0.63	X		
	Coll. w/ Bicycle	0	0	1	1	2%	0.33	0.00	0.00	0.00	X	X	X
	Fixed Object	0	0	0	0	0%	0.00	0.22	0.55	0.62			
	Ran Off Road	0	0	0	0	0%	0.00	0.00	0.00	0.00			
	Overtuned	0	0	0	0	0%	0.00	0.01	0.11	0.13			
	Other	0	0	0	0	0%	0.00	2.44	6.28	7.02			
	Total Crashes	11	29	14	54	100%	18.00	7.27	15.00	16.48	X	X	X
SEVERITY	PDO crashes	6	21	9	36	67%	12.00	3.99	9.34	10.36	X	X	X
	Fatal crashes	0	0	0	0	0%	0.00	0.00	0.00	0.00			
	Injury crashes	5	8	5	18	33%	6.00	5.10	11.25	12.43	X		
LIGHT CONDITIONS	Day Light	9	20	10	39	72%	13.00	4.76	9.80	10.76	X	X	X
	Dusk	0	0	2	2	4%	0.67	0.24	0.65	0.73	X	X	
	Dawn	0	1	0	1	2%	0.33	0.14	0.49	0.55	X		
	Dark	2	7	2	11	20%	3.67	2.00	4.57	5.06	X		
	Unknown	0	1	0	1	2%	0.33	0.12	0.46	0.52	X		
SURFACE CONDITIONS	Dry	10	28	13	51	94%	17.00	0.63	13.06	14.37	X	X	X
	Wet	1	0	1	2	4%	0.67	0.87	1.92	2.12			
	Others	0	1	0	1	2%	0.33	0.14	0.57	0.65	X		
MONTH OF A YEAR	January	2	1	2	5	9%	1.67	0.48	1.33	1.49	X	X	X
	February	1	1	1	3	6%	1.00	0.59	1.40	1.56	X		
	March	0	2	1	3	6%	1.00	0.71	1.76	1.96	X		
	April	0	3	1	4	7%	1.33	0.58	1.47	1.65	X		
	May	0	5	2	7	13%	2.33	0.61	1.50	1.67	X	X	X
	June	0	4	1	5	9%	1.67	0.52	1.32	1.47	X	X	X
	July	3	1	0	4	7%	1.33	0.53	1.28	1.42	X	X	
	August	0	1	0	1	2%	0.33	0.69	1.68	1.87			
	September	1	3	1	5	9%	1.67	0.73	1.96	2.19	X		
	October	2	4	3	9	17%	3.00	0.74	1.92	2.14	X	X	X
	November	2	2	2	6	11%	2.00	0.53	1.49	1.68	X	X	X
	December	0	2	0	2	4%	0.67	0.54	1.33	1.48	X		
DAY OF THE WEEK	Sunday	2	3	2	7	13%	2.33	0.96	1.99	2.19	X	X	X
	Monday	2	5	1	8	15%	2.67	1.16	2.90	3.23	X		
	Tuesday	1	4	1	6	11%	2.00	1.11	2.43	2.68	X		
	Wednesday	2	5	4	11	20%	3.67	1.10	2.49	2.76	X	X	X
	Thursday	0	3	0	3	6%	1.00	1.09	2.49	2.76			
	Friday	2	2	3	7	13%	2.33	0.92	2.25	2.50	X	X	
	Saturday	2	7	3	12	22%	4.00	0.93	2.38	2.66	X	X	X
HOUR OF THE DAY	00:00-06:00	1	3	1	5	9%	1.67	0.71	2.04	2.29	X		
	06:00-09:00	2	1	1	4	8%	1.33	0.78	2.23	2.50	X		
	09:00-11:00	3	6	2	11	21%	3.67	0.63	1.67	1.86	X	X	X
	11:00-13:00	2	5	3	10	19%	3.33	0.69	1.60	1.77	X	X	X
	13:00-15:00	1	3	1	5	9%	1.67	0.79	1.96	2.18	X		
	15:00-18:00	1	6	2	9	17%	3.00	1.53	3.50	3.88	X		
	18:00-24:00	1	5	3	9	17%	3.00	2.13	4.38	4.81	X		

	YEAR			3-Year Average
	1	2	3	
Average Daily Traffic ADT *(Vehicles per Day)*	15,874	17,255	18,755	17,295
Florida Average Crash rate *(Crashes per Million Entering Vehicles)*	1.062	1.062	1.062	1.062
Traffic Base	5.794	6.298	6.846	6.313
Actual Crash Rate *(Crashes per Million Entering Vehicles)*	1.898	4.605	2.045	2.849
Critical Crash Rate *(Crashes per Million Entering Vehicles)*	2.557	2.492	2.431	2.493
Safety Ratio	**0.743**	**1.847**	**0.841**	**1.144**
High Crash Location??	***NO***	***YES***	***NO***	***YES***

$$Actual\ \ Crash\ \ Rate\ \ =\ \ \frac{A \times 1{,}000\ ,000}{V}$$

Where:
A = Total number of crashes or number of crashes by type occurring in a 1 year period.
V = Average Annual Daily Traffic X 365

$$CriticalCrashRate = AVR + \frac{0.5}{TB} + TF\sqrt{\frac{AVR}{TB}}$$

$$Traffic\,Base = \frac{Years \times ADT \times 365}{1{,}000{,}000}$$

$$Safety\ \ Ratio\ \ =\ \ \frac{Actual\ \ Crash\ \ Rate}{Critical\ \ Crash\ \ Rate}$$

Where:
AVR = Average Statewide Crash Rate for a particular type of intersection or roadway segment.
TB = Traffic Base
TF = Test Factor (z-value)
= 1.96 (assume 95% Confidence Level for RURAL areas)
= 3.29 (assume 99.95% Confidence Level for URBAN areas)

Confidence Level (%)	Constant Z
68.30	1.00
86.60	1.50
90.00	1.64
95.00	1.96
95.50	2.00
98.80	2.50
99.00	2.58
99.70	3.00
99.95	3.29

From this analysis, it was determined that angle, sideswipe and bicycle collisions presented abnormal crash patterns that exceed the threshold limits for the 95th percentile and 90th percentile confidence level. Those results indicate that these types of collisions were abnormally high during the period of 2011 through 2013. A detailed review of the abnormal crashes as well as probable countermeasures is presented in *Table 24*.

Table 24 – Abnormal Crash Details & Countermeasures
NW 3 Avenue and NW 5 Street

NW 3 Avenue & NW 5 Street

(4 Lane x 2 Lane, Signalized, With Turn Lanes, 4 Leg Intersection -Table 23) - URBAN Spot

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHE	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Angle	Total Rear End Crashes		8	25	9	42	100%	14.00	(1)	2
	Lighting Conditions	Day Light	6	18	5	29	69%	9.67	(3)	4
		Dawn	0	0	0	0	0%	0.00	(7)	7
		Dark	2	7	4	13	31%	4.33	(12)	
	Hours of Day	00:00 - 06:00	1	3	1	5	12%	1.67		
		06:00 - 09:00	1	1	0	2	5%	0.67		
		09:00 - 11:00	1	6	1	8	20%	2.67		
		11:00 - 13:00	2	5	3	10	24%	3.33		
		13:00 - 15:00	1	2	0	3	7%	1.00		
		15:00 - 18:00	1	5	1	7	17%	2.33		
		18:00 - 24:00	1	3	2	6	15%	2.00		
	Direction	NB + EB	8	24	8	40	95%	13.33		
		NB + WB	0	1	1	2	5%	0.67		
		SB + EB	0	0	0	0	0%	0.00		
		SB + WB	0	0	0	0	0%	0.00		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHE	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Sideswipe (Overtake)	Total Left Turn Crashes		2	1	2	5	100%	1.67	(9)	9
	Lighting Conditions	Day Light	2	0	2	4	80%	1.33	(13)	13
		Dawn	0	0	0	0	0%	0.00		17
		Dark	0	1	0	1	20%	0.33		
	Hours of Day	00:00 - 06:00	0	0	0	0	0%	0.00		
		06:00 - 09:00	0	0	1	1	20%	0.33		
		09:00 - 11:00	2	0	0	2	40%	0.67		
		11:00 - 13:00	0	0	0	0	0%	0.00		
		13:00 - 15:00	0	0	0	0	0%	0.00		
		15:00 - 18:00	0	0	1	1	20%	0.33		
		18:00 - 24:00	0	1	0	1	20%	0.33		
	Direction	North	0	0	0	0	0%	0.00		
		South	1	0	0	1	20%	0.33		
		East	1	1	2	4	80%	1.33		
		West	0	0	0	0	0%	0.00		
		Unknown	0	0	0	0	0%	0.00		

3.10.3. Traffic Operation Conditions and Analysis

In order to identify the traffic operation characteristics and safety relevant conflicts, field observations at NW 3 Avenue and NW 5 Street were performed on a typical weekday on May 15, 2014. A summary of the traffic data is presented in *Figure 39*, and the field review is presented in *Figure 40*.

The eastbound approach has one left turn lane and three thru lanes while the northbound approach has one shared right and thru lane and two thru lanes. Eastbound traffic has auxiliary pedestal signals at both sides of NW 5 Street and also mounted on the signal mast

arm posts. However the signal visibility is still poor since the bridge darkens the approach significantly. Obstruction to the sight distance exists at the southwest corner affecting both east and north approach due to the unique characteristics of these two one-way roads. On-street parking exists on the east leg at the north side of NW 5 Street.

Public parking lots exist on the north and south-west corners while many governmental and public offices exist to the east of the intersection. Downtown Miami Charter School and Law Enforcement Officer Memorial High School are located south of the study intersection. Pedestrian activity is moderate during the entire day and increases during student arrival and dismissal times.

The pavement is in substandard conditions and mast arm post cover plates were either damaged or missing. Updated ADA pedestrian ramps exist only on the intersection north leg for the east-west crossing direction. Crosswalks and pedestrian head counts are provided for all directions.

3.10.4. Recommendations

Based on the safety analysis, field observations and traffic operations for the intersection of NW 3 Avenue and NW 5 Street, the following is recommended:

- Update ADA ramps at all corners
- Installing reflective back plates for all signals heads
- Provide signal ahead warning signs on both sides of NW 5 Street for eastbound traffic
- Retiming/optimizing of the existing signal while maintaining cycle length for both the AM and PM peak hours pursuing to extend clearance timing for east direction.
- Provide mast arm post cover plates
- Provide “No Right Turn On Red” sign for northbound traffic
- Resurfacing the intersection and refurbishing of pavement markings using thermoplastic painting.

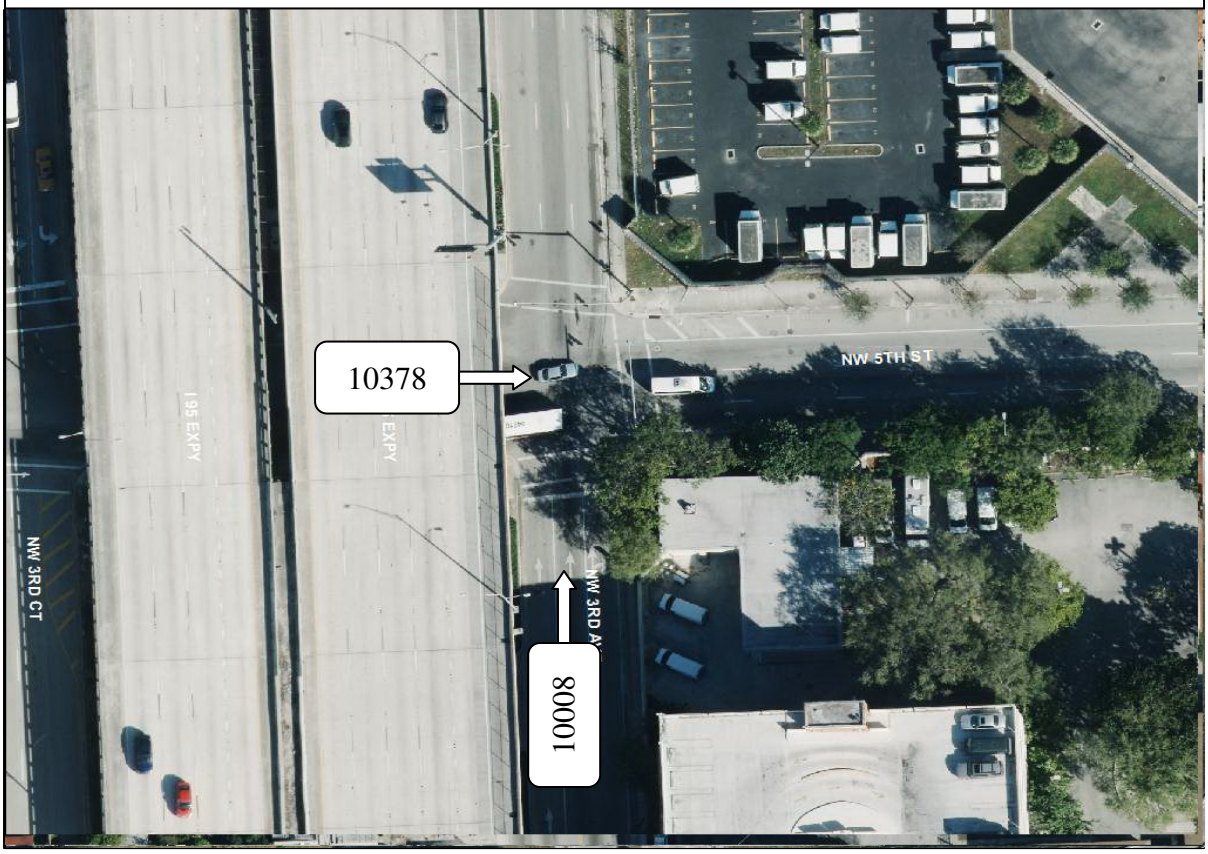
A conceptual vision of the proposed roadway improvements is exhibited in *Figure 41*.

3.10.5. Cost Estimate

Based on the recommended improvements and the Conceptual Plan, the estimated cost for this project is approximately $54,925. The details of the preliminary project costs are presented in *Appendix D*.

Construction costs were obtained from items cost on the latest pay item Average Unit Cost Report for the Area 13 (Miami-Dade County), and the Miami-Dade Traffic Signal Division price list.

24-hr Approach Counts



Turning Movement Counts (TMC)

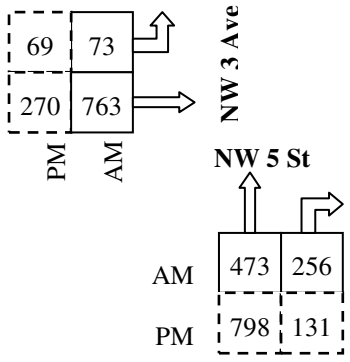


Figure 39: Traffic Data – *NW 3 Avenue and NW 5 Street*

Eastbound approach: Poor signal visibility.

Outdated pedestrian ramps.

South-East corner: Mast arm post in substandard conditions.

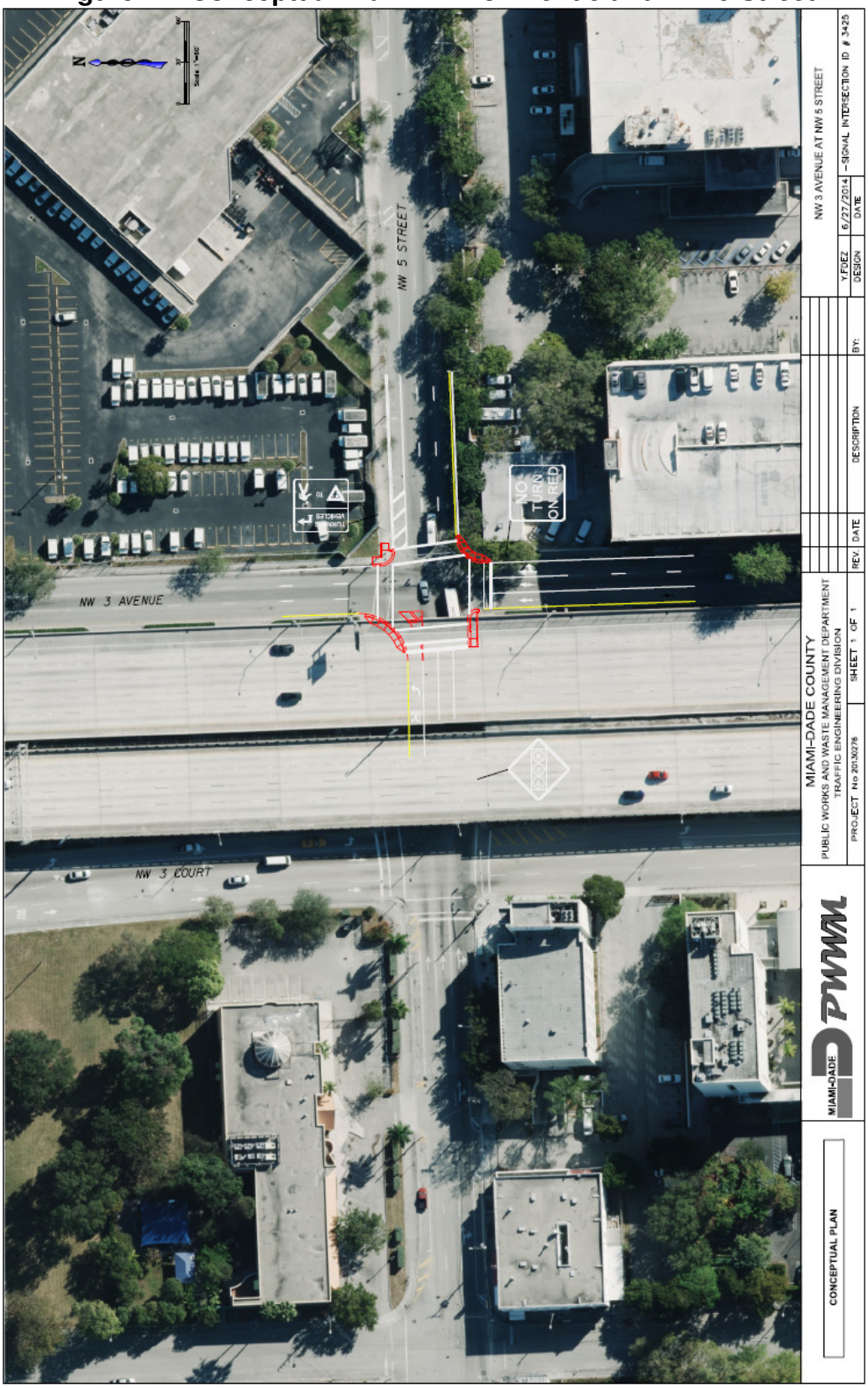
North-East corner: Mast arm post in substandard conditions.

Eastbound: High demand of heavy vehicles.

Substandard pavement conditions.

Figure 40: Field Review – *NW 3 Avenue and NW 5 Street*

Figure 41: Conceptual Plan – *NW 3 Avenue and NW 5 Street*



3.11. W 28 Avenue and W 76 Street

3.11.1. Site Description

This intersection is a signalized four legged intersection located within the City of Hialeah in the northwest area of Miami Dade County. West 28 Avenue is a four lane urban arterial divided by a median mostly paved that runs north-south, and West 76 Street is a two lane local road that runs east-west.

3.11.2. Safety Conditions and Analysis

The intersection of W 28 Avenue and W 76 Street is ranked number 11 in our high crash locations list. A review of the hard copy police reports for the year 2011 through 2013 was performed. During the three-year analysis period, 68 relevant crashes occurred at the intersection. The analysis indicated that the average number of crashes per year is 23. The crash summaries, crash statistics and collision diagrams for the intersection are documented in *Appendix A*.

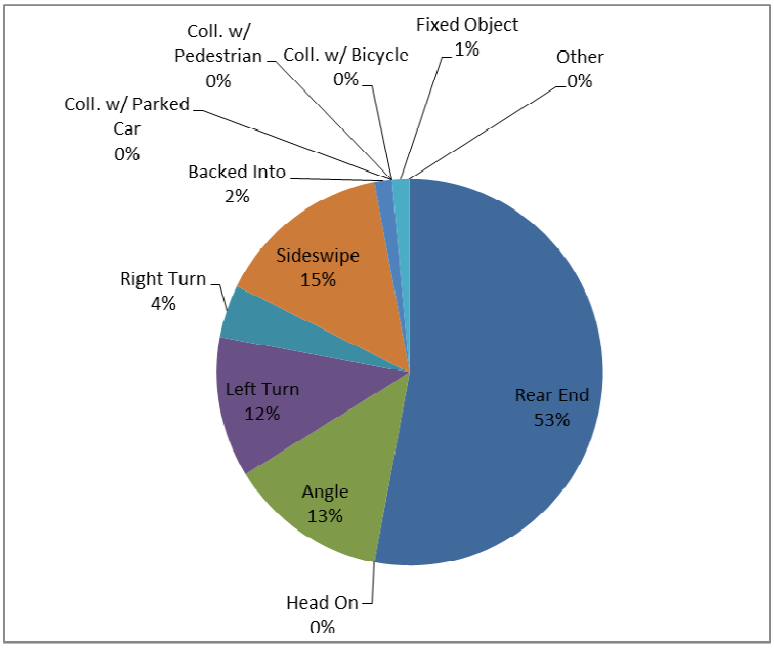


Figure 42 Predominant Crash Types
W 28 AVE & W 76 ST

Based on the analysis of crash records for this intersection, the predominant types of crashes are shown in *Figure 42*.

Calculated intersection mean crash per year were compared to the average Miami-Dade Crash Rate for County corridors to assess the safety conditions at the study intersection in relation to other roadways with similar traffic and geometric characteristics. This study is based on the 2010 FDOT's "Expected Value Analysis." *Table 25* illustrates the expected accident volume analysis of this intersection as well as the safety ratios and the confidence levels during the analysis period.

Based on a regression growth of 8% from the 2014 entering volume, the calculated safety ratios for the years 2011, 2012, and 2013 were 0.899, 1.395, and 1.079, respectively. The safety ratio for the three years averaged 1.124. Also, results of confidence level indicated that this intersection has been a high crash location during the three years with a confidence level higher than 99.95%.

Table 25 – Crash Analysis – W 28 Avenue and W 76 Street

W 28 Avenue & W 76 Street

(4 Lane x 2 Lane, Signalized, With Turn Lanes, 4 Leg Intersection - Table 23) - URBAN Spot

	TYPE OF CRASH	NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	EXPECTED ANNUAL CRASH VALUE			ABNORMALLY HIGH CRASHES		
		2011	2012	2013				MEAN	90th Percentile	95th Percentile	Mean	90th Percentil	95th Percentil
COLLISION TYPE	Rear End	8	16	12	36	53%	12.00	1.62	4.09	4.56	X	X	X
	Head On	0	0	0	0	0%	0.00	0.16	0.58	0.66			
	Angle	5	3	1	9	13%	3.00	1.37	3.01	3.33	X		
	Left Turn	3	2	3	8	12%	2.67	0.49	1.29	1.44	X	X	X
	Right Turn	0	2	1	3	4%	1.00	0.10	0.39	0.45	X	X	X
	Sideswipe	0	4	6	10	15%	3.33	0.56	1.40	1.56	X	X	X
	Backed Into	1	0	0	1	1%	0.33	0.07	0.40	0.46	X		
	Coll. w/ Parked Car	0	0	0	0	0%	0.00	0.08	0.50	0.58			
	Coll. w/ Pedestrian	0	0	0	0	0%	0.00	0.16	0.56	0.63			
	Coll. w/ Bicycle	0	0	0	0	0%	0.00	0.00	0.00	0.00			
	Fixed Object	0	1	0	1	1%	0.33	0.22	0.55	0.62	X		
	Ran Off Road	0	0	0	0	0%	0.00	0.00	0.00	0.00			
	Overtuned	0	0	0	0	0%	0.00	0.01	0.11	0.13			
	Other	0	0	0	0	0%	0.00	2.44	6.28	7.02			
	Total Crashes	17	28	23	68	100%	22.67	7.27	15.00	16.48	X	X	X
SEVERITY	PDO crashes	13	24	20	57	84%	19.00	3.99	9.34	10.36	X	X	X
	Fatal crashes	0	0	0	0	0%	0.00	0.00	0.00	0.00			
	Injury crashes	4	4	3	11	16%	3.67	5.10	11.25	12.43			
LIGHT CONDITIONS	Day Light	16	21	17	54	79%	18.00	4.76	9.80	10.76	X	X	X
	Dusk	0	2	1	3	4%	1.00	0.24	0.65	0.73	X	X	X
	Dawn	1	0	0	1	1%	0.33	0.14	0.49	0.55	X		
	Dark	0	4	5	9	13%	3.00	2.00	4.57	5.06	X		
	Unknown	0	1	0	1	1%	0.33	0.12	0.46	0.52	X		
SURFACE CONDITIONS	Dry	14	20	21	55	81%	18.33	0.63	13.06	14.37	X	X	X
	Wet	3	7	2	12	18%	4.00	0.87	1.92	2.12	X	X	X
	Others	0	1	0	1	1%	0.33	0.14	0.57	0.65	X		
MONTH OF A YEAR	January	0	1	3	4	6%	1.33	0.48	1.33	1.49	X	X	
	February	2	2	1	5	7%	1.67	0.59	1.40	1.56	X	X	X
	March	2	4	3	9	13%	3.00	0.71	1.76	1.96	X	X	X
	April	1	1	2	4	6%	1.33	0.58	1.47	1.65	X		
	May	2	4	2	8	12%	2.67	0.61	1.50	1.67	X	X	X
	June	4	4	3	11	16%	3.67	0.52	1.32	1.47	X	X	X
	July	2	1	0	3	4%	1.00	0.53	1.28	1.42	X		
	August	1	4	2	7	10%	2.33	0.69	1.68	1.87	X	X	X
	September	0	1	1	2	3%	0.67	0.73	1.96	2.19			
	October	2	1	3	6	9%	2.00	0.74	1.92	2.14	X	X	
	November	1	3	2	6	9%	2.00	0.53	1.49	1.68	X	X	X
	December	0	2	1	3	4%	1.00	0.54	1.33	1.48	X		
DAY OF THE WEEK	Sunday	2	3	3	8	12%	2.67	0.93	2.38	2.66	X	X	X
	Monday	6	2	1	9	13%	3.00	0.96	1.99	2.19	X	X	X
	Tuesday	1	4	6	11	16%	3.67	1.16	2.90	3.23	X	X	X
	Wednesday	2	2	3	7	10%	2.33	1.11	2.43	2.68	X		
	Thursday	4	4	5	13	19%	4.33	1.10	2.49	2.76	X	X	X
	Friday	2	6	4	12	18%	4.00	1.09	2.49	2.76	X	X	X
	Saturday	0	7	1	8	12%	2.67	0.92	2.25	2.50	X	X	X
HOUR OF THE DAY	00:00-06:00	0	2	3	5	7%	1.67	0.71	2.04	2.29	X		
	06:00-09:00	2	2	3	7	10%	2.33	0.78	2.23	2.50	X	X	
	09:00-11:00	3	0	0	3	4%	1.00	0.63	1.67	1.86	X		
	11:00-13:00	0	5	0	5	7%	1.67	0.69	1.60	1.77	X	X	
	13:00-15:00	2	5	2	9	13%	3.00	0.79	1.96	2.18	X	X	X
	15:00-18:00	8	7	8	23	34%	7.67	1.53	3.50	3.88	X	X	X
	18:00-24:00	2	6	7	15	22%	5.00	2.13	4.38	4.81	X	X	X

	YEAR			3-Year Average
	1	2	3	
Average Daily Traffic ADT *(Vehicles per Day)*	31,482	34,219	37,195	34,298
Florida Average Crash rate *(Crashes per Million Entering Vehicles)*	0.757	0.757	0.757	0.757
Traffic Base	11.491	12.490	13.576	12.519
Actual Crash Rate *(Crashes per Million Entering Vehicles)*	1.479	2.242	1.694	1.805
Critical Crash Rate *(Crashes per Million Entering Vehicles)*	1.645	1.607	1.571	1.608
Safety Ratio	**0.899**	**1.395**	**1.079**	**1.124**
High Crash Location??	***NO***	***YES***	***YES***	***YES***

$$Actual\ \ Crash\ \ Rate\ = \frac{A \times 1{,}000{,}000}{V}$$

Where:
A = Total number of crashes or number of crashes by type occurring in a 1 year period.
V = Average Annual Daily Traffic X 365

$$CriticalCrashRate = AVR + \frac{0.5}{TB} + TF\sqrt{\frac{AVR}{TB}}$$

Where:
AVR = Average Statewide Crash Rate for a particular type of intersection or roadway segment.
TB = Traffic Base
TF = Test Factor (z-value)
= *1.96 (assume 95% Confidence Level for RURAL areas)*
= *3.29 (assume 99.95% Confidence Level for URBAN areas)*

Confidence Level (%)	Constant Z
68.30	1.00
86.60	1.50
90.00	1.64
95.00	1.96
95.50	2.00
98.80	2.50
99.00	2.58
99.70	3.00
99.95	3.29

$$Traffic\ Base = \frac{Years \times ADT \times 365}{1{,}000{,}000}$$

$$Safety\ \ Ratio\ \ = \frac{Actual\ \ Crash\ \ Rate}{Critical\ \ Crash\ \ Rate}$$

Table 26 – Abnormal Crash Details & Countermeasures
W 28 Avenue and W 76 Street

W 28 Avenue & W 76 Street

(4 Lane x 2 Lane, Signalized, With Turn Lanes, 4 Leg Intersection - Table 23) - URBAN Spot

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Rear End	Total Rear End Crashes		**8**	**16**	**12**	**36**	**100%**	**12.00**	(6)	10
	Lighting Conditions	Day Light	8	12	9	29	81%	9.67	(11)	11
		Dawn	0	0	0	0	0%	0.00	(18)	12
		Dark	0	4	3	7	19%	2.33	(19)	13
	Hours of Day	00:00 - 06:00	0	1	1	2	6%	0.67	(21)	19
		06:00 - 09:00	1	0	2	3	9%	1.00		21
		09:00 - 11:00	2	0	0	2	6%	0.67		
		11:00 - 13:00	0	3	0	3	9%	1.00		
		13:00 - 15:00	1	4	2	7	20%	2.33		
		15:00 - 18:00	4	4	4	12	34%	4.00		
		18:00 - 24:00	0	3	3	6	17%	2.00		
	Direction	North	1	4	2	7	17%	2.33		
		South	3	3	2	8	20%	2.67		
		East	2	6	5	13	32%	4.33		
		West	2	3	8	13	32%	4.33		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Angle	Total Rear End Crashes		**5**	**3**	**1**	**9**	**100%**	**3.00**	(6)	8
	Lighting Conditions	Day Light	4	2	0	6	67%	2.00	(8)	9
		Dawn	1	0	0	1	11%	0.33	(9)	10
		Dark	0	1	1	2	22%	0.67		11
	Hours of Day	00:00 - 06:00	0	1	1	2	22%	0.67		12
		06:00 - 09:00	1	0	0	1	11%	0.33		
		09:00 - 11:00	1	0	0	1	11%	0.33		
		11:00 - 13:00	0	0	0	0	0%	0.00		
		13:00 - 15:00	0	0	0	0	0%	0.00		
		15:00 - 18:00	3	2	0	5	56%	1.67		
		18:00 - 24:00	0	0	0	0	0%	0.00		
	Direction	NB + EB	3	0	0	3	33%	1.00		
		NB + WB	0	2	0	2	22%	0.67		
		SB + EB	2	1	0	3	33%	1.00		
		SB + WB	0	0	1	1	11%	0.33		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Left Turn	Total Rear End Crashes		**3**	**2**	**3**	**8**	**100%**	**2.67**	(6)	8
	Lighting Conditions	Day Light	3	1	1	5	63%	1.67	(8)	9
		Dawn	0	0	0	0	0%	0.00	(14)	11
		Dark	0	1	2	3	38%	1.00	(16)	12
	Hours of Day	00:00 - 06:00	0	0	0	0	0%	0.00		13
		06:00 - 09:00	0	0	0	0	0%	0.00		
		09:00 - 11:00	0	0	0	0	0%	0.00		
		11:00 - 13:00	0	0	0	0	0%	0.00		
		13:00 - 15:00	1	0	0	1	13%	0.33		
		15:00 - 18:00	0	1	1	2	25%	0.67		
		18:00 - 24:00	2	1	2	5	63%	1.67		
	Direction	NB → WB	0	0	3	3	38%	1.00		
		WB → SB	1	0	0	1	13%	0.33		
		SB → EB	0	1	0	1	13%	0.33		
		EB → NB	2	1	0	3	38%	1.00		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Right Turn	Total Right Turn Crashes		**0**	**2**	**1**	**3**	**100%**	**1.00**	(1)	5
	Lighting Conditions	Day Light	0	2	0	2	67%	0.67	(9)	9
		Dawn	0	0	0	0	0%	0.00	(19)	13
		Dark	0	0	1	1	33%	0.33	(21)	
	Hours of Day	00:00 - 06:00	0	0	0	0	0%	0.00		
		06:00 - 09:00	0	0	0	0	0%	0.00		
		09:00 - 11:00	0	0	0	0	0%	0.00		
		11:00 - 13:00	0	1	0	1	33%	0.33		
		13:00 - 15:00	0	1	0	1	33%	0.33		
		15:00 - 18:00	0	0	0	0	0%	0.00		
		18:00 - 24:00	0	0	1	1	33%	0.33		
	Direction	NB→EB	0	2	0	2	67%	0.67		
		EB→SB	0	0	1	1	33%	0.33		
		WB→NB	0	0	0	0	0%	0.00		
		SB→WB	0	0	0	0	0%	0.00		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Sideswipe (Overtake)	Total Sideswipe Crashes		**0**	**4**	**6**	**10**	**100%**	**3.33**	(18)	19
	Lighting Conditions	Day Light	0	2	5	7	70%	2.33	(19)	21
		Dawn	0	0	0	0	0%	0.00		
		Dark	0	2	1	3	30%	1.00		
	Hours of Day	00:00 - 06:00	0	0	1	1	10%	0.33		
		06:00 - 09:00	0	2	1	3	30%	1.00		
		09:00 - 11:00	0	0	0	0	0%	0.00		
		11:00 - 13:00	0	0	0	0	0%	0.00		
		13:00 - 15:00	0	0	0	0	0%	0.00		
		15:00 - 18:00	0	0	3	3	30%	1.00		
		18:00 - 24:00	0	2	1	3	30%	1.00		
	Direction	North	0	1	2	3	30%	1.00		
		South	0	0	1	1	10%	0.33		
		East	0	3	1	4	40%	1.33		
		West	0	0	2	2	20%	0.67		
		Unknown	0	0	0	0	0%	0.00		

From this analysis, it was determined that rear end, left-turn, right-turn and sideswipe collisions presented abnormal crash patterns that exceed the threshold limits for the 95th percentile and 90th percentile confidence level. Also, Angle, backing and bicycle collisions exceeded the mean. Those results indicate that these types of collisions were abnormally high during the period of 2011 through 2013. A detailed review of the abnormal crashes as well as probable countermeasures is presented in *Table 26*.

3.11.3. Traffic Operation Conditions and Analysis

In order to identify the traffic operation characteristics and safety relevant conflicts, field observations at West 28th Avenue and West 76th Street were performed on a typical weekday on May 15, 2014. A summary of the traffic data is presented in *Figure 43*, and the field review is presented in *Figure 44*.

This intersection has single left-turn bays for all approaches. The signal operation is protected/permissive for all approaches left-turn traffic.

The intersection has no pedestrian signal, detectable warnings devices are not present on existing ramps, and no connections are provided to existing sidewalks. Pedestrians including a visually challenged individual were observed during the field visit walking in the area and using the transit stops.

The pavement exhibits wear and deterioration and pavement markings are faded.

All returns present a small radius, large vehicles encroach into the second (inner lane) in order to make the turns at the SE corner where only one lane exists eastbound. Vehicles encroach into the left turn lane in order to proceed at the NW corner. The stop bar for the left turn bay on the west leg has been pushed back to avoid conflicts with turning vehicles.

Illegal parking takes place on the south side of the east leg which possibly creates conflicts with thru movement as well as right turn vehicles.

Visibility is impacted by landscaping installed on the east swale on the south leg of the intersection.

Cars currently use the west leg right turn only bay as a thru lane to continue thru the intersection. This lane used to be thru and right before the lane designation was changed by the City of Hialeah Reconstruction Project.

Westbound thru lane is not aligned because of temporary marking by City of Hialeah MOT.

Light poles along West 76 Street on the east side of West 28 Avenue are covered by trees.

Red light running was observed at the intersection as well as a failure of right turning vehicles from making a complete stop before proceeding to turn.

3.11.4. Recommendations

Based on the safety analysis, field observations and traffic operations for the intersection of West 28 Avenue and West 76 Street, the following is recommended:

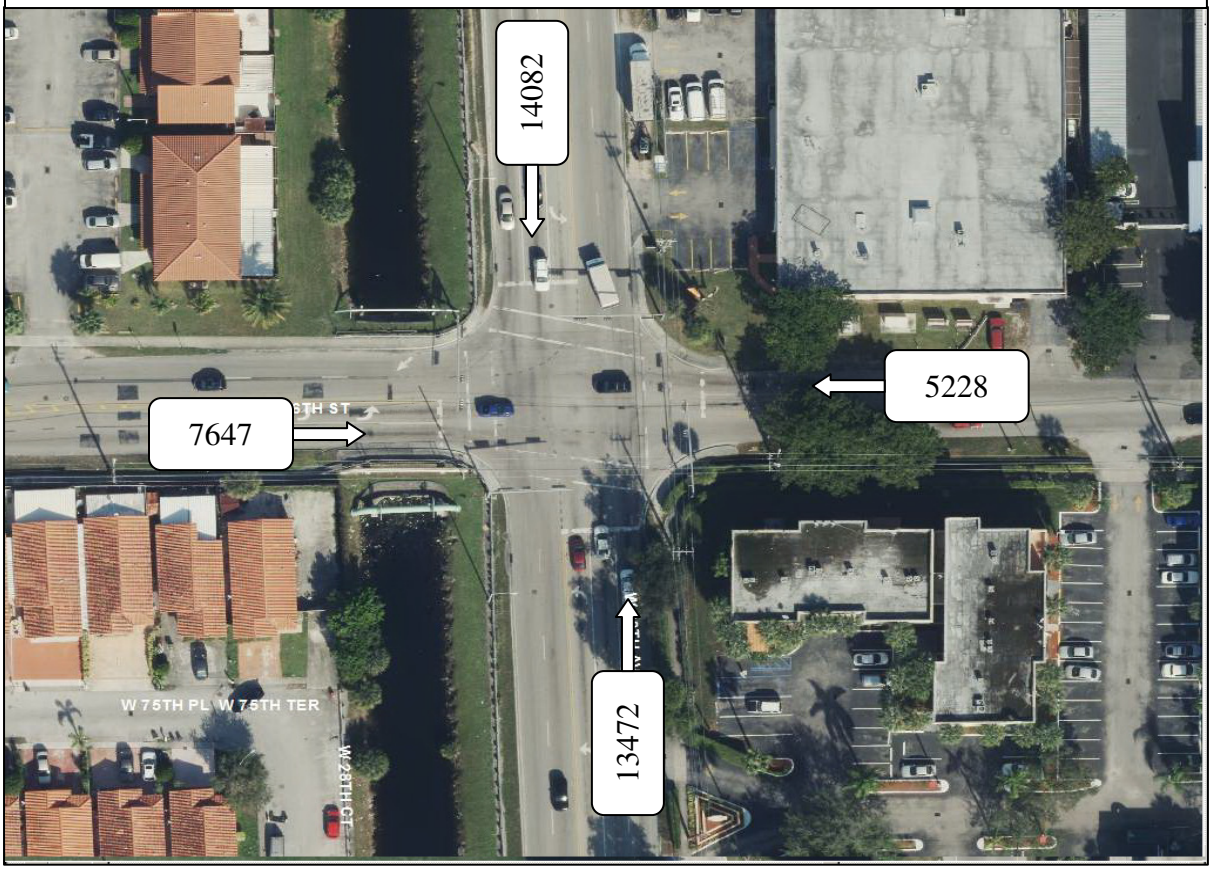
- Provide ADA complaint ramps.
- Provide ADA complaint pedestrian signals.
- Provide sidewalk continuity and connection especially to existing bus stops.
- Relocate existing bus stop to far side of the intersection
- Remove landscaping on the east side of the south leg.
- Extend the return curbing to discourage parking along the south side of the east leg.
- Trim tree canopies to allow passage of light.
- Provide at a minimum painted channelization for the exclusive right turn bays on the east and west legs.
- Provide exclusive westbound right turn bay.
- Install "Right Lane Must Turn Right" Signs on the approach to the exclusive right turn bays on the east and west leg.
- Resurface the intersection.
- Refurbish pavement markings using thermoplastic painting.
- City of Hialeah currently has a project that will implement several improvements, most of which coincide with the recommendations proposed herein. Once this project is fully constructed, it's recommended to perform a field review of the site and compare and analyze new markings, lane designations and new conditions.

A conceptual vision of the proposed roadway improvements is exhibited in *Figure 45*.

3.11.5. Cost Estimate

No cost estimate was developed for this project since improvements are included in the City of Hialeah project.

24-hr Approach Counts



Turning Movement Counts (TMC)

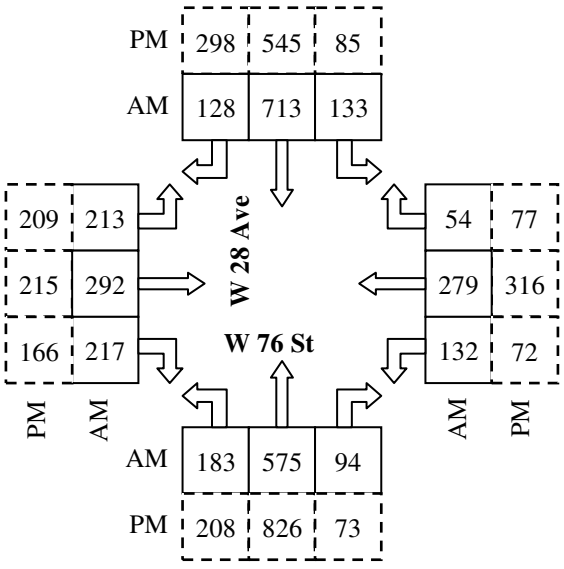


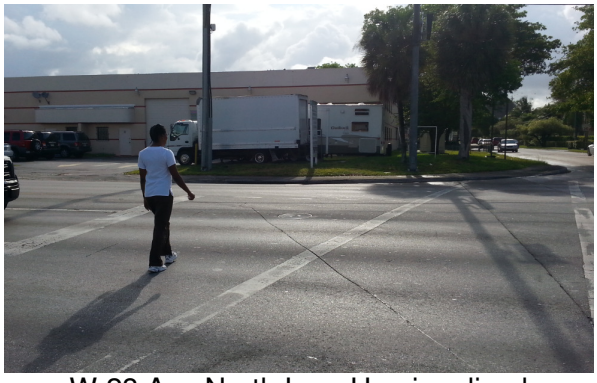
Figure 43: Traffic Data – *W 28 Avenue and W 76 Street*

W 28 Ave Southbound: No sidewalks to bus stop.

W 76 St Eastbound: Illegal parking on swale.

W 76 St Eastbound: Light poles covered by tree canopies.

W 76 St west leg: Staggered stop bar.

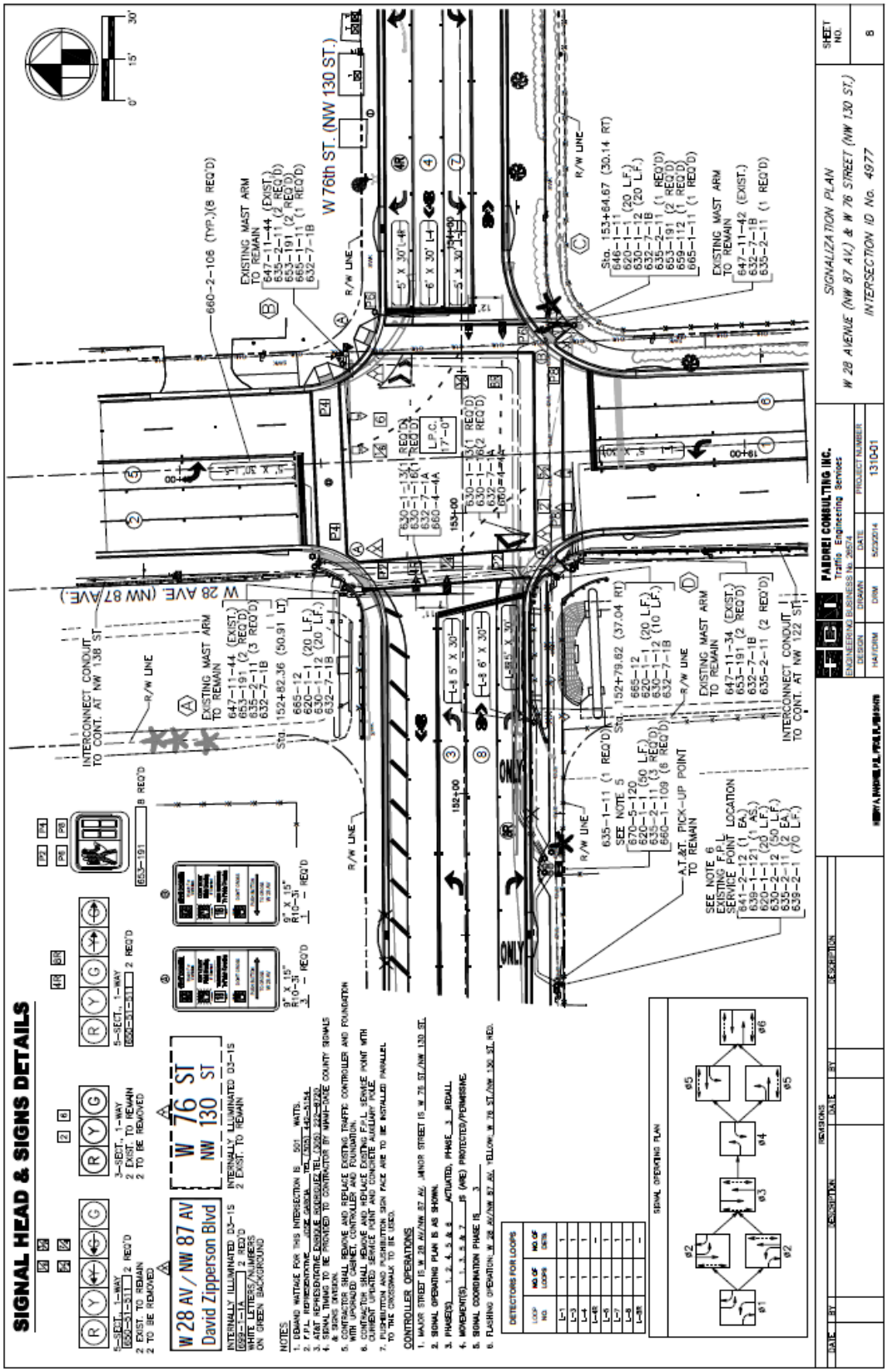


W 28 Ave North Leg: Un-signalized pedestrian crossing/faded markings.

W 76 St Eastbound: Right turning vehicles do not stop.

Figure 44: Field Review – *W 28 Avenue and W 76 Street*

Figure 45: Conceptual Plan – *W 28 Avenue and W 76 Street*



3.12. W 8 Avenue and W 29 Street

3.12.1. Site Description

This intersection is a signalized four legged intersection located within the City of Hialeah in the northwest area of Miami Dade County. West 8 Avenue is a four lane urban collector divided by a median mostly paved that runs north-south, and West 29 Street is a four lane urban undivided collector that runs east-west.

3.12.2. Safety Conditions and Analysis

The intersection of W 8 Avenue and W 29 Street is ranked number 12 in our high crash locations list. A review of the hard copy police reports for the year 2011 through 2013 was performed. During the three-year analysis period, 60 relevant crashes occurred at the intersection. The analysis indicated that the average number of crashes per year is 20. The crash summaries, crash statistics and collision diagrams for the intersection are documented in *Appendix A*.

Based on the analysis of crash records for this intersection, the predominant types of crashes are shown in *Figure 46.*

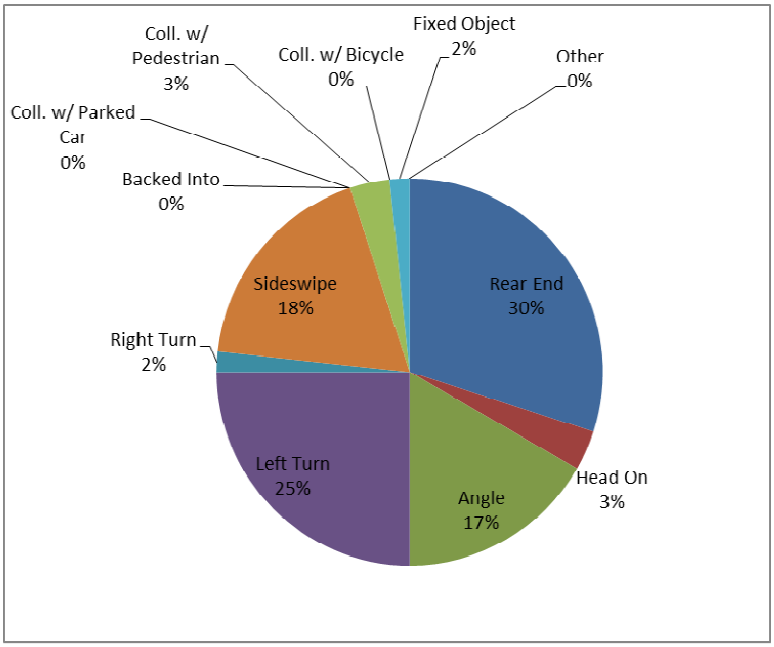


Figure 46 Predominant Crash Types
W 8 AVE & W 29 ST

Calculated intersection mean crash per year were compared to the average Miami-Dade Crash Rate for County corridors to assess the safety conditions at the study intersection in relation to other roadways with similar traffic and geometric characteristics. This study is based on the 2010 FDOT's "Expected Value Analysis." *Table 27* illustrates the expected accident volume analysis of this intersection as well as the safety ratios and the confidence levels during the analysis period.

Based on a regression growth of 8% from the 2014 entering volume, the calculated safety ratios for the years 2011, 2012, and 2013 were 1.122, 1.004, and 1.045, respectively. The safety ratio for the three years averaged 1.057. Also, results of confidence level indicated that this intersection has been a high crash location during the three years with a confidence level higher than 99.95%.

Table 27 – Crash Analysis – W 8 Avenue and W 29 Street

W 8 Avenue & W 29 Street

(4 Lane x 4 Lane, Signalized, With Turn Lanes, 4 Leg Intersection - Table 29) - URBAN Spot

	TYPE OF CRASH	NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	EXPECTED ANNUAL CRASH VALUE			ABNORMALLY HIGH CRASHES		
		2011	2012	2013				MEAN	90th Percentile	95th Percentile	Mean	90th Percentil	95th Percentil
COLLISION TYPE	Rear End	9	6	3	18	30%	6.00	3.43	8.08	8.97	X		
	Head On	0	1	1	2	3%	0.67	0.51	1.15	1.28	X		
	Angle	2	2	6	10	17%	3.33	3.11	6.53	7.19	X		
	Left Turn	6	4	5	15	25%	5.00	1.44	3.22	3.56	X	X	X
	Right Turn	0	0	1	1	2%	0.33	0.34	1.07	1.21			
	Sideswipe	2	6	3	11	18%	3.67	1.51	4.91	5.56	X		
	Backed Into	0	0	0	0	0%	0.00	0.11	0.47	0.54			
	Coll. w/ Parked Car	0	0	0	0	0%	0.00	0.11	0.57	0.66			
	Coll. w/ Pedestrian	1	0	1	2	3%	0.67	0.47	1.35	1.52	X		
	Coll. w/ Bicycle	0	0	0	0	0%	0.00	0.12	0.49	0.56			
	Fixed Object	0	0	1	1	2%	0.33	0.04	0.23	0.27	X	X	X
	Ran Off Road	0	0	0	0	0%	0.00	0.00	0.00	0.00			
	Overtuned	0	0	0	0	0%	0.00	0.01	0.10	0.13			
	Other	0	0	0	0	0%	0.00	5.26	12.78	14.22			
	Total Crashes	20	19	21	60	100%	20.00	17.31	37.75	41.66	X		
SEVERITY	PDO crashes	16	16	16	48	80%	16.00	8.79	24.57	27.59	X		
	Fatal crashes	0	0	0	0	0%	0.00	2.49	15.45	17.93			
	Injury crashes	4	3	5	12	20%	4.00	10.55	20.71	22.66			
LIGHT CONDITIONS	Day Light	11	14	16	41	68%	13.67	9.69	23.99	26.72	X		
	Dusk	1	0	0	1	2%	0.33	0.53	1.61	1.81			
	Dawn	0	1	0	1	2%	0.33	0.39	1.43	1.63			
	Dark	8	4	5	17	28%	5.67	4.30	9.57	10.57	X		
	Unknown	0	0	0	0	0%	0.00	0.61	2.23	2.54			
SURFACE CONDITIONS	Dry	18	16	16	50	83%	16.67	12.76	30.50	33.90	X		
	Wet	2	3	5	10	17%	3.33	1.91	4.43	4.92	X		
	Others	0	0	0	0	0%	0.00	0.68	2.09	2.36			
MONTH OF A YEAR	January	1	2	0	3	5%	1.00	1.24	2.67	2.94			
	February	1	0	0	1	2%	0.33	1.67	4.01	4.46			
	March	2	0	2	4	7%	1.33	1.64	4.07	4.53			
	April	4	4	1	9	15%	3.00	1.50	3.60	4.01	X		
	May	1	5	3	9	15%	3.00	1.51	3.24	3.57	X		
	June	1	2	2	5	8%	1.67	1.62	3.97	4.42	X		
	July	1	1	3	5	8%	1.67	1.67	3.82	4.24			
	August	2	0	1	3	5%	1.00	1.73	4.09	4.54			
	September	1	0	0	1	2%	0.33	1.63	4.31	4.83			
	October	3	1	3	7	12%	2.33	1.46	3.92	4.39	X		
	November	2	1	4	7	12%	2.33	1.40	3.97	4.46	X		
	December	1	3	2	6	10%	2.00	1.41	4.02	4.52	X		
DAY OF THE WEEK	Sunday	3	1	3	7	12%	2.33	2.67	7.18	8.04			
	Monday	0	0	3	3	5%	1.00	2.47	5.66	6.27			
	Tuesday	3	3	2	8	13%	2.67	2.47	5.61	6.21	X		
	Wednesday	2	4	6	12	20%	4.00	2.33	5.55	6.16	X		
	Thursday	2	3	3	8	13%	2.67	2.44	5.25	5.79	X		
	Friday	4	3	2	9	15%	3.00	2.46	5.51	6.10	X		
	Saturday	6	5	2	13	22%	4.33	2.52	6.23	6.94	X		
HOUR OF THE DAY	00:00-06:00	3	0	2	5	8%	1.67	1.61	4.23	4.73	X		
	06:00-09:00	0	3	1	4	7%	1.33	1.36	3.39	3.78			
	09:00-11:00	1	2	2	5	8%	1.67	1.28	3.25	3.62	X		
	11:00-13:00	3	3	1	7	12%	2.33	1.70	4.20	4.68	X		
	13:00-15:00	2	0	1	3	5%	1.00	1.88	5.42	6.09			
	15:00-18:00	1	6	9	16	27%	5.33	2.99	7.98	8.94	X		
	18:00-24:00	10	5	5	20	33%	6.67	3.79	9.27	10.32	X		

	YEAR			3-Year Average
	1	2	3	
Average Daily Traffic ADT *(Vehicles per Day)*	29,010	31,533	34,275	31,606
Florida Average Crash rate *(Crashes per Million Entering Vehicles)*	0.757	0.757	0.757	0.757
Traffic Base	10.589	11.509	12.510	11.536
Actual Crash Rate *(Crashes per Million Entering Vehicles)*	1.889	1.651	1.679	1.739
Critical Crash Rate *(Crashes per Million Entering Vehicles)*	1.684	1.644	1.606	1.645
Safety Ratio	**1.122**	**1.004**	**1.045**	**1.057**
High Crash Location??	***YES***	***YES***	***YES***	***YES***

$$Actual\ \ Crash\ \ Rate\ = \frac{A \times 1{,}000{,}000}{V}$$

Where:
A = Total number of crashes or number of crashes by type occurring in a 1 year period.
V = Average Annual Daily Traffic X 365

$$CriticalCrashRate = AVR + \frac{0.5}{TB} + TF\sqrt{\frac{AVR}{TB}}$$

Where:
AVR = Average Statewide Crash Rate for a particular type of intersection or roadway segment.
TB = Traffic Base
TF = Test Factor (z-value)
= *1.96 (assume 95% Confidence Level for RURAL areas)*
= *3.29 (assume 99.95% Confidence Level for URBAN areas)*

$$Traffic\ Base = \frac{Years \times ADT \times 365}{1{,}000{,}000}$$

$$Safety\ \ Ratio\ = \frac{Actual\ \ Crash\ \ Rate}{Critical\ \ Crash\ \ Rate}$$

Confidence Level (%)	Constant Z
68.30	1.00
86.60	1.50
90.00	1.64
95.00	1.96
95.50	2.00
98.80	2.50
99.00	2.58
99.70	3.00
99.95	3.29

From this analysis, it was determined that left-turn and fixed object collisions exceeded the 95th percentile and 90th percentile confidence level threshold limits. Also, rear end, angle, sideswipe and pedestrian collisions exceeded the mean. Those results indicate that these types of collisions were abnormally high during the period of 2011 through 2013. A detailed review of the abnormal crashes as well as probable countermeasures is presented in *Table 28*.

Table 28 – Abnormal Crash Details & Countermeasures
W 8 Avenue and W 29 Street

W 8 Avenue & W 29 Street

(4 Lane x 4 Lane, Signalized, With Turn Lanes, 4 Leg Intersection - Table 29) - URBAN Spot

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Angle	Total Rear End Crashes		**2**	**2**	**6**	**10**	**100%**	**3.33**	(1)	8
	Lighting Conditions	Day Light	0	1	5	6	60%	2.00	(8)	11
		Dawn	0	0	0	0	0%	0.00	(15)	
		Dark	2	1	1	4	40%	1.33		
	Hours of Day	00:00 - 06:00	1	0	0	1	10%	0.33		
		06:00 - 09:00	0	0	0	0	0%	0.00		
		09:00 - 11:00	0	1	0	1	10%	0.33		
		11:00 - 13:00	0	0	1	1	10%	0.33		
		13:00 - 15:00	0	0	0	0	0%	0.00		
		15:00 - 18:00	0	0	4	4	40%	1.33		
		18:00 - 24:00	1	1	1	3	30%	1.00		
	Direction	NB + EB	1	1	1	3	30%	1.00		
		NB + WB	0	0	2	2	20%	0.67		
		SB + EB	1	1	1	3	30%	1.00		
		SB + WB	0	0	2	2	20%	0.67		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Left Turn	Total Left Turn Crashes		**6**	**4**	**5**	**15**	**100%**	**5.00**	(8)	9
	Lighting Conditions	Day Light	4	2	4	10	67%	3.33	(9)	11
		Dawn	0	0	0	0	0%	0.00	(15)	12
		Dark	2	2	1	5	33%	1.67		13
	Hours of Day	00:00 - 06:00	0	0	0	0	0%	0.00		14
		06:00 - 09:00	0	1	1	2	13%	0.67		
		09:00 - 11:00	1	0	1	2	13%	0.67		
		11:00 - 13:00	1	0	0	1	7%	0.33		
		13:00 - 15:00	1	0	1	2	13%	0.67		
		15:00 - 18:00	0	1	2	3	20%	1.00		
		18:00 - 24:00	3	2	0	5	33%	1.67		
	Direction	NB → WB	2	1	0	3	20%	1.00		
		WB → SB	2	2	2	6	40%	2.00		
		SB → EB	0	0	0	0	0%	0.00		
		EB → NB	1	1	3	5	33%	1.67		
		Unknown	1	0	0	1	7%	0.33		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Sideswipe (Overtake)	Total Left Turn Crashes		**2**	**6**	**3**	**11**	**100%**	**3.67**	(8)	13
	Lighting Conditions	Day Light	0	5	3	8	73%	2.67	(15)	
		Dawn	0	1	0	1	9%	0.33		
		Dark	2	0	0	2	18%	0.67		
	Hours of Day	00:00 - 06:00	1	0	0	1	9%	0.33		
		06:00 - 09:00	0	2	0	2	18%	0.67		
		09:00 - 11:00	0	0	0	0	0%	0.00		
		11:00 - 13:00	0	1	0	1	9%	0.33		
		13:00 - 15:00	0	0	0	0	0%	0.00		
		15:00 - 18:00	0	2	1	3	27%	1.00		
		18:00 - 24:00	1	1	2	4	36%	1.33		
	Direction	North	0	1	0	1	9%	0.33		
		South	0	0	1	1	9%	0.33		
		East	1	2	1	4	36%	1.33		
		West	1	3	1	5	45%	1.67		
		Unknown	0	0	0	0	0%	0.00		

3.12.3. Traffic Operation Conditions and Analysis

In order to identify the traffic operation characteristics and safety relevant conflicts, field observations at West 8 Avenue and West 29 Street were performed on a typical weekday on May 14, 2014. A summary of the traffic data is presented in *Figure 47*, and the field review is presented in *Figure 48*.

This intersection has single left-turn bays for the north and south legs where the signal operation is protected/permissive. The signal operation is permissive for the east and west leg left-turn traffic. The intersection is span wire with standard overhead street signs. The pavement exhibits deterioration on the north and south legs. Vehicles travel at higher speeds thru both corridors.

High volume of left turns was observed along West 29 Street mainly for the northbound movement to West 8 Avenue. These vehicles do not have an exclusive left turn bay nor exclusive left turn signal therefore red-light running and turning conflicts were observed for this movement.

Red light running was observed at the intersection as well as a failure of right turning vehicles from completely stopping before proceeding to turn. Many conflicts were also observed with vehicles coming in and out of existing driveways close to the intersection.

A high volume of vehicles exit the Walgreens located on the southeast corner of the intersection thru the driveway fronting West 8 Avenue and change lanes twice in a distance of about 70'. This recurrent maneuver creates conflicts with the thru movement of traffic heading north along West 8 Avenue.

There is a Bus Stop on near side of the east and west leg on West 29 Street. Lighting along West 8 Avenue does not seem adequate for a five-lane road.

3.12.4. Recommendations

Based on the safety analysis, field observations and traffic operations for the intersection of West 8 Avenue and West 29 Street, the following is recommended:

- Upgrade span wire intersection to mast arm.
- Provide illuminated overhead street signs
- Install directional arrow markings for the all approaches along West 29 Street.
- Relocate bus stops along West 29 Street from near to the far side of the intersection.
- Resurface the intersection.
- Provide "right turn only" signs to the Marathon gas station driveways on the NW corner of the intersection.
- Close entrance to Walgreens on the SE corner along West 8th Avenue.

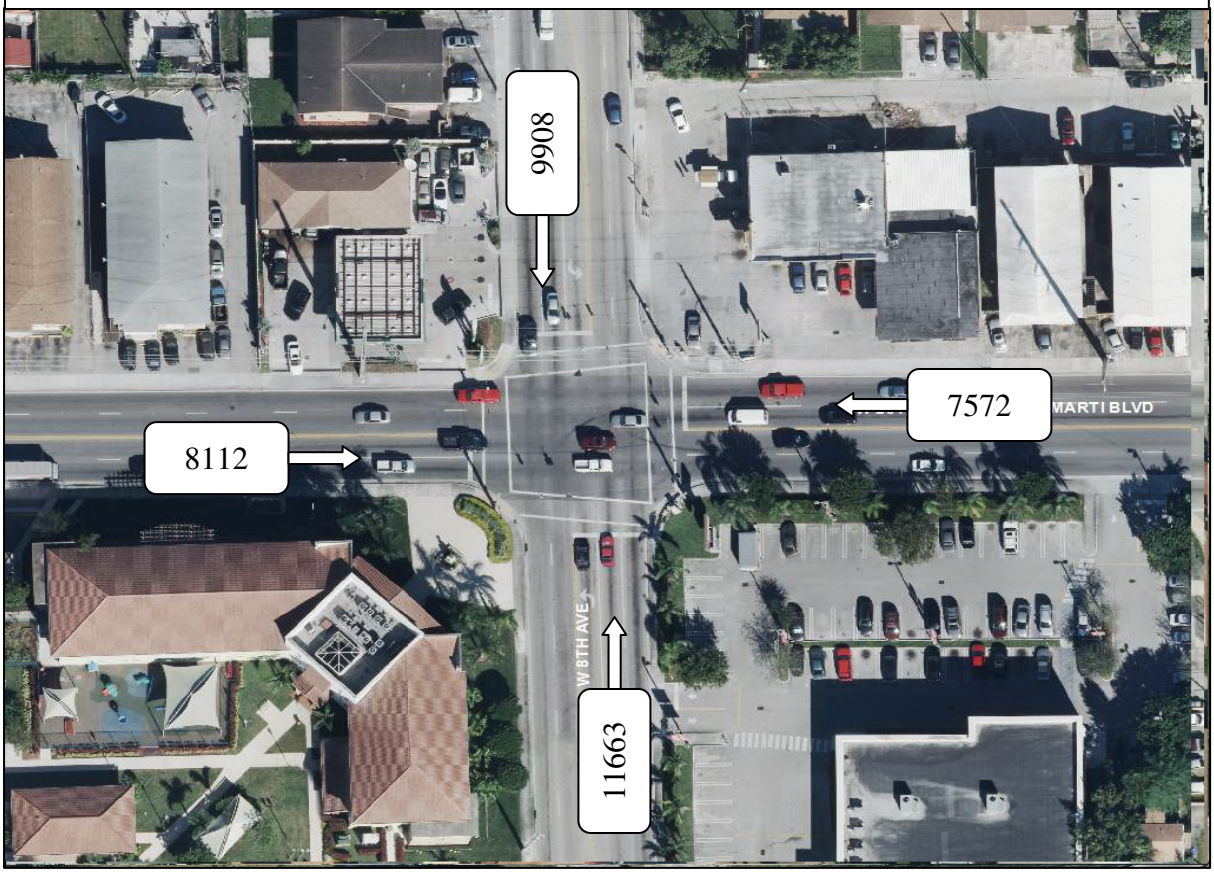
A conceptual vision of the proposed roadway improvements is exhibited in *Figure 49*.

3.12.5. Cost Estimate

Based on the recommended improvements and the Conceptual Plan, the estimated cost for this project is approximately $311,518. The details of the preliminary project costs are presented in *Appendix D*.

Construction costs were obtained from items cost on the latest pay item Average Unit Cost Report for the Area 13 (Miami-Dade County), and the Miami-Dade Traffic Signal Division price list.

24-hr Approach Counts



Turning Movement Counts (TMC)

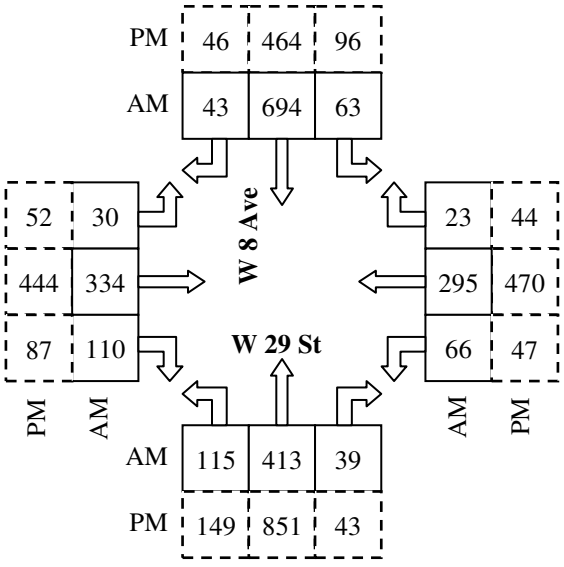


Figure 47: Traffic Data – *W 8 Avenue and W 29 Street*

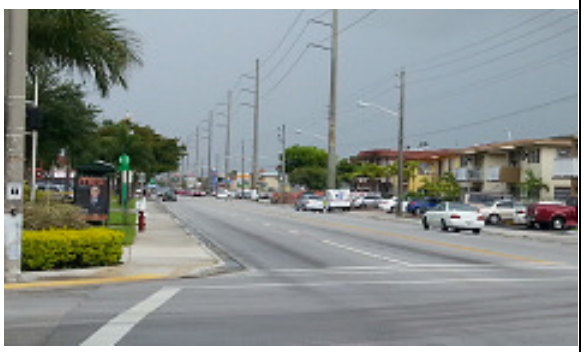
W 29 St Eastbound: Bus Stop on near side of westbound approach

W 29 St Westbound: Span wire Signal

W 8 Ave Northbound: Driveways conflicts with signal operation

W 8 Ave Southbound: Vehicle tuning left from left/thru lane

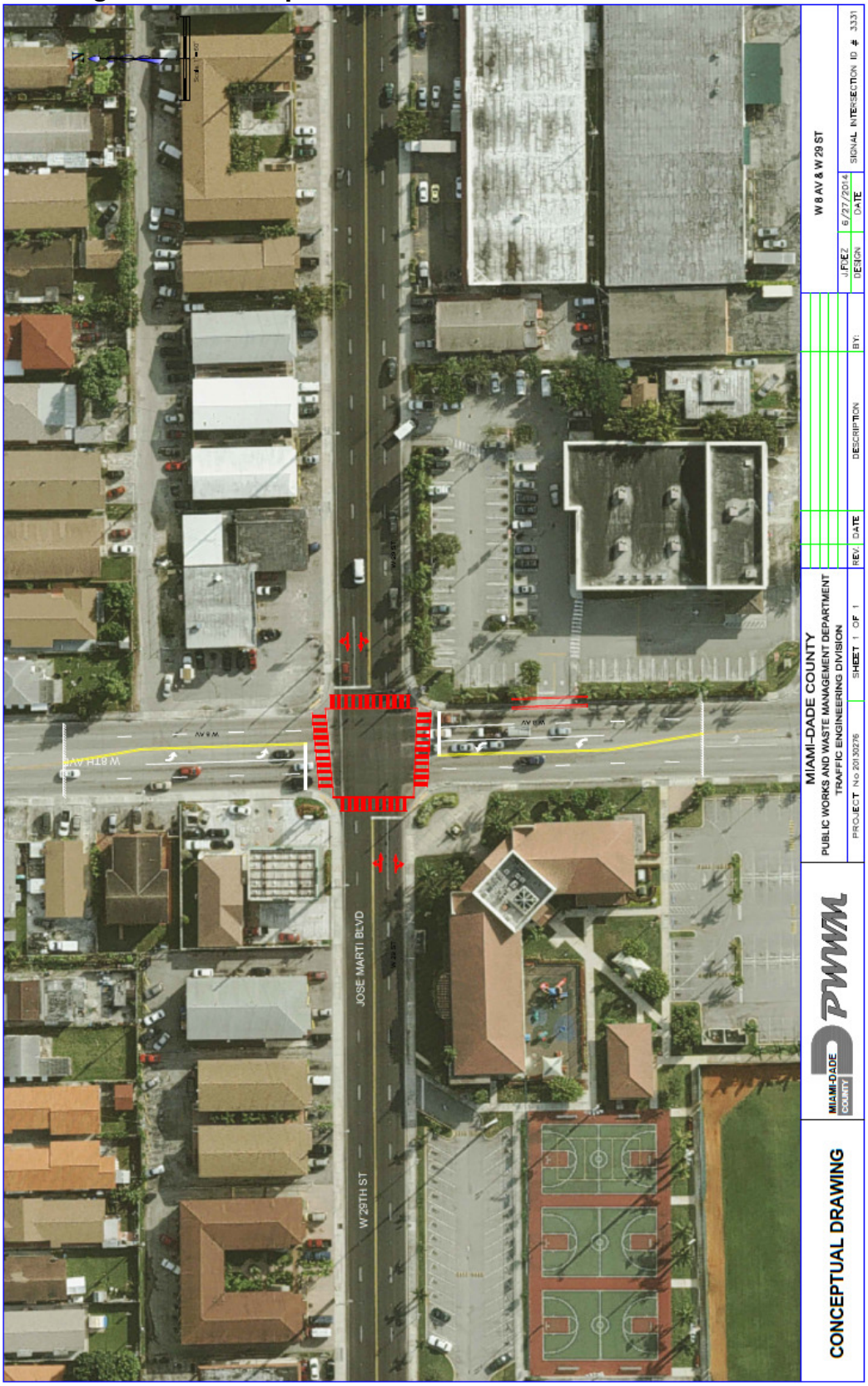
W 8 Ave Southbound: Only Walgreens site lighting provide illumination on south approach.



W 29 St Westbound: Lane designation could be more clearly defined by adding directional arrow markings.

Figure 48: Field Review – *W 8 Avenue and W 29 Street*

Figure 49: Conceptual Plan – *W 8 Avenue and W 29 Street*



3.13. W 12 Avenue and W 29 Street

3.13.1. Site Description

This intersection is a signalized four legged intersection located in the City of Hialeah in the area of Northwest Miami Dade County. W 12 Avenue is a four lane urban arterial divided by a median mostly paved that runs North- South, and W 29 Street is a four lane undivided urban collector that runs east-west.

3.13.2. Safety Conditions and Analysis

The intersection of W 12 Avenue and W 29 Street is ranked number 13 in our high crash locations list. A review of the hard copy police reports for the years 2011 through 2013 was performed. During the three-year analysis period, 69 relevant crashes occurred at the intersection. The analysis indicated that the average number of crashes per year is 23. The crash summaries, crash statistics and collision diagrams for the intersection are documented in *Appendix A*.

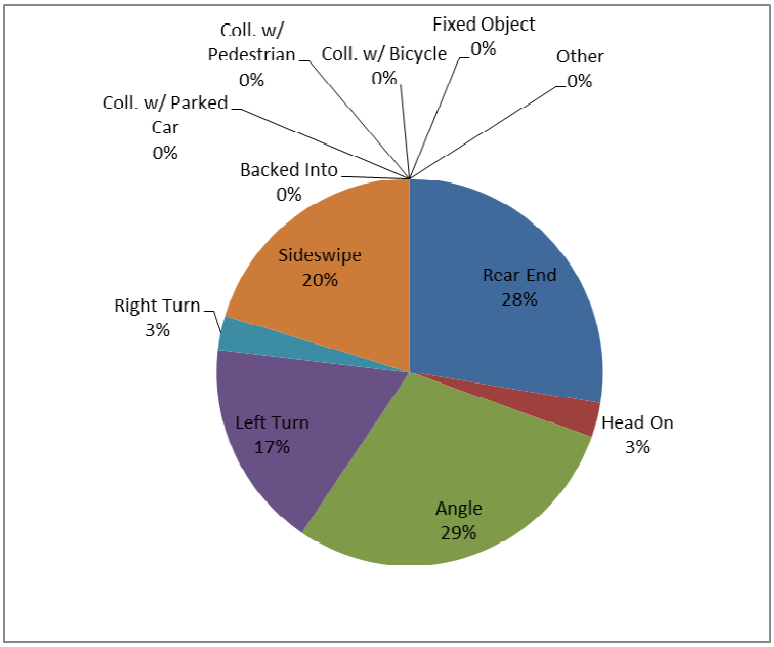


Figure 50 Predominant Crash Types
W 12 AVE & W 29 ST

Based on the analysis of crash records for this intersection, the predominant types of crashes are shown in *Figure 50.*

Calculated intersection mean crash per year were compared to the average Miami-Dade Crash Rate for County corridors to assess the safety conditions at the study intersection in relation to other roadways with similar traffic and geometric characteristics. This study is based on the 2010 FDOT's "Expected Value Analysis." *Table 29* illustrates the expected accident volume analysis of this intersection as well as the safety ratios and the confidence levels during the analysis period.

Based on a regression growth of 8% from the 2014 entering volume, the calculated safety ratios for the years 2011, 2012, and 2013 were 1.065, 1.146, and 1.079, respectively. The safety ratio for the three years averaged 1.097. Also, results of confidence level indicated that this intersection has been a high crash location during the three years with a confidence level higher than 99.95%.

Table 29 – Crash Analysis – W 12 Avenue and W 29 Street

W 12 Avenue & W 29 Street

(4 Lane x 4 Lane, Signalized, With Turn Lanes, 4 Leg Intersection -Table 29) - URBAN Spot

	TYPE OF CRASH	NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	EXPECTED ANNUAL CRASH VALUE			ABNORMALLY HIGH CRASHES		
		2011	2012	2013				MEAN	90th Percentile	95th Percentile	Mean	90th Percentil	95th Percentil
COLLISION TYPE	Rear End	4	10	5	19	28%	6.33	3.43	8.08	8.97	X		
	Head On	1	0	1	2	3%	0.67	0.51	1.15	1.28	X		
	Angle	7	6	7	20	29%	6.67	3.11	6.53	7.19	X	X	
	Left Turn	5	3	4	12	17%	4.00	1.44	3.22	3.56	X	X	X
	Right Turn	0	1	1	2	3%	0.67	0.34	1.07	1.21	X		
	Sideswipe	4	4	6	14	20%	4.67	1.51	4.91	5.56	X		
	Backed Into	0	0	0	0	0%	0.00	0.11	0.47	0.54			
	Coll. w/ Parked Car	0	0	0	0	0%	0.00	0.11	0.57	0.66			
	Coll. w/ Pedestrian	0	0	0	0	0%	0.00	0.47	1.35	1.52			
	Coll. w/ Bicycle	0	0	0	0	0%	0.00	0.12	0.49	0.56			
	Fixed Object	0	0	0	0	0%	0.00	0.04	0.23	0.27			
	Ran Off Road	0	0	0	0	0%	0.00	0.00	0.00	0.00			
	Overtuned	0	0	0	0	0%	0.00	0.01	0.10	0.13			
	Other	0	0	0	0	0%	0.00	5.26	12.78	14.22			
	Total Crashes	21	24	24	69	100%	23.00	17.31	37.75	41.66	X		
SEVERITY	PDO crashes	17	22	22	61	88%	20.33	8.79	24.57	27.59	X		
	Fatal crashes	0	0	0	0	0%	0.00	2.49	15.45	17.93			
	Injury crashes	4	2	2	8	12%	2.67	10.55	20.71	22.66			
LIGHT CONDITIONS	Day Light	16	17	18	51	74%	17.00	9.69	23.99	26.72	X		
	Dusk	0	1	0	1	1%	0.33	0.53	1.61	1.81			
	Dawn	0	0	0	0	0%	0.00	0.39	1.43	1.63			
	Dark	5	5	6	16	23%	5.33	4.30	9.57	10.57	X		
	Unknown	0	1	0	1	1%	0.33	0.61	2.23	2.54			
SURFACE CONDITIONS	Dry	20	23	22	65	94%	21.67	12.76	30.50	33.90	X		
	Wet	1	0	2	3	4%	1.00	1.91	4.43	4.92			
	Others	0	1	0	1	1%	0.33	0.68	2.09	2.36			
MONTH OF A YEAR	January	0	4	3	7	10%	2.33	1.24	2.67	2.94	X		
	February	3	1	4	8	12%	2.67	1.67	4.01	4.46	X		
	March	4	2	0	6	9%	2.00	1.64	4.07	4.53	X		
	April	2	3	0	5	7%	1.67	1.50	3.60	4.01	X		
	May	3	3	3	9	13%	3.00	1.51	3.24	3.57	X		
	June	0	2	2	4	6%	1.33	1.62	3.97	4.42			
	July	3	3	1	7	10%	2.33	1.67	3.82	4.24	X		
	August	2	1	5	8	12%	2.67	1.73	4.09	4.54	X		
	September	2	2	0	4	6%	1.33	1.63	4.31	4.83			
	October	0	2	2	4	6%	1.33	1.46	3.92	4.39			
	November	1	1	2	4	6%	1.33	1.40	3.97	4.46			
	December	1	0	2	3	4%	1.00	1.41	4.02	4.52			
DAY OF THE WEEK	Sunday	1	3	2	6	9%	2.00	2.67	7.18	8.04			
	Monday	5	4	4	13	19%	4.33	2.47	5.66	6.27	X		
	Tuesday	1	4	5	10	14%	3.33	2.47	5.61	6.21	X		
	Wednesday	5	3	2	10	14%	3.33	2.33	5.55	6.16	X		
	Thursday	6	3	3	12	17%	4.00	2.44	5.25	5.79	X		
	Friday	1	1	4	6	9%	2.00	2.46	5.51	6.10			
	Saturday	2	6	4	12	17%	4.00	2.52	6.23	6.94	X		
HOUR OF THE DAY	00:00-06:00	1	3	1	5	7%	1.67	1.61	4.23	4.73	X		
	06:00-09:00	2	0	1	3	4%	1.00	1.36	3.39	3.78			
	09:00-11:00	1	4	3	8	12%	2.67	1.28	3.25	3.62	X		
	11:00-13:00	2	0	3	5	7%	1.67	1.70	4.20	4.68			
	13:00-15:00	3	3	5	11	16%	3.67	1.88	5.42	6.09	X		
	15:00-18:00	3	8	3	14	20%	4.67	2.99	7.98	8.94	X		
	18:00-24:00	9	6	8	23	33%	7.67	3.79	9.27	10.32	X		

	YEAR			3-Year Average
	1	2	3	
Average Daily Traffic ADT *(Vehicles per Day)*	33,371	36,273	39,428	36,357
Florida Average Crash rate *(Crashes per Million Entering Vehicles)*	0.757	0.757	0.757	0.757
Traffic Base	12.181	13.240	14.391	13.270
Actual Crash Rate *(Crashes per Million Entering Vehicles)*	1.724	1.813	1.668	1.735
Critical Crash Rate *(Crashes per Million Entering Vehicles)*	1.618	1.581	1.546	1.582
Safety Ratio	**1.065**	**1.146**	**1.079**	**1.097**
High Crash Location??	***YES***	***YES***	***YES***	***YES***

$$Actual\ \ Crash\ \ Rate\ = \frac{A \times 1{,}000{,}000}{V}$$

Where:
A = Total number of crashes or number of crashes by type occurring in a 1 year period.
V = Average Annual Daily Traffic X 365

$$CriticalCrashRate = AVR + \frac{0.5}{TB} + TF\sqrt{\frac{AVR}{TB}}$$

Where:
AVR = Average Statewide Crash Rate for a particular type of intersection or roadway segment.
TB = Traffic Base
TF = Test Factor (z-value)
= *1.96 (assume 95% Confidence Level for RURAL areas)*
= *3.29 (assume 99.95% Confidence Level for URBAN areas)*

$$Traffic\ Base = \frac{Years \times ADT \times 365}{1{,}000{,}000}$$

$$Safety\ \ Ratio\ = \frac{Actual\ \ Crash\ \ Rate}{Critical\ \ Crash\ \ Rate}$$

Confidence Level (%)	Constant Z
68.30	1.00
86.60	1.50
90.00	1.64
95.00	1.96
95.50	2.00
98.80	2.50
99.00	2.58
99.70	3.00
99.95	3.29

From this analysis, it was determined that left-turn collisions exceeded the threshold limits for the 95th percentile and 90th percentile confidence level. Also, rear end, angle and sideswipe exceeded the mean. Those results indicate that these types of collisions were abnormally high during the period of 2011 through 2013. A detailed review of the abnormal crashes as well as probable countermeasures is presented in *Table 30*.

Table 30 – Abnormal Crash Details & Countermeasures
W 12 Avenue and W 29 Street

W 12 Avenue & W 29 Street

(4 Lane x 4 Lane, Signalized, With Turn Lanes, 4 Leg Intersection -Table 29) - URBAN Spot

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Angle	Total Rear End Crashes		**7**	**6**	**7**	**20**	**100%**	**6.67**	(8)	8
	Lighting Conditions	Day Light	4	3	4	11	55%	3.67	(9)	9
		Dawn	0	0	0	0	0%	0.00		10
		Dark	3	3	3	9	45%	3.00		11
	Hours of Day	00:00 - 06:00	1	1	0	2	10%	0.67		
		06:00 - 09:00	1	0	0	1	5%	0.33		
		09:00 - 11:00	0	1	1	2	10%	0.67		
		11:00 - 13:00	1	0	0	1	5%	0.33		
		13:00 - 15:00	0	1	3	4	20%	1.33		
		15:00 - 18:00	1	1	0	2	10%	0.67		
		18:00 - 24:00	3	2	3	8	40%	2.67		
	Direction	NB + EB	0	1	3	4	20%	1.33		
		NB + WB	1	1	2	4	20%	1.33		
		SB + EB	0	2	0	2	10%	0.67		
		SB + WB	6	2	2	10	50%	3.33		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Left Turn	Total Rear End Crashes		**5**	**3**	**4**	**12**	**100%**	**4.00**	(8)	9
	Lighting Conditions	Day Light	4	2	2	8	67%	2.67	(9)	11
		Dawn	0	0	0	0	0%	0.00	(15)	13
		Dark	1	1	2	4	33%	1.33		14
	Hours of Day	00:00 - 06:00	0	1	1	2	17%	0.67		16
		06:00 - 09:00	1	0	0	1	8%	0.33		
		09:00 - 11:00	0	0	0	0	0%	0.00		
		11:00 - 13:00	0	0	0	0	0%	0.00		
		13:00 - 15:00	1	0	1	2	17%	0.67		
		15:00 - 18:00	0	2	1	3	25%	1.00		
		18:00 - 24:00	3	0	1	4	33%	1.33		
	Direction	NB → WB	1	0	0	1	8%	0.33		
		WB → SB	2	0	0	2	17%	0.67		
		SB → EB	0	1	1	2	17%	0.67		
		EB → NB	2	2	3	7	58%	2.33		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Sideswipe (Overtake)	Total Rear End Crashes		**4**	**4**	**6**	**14**	**100%**	**4.67**	(1)	13
	Lighting Conditions	Day Light	4	3	6	13	93%	4.33	(8)	19
		Dawn	0	0	0	0	0%	0.00		
		Dark	0	1	0	1	7%	0.33		
	Hours of Day	00:00 - 06:00	0	1	0	1	7%	0.33		
		06:00 - 09:00	0	0	0	0	0%	0.00		
		09:00 - 11:00	0	0	1	1	7%	0.33		
		11:00 - 13:00	1	0	2	3	21%	1.00		
		13:00 - 15:00	1	1	0	2	14%	0.67		
		15:00 - 18:00	1	2	2	5	36%	1.67		
		18:00 - 24:00	1	0	1	2	14%	0.67		
	Direction	North	3	1	0	4	29%	1.33		
		South	0	0	0	0	0%	0.00		
		East	0	1	2	3	21%	1.00		
		West	1	2	4	7	50%	2.33		
		Unknown	0	0	0	0	0%	0.00		

3.13.3. Traffic Operation Conditions and Analysis

In order to identify the traffic operation characteristics and safety relevant conflicts, field observations at W 12 Avenue & W 29 Street were performed on a typical weekday on May 21, 2014. A summary of the traffic data is presented in *Figure 51*, and the field review is presented in *Figure 52*.

This intersection has single left-turn bays for the north and south legs where the signal operation is protected/permissive. The signal operation is permissive for the east and west leg left-turn traffic. The intersection is span wire with standard overhead street signs. Vehicles travel at high speeds thru both corridors.

Two strip malls and a CVS are present at this intersection with many driveways that generate potential conflicts with the other movements.

Pavement Markings and Pedestrian crosswalks at all four legs are faded.

Red light running was observed at the intersection as well as failure of right turning vehicles from making a complete stop before proceeding to turn. Many conflicts were also observed with vehicles coming in and out of existing driveways close to the intersection.

3.13.4. Recommendations

Based on the safety analysis, field observations and traffic operations for the intersection of W 12 Avenue & W 29 Street, the following is recommended:

- Refurbish pavement markings including crosswalks using thermoplastic painting.
- Add “Right turn yield to pedestrian” sign on all approaches.
- Change the span wire intersection to mast arm with illuminated street signs.
- Upgrade push button on northeast corner.
- Install high visibility ladder crosswalks on all approaches.
- Install retroreflective backplates to all signals on the intersection.
- Close the driveway closest to the intersection that leads to the shopping center on the northwest corner.
- Close the driveway closest to the intersection that leads to the shopping center on the northeast corner.
- Mill and Resurface north and south legs.
- Install “Right turn only” signs on all driveways on all four corners of the intersection.
- Only one pedestrian signal is countdown, upgrade all others to countdown.
- Install directional arrow markings for the all approaches along West 29 Street.

A conceptual vision of the proposed roadway improvements is exhibited in *Figure 53*.

3.13.5. Cost Estimate

Based on the recommended improvements and the Conceptual Plan, the estimated cost for this project is approximately $285,590. The details of the preliminary project costs are presented in *Appendix D*.

Construction costs were obtained from items cost on the latest pay item Average Unit Cost Report for the Area 13 (Miami-Dade County), and the Miami-Dade Traffic Signal Division price list.

24-hr Approach Counts

Turning Movement Counts (TMC)

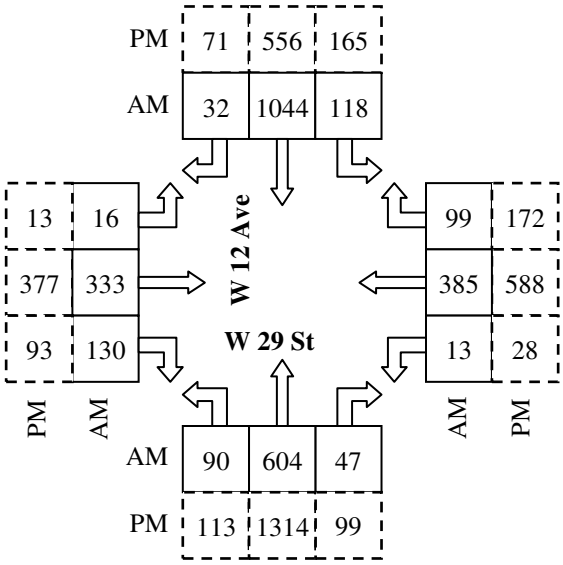


Figure 51: Traffic Data – *W 12 Avenue and W 29 Street*

Driveways close to the intersection present conflicts with thru traffic.

Span wire signal, and turn restrictions during peak hours for east/west traffic.

Faded pavement markings.

Accident due to running red light.

Only one pedestrian signal is countdown.

Bicyclist/pedestrian conflicts with right-turning vehicles.

Figure 52: Field Review – *W 12 Avenue and W 29 Street*

Figure 53: Conceptual Plan – *W 12 Avenue and W 29 Street*

3.14. W 21 Court and W 68 Street

3.14.1. Site Description

This intersection is a signalized four legged intersection located within the City of Hialeah in the northwest area of Miami Dade County. W 21 Court is a two lane local road with a center scramble lane that runs north-south from W 60 Street to W 68 Street where it acts as a main entrance to the Palmetto Hospital. West 68th Street is a four-lane collector that runs east-west and exhibits a paved center lane that allows for left turns or for the location of a raised median. As West 68 street approaches W 21 Court it gains additional lanes to accommodate the 826 entrance and exit ramp traffic and the complex traffic circulation of the area.

3.14.2. Safety Conditions and Analysis

The intersection of W 21 Court and W 68 Street is ranked number 14 in our high crash locations list. A review of the hard copy police reports for the years 2011 through 2013 was performed. During the three-year analysis period, 76 relevant crashes occurred at the intersection. The analysis indicated that the average number of crashes per year is 25. The crash summaries, crash statistics and collision diagrams for the intersection are documented in *Appendix A*.

Based on the analysis of crash records for this intersection, the predominant types of crashes are shown in *Figure 54*.

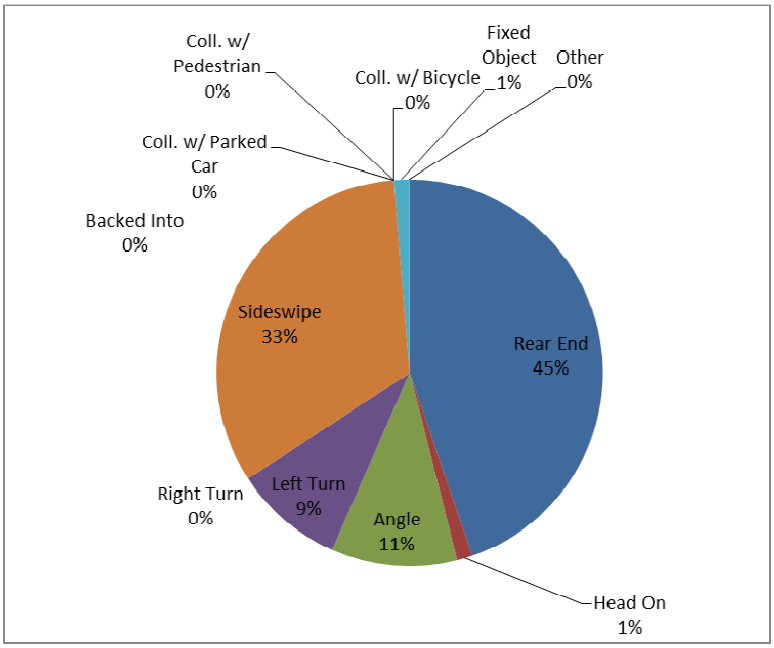


Figure 54 Predominant Crash Types
W 21 CT & W 68 ST

Calculated intersection mean crash per year were compared to the average Miami-Dade Crash Rate for County corridors to assess the safety conditions at the study intersection in relation to other roadways with similar traffic and geometric characteristics. This study is based on the 2007 FDOT's "Expected Value Analysis." *Table 31* illustrates the expected accident volume analysis of this intersection as well as the safety ratios and the confidence levels during the analysis period.

Based on a regression growth of 8% from the 2014 entering volume, the calculated safety ratios for the years 2011, 2012, and 2013 were 1.411, 1.190, and 0.904, respectively. The safety ratio for the three years averaged 1.169. Also, results of confidence level indicated that this intersection has been a high crash location during the three years with a confidence level higher than 99.95%.

Table 31 – Crash Analysis – W 21 Court and W 68 Street

W 21 Court & W 68 Street

(4 Lane x 2 Lane, Signalized, With Turn Lanes, 4 Leg Intersection - Table 23) - URBAN Spot

	TYPE OF CRASH	NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	EXPECTED ANNUAL CRASH VALUE			ABNORMALLY HIGH CRASHES		
		2011	2012	2013				MEAN	90th Percentile	95th Percentile	Mean	90th Percentil	95th Percentil
COLLISION TYPE	Rear End	11	14	9	34	45%	11.33	1.62	4.09	4.56	X	X	X
	Head On	0	0	1	1	1%	0.33	0.16	0.58	0.66	X		
	Angle	4	2	2	8	11%	2.67	1.37	3.01	3.33	X		
	Left Turn	3	2	2	7	9%	2.33	0.49	1.29	1.44	X	X	X
	Right Turn	0	0	0	0	0%	0.00	0.10	0.39	0.45			
	Sideswipe	10	8	7	25	33%	8.33	0.56	1.40	1.56	X	X	X
	Backed Into	0	0	0	0	0%	0.00	0.07	0.40	0.46			
	Coll. w/ Parked Car	0	0	0	0	0%	0.00	0.08	0.50	0.58			
	Coll. w/ Pedestrian	0	0	0	0	0%	0.00	0.16	0.56	0.63			
	Coll. w/ Bicycle	0	0	0	0	0%	0.00	0.00	0.00	0.00			
	Fixed Object	1	0	0	1	1%	0.33	0.22	0.55	0.62	X		
	Ran Off Road	0	0	0	0	0%	0.00	0.00	0.00	0.00			
	Overtuned	0	0	0	0	0%	0.00	0.01	0.11	0.13			
	Other	0	0	0	0	0%	0.00	2.44	6.28	7.02			
	Total Crashes	29	26	21	76	100%	25.33	7.27	15.00	16.48	X	X	X
SEVERITY	PDO crashes	27	24	20	71	93%	23.67	3.99	9.34	10.36	X	X	X
	Fatal crashes	0	0	0	0	0%	0.00	0.00	0.00	0.00			
	Injury crashes	2	2	1	5	7%	1.67	5.10	11.25	12.43			
LIGHT CONDITIONS	Day Light	19	24	18	61	80%	20.33	4.76	9.80	10.76	X	X	X
	Dusk	1	0	2	3	4%	1.00	0.24	0.65	0.73	X	X	X
	Dawn	0	0	0	0	0%	0.00	0.14	0.49	0.55			
	Dark	9	2	1	12	16%	4.00	2.00	4.57	5.06	X		
	Unknown	0	0	0	0	0%	0.00	0.12	0.46	0.52			
SURFACE CONDITIONS	Dry	24	22	18	64	84%	21.33	0.63	13.06	14.37	X	X	X
	Wet	5	4	3	12	16%	4.00	0.87	1.92	2.12	X	X	X
	Others	0	0	0	0	0%	0.00	0.14	0.57	0.65			
MONTH OF A YEAR	January	2	3	2	7	9%	2.33	0.48	1.33	1.49	X	X	X
	February	3	0	1	4	5%	1.33	0.59	1.40	1.56	X		
	March	1	3	1	5	7%	1.67	0.71	1.76	1.96	X		
	April	3	1	1	5	7%	1.67	0.58	1.47	1.65	X	X	X
	May	4	3	1	8	11%	2.67	0.61	1.50	1.67	X	X	X
	June	2	0	3	5	7%	1.67	0.52	1.32	1.47	X	X	X
	July	6	1	1	8	11%	2.67	0.53	1.28	1.42	X	X	X
	August	2	3	2	7	9%	2.33	0.69	1.68	1.87	X	X	X
	September	1	4	1	6	8%	2.00	0.73	1.96	2.19	X	X	
	October	3	1	4	8	11%	2.67	0.74	1.92	2.14	X	X	X
	November	1	4	2	7	9%	2.33	0.53	1.49	1.68	X	X	X
	December	1	3	2	6	8%	2.00	0.54	1.33	1.48	X	X	X
DAY OF THE WEEK	Sunday	0	1	0	1	1%	0.33	0.93	2.38	2.66			
	Monday	9	4	2	15	20%	5.00	0.96	1.99	2.19	X	X	X
	Tuesday	6	6	6	18	24%	6.00	1.16	2.90	3.23	X	X	X
	Wednesday	4	5	1	10	13%	3.33	1.11	2.43	2.68	X	X	X
	Thursday	4	3	5	12	16%	4.00	1.10	2.49	2.76	X	X	X
	Friday	5	4	4	13	17%	4.33	1.09	2.49	2.76	X	X	X
	Saturday	1	3	3	7	9%	2.33	0.92	2.25	2.50	X	X	
HOUR OF THE DAY	00:00-06:00	1	1	0	2	3%	0.67	0.71	2.04	2.29			
	06:00-09:00	1	4	3	8	11%	2.67	0.78	2.23	2.50	X	X	X
	09:00-11:00	2	4	3	9	12%	3.00	0.63	1.67	1.86	X	X	X
	11:00-13:00	3	2	6	11	14%	3.67	0.69	1.60	1.77	X	X	X
	13:00-15:00	6	4	1	11	14%	3.67	0.79	1.96	2.18	X	X	X
	15:00-18:00	5	9	5	19	25%	6.33	1.53	3.50	3.88	X	X	X
	18:00-24:00	11	2	3	16	21%	5.33	2.13	4.38	4.81	X	X	X

	YEAR			3-Year Average
	1	2	3	
Average Daily Traffic ADT *(Vehicles per Day)*	45,605	49,571	53,882	49,686
Florida Average Crash rate *(Crashes per Million Entering Vehicles)*	0.575	0.575	0.575	0.575
Traffic Base	16.646	18.093	19.667	18.135
Actual Crash Rate *(Crashes per Million Entering Vehicles)*	1.742	1.437	1.068	1.416
Critical Crash Rate *(Crashes per Million Entering Vehicles)*	1.217	1.189	1.163	1.190
Safety Ratio	**1.432**	**1.208**	**0.918**	**1.186**
High Crash Location??	***YES***	***YES***	***NO***	***YES***

$$Actual\ \ Crash\ \ Rate\ \ =\ \ \frac{A \times 1{,}000{,}000}{V}$$

Where:
A = Total number of crashes or number of crashes by type occurring in a 1 year period.
V = Average Annual Daily Traffic X 365

$$CriticalCrashRate = AVR + \frac{0.5}{TB} + TF\sqrt{\frac{AVR}{TB}}$$

Where:
AVR = Average Statewide Crash Rate for a particular type of intersection or roadway segment.
TB = Traffic Base
TF = Test Factor (z-value)
= 1.96 (assume 95% Confidence Level for RURAL areas)
= 3.29 (assume 99.95% Confidence Level for URBAN areas)

Confidence Level (%)	Constant Z
68.30	1.00
86.60	1.50
90.00	1.64
95.00	1.96
95.50	2.00
98.80	2.50
99.00	2.58
99.70	3.00
99.95	3.29

$$TrafficBase = \frac{Years \times ADT \times 365}{1{,}000{,}000}$$

$$Safety\ \ Ratio\ \ =\ \ \frac{Actual\ \ Crash\ \ Rate}{Critical\ \ Crash\ \ Rate}$$

From this analysis, it was determined that rear end, left-turn and sideswipe collisions presented abnormal crash patterns that exceed the 95th percentile and 90th percentile confidence level threshold limits. Those results indicate that these types of collisions were abnormally high during the period of 2011 through 2013. A detailed review of the abnormal crashes as well as probable countermeasures is presented in *Table 32*.

Table 32 – Abnormal Crash Details & Countermeasures
W 21 Court and W 68 Street

W 21 Court & W 68 Street

(4 Lane x 2 Lane, Signalized, With Turn Lanes, 4 Leg Intersection - Table 23) - URBAN Spot

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Rear End	Total Rear End Crashes		**11**	**14**	**9**	**34**	**100%**	**11.33**	(1)	2
	Lighting Conditions	Day Light	6	12	8	26	76%	8.67	(8)	4
		Dawn	0	0	0	0	0%	0.00	(12)	13
		Dark	5	2	1	8	24%	2.67	(16)	
	Hours of Day	00:00 - 06:00	1	0	0	1	3%	0.33		
		06:00 - 09:00	1	2	1	4	12%	1.33		
		09:00 - 11:00	0	0	1	1	3%	0.33		
		11:00 - 13:00	1	0	2	3	9%	1.00		
		13:00 - 15:00	1	3	1	5	15%	1.67		
		15:00 - 18:00	2	7	2	11	32%	3.67		
		18:00 - 24:00	5	2	2	9	26%	3.00		
	Direction	North	4	3	2	9	26%	3.00		
		South	0	2	0	2	6%	0.67		
		East	5	7	4	16	47%	5.33		
		West	2	2	3	7	21%	2.33		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Left Turn	Total Left Turn Crashes		**3**	**2**	**2**	**7**	**100%**	**2.33**	(9)	9
	Lighting Conditions	Day Light	3	1	2	6	86%	2.00	(13)	11
		Dawn	0	0	0	0	0%	0.00	(16)	14
		Dark	0	1	0	1	14%	0.33		16
	Hours of Day	00:00 - 06:00	0	1	0	1	14%	0.33		
		06:00 - 09:00	0	0	0	0	0%	0.00		
		09:00 - 11:00	0	0	0	0	0%	0.00		
		11:00 - 13:00	0	1	1	2	29%	0.67		
		13:00 - 15:00	2	0	0	2	29%	0.67		
		15:00 - 18:00	0	0	1	1	14%	0.33		
		18:00 - 24:00	1	0	0	1	14%	0.33		
	Direction	NB → WB	0	0	0	0	0%	0.00		
		WB → SB	1	2	0	3	43%	1.00		
		SB → EB	1	0	1	2	29%	0.67		
		EB → NB	1	0	1	2	29%	0.67		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Sideswipe (Overtake)	Total Sideswipe Crashes		**10**	**8**	**7**	**25**	**100%**	**8.33**	(8)	19
	Lighting Conditions	Day Light	8	8	7	23	92%	7.67	(11)	20
		Dawn	0	0	0	0	0%	0.00	(18)	21
		Dark	2	0	0	2	8%	0.67	(19)	22
	Hours of Day	00:00 - 06:00	0	0	0	0	0%	0.00		
		06:00 - 09:00	0	2	2	4	16%	1.33		
		09:00 - 11:00	2	3	1	6	24%	2.00		
		11:00 - 13:00	1	1	2	4	16%	1.33		
		13:00 - 15:00	2	1	0	3	12%	1.00		
		15:00 - 18:00	2	1	2	5	20%	1.67		
		18:00 - 24:00	3	0	0	3	12%	1.00		
	Direction	North	0	1	1	2	8%	0.67		
		South	1	0	0	1	4%	0.33		
		East	5	6	5	16	64%	5.33		
		West	4	1	1	6	24%	2.00		
		Unknown	0	0	0	0	0%	0.00		

3.14.3. Traffic Operation Conditions and Analysis

In order to identify the traffic operation characteristics and safety relevant conflicts, field observations at W 21 Court and W 68 Street were performed on a typical weekday on May 13, 2014. A summary of the traffic data is presented in *Figure 55*, and the field review is presented in *Figure 56*.

This intersection has single left-turn bays for the north, east and west legs with protected/permissive phases. The south leg provides one shared lane for left and thru movements with a permissive phase. Left and right turning volumes on this leg were high during the field review.

The intersection is located about 800 feet from the SR 826 exit ramp. Very often the exclusive left turn lane on the east leg of the intersection has a long queue that takes up the whole length of the left turn bay and vehicles exiting SR 826 and wanting to make a left turn at W 21 Court do not have enough space to transition from the north side of the road to the left turn bay on the south. This movement, along with the existence of a very short merge lane west of W 20 Avenue, creates conflicts with the thru westbound movement along W 68 Street as well as the operation of the intersection.

The operation at the intersection of W 21 Court and W 68 Street seem to be highly affected by the operation of the intersection of W 67 Place at W 21 Court. These two intersections are very close to each other; and the space between the two does not provide sufficient storage for the volume of traffic wanting to access W 68 Street. As a result, the intersection at W 67 Place gets blocked and the southbound left-turn movement from the east leg on W 68 Street cannot proceed.

The eastbound approach of the intersection at W 21 Court and W 68 Street presents a curvy alignment with a little bit of a vertical grade which could create confusion for the inexperienced, less skilled, or out of area driver. Also, several driveways are located at the beginning of the curve adding more conflicts points to the eastbound thru movement on W 68 Street. The eastbound driver is presented with decision points and weaving locations to access SR 826 south and north directions as well as a high volume of right turning movements from W 21 Court that do not always yields the right of way to thru movement.

A number of pedestrians were observed crossing the intersection from the Palmetto Hospital to the south side along the west crossing. Existing pedestrian signal timing is short for the wide crossing.

There is an existing tree on the southeast corner that restricts visibility of turning vehicles and pedestrian using the crosswalk on the south leg. Red light running was observed at the intersection as well as a failure of right turning vehicles from making a complete stop before proceeding to turn.

3.14.4. Recommendations

Based on the safety analysis, field observations and traffic operations for the intersection of W 21 Court and W 68 Street, the following is recommended:

- Install RPM's on all lane lines to better delineate the location and direction of lanes.
- Provide retroflectorized backplates for all signal heads.
- Provide High visibility ladder crosswalks for all crossings.
- Provide Pavement messages on west and east legs of the intersection (eastbound direction) to better direct users to expressway north and south ramps and W68 Street eastbound.
- Relocate or remove tree on the southeast corner of the intersection.
- Modify the pavement markings to restrict movements at the intersection of W 21 Court and W 67 Place (see sketch).
- Restripe the south leg of the intersection to provide one exclusive left-turn lane, one thru lane and one exclusive right turn lane for the northbound movement.
- Provide sidewalk along the west side of W 21 Court (north leg) by possibly reducing lane widths.
- Improve alignment of W 68 Street to soften curves and provide a bus bay.

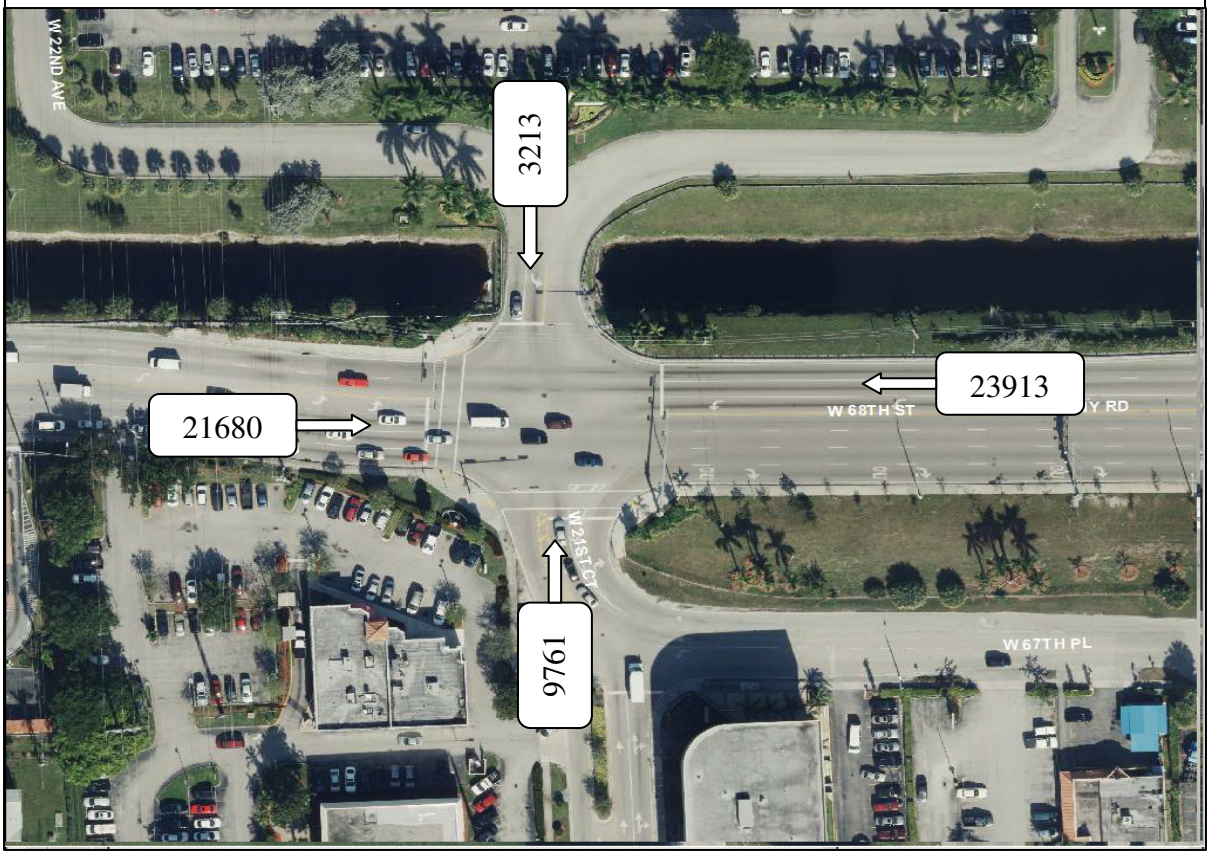
A conceptual vision of the proposed roadway improvements is exhibited in *Figure 57*.

3.14.5. Cost Estimate

Based on the recommended improvements and the Conceptual Plan, the estimated cost for this project is approximately $368,269. The details of the preliminary project costs are presented in *Appendix D*.

Construction costs were obtained from items cost on the latest pay item Average Unit Cost Report for the Area 13 (Miami-Dade County), and the Miami-Dade Traffic Signal Division price list.

24-hr Approach Counts



Turning Movement Counts (TMC)

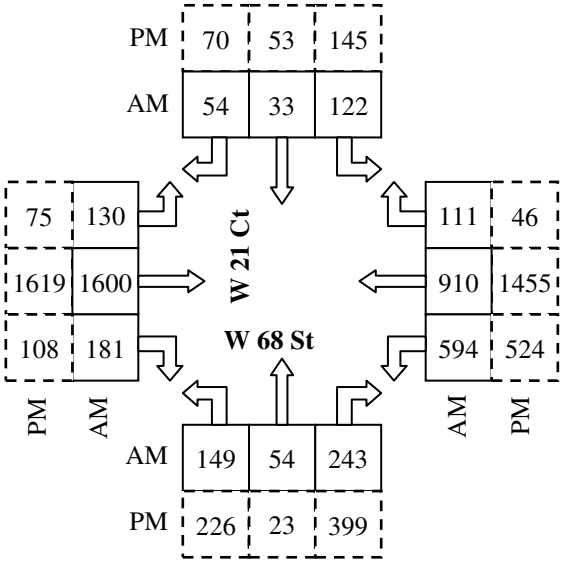


Figure 55: Traffic Data – *W 21 Court and W 68 Street*

W 68 St Westbound: Left turning vehicle proceeding on red.

Operation at W 21 Ct and W 67 Pl blocking southbound left turns from W 68 St.

W 21 Ct Northbound: Pedestrian walking on road.

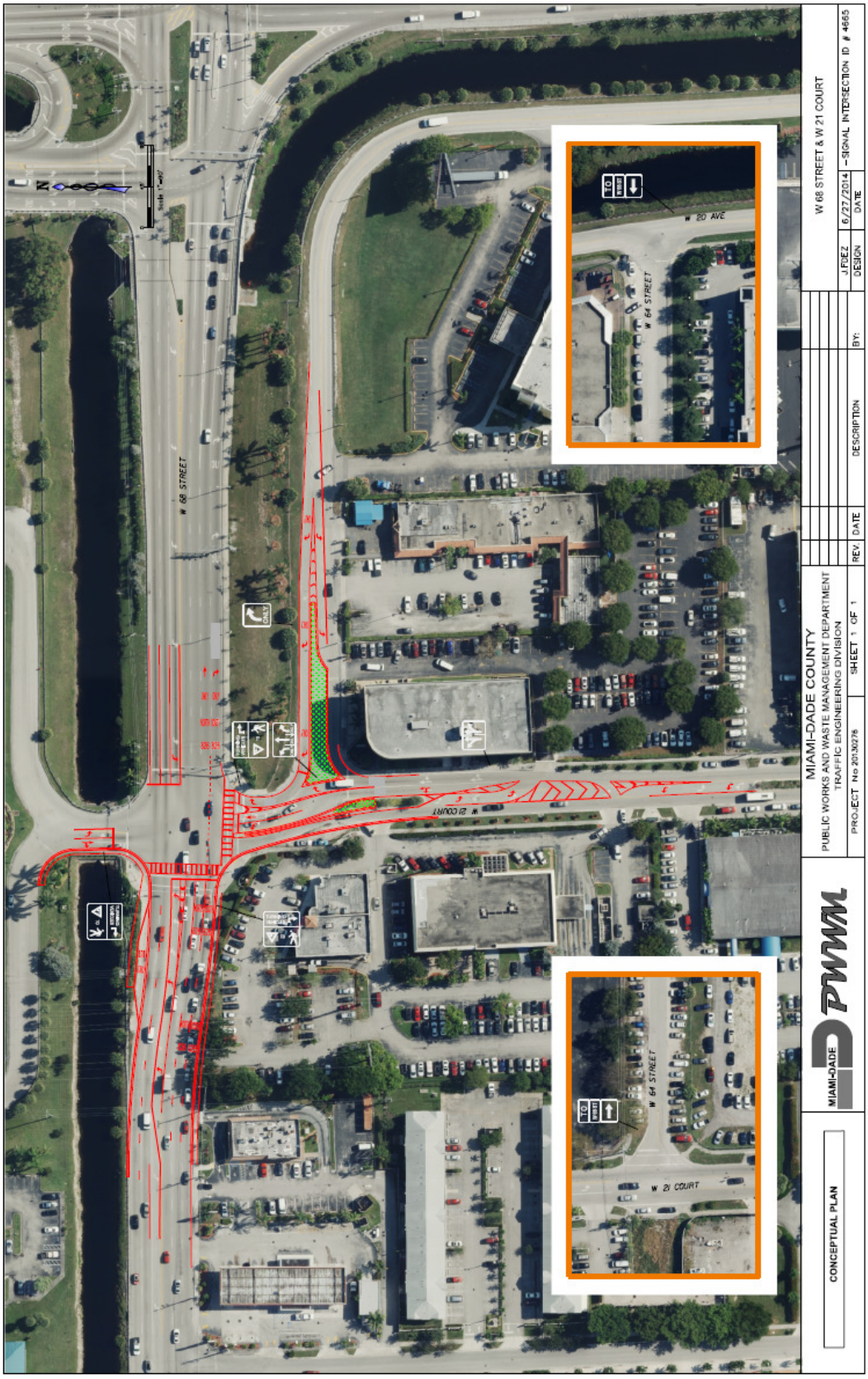
W 68 St eastbound: curved alignment

W 68 St Westbound: Driveway at beginning of curve.

W 68 St Westbound: Left turn delays due to operations at W 21 Ct @ W 67 PL intersection.

Figure 56: Field Review – *W 21 Court and W 68 Street*

Figure 57: Conceptual Plan – *W 21 Court and W 68 Street*



3.15. NW 17 Avenue and NW 7 Street

3.15.1. Site Description

This intersection is a signalized four legged intersection located in the City of Miami. NW 17 Avenue is a six lane urban minor arterial divided by a raised median that runs north-south, and NW 7 Street is a four lane minor arterial divided by painted median that runs east-west. This intersection was directly affected by the construction of the Marlins Ballpark, project that broke ground in July 2009 and was completed in March 2012.

3.15.2. Safety Conditions and Analysis

The intersection of NW 17 Avenue and NW 7 Street is ranked number 15 in our high crash locations list. A review of the hard copy police reports for the years 2011 through 2013 was performed. During the three-year analysis period, 75 relevant crashes occurred at the intersection. The analysis indicated that the average number of crashes per year is 25. The crash summaries, crash statistics and collision diagrams for the intersection are documented in *Appendix A*.

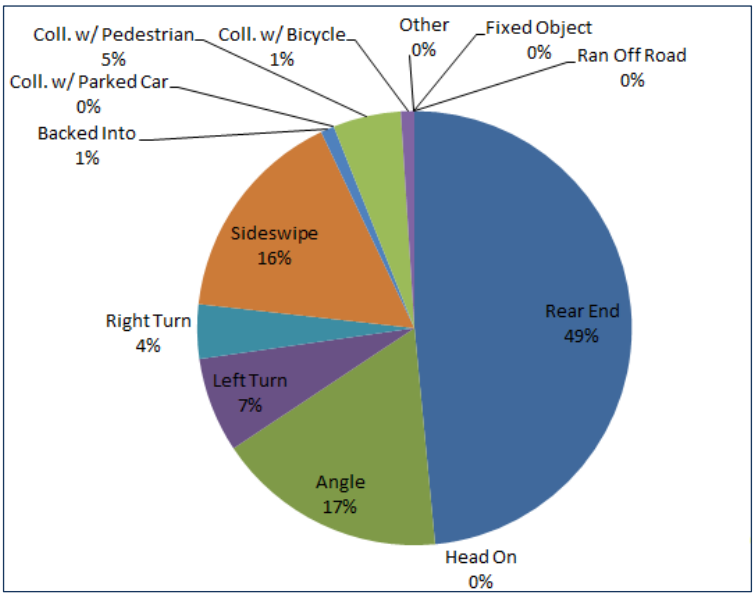


Figure 58 Predominant Crash Types
NW 17 AVE & NW 7 ST

Based on the analysis of crash records for this intersection, the predominant types of crashes are shown in *Figure 58.*

Calculated intersection mean crash per year were compared to the average Miami-Dade Crash Rate for County corridors to assess the safety conditions at the study intersection in relation to other roadways with similar traffic and geometric characteristics. This study is based on the 2010 FDOT's "Expected Value Analysis." *Table 33* illustrates the expected accident volume analysis of this intersection as well as the safety ratios and the confidence levels during the analysis period.

Based on a regression growth of 8% from the 2014 entering volume, the calculated safety ratios for the years 2011, 2012, and 2013 were 1.296, 0.695, and 0.652, respectively. The safety ratio for the three years averaged 0.881. Also, results of confidence level indicated that this intersection has been a high crash location during 2011 with a confidence level higher than 99.95%.

Table 33 – Crash Analysis – NW 17 Avenue and NW 7 Street

NW 17 Avenue & NW 7 Street

(6 Lane x 4 Lane, Signalized, With Turn Lanes, 4 Leg Intersection - Table 35) - URBAN Spot

	TYPE OF CRASH	NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	EXPECTED ANNUAL CRASH VALUE			ABNORMALLY HIGH CRASHES		
		2011	2012	2013				MEAN	90th Percentile	95th Percentile	Mean	90th Percentil	95th Percentil
COLLISION TYPE	Rear End	17	7	12	36	49%	12.00	8.68	17.26	18.90	X		
	Head On	0	0	0	0	0%	0.00	0.60	1.64	1.84			
	Angle	7	5	1	13	17%	4.33	5.40	9.19	9.92			
	Left Turn	3	0	2	5	7%	1.67	3.00	6.13	6.73			
	Right Turn	0	2	1	3	4%	1.00	0.46	1.36	1.53	X		
	Sideswipe	5	3	4	12	16%	4.00	2.58	4.92	5.37	X		
	Backed Into	1	0	0	1	1%	0.33	0.28	0.84	0.94	X		
	Coll. w/ Parked Car	0	0	0	0	0%	0.00	0.12	0.57	0.65			
	Coll. w/ Pedestrian	2	2	0	4	5%	1.33	0.74	1.80	2.00	X		
	Coll. w/ Bicycle	0	1	0	1	1%	0.33	0.14	0.49	0.55	X		
	Fixed Object	0	0	0	0	0%	0.00	0.79	2.01	2.24			
	Ran Off Road	0	0	0	0	0%	0.00	0.01	0.11	0.13			
	Overtuned	0	0	0	0	0%	0.00	0.04	0.28	0.33			
	Other	0	0	0	0	0%	0.00	8.67	21.05	23.42			
	Total Crashes	35	20	20	75	100%	25.00	31.51	54.94	59.43			
SEVERITY	PDO crashes	28	15	20	63	84%	21.00	19.21	36.95	40.35	X		
	Fatal crashes	0	0	0	0	0%	0.00	0.16	0.56	0.63			
	Injury crashes	7	5	0	12	16%	4.00	20.77	38.34	41.71			
LIGHT CONDITIONS	Day Light	22	14	11	47	63%	15.67	19.89	35.12	38.03			
	Dusk	2	0	1	3	4%	1.00	0.61	1.43	1.58	X		
	Dawn	0	0	1	1	1%	0.33	0.38	1.03	1.16			
	Dark	10	5	7	22	29%	7.33	10.22	18.94	20.61			
	Unknown	1	1	0	2	3%	0.67	0.41	1.15	1.30	X		
SURFACE CONDITIONS	Dry	29	16	17	62	83%	20.67	26.41	45.71	49.41			
	Wet	5	3	3	11	15%	3.67	4.41	8.78	9.62			
	Others	1	1	0	2	3%	0.67	0.69	1.88	2.11			
MONTH OF A YEAR	January	1	4	1	6	8%	2.00	2.57	5.04	5.52			
	February	2	2	0	4	5%	1.33	2.37	4.59	5.02			
	March	2	0	1	3	4%	1.00	3.09	5.92	6.46			
	April	3	2	2	7	9%	2.33	2.57	5.30	5.82			
	May	1	1	1	3	4%	1.00	2.51	4.81	5.25			
	June	5	1	2	8	11%	2.67	2.81	5.74	6.30			
	July	3	4	1	8	11%	2.67	2.60	4.96	5.42	X		
	August	5	1	2	8	11%	2.67	3.00	5.66	6.17			
	September	4	0	4	8	11%	2.67	2.48	4.92	5.39	X		
	October	2	1	1	4	5%	1.33	2.89	5.40	5.88			
	November	6	2	2	10	13%	3.33	2.41	4.85	5.32	X		
	December	1	2	3	6	8%	2.00	2.22	4.55	5.00			
DAY OF THE WEEK	Sunday	3	3	4	10	13%	3.33	4.00	6.58	7.08			
	Monday	7	2	1	10	13%	3.33	4.62	9.23	10.11			
	Tuesday	5	2	3	10	13%	3.33	4.46	7.81	8.46			
	Wednesday	4	2	3	9	12%	3.00	4.56	8.62	9.40			
	Thursday	3	2	4	9	12%	3.00	5.04	9.04	9.80			
	Friday	4	2	2	8	11%	2.67	4.86	9.39	10.26			
	Saturday	9	7	3	19	25%	6.33	3.98	8.10	8.89	X		
HOUR OF THE DAY	00:00-06:00	4	3	1	8	11%	2.67	3.79	8.65	9.58			
	06:00-09:00	6	0	4	10	13%	3.33	3.44	6.94	7.61			
	09:00-11:00	3	1	1	5	7%	1.67	2.58	5.30	5.82			
	11:00-13:00	6	4	3	13	17%	4.33	3.12	5.78	6.29	X		
	13:00-15:00	1	4	3	8	11%	2.67	3.57	6.32	6.85			
	15:00-18:00	9	3	2	14	19%	4.67	6.38	11.52	12.50			
	18:00-24:00	6	5	6	17	23%	5.67	8.60	15.51	16.83			

	YEAR			3-Year Average
	1	2	3	
Average Daily Traffic ADT *(Vehicles per Day)*	42,533	46,232	50,252	46,339
Florida Average Crash rate *(Crashes per Million Entering Vehicles)*	0.911	0.911	0.911	0.911
Traffic Base	15.525	16.875	18.342	16.914
Actual Crash Rate *(Crashes per Million Entering Vehicles)*	2.254	1.185	1.090	1.510
Critical Crash Rate *(Crashes per Million Entering Vehicles)*	1.740	1.705	1.671	1.706
Safety Ratio	**1.296**	**0.695**	**0.652**	**0.881**
High Crash Location??	***YES***	***NO***	***NO***	***NO***

$$Actual\ \ Crash\ \ Rate\ \ =\ \ \frac{A \times 1{,}000\ ,000}{V}$$

Where:
A = Total number of crashes or number of crashes by type occurring in a 1 year period.
V = Average Annual Daily Traffic X 365

$$CriticalCrashRate = AVR + \frac{0.5}{TB} + TF\sqrt{\frac{AVR}{TB}}$$

Where:
AVR = Average Statewide Crash Rate for a particular type of intersection or roadway segment.
TB = Traffic Base
TF = Test Factor (z-value)
= 1.96 (assume 95% Confidence Level for RURAL areas)
= 3.29 (assume 99.95% Confidence Level for URBAN areas)

Confidence Level (%)	Constant Z
68.30	1.00
86.60	1.50
90.00	1.64
95.00	1.96
95.50	2.00
98.80	2.50
99.00	2.58
99.70	3.00
99.95	3.29

$$Traffic\ Base = \frac{Years \times ADT \times 365}{1{,}000{,}000}$$

$$Safety\ \ Ratio\ \ =\ \ \frac{Actual\ \ Crash\ \ Rate}{Critical\ \ Crash\ \ Rate}$$

From this analysis, it was determined that rear end, right-turn, sideswipe, pedestrian and bicycle collisions presented abnormal crash patterns that exceed the threshold limits for the mean. Those results indicate that these types of collisions were abnormally high during the period of 2011 through 2013. A detailed review of the abnormal crashes as well as probable countermeasures is presented in *Table 34*.

Table 34 – Abnormal Crash Details & Countermeasures NW 17 Avenue and NW 7 Street

NW 17 Avenue & NW 7 Street

(6 Lane x 4 Lane, Signalized, With Turn Lanes, 4 Leg Intersection - Table 35) - URBAN Spot

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Rear End	Total Rear End Crashes		**17**	**7**	**12**	**36**	**100%**	**12.00**	(1)	2
	Lighting Conditions	Day Light	12	5	6	23	66%	7.67	(3)	4
		Dawn	0	0	0	0	0%	0.00	(7)	
		Dark	5	1	6	12	34%	4.00	(12)	
	Hours of Day	00:00 - 06:00	1	0	0	1	3%	0.33		
		06:00 - 09:00	1	0	2	3	8%	1.00		
		09:00 - 11:00	1	0	0	1	3%	0.33		
		11:00 - 13:00	4	0	2	6	17%	2.00		
		13:00 - 15:00	0	3	3	6	17%	2.00		
		15:00 - 18:00	7	2	0	9	25%	3.00		
		18:00 - 24:00	3	2	5	10	28%	3.33		
	Direction	NB→EB	4	0	6	10	28%	3.33		
		EB→SB	6	5	2	13	36%	4.33		
		WB→NB	6	2	4	12	33%	4.00		
		SB→WB	1	0	0	1	3%	0.33		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Sideswipe (Overtake)	Total Sideswipe Crashes		**5**	**3**	**4**	**12**	**100%**	**4.00**	(1)	2
	Lighting Conditions	Day Light	5	3	3	11	92%	3.67	(3)	4
		Dawn	0	0	0	0	0%	0.00	(7)	
		Dark	0	0	1	1	8%	0.33	(12)	
	Hours of Day	00:00 - 06:00	0	0	1	1	8%	0.33		
		06:00 - 09:00	2	0	1	3	25%	1.00		
		09:00 - 11:00	2	0	0	2	17%	0.67		
		11:00 - 13:00	0	2	1	3	25%	1.00		
		13:00 - 15:00	0	0	0	0	0%	0.00		
		15:00 - 18:00	0	0	0	0	0%	0.00		
		18:00 - 24:00	1	1	1	3	25%	1.00		
	Direction	North	2	1	2	5	42%	1.67		
		South	0	2	0	2	17%	0.67		
		East	2	0	2	4	33%	1.33		
		West	1	0	0	1	8%	0.33		
		Unknown	0	0	0	0	0%	0.00		

3.15.3. Traffic Operation Conditions and Analysis

In order to identify the traffic operation characteristics and safety relevant conflicts, field observations at NW 17 Avenue and NW 7 Street were performed on a typical weekday on May 13, 2014. A summary of the traffic data is presented in *Figure 59*, and the field review is presented in *Figure 60*.

This intersection has left-turn lanes with protected-permissive signal operation for all approaches. Pedestrian crosswalks exist on all legs and are equipped with head counts and push buttons to cross NW 7 Street. Pavement and marking conditions were fair since the intersection was improved by the Marlin Ballpark project.

Traffic was observed to be heavy but balanced in all approaches with the exception of the westbound in the am peak. Southbound left turn vehicles spilled back obstructing thru traffic during pm peak. Pedestrian activity was moderate during field inspection. Also vehicles were observed careless turning while pedestrian were crossing at crosswalks. Speeding was observed for northbound.

3.15.4. Recommendations

Based on the safety analysis, field observations and traffic operations for the intersection of NW 17 Avenue and NW 7 Street, the following is recommended:

- Lengthen the southbound left-turn lane to approximately 300 feet
- Retime/optimize of the existing signal while maintaining cycle length for both the AM and PM peak hours.
- Install reflective back plates for all signals heads
- Provide Turning Vehicles Yield to Pedestrians (R10-15) signs for all directions
- Provide push button to cross NW 17 Avenue

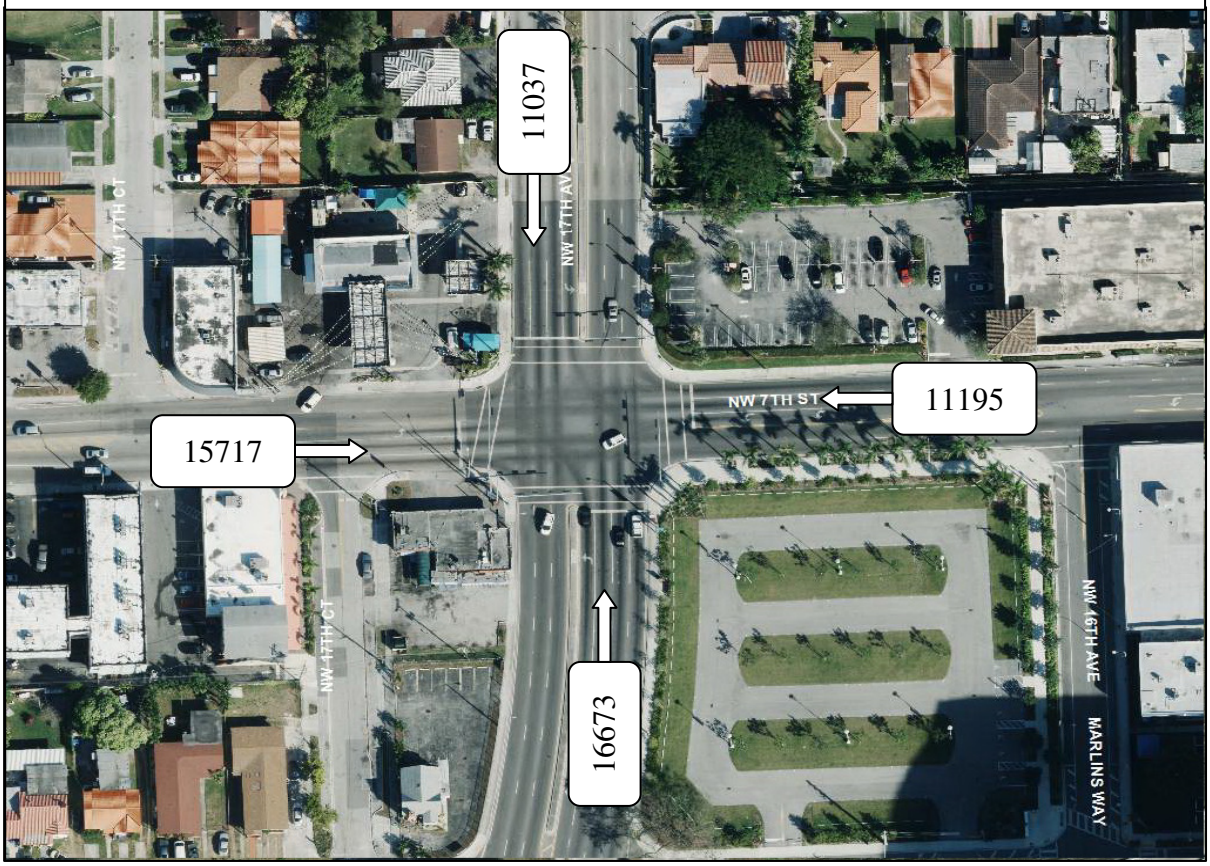
A conceptual vision of the proposed roadway improvements is exhibited in *Figure 61*.

3.15.5. Cost Estimate

Based on the recommended improvements and the Conceptual Plan, the estimated cost for this project is approximately $30,911. The details of the preliminary project costs are presented in *Appendix D*.

Construction costs were obtained from items cost on the latest pay item Average Unit Cost Report for the Area 13 (Miami-Dade County), and the Miami-Dade Traffic Signal Division price list.

24-hr Approach Counts



Turning Movement Counts (TMC)

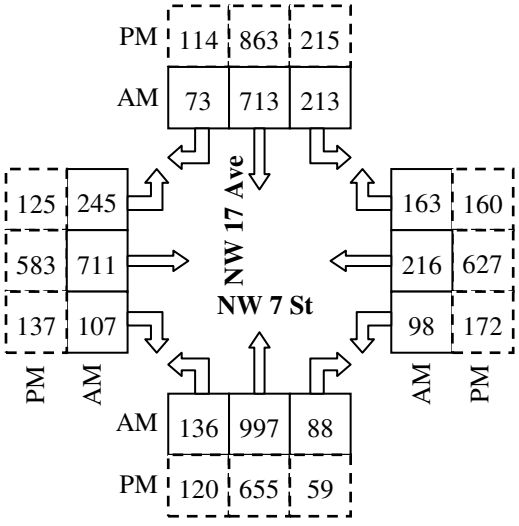


Figure 59: Traffic Data – *NW 17 Avenue and NW 7 Street*

Northbound approach: Balanced vehicle traffic.

Moderate pedestrian activity in all directions.

Push button to cross NW 17 Avenue.

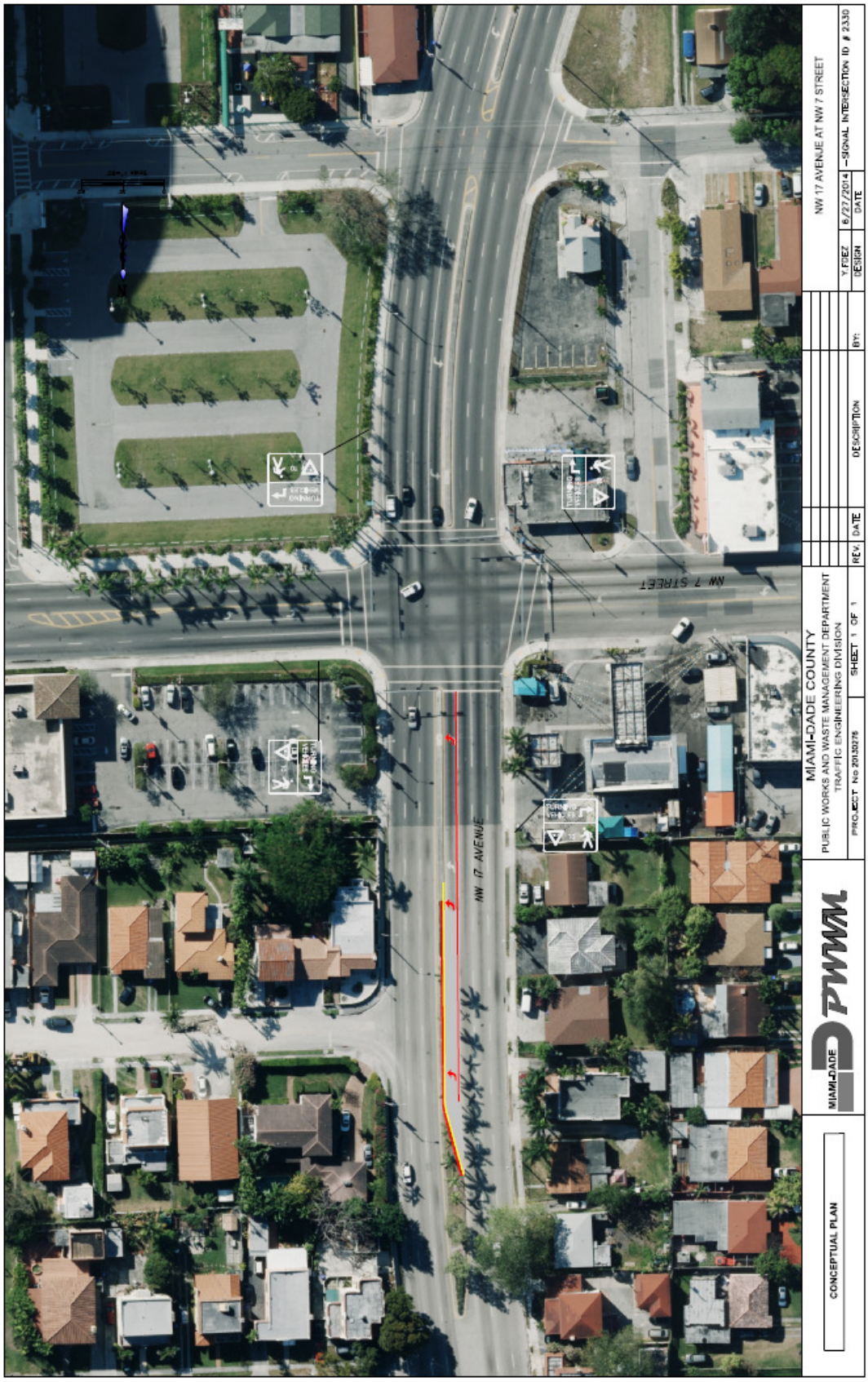
Westbound approach: Signals heads poorly visible.

Right-turn vehicles and potential conflict with pedestrians near the Ballpark.

Pavement markings are fair and ADA pedestrian ramps exist at all corners.

Figure 60: Field Review – *NW 17 Avenue and NW 7 Street*

Figure 61: Conceptual Plan – *NW 17 Avenue and NW 7 Street*



3.16. NW 45 Avenue and NW 7 Street

3.16.1. Site Description

This intersection is a signalized four legged intersection located in the City of Miami. NW 45 Avenue is a two lane local road that runs north-south and offsets when intersecting with NW 7 Street which is a four lane urban minor arterial with a two-way left-turn center lane that runs east-west.

3.16.2. Safety Conditions and Analysis

The intersection of NW 45 Avenue and NW 7 Street is ranked number 16 in our high crash locations list. A review of the hard copy police reports for the years 2011 through 2013 was performed. During the three-year analysis period, 51 relevant crashes occurred at the intersection. The analysis indicated that the average number of crashes per year is 17. The crash summaries, crash statistics and collision diagrams for the intersection are documented in *Appendix A*.

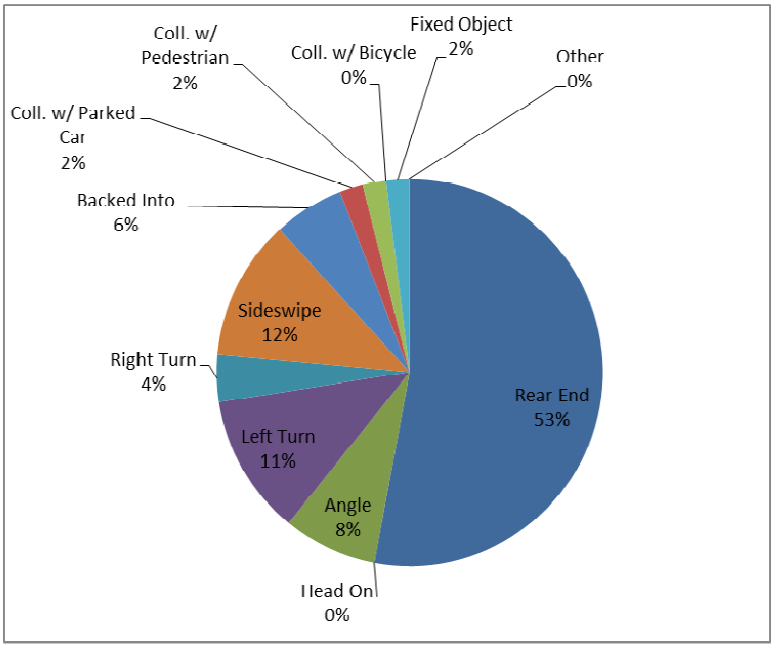


Figure 62 Predominant Crash Types
NW 45 AVE & NW 7 ST

Based on the analysis of crash records for this intersection, the predominant types of crashes are shown in *Figure 62*.

Calculated intersection mean crash per year were compared to the average Miami-Dade Crash Rate for County corridors to assess the safety conditions at the study intersection in relation to other roadways with similar traffic and geometric characteristics. This study is based on the 2010 FDOT's "Expected Value Analysis." *Table 35* illustrates the expected accident volume analysis of this intersection as well as the safety ratios and the confidence levels during the analysis period.

Based on a regression growth of 8% from the 2014 entering volume, the calculated safety ratios for the years 2011, 2012, and 2013 were 2.214, 1.396, and 0.440, respectively. The safety ratio for the three years averaged 1.350. Also, results of confidence level indicated that this intersection has been a high crash location during the three years with a confidence level higher than 99.95%.

Table 35 – Crash Analysis – NW 45 Avenue and NW 7 Street

NW 45 Avenue & NW 7 Street

(4 Lane x 2 Lane, Signalized, With Turn Lanes, 4 Leg Intersection -Table 23) - URBAN Spot

	TYPE OF CRASH	NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	EXPECTED ANNUAL CRASH VALUE			ABNORMALLY HIGH CRASHES		
		2011	2012	2013				MEAN	90th Percentile	95th Percentile	Mean	90th Percentil	95th Percentil
COLLISION TYPE	Rear End	16	8	3	27	53%	9.00	1.62	4.09	4.56	X	X	X
	Head On	0	0	0	0	0%	0.00	0.16	0.58	0.66			
	Angle	2	0	2	4	8%	1.33	1.37	3.01	3.33			
	Left Turn	1	4	1	6	12%	2.00	0.49	1.29	1.44	X	X	X
	Right Turn	1	1	0	2	4%	0.67	0.10	0.39	0.45	X	X	X
	Sideswipe	2	4	0	6	12%	2.00	0.56	1.40	1.56	X	X	X
	Backed Into	3	0	0	3	6%	1.00	0.07	0.40	0.46	X	X	X
	Coll. w/ Parked Car	1	0	0	1	2%	0.33	0.08	0.50	0.58	X		
	Coll. w/ Pedestrian	0	1	0	1	2%	0.33	0.16	0.56	0.63	X		
	Coll. w/ Bicycle	0	0	0	0	0%	0.00	0.00	0.00	0.00			
	Fixed Object	1	0	0	1	2%	0.33	0.22	0.55	0.62	X		
	Ran Off Road	0	0	0	0	0%	0.00	0.00	0.00	0.00			
	Overtuned	0	0	0	0	0%	0.00	0.01	0.11	0.13			
	Other	0	0	0	0	0%	0.00	2.44	6.28	7.02			
	Total Crashes	27	18	6	51	100%	17.00	7.27	15.00	16.48	X	X	X
SEVERITY	PDO crashes	26	15	6	47	92%	15.67	3.99	9.34	10.36	X	X	X
	Fatal crashes	0	0	0	0	0%	0.00	0.00	0.00	0.00			
	Injury crashes	1	3	0	4	8%	1.33	5.10	11.25	12.43			
LIGHT CONDITIONS	Day Light	19	15	6	40	78%	13.33	4.76	9.80	10.76	X	X	X
	Dusk	2	1	0	3	6%	1.00	0.24	0.65	0.73	X	X	X
	Dawn	1	0	0	1	2%	0.33	0.14	0.49	0.55	X		
	Dark	4	2	0	6	12%	2.00	2.00	4.57	5.06	X		
	Unknown	1	0	0	1	2%	0.33	0.12	0.46	0.52	X		
SURFACE CONDITIONS	Dry	23	17	6	46	90%	15.33	0.63	13.06	14.37	X	X	X
	Wet	2	1	0	3	6%	1.00	0.87	1.92	2.12	X		
	Others	2	0	0	2	4%	0.67	0.14	0.57	0.65	X	X	X
MONTH OF A YEAR	January	0	3	2	5	10%	1.67	0.48	1.33	1.49	X	X	X
	February	3	2	0	5	10%	1.67	0.59	1.40	1.56	X	X	X
	March	2	1	2	5	10%	1.67	0.71	1.76	1.96	X		
	April	2	2	0	4	8%	1.33	0.58	1.47	1.65	X		
	May	4	3	1	8	16%	2.67	0.61	1.50	1.67	X	X	X
	June	1	2	0	3	6%	1.00	0.52	1.32	1.47	X		
	July	6	0	0	6	12%	2.00	0.53	1.28	1.42	X	X	X
	August	1	2	0	3	6%	1.00	0.69	1.68	1.87	X		
	September	2	2	1	5	10%	1.67	0.73	1.96	2.19	X		
	October	2	1	0	3	6%	1.00	0.74	1.92	2.14	X		
	November	2	0	0	2	4%	0.67	0.53	1.49	1.68	X		
	December	2	0	0	2	4%	0.67	0.54	1.33	1.48	X		
DAY OF THE WEEK	Sunday	2	1	2	5	10%	1.67	0.96	1.99	2.19	X		
	Monday	1	2	0	3	6%	1.00	1.16	2.90	3.23			
	Tuesday	6	1	0	7	14%	2.33	1.11	2.43	2.68	X		
	Wednesday	4	3	1	8	16%	2.67	1.10	2.49	2.76	X	X	
	Thursday	5	7	1	13	25%	4.33	1.09	2.49	2.76	X	X	X
	Friday	2	2	2	6	12%	2.00	0.92	2.25	2.50	X		
	Saturday	7	2	0	9	18%	3.00	0.93	2.38	2.66	X	X	X
HOUR OF THE DAY	00:00-06:00	2	2	0	4	8%	1.33	0.71	2.04	2.29	X		
	06:00-09:00	5	4	0	9	18%	3.00	0.78	2.23	2.50	X	X	X
	09:00-11:00	1	0	2	3	6%	1.00	0.63	1.67	1.86	X		
	11:00-13:00	3	2	1	6	12%	2.00	0.69	1.60	1.77	X	X	X
	13:00-15:00	4	3	0	7	14%	2.33	0.79	1.96	2.18	X	X	X
	15:00-18:00	8	4	2	14	28%	4.67	1.53	3.50	3.88	X	X	X
	18:00-24:00	3	3	1	7	14%	2.33	2.13	4.38	4.81	X		

	YEAR			3-Year Average
	1	2	3	
Average Daily Traffic ADT *(Vehicles per Day)*	16,727	18,182	19,763	18,224
Florida Average Crash rate *(Crashes per Million Entering Vehicles)*	0.757	0.757	0.757	0.757
Traffic Base	6.105	6.636	7.213	6.652
Actual Crash Rate *(Crashes per Million Entering Vehicles)*	4.422	2.712	0.832	2.656
Critical Crash Rate *(Crashes per Million Entering Vehicles)*	1.997	1.944	1.892	1.944
Safety Ratio	**2.214**	**1.396**	**0.440**	**1.350**
High Crash Location??	***YES***	***YES***	***NO***	***YES***

$$Actual\ \ Crash\ \ Rate\ \ =\ \ \frac{A \times 1{,}000{,}000}{V}$$

Where:
A = Total number of crashes or number of crashes by type occurring in a 1 year period.
V = Average Annual Daily Traffic X 365

$$CriticalCrashRate = AVR + \frac{0.5}{TB} + TF\sqrt{\frac{AVR}{TB}}$$

Where:
AVR = Average Statewide Crash Rate for a particular type of intersection or roadway segment.
TB = Traffic Base
TF = Test Factor (z-value)
= 1.96 (assume 95% Confidence Level for RURAL areas)
= 3.29 (assume 99.95% Confidence Level for URBAN areas)

$$Traffic\,Base = \frac{Years \times ADT \times 365}{1{,}000{,}000}$$

$$Safety\ \ Ratio\ \ =\ \ \frac{Actual\ \ Crash\ \ Rate}{Critical\ \ Crash\ \ Rate}$$

Confidence Level (%)	Constant Z
68.30	1.00
86.60	1.50
90.00	1.64
95.00	1.96
95.50	2.00
98.80	2.50
99.00	2.58
99.70	3.00
99.95	3.29

Table 36 – Abnormal Crash Details & Countermeasures
NW 45 Avenue and NW 7 Street

NW 45 Avenue & NW 7 Street

(4 Lane x 2 Lane, Signalized, With Turn Lanes, 4 Leg Intersection -Table 23) - URBAN Spot

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHE	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Rear End	Total Rear End Crashes		**16**	**8**	**3**	**27**	**100%**	**9.00**	(1)	2
	Lighting Conditions	Day Light	13	6	3	22	81%	7.33	(3)	4
		Dawn	1	0	0	1	4%	0.33	(7)	7
		Dark	2	2	0	4	15%	1.33	(12)	
	Hours of Day	00:00 - 06:00	0	1	0	1	4%	0.33		
		06:00 - 09:00	4	2	1	7	27%	2.33		
		09:00 - 11:00	1	0	0	1	4%	0.33		
		11:00 - 13:00	1	1	0	2	8%	0.67		
		13:00 - 15:00	2	0	0	2	8%	0.67		
		15:00 - 18:00	5	2	1	8	31%	2.67		
		18:00 - 24:00	2	2	1	5	19%	1.67		
	Direction	North	1	0	0	1	4%	0.33		
		South	1	1	0	2	7%	0.67		
		East	1	2	1	4	15%	1.33		
		West	13	5	2	20	74%	6.67		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHE	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Left Turn	Total Left Turn Crashes		**1**	**4**	**1**	**6**	**100%**	**2.00**	(8)	3
	Lighting Conditions	Day Light	1	3	1	5	83%	1.67	(10)	8
		Dawn	0	0	0	0	0%	0.00	(16)	
		Dark	0	1	0	1	17%	0.33		
	Hours of Day	00:00 - 06:00	0	1	0	1	17%	0.33		
		06:00 - 09:00	1	0	0	1	17%	0.33		
		09:00 - 11:00	0	0	1	1	17%	0.33		
		11:00 - 13:00	0	0	0	0	0%	0.00		
		13:00 - 15:00	0	2	0	2	33%	0.67		
		15:00 - 18:00	0	1	0	1	17%	0.33		
		18:00 - 24:00	0	0	0	0	0%	0.00		
	Direction	NB → WB	0	1	0	1	17%	0.33		
		WB → SB	0	1	0	1	17%	0.33		
		SB → EB	0	0	0	0	0%	0.00		
		EB → NB	1	2	1	4	67%	1.33		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHE	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Right Turn	Total Rear End Crashes		**1**	**1**	**0**	**2**	**100%**	**0.67**	(9)	4
	Lighting Conditions	Day Light	1	1	0	2	67%	0.67	(16)	6
		Dawn	0	0	0	0	0%	0.00		
		Dark	0	0	1	1	33%	0.33		
	Hours of Day	00:00 - 06:00	0	0	0	0	0%	0.00		
		06:00 - 09:00	0	0	0	0	0%	0.00		
		09:00 - 11:00	0	0	0	0	0%	0.00		
		11:00 - 13:00	1	0	0	1	33%	0.33		
		13:00 - 15:00	0	0	0	0	0%	0.00		
		15:00 - 18:00	0	1	0	1	33%	0.33		
		18:00 - 24:00	0	0	1	1	33%	0.33		
	Direction	NB→EB	0	1	0	1	33%	0.33		
		EB→SB	0	0	0	0	0%	0.00		
		WB→NB	0	0	0	0	0%	0.00		
		SB→WB	1	0	1	2	67%	0.67		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHE	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Sideswipe (Overtake)	Total Left Turn Crashes		**2**	**4**	**0**	**6**	**100%**	**2.00**	(4)	3
	Lighting Conditions	Day Light	1	3	7	11	85%	3.67	(8)	4
		Dawn	0	0	0	0	0%	0.00		
		Dark	1	1	0	2	15%	0.67		
	Hours of Day	00:00 - 06:00	0	0	0	0	0%	0.00		
		06:00 - 09:00	0	2	1	3	23%	1.00		
		09:00 - 11:00	0	0	0	0	0%	0.00		
		11:00 - 13:00	0	1	2	3	23%	1.00		
		13:00 - 15:00	1	1	1	3	23%	1.00		
		15:00 - 18:00	1	0	2	3	23%	1.00		
		18:00 - 24:00	0	0	1	1	8%	0.33		
	Direction	North	0	0	2	2	15%	0.67		
		South	0	1	1	2	15%	0.67		
		East	1	1	3	5	38%	1.67		
		West	1	2	1	4	31%	1.33		
		Unknown	0	0	0	0	0%	0.00		

From this analysis, it was determined that rear end, left-turn, right-turn, sideswipe and backing collisions presented abnormal crash patterns that exceed the 95th percentile and 90th percentile confidence level threshold limits. Those results indicate that these types of collisions were abnormally high during the period of 2011 through 2013. A detailed review of the abnormal crashes as well as probable countermeasures is presented in *Table 36*.

3.16.3. Traffic Operation Conditions and Analysis

In order to identify the traffic operation characteristics and safety relevant conflicts, field observations at NW 45 Avenue and NW 7 Street were performed on a typical weekday on May 15, 2014. A summary of the traffic data is presented in *Figure 63*, and the field review is presented in *Figure 64*.

The intersection is controlled by a signal suspended in span wires. This intersection has left-turn lanes for all approaches except for southbound. The signal operation is protected-permissive for eastbound left turn and permissive only for westbound left turns; north and southbound approaches are operating on split phases. Obstructions to the sight distance are present at all corners due to buildings and fences.

Pavement and markings are in fair conditions. Skid marks were visible on markings for east and west directions. Speeding was observed for east and west traffic.

High pedestrian activity was observed on all directions. Crosswalks are provided in all legs except for the south leg. Push buttons are provided to cross NW 7 Street at east and west legs. ADA ramps exist on NW 7 Street to cross north-south direction on both legs east and west.

3.16.4. Recommendations

Based on the safety analysis, field observations and traffic operations for the intersection of NW 45 Avenue and NW 7 Street, the following is recommended:

- Update span wire traffic signal to mast arm.
- Provide crosswalk on south leg.
- Provide countdown pedestrian signal heads for all directions.
- Provide ADA ramps for east-west directions on north and south legs.
- Install reflective back plates for all signals heads.
- Provide solar powered speed limit feedback signs on NW 7 Street for east and westbound traffic.

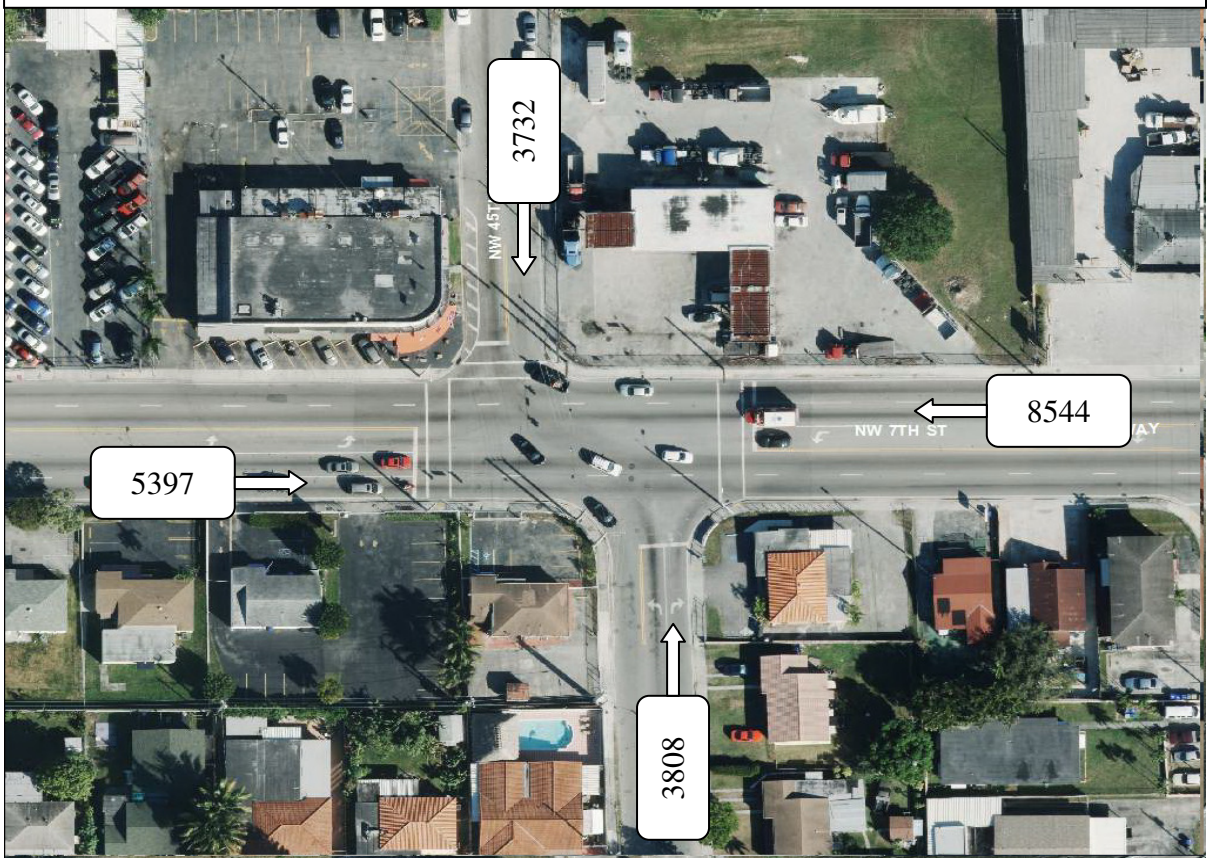
A conceptual vision of the proposed roadway improvements is exhibited in *Figure 65*.

3.16.5. Cost Estimate

Based on the recommended improvements and the Conceptual Plan, the estimated cost for this project is approximately $433,989. The details of the preliminary project costs are presented in *Appendix D*.

Construction costs were obtained from items cost on the latest pay item Average Unit Cost Report for the Area 13 (Miami-Dade County), and the Miami-Dade Traffic Signal Division price list.

24-hr Approach Counts



Turning Movement Counts (TMC)

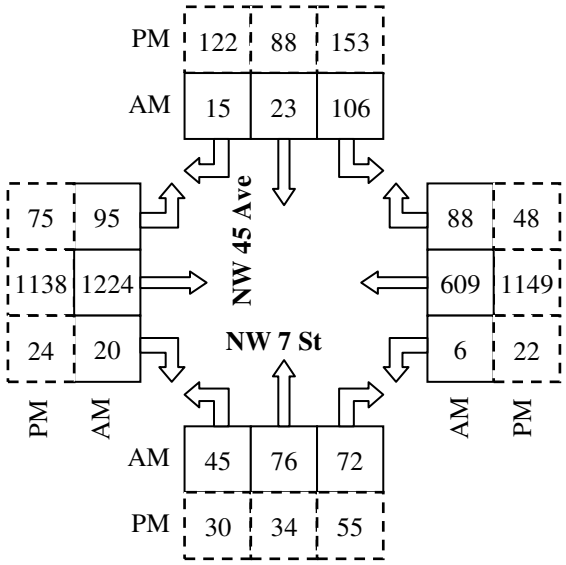


Figure 63: Traffic Data – *NW 45 Avenue and NW 7 Street*

Westbound approach

Northbound approach

Eastbound approach

Southbound approach

Northwest corner

Northeast corner

Figure 64: Field Review – *NW 45 Avenue and NW 7 Street*

Figure 65: Conceptual Plan – *NW 45 Avenue and NW 7 Street*

3.17. W 14 Avenue and W 29 Street

3.17.1. Site Description

This intersection is a signalized four legged intersection located in the City of Hialeah in the area of Northwest Miami Dade County. W 14 Avenue is a two lane undivided local road that runs North- South, and W 29 Street is a four lane undivided collector that runs east-west.

3.17.2. Safety Conditions and Analysis

The intersection of W 14 Avenue and W 29 Street is ranked number 17 in our high crash locations list. A review of the hard copy police reports for the years 2011 through 2013 was performed. During the three-year analysis period, 40 relevant crashes occurred at the intersection. The analysis indicated that the average number of crashes per year is 13. The crash summaries, crash statistics and collision diagrams for the intersection are documented in *Appendix A*.

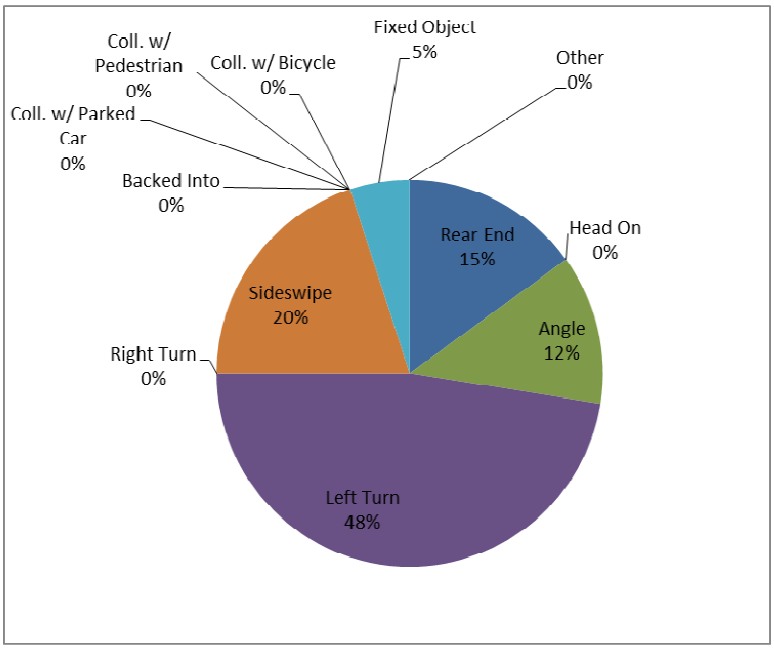


Figure 66 Predominant Crash Types
W 14 AVE & W 29 ST

Based on the analysis of crash records for this intersection, the predominant types of crashes are shown in *Figure 66.*

Calculated intersection mean crash per year were compared to the average Miami-Dade Crash Rate for County corridors to assess the safety conditions at the study intersection in relation to other roadways with similar traffic and geometric characteristics. This study is based on the 2010 FDOT's "Expected Value Analysis." *Table 37* illustrates the expected accident volume analysis of this intersection as well as the safety ratios and the confidence levels during the analysis period.

Based on a regression growth of 8% from the 2014 entering volume, the calculated safety ratios for the years 2011, 2012, and 2013 were 1.405, 1.153, and 1.007, respectively. The safety ratio for the three years averaged 1.188. Also, results of confidence level indicated that this intersection has been a high crash location during the three years with a confidence level higher than 99.95%.

Table 37 – Crash Analysis – W 14 Avenue and W 29 Street

W 14 Avenue & W 29 Street

(4 Lane x 2 Lane, Signalized, Without Turn Lanes, 4 Leg Intersection - Table 23) - URBAN Spot

	TYPE OF CRASH	NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	EXPECTED ANNUAL CRASH VALUE			ABNORMALLY HIGH CRASHES		
		2011	2012	2013				MEAN	90th Percentile	95th Percentile	Mean	90th Percentil	95th Percentil
COLLISION TYPE	Rear End	5	1	0	6	15%	2.00	1.62	4.09	4.56	X		
	Head On	0	0	0	0	0%	0.00	0.16	0.58	0.66			
	Angle	1	1	3	5	13%	1.67	1.37	3.01	3.33	X		
	Left Turn	5	9	5	19	48%	6.33	0.49	1.29	1.44	X	X	X
	Right Turn	0	0	0	0	0%	0.00	0.10	0.39	0.45			
	Sideswipe	2	2	4	8	20%	2.67	0.56	1.40	1.56	X	X	X
	Backed Into	0	0	0	0	0%	0.00	0.07	0.40	0.46			
	Coll. w/ Parked Car	0	0	0	0	0%	0.00	0.08	0.50	0.58			
	Coll. w/ Pedestrian	0	0	0	0	0%	0.00	0.16	0.56	0.63			
	Coll. w/ Bicycle	0	0	0	0	0%	0.00	0.00	0.00	0.00			
	Fixed Object	2	0	0	2	5%	0.67	0.22	0.55	0.62	X	X	X
	Ran Off Road	0	0	0	0	0%	0.00	0.00	0.00	0.00			
	Overtuned	0	0	0	0	0%	0.00	0.01	0.11	0.13			
	Other	0	0	0	0	0%	0.00	2.44	6.28	7.02			
	Total Crashes	15	13	12	40	100%	13.33	7.27	15.00	16.48	X		
SEVERITY	PDO crashes	15	9	11	35	88%	11.67	3.99	9.34	10.36	X	X	X
	Fatal crashes	0	0	0	0	0%	0.00	0.00	0.00	0.00			
	Injury crashes	0	4	1	5	13%	1.67	5.10	11.25	12.43			
LIGHT CONDITIONS	Day Light	8	11	9	28	70%	9.33	4.76	9.80	10.76	X		
	Dusk	2	1	0	3	8%	1.00	0.24	0.65	0.73	X	X	X
	Dawn	1	0	0	1	3%	0.33	0.14	0.49	0.55	X		
	Dark	4	1	3	8	20%	2.67	2.00	4.57	5.06	X		
	Unknown	0	0	0	0	0%	0.00	0.12	0.46	0.52			
SURFACE CONDITIONS	Dry	11	9	11	31	78%	10.33	0.63	13.06	14.37	X		
	Wet	4	4	1	9	23%	3.00	0.87	1.92	2.12	X	X	X
	Others	0	0	0	0	0%	0.00	0.14	0.57	0.65			
MONTH OF A YEAR	January	0	1	1	2	5%	0.67	0.48	1.33	1.49	X		
	February	2	0	0	2	5%	0.67	0.59	1.40	1.56	X		
	March	2	1	2	5	13%	1.67	0.71	1.76	1.96	X		
	April	2	1	0	3	8%	1.00	0.58	1.47	1.65	X		
	May	1	1	0	2	5%	0.67	0.61	1.50	1.67	X		
	June	1	1	2	4	10%	1.33	0.52	1.32	1.47	X	X	
	July	0	2	1	3	8%	1.00	0.53	1.28	1.42	X		
	August	3	2	1	6	15%	2.00	0.69	1.68	1.87	X	X	X
	September	0	1	0	1	3%	0.33	0.73	1.96	2.19			
	October	2	1	1	4	10%	1.33	0.74	1.92	2.14	X		
	November	1	2	2	5	13%	1.67	0.53	1.49	1.68	X	X	
	December	1	0	2	3	8%	1.00	0.54	1.33	1.48	X		
DAY OF THE WEEK	Sunday	1	1	1	3	8%	1.00	0.96	1.99	2.19	X		
	Monday	3	2	2	7	18%	2.33	1.16	2.90	3.23	X		
	Tuesday	4	2	2	8	20%	2.67	1.11	2.43	2.68	X	X	
	Wednesday	2	1	2	5	13%	1.67	1.10	2.49	2.76	X		
	Thursday	2	3	1	6	15%	2.00	1.09	2.49	2.76	X		
	Friday	2	1	1	4	10%	1.33	0.92	2.25	2.50	X		
	Saturday	1	3	3	7	18%	2.33	0.93	2.38	2.66	X		
HOUR OF THE DAY	00:00-06:00	0	0	1	1	2%	0.33	0.71	2.04	2.29			
	06:00-09:00	2	0	9	11	22%	3.67	0.78	2.23	2.50	X	X	X
	09:00-11:00	0	0	0	0	0%	0.00	0.63	1.67	1.86			
	11:00-13:00	0	1	3	4	8%	1.33	0.69	1.60	1.77	X		
	13:00-15:00	1	3	2	6	12%	2.00	0.79	1.96	2.18	X	X	
	15:00-18:00	5	5	4	14	29%	4.67	1.53	3.50	3.88	X	X	X
	18:00-24:00	7	4	2	13	27%	4.33	2.13	4.38	4.81	X		

	YEAR			3-Year Average
	1	2	3	
Average Daily Traffic ADT *(Vehicles per Day)*	13,683	14,873	16,166	14,907
Florida Average Crash rate *(Crashes per Million Entering Vehicles)*	0.757	0.757	0.757	0.757
Traffic Base	4.994	5.429	5.901	5.441
Actual Crash Rate *(Crashes per Million Entering Vehicles)*	3.003	2.395	2.034	2.477
Critical Crash Rate *(Crashes per Million Entering Vehicles)*	2.138	2.078	2.020	2.079
Safety Ratio	**1.405**	**1.153**	**1.007**	**1.188**
High Crash Location??	***YES***	***YES***	***YES***	***YES***

$$Actual\ \ Crash\ \ Rate\ \ =\ \ \frac{A \times 1{,}000{,}000}{V}$$

Where:
A = Total number of crashes or number of crashes by type occurring in a 1 year period.
V = Average Annual Daily Traffic X 365

$$CriticalCrashRate = AVR + \frac{0.5}{TB} + TF\sqrt{\frac{AVR}{TB}}$$

Where:
AVR = Average Statewide Crash Rate for a particular type of intersection or roadway segment.
TB = Traffic Base
TF = Test Factor (z-value)
= 1.96 (assume 95% Confidence Level for RURAL areas)
= 3.29 (assume 99.95% Confidence Level for URBAN areas)

$$Traffic\,Base = \frac{Years \times ADT \times 365}{1{,}000{,}000}$$

$$Safety\ \ Ratio\ \ =\ \ \frac{Actual\ \ Crash\ \ Rate}{Critical\ \ Crash\ \ Rate}$$

Confidence Level (%)	Constant Z
68.30	1.00
86.60	1.50
90.00	1.64
95.00	1.96
95.50	2.00
98.80	2.50
99.00	2.58
99.70	3.00
99.95	3.29

From this analysis, it was determined that left turn, sideswipe and fixed object collisions presented abnormal crash pattern that exceeds the threshold limits for the 95th percentile and 90th percentile confidence level. Also, rear end and angle collisions exceeded the mean. Those results indicate that these types of collisions were abnormally high during the period of 2011 through 2013. A detailed review of the abnormal crashes as well as probable countermeasures is presented in *Table 38*.

Table 38 – Abnormal Crash Details & Countermeasures
W 14 Avenue and W 29 Street

W 14 Avenue & W 29 Street

(4 Lane x 2 Lane, Signalized, Without Turn Lanes, 4 Leg Intersection - Table 23) - URBAN Spot

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHE	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Left Turn	Total Left Turn Crashes		**5**	**9**	**5**	**19**	**100%**	**6.33**	(1)	6
	Lighting Conditions	Day Light	2	8	4	14	74%	4.67	(4)	13
		Dawn	1	0	0	1	5%	0.33	(15)	14
		Dark	2	1	1	4	21%	1.33		
	Hours of Day	00:00 - 06:00	0	0	0	0	0%	0.00		
		06:00 - 09:00	1	0	0	1	5%	0.33		
		09:00 - 11:00	0	0	0	0	0%	0.00		
		11:00 - 13:00	0	1	1	2	11%	0.67		
		13:00 - 15:00	1	1	0	2	11%	0.67		
		15:00 - 18:00	1	5	3	9	47%	3.00		
		18:00 - 24:00	2	2	1	5	26%	1.67		
	Direction	NB → WB	0	0	0	0	0%	0.00		
		WB → SB	0	3	4	7	37%	2.33		
		SB → EB	2	0	0	2	11%	0.67		
		EB → NB	3	6	1	10	53%	3.33		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHE	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Sideswipe (Overtake)	Total Left Turn Crashes		**2**	**2**	**4**	**8**	**100%**	**2.67**	(8)	8
	Lighting Conditions	Day Light	1	2	3	6	75%	2.00	(17)	22
		Dawn	0	0	0	0	0%	0.00		
		Dark	1	0	1	2	25%	0.67		
	Hours of Day	00:00 - 06:00	0	0	1	1	13%	0.33		
		06:00 - 09:00	0	0	0	0	0%	0.00		
		09:00 - 11:00	0	0	0	0	0%	0.00		
		11:00 - 13:00	0	0	1	1	13%	0.33		
		13:00 - 15:00	0	1	1	2	25%	0.67		
		15:00 - 18:00	0	0	1	1	13%	0.33		
		18:00 - 24:00	2	1	0	3	38%	1.00		
	Direction	North	0	0	0	0	0%	0.00		
		South	1	0	0	1	13%	0.33		
		East	1	1	4	6	75%	2.00		
		West	0	1	0	1	13%	0.33		
		Unknown	0	0	0	0	0%	0.00		

3.17.3. Traffic Operation Conditions and Analysis

In order to identify the traffic operation characteristics and safety relevant conflicts, field observations at W 14 Avenue & W 29 Street were performed on a typical weekday on May 21, 2014. A summary of the traffic data is presented in *Figure 67*, and the field review is presented in *Figure 68*.

This is a signalized intersection with permissive left-turn movements, and no left-turn lanes for all directions. The east/west left-turn vehicles find difficulties turning due to the heavy opposing east/west thru traffic.

At the northwest corner trees, shrubberies and an FPL concrete pole are blocking the view of oncoming traffic. Cars were observed parked at the SW corner blocking the view as well.

3.17.4. Recommendations

Based on the safety analysis, field observations and traffic operations for the intersection of W 14 Avenue & W 29 Street, the following is recommended:

- Refurbish pavement markings including crosswalks using thermoplastic painting at the south leg.
- Add Yellow Pedestrian ramps for northwest and northeast corners.
- Add pedestrian signal heads for all directions.
- Upgrade the crosswalks to high visibility ladder crosswalks.
- Add lane designation pavement marking arrows for east/west approaches.

A conceptual vision of the proposed roadway improvements is exhibited in *Figure 69*.

3.17.5. Cost Estimate

Based on the recommended improvements and the Conceptual Plan, the estimated cost for this project is approximately $22,420. The details of the preliminary project costs are presented in *Appendix D*.

Construction costs were obtained from items cost on the latest pay item Average Unit Cost Report for the Area 13 (Miami-Dade County), and the Miami-Dade Traffic Signal Division price list.

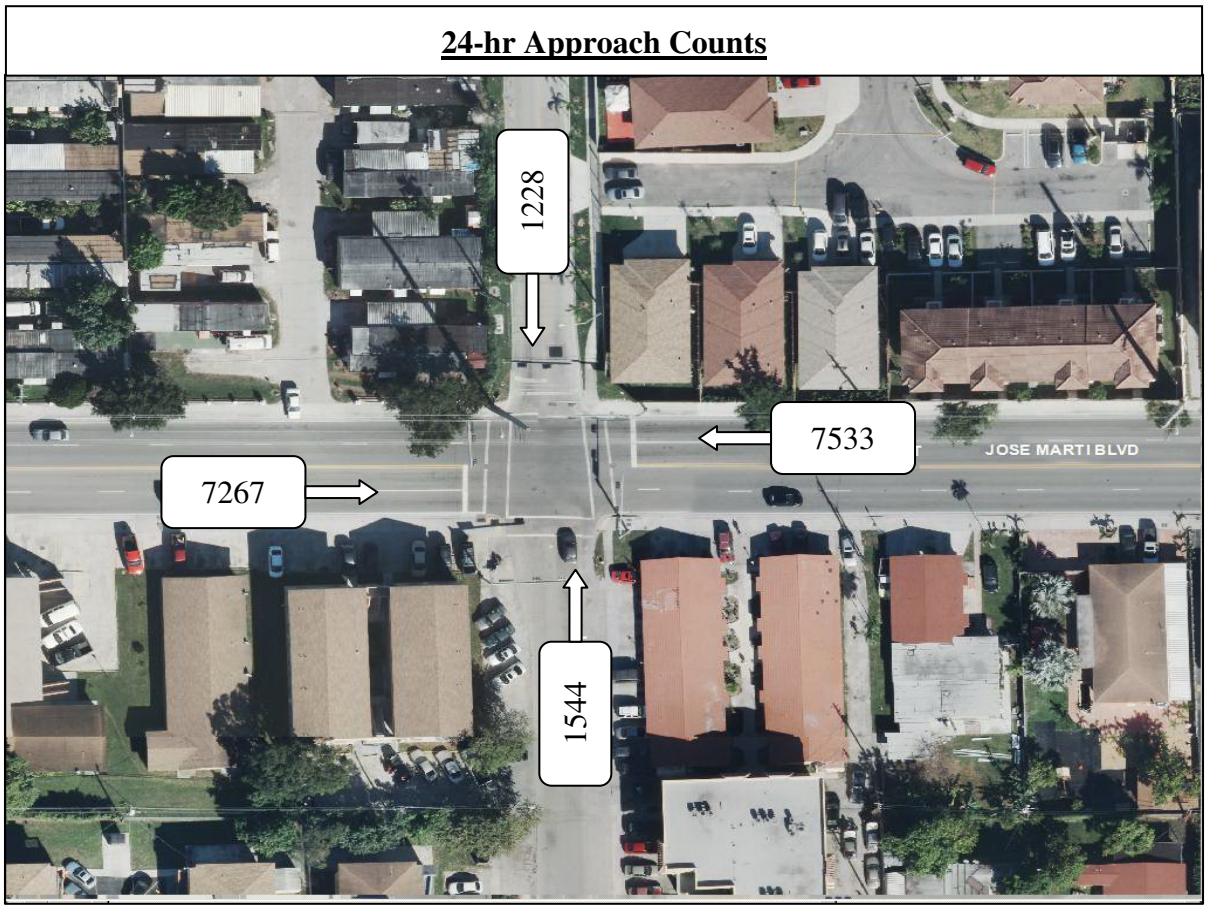


Figure 67: Traffic Data – *W 14 Avenue and W 29 Street*

Northwest corner: trees, shrubberies and FPL pole block the view of oncoming traffic

East/west directions: heavy traffic and no left-turn lanes.

Southwest corner: angle parked cars block the view of oncoming traffic.

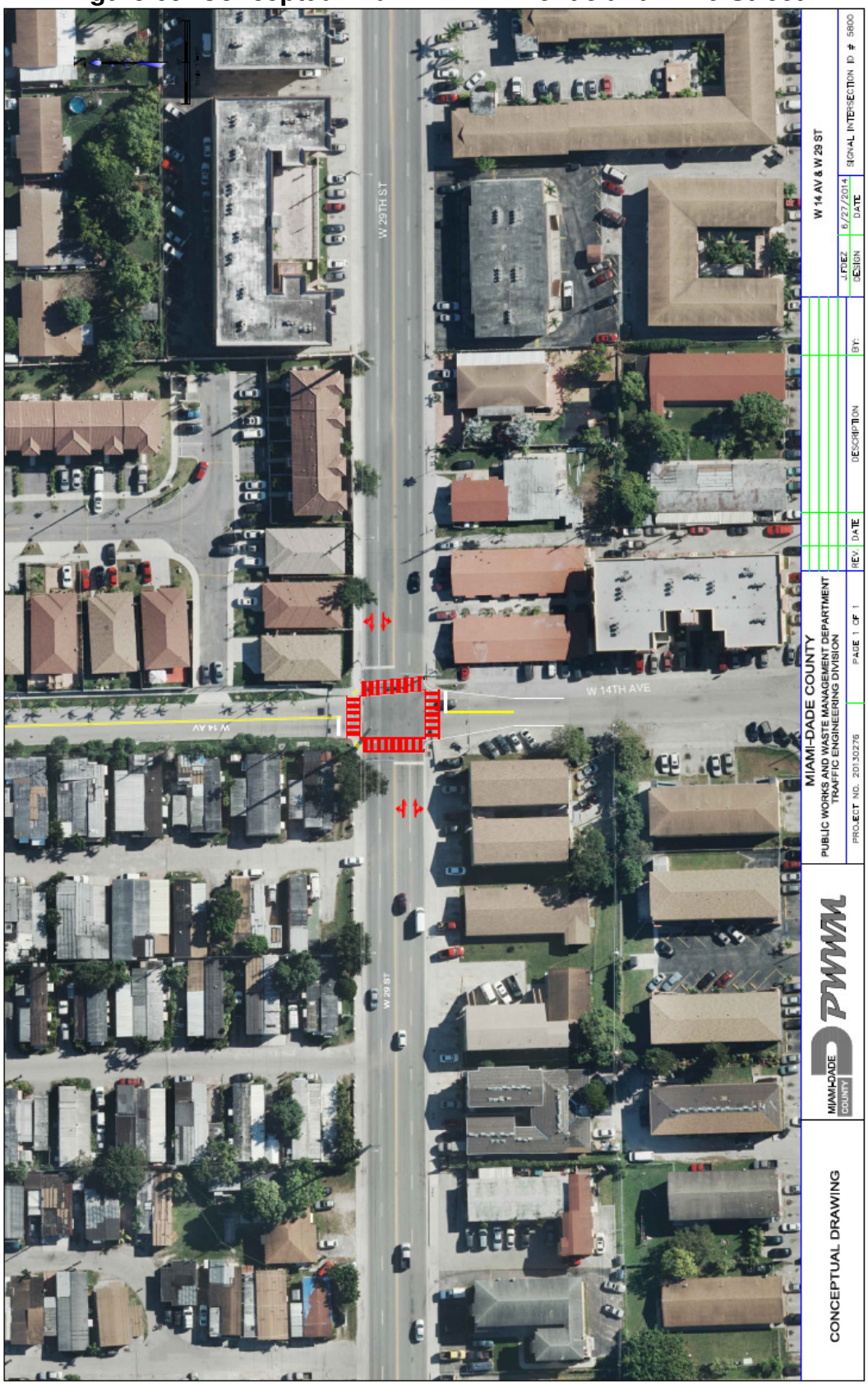
Southeast corner: angle parking damages the edge of pavement.

No pedestrian signal heads.

Bicyclists/pedestrians use the intersection.

Figure 68: Field Review – *W 14 Avenue and W 29 Street*

Figure 69: Conceptual Plan – *W 14 Avenue and W 29 Street*



3.18. W 28 Avenue and W 68 Street

3.18.1. Site Description

This intersection is a signalized four-legged intersection located at the city limit between the City of Hialeah and the City of Hialeah Gardens in the northwest area of Miami Dade County. W 28 Avenue is a four lane urban arterial divided by a median mostly paved that runs north-south, and W 68 Street is a four lane collector divided by a median mostly paved that runs east-west.

3.18.2. Safety Conditions and Analysis

The intersection of W 28 Avenue and W 68 Street is ranked number 18 in our high crash locations list. A review of the hard copy police reports for the years 2011 through 2013 was performed. During the three-year analysis period, 85 relevant crashes occurred at the intersection. The analysis indicated that the average number of crashes per year is 28. The crash summaries, crash statistics and collision diagrams for the intersection are documented in *Appendix A*.

Based on the analysis of crash records for this intersection, the predominant types of crashes are shown in *Figure 70.*

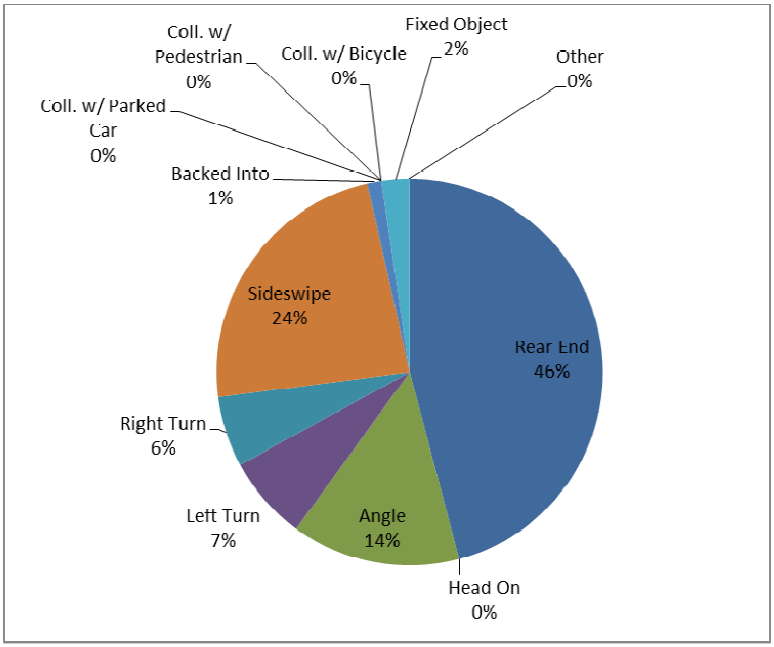


Figure 70 Predominant Crash Types
W 28 AVE & W 68 ST

Calculated intersection mean crash per year were compared to the average Miami-Dade Crash Rate for County corridors to assess the safety conditions at the study intersection in relation to other roadways with similar traffic and geometric characteristics. This study is based on the 2010 FDOT's "Expected Value Analysis." *Table 39* illustrates the expected accident volume analysis of this intersection as well as the safety ratios and the confidence levels during the analysis period.

Based on a regression growth of 8% from the 2014 entering volume, the calculated safety ratios for the years 2011, 2012, and 2013 were 1.110, 1.155, and 0.909, respectively. The safety ratio for the three years averaged 1.058. Also, results of confidence level indicated that this intersection has been a high crash location during the three years with a confidence level higher than 99.95%.

Table 39 – Crash Analysis – W 28 Avenue and W 68 Street

W 28 Avenue & W 68 Street

(4 Lane x 4 Lane, Signalized, With Turn Lanes, 4 Leg Intersection - Table 29) - URBAN Spot

	TYPE OF CRASH	NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	EXPECTED ANNUAL CRASH VALUE			ABNORMALLY HIGH CRASHES		
		2011	2012	2013				MEAN	90th Percentile	95th Percentile	Mean	90th Percentil	95th Percentil
COLLISION TYPE	Rear End	9	19	11	39	46%	13.00	3.43	8.08	8.97	X	X	X
	Head On	0	0	0	0	0%	0.00	0.51	1.15	1.28			
	Angle	6	2	4	12	14%	4.00	3.11	6.53	7.19	X		
	Left Turn	1	1	4	6	7%	2.00	1.44	3.22	3.56	X		
	Right Turn	4	0	1	5	6%	1.67	0.34	1.07	1.21	X	X	X
	Sideswipe	8	7	5	20	24%	6.67	1.51	4.91	5.56	X	X	X
	Backed Into	0	1	0	1	1%	0.33	0.11	0.47	0.54	X		
	Coll. w/ Parked Car	0	0	0	0	0%	0.00	0.11	0.57	0.66			
	Coll. w/ Pedestrian	0	0	0	0	0%	0.00	0.47	1.35	1.52			
	Coll. w/ Bicycle	0	0	0	0	0%	0.00	0.12	0.49	0.56			
	Fixed Object	0	1	1	2	2%	0.67	0.04	0.23	0.27	X	X	X
	Ran Off Road	0	0	0	0	0%	0.00	0.00	0.00	0.00			
	Overtuned	0	0	0	0	0%	0.00	0.01	0.10	0.13			
	Other	0	0	0	0	0%	0.00	5.26	12.78	14.22			
	Total Crashes	28	31	26	85	100%	28.33	17.31	37.75	41.66	X		
SEVERITY	PDO crashes	28	29	22	79	93%	26.33	8.79	24.57	27.59	X	X	
	Fatal crashes	0	0	0	0	0%	0.00	2.49	15.45	17.93			
	Injury crashes	0	2	4	6	7%	2.00	10.55	20.71	22.66			
LIGHT CONDITIONS	Day Light	23	27	19	69	81%	23.00	9.69	23.99	26.72	X		
	Dusk	0	1	0	1	1%	0.33	0.53	1.61	1.81			
	Dawn	0	0	0	0	0%	0.00	0.39	1.43	1.63			
	Dark	5	2	7	14	16%	4.67	4.30	9.57	10.57	X		
	Unknown	0	1	0	1	1%	0.33	0.61	2.23	2.54			
SURFACE CONDITIONS	Dry	24	22	19	65	76%	21.67	12.76	30.50	33.90	X		
	Wet	4	8	7	19	22%	6.33	1.91	4.43	4.92	X	X	X
	Others	0	1	0	1	1%	0.33	0.68	2.09	2.36			
MONTH OF A YEAR	January	2	3	2	7	8%	2.33	1.24	2.67	2.94	X		
	February	4	0	2	6	7%	2.00	1.67	4.01	4.46	X		
	March	1	1	4	6	7%	2.00	1.64	4.07	4.53	X		
	April	2	3	4	9	11%	3.00	1.50	3.60	4.01	X		
	May	3	9	2	14	16%	4.67	1.51	3.24	3.57	X	X	X
	June	1	2	3	6	7%	2.00	1.62	3.97	4.42	X		
	July	6	5	1	12	14%	4.00	1.67	3.82	4.24	X	X	
	August	4	1	2	7	8%	2.33	1.73	4.09	4.54	X		
	September	2	3	3	8	9%	2.67	1.63	4.31	4.83	X		
	October	1	3	1	5	6%	1.67	1.46	3.92	4.39	X		
	November	1	1	0	2	2%	0.67	1.40	3.97	4.46			
	December	1	0	2	3	4%	1.00	1.41	4.02	4.52			
DAY OF THE WEEK	Sunday	2	2	2	6	7%	2.00	2.67	7.18	8.04			
	Monday	6	4	4	14	16%	4.67	2.47	5.66	6.27	X		
	Tuesday	5	4	3	12	14%	4.00	2.47	5.61	6.21	X		
	Wednesday	5	2	5	12	14%	4.00	2.33	5.55	6.16	X		
	Thursday	2	7	2	11	13%	3.67	2.44	5.25	5.79	X		
	Friday	6	6	8	20	24%	6.67	2.46	5.51	6.10	X	X	X
	Saturday	2	6	2	10	12%	3.33	2.52	6.23	6.94	X		
HOUR OF THE DAY	00:00-06:00	0	0	0	0	0%	0.00	1.61	4.23	4.73			
	06:00-09:00	1	0	2	3	4%	1.00	1.36	3.39	3.78			
	09:00-11:00	1	2	1	4	5%	1.33	1.28	3.25	3.62	X		
	11:00-13:00	5	4	4	13	15%	4.33	1.70	4.20	4.68	X	X	
	13:00-15:00	5	5	3	13	15%	4.33	1.88	5.42	6.09	X		
	15:00-18:00	11	10	8	29	34%	9.67	2.99	7.98	8.94	X	X	X
	18:00-24:00	5	10	8	23	27%	7.67	3.79	9.27	10.32	X		

	YEAR			3-Year Average
	1	2	3	
Average Daily Traffic ADT *(Vehicles per Day)*	46,696	50,756	55,170	50,874
Florida Average Crash rate *(Crashes per Million Entering Vehicles)*	0.757	0.757	0.757	0.757
Traffic Base	17.044	18.526	20.137	18.569
Actual Crash Rate *(Crashes per Million Entering Vehicles)*	1.643	1.673	1.291	1.536
Critical Crash Rate *(Crashes per Million Entering Vehicles)*	1.480	1.449	1.420	1.449
Safety Ratio	**1.110**	**1.155**	**0.909**	**1.058**
High Crash Location??	***YES***	***YES***	***NO***	***YES***

$$Actual\ \ Crash\ \ Rate\ \ =\ \ \frac{A \times 1{,}000{,}000}{V}$$

Where:
A = Total number of crashes or number of crashes by type occurring in a 1 year period.
V = Average Annual Daily Traffic X 365

$$CriticalCrashRate = AVR + \frac{0.5}{TB} + TF\sqrt{\frac{AVR}{TB}}$$

Where:
AVR = Average Statewide Crash Rate for a particular type of intersection or roadway segment.
TB = Traffic Base
TF = Test Factor (z-value)
= *1.96 (assume 95% Confidence Level for RURAL areas)*
= *3.29 (assume 99.95% Confidence Level for URBAN areas)*

$$Traffic\ Base = \frac{Years \times ADT \times 365}{1{,}000{,}000}$$

$$Safety\ \ Ratio\ \ =\ \ \frac{Actual\ \ Crash\ \ Rate}{Critical\ \ Crash\ \ Rate}$$

Confidence Level (%)	Constant Z
68.30	1.00
86.60	1.50
90.00	1.64
95.00	1.96
95.50	2.00
98.80	2.50
99.00	2.58
99.70	3.00
99.95	3.29

From this analysis, it was determined that rear end, right-turn, sideswipe and fixed object collisions presented abnormal crash patterns that exceed the 95th percentile and 90th percentile confidence level threshold limits. Also, angle and left-turn collisions exceeded the mean. Those results indicate that these types of collisions were abnormally high during the period of 2011 through 2013. A detailed review of the abnormal crashes as well as probable countermeasures is presented in *Table 40*.

Table 40 – Abnormal Crash Details & Countermeasures
W 28 Avenue and W 68 Street

W 28 Avenue & W 68 Street

(4 Lane x 4 Lane, Signalized, With Turn Lanes, 4 Leg Intersection - Table 29) - URBAN Spot

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Rear End	Total Rear End Crashes		**9**	**19**	**11**	**39**	**100%**	**13.00**	(1)	2
	Lighting Conditions	Day Light	7	17	9	33	85%	11.00	(8)	5
		Dawn	0	1	0	1	3%	0.33	(10)	8
		Dark	2	1	2	5	13%	1.67		
	Hours of Day	00:00 - 06:00	0	0	0	0	0%	0.00		
		06:00 - 09:00	1	0	0	1	3%	0.33		
		09:00 - 11:00	1	1	1	3	8%	1.00		
		11:00 - 13:00	1	2	2	5	13%	1.67		
		13:00 - 15:00	2	5	2	9	23%	3.00		
		15:00 - 18:00	2	7	4	13	33%	4.33		
		18:00 - 24:00	2	4	2	8	21%	2.67		
	Direction	North	7	7	4	18	46%	6.00		
		South	2	4	2	8	21%	2.67		
		East	0	1	4	5	13%	1.67		
		West	0	7	1	8	21%	2.67		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Right Turn	Total Rear End Crashes		**4**	**0**	**1**	**5**	**100%**	**1.67**	(8)	9
	Lighting Conditions	Day Light	2	0	1	3	60%	1.00	(9)	10
		Dawn	0	0	0	0	0%	0.00	(10)	
		Dark	2	0	0	2	40%	0.67	(17)	
	Hours of Day	00:00 - 06:00	0	0	0	0	0%	0.00		
		06:00 - 09:00	0	0	1	1	20%	0.33		
		09:00 - 11:00	0	0	0	0	0%	0.00		
		11:00 - 13:00	0	0	0	0	0%	0.00		
		13:00 - 15:00	0	0	0	0	0%	0.00		
		15:00 - 18:00	2	0	0	2	40%	0.67		
		18:00 - 24:00	2	0	0	2	40%	0.67		
	Direction	NB→EB	0	0	1	1	10%	0.33		
		EB→SB	1	0	0	1	10%	0.33		
		WB→NB	8	0	0	8	80%	2.67		
		SB→WB	0	0	0	0	0%	0.00		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Sideswipe (Overtake)	Total Left Turn Crashes		**8**	**7**	**5**	**20**	**100%**	**6.67**	(8)	8
	Lighting Conditions	Day Light	7	7	3	17	85%	5.67		19
		Dawn	0	0	0	0	0%	0.00		
		Dark	1	0	2	3	15%	1.00		
	Hours of Day	00:00 - 06:00	0	0	0	0	0%	0.00		
		06:00 - 09:00	0	0	0	0	0%	0.00		
		09:00 - 11:00	0	1	0	1	5%	0.33		
		11:00 - 13:00	2	1	2	5	25%	1.67		
		13:00 - 15:00	2	0	1	3	15%	1.00		
		15:00 - 18:00	3	2	1	6	30%	2.00		
		18:00 - 24:00	1	3	1	5	25%	1.67		
	Direction	North	2	1	2	5	25%	1.67		
		South	2	2	0	4	20%	1.33		
		East	0	1	1	2	10%	0.67		
		West	4	3	2	9	45%	3.00		
		Unknown	0	0	0	0	0%	0.00		

3.18.3. Traffic Operation Conditions and Analysis

In order to identify the traffic operation characteristics and safety relevant conflicts, field observations at W 28 Avenue and W 68 Street were performed on a typical weekday on May 13, 2014. A summary of the traffic data is presented in *Figure 71*, and the field review is presented in *Figure 72*.

This intersection has double left-turn bays for the north/south approaches with protected phases. The east/west left turn movements operate on single left-turn bays with protected/permissive phases.

Pavement markings are faded. Vehicles travel at high speeds thru both corridors. Left-turn movements during the permissive phase on W 68 Street go up to the middle of the road waiting for a gap which many times occurs after the light has turned red.

Red light running was observed at the intersection as well as a failure of right turning vehicles from making a complete stop before proceeding to turn. Many driveways are present on the east side of the south leg along W 28 Avenue with one in particular at the return of the southeast corner.

Tire marks were observed over the southeast sidewalk return, evidence of crashes were present on the south leg southbound lanes as well as the northeast corner. Pedestrian push buttons need to be upgraded and ramps are missing detectable warning devices. Sidewalk connection to bus stop on the south leg of the intersection (west side) is missing.

3.18.4. Recommendations

Based on the safety analysis, field observations and traffic operations for the intersection of West 28 Avenue and West 68 Street, the following is recommended:

- Provide retroflectorized back plates for all signal heads.
- Mill and resurface intersection; possible reconstruction due to rutting on south leg.
- Restripe intersection with thermoplastic markings and install additional RPMs to emphasize location and direction of lanes.
- Upgrade pedestrian pushbuttons and add detectable warning devices to all existing ramps.
- Install “Right Turn Only” sign at driveways on the intersection.
- Upgrade crosswalks to high visibility ladder type crosswalks.
- Add sidewalk connection to existing bus stop on the south leg of the intersection (west side)
- Lengthen the northbound left-turn lanes to 250 feet each.

A conceptual vision of the proposed roadway improvements is exhibited in *Figure 73*.

3.18.5. Cost Estimate

Based on the recommended improvements and the Conceptual Plan, the estimated cost for this project is approximately $116,522. The details of the preliminary project costs are presented in *Appendix D*.

Construction costs were obtained from items cost on the latest pay item Average Unit Cost Report for the Area 13 (Miami-Dade County), and the Miami-Dade Traffic Signal Division price list.

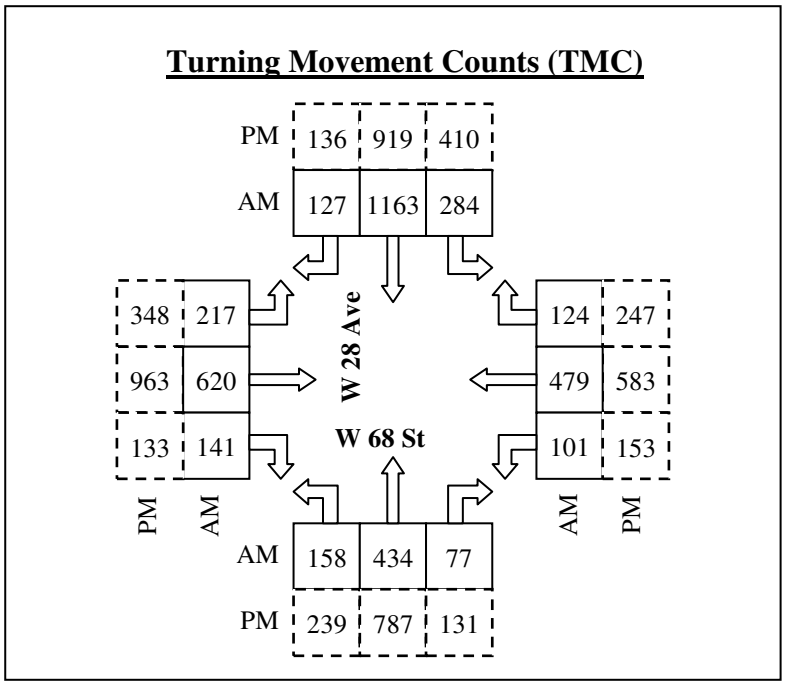


Figure 71: Traffic Data – *W 28 Avenue and W 68 Street*

W 28 Ave Northbound: Red light running

W 68 St Eastbound: Right turn vehicles do not stop at the intersection.

W 68 St Eastbound: Faded Pavement markings.

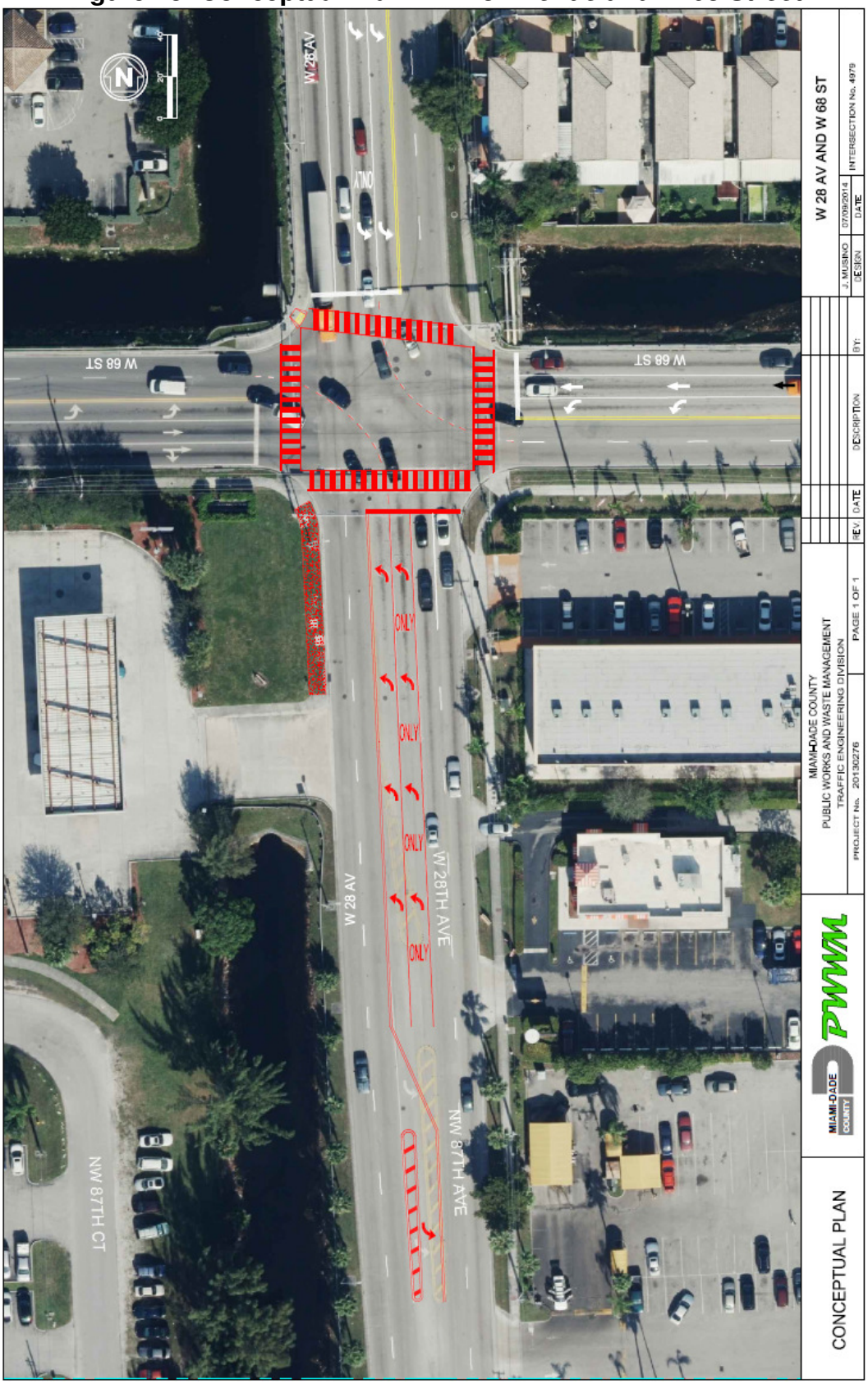
W 28 Ave Southbound: Driveway too close to intersection

SE corner of W 28 Ave and W 68 St: Tire marks cutting into return and pedestrian ramp

W 68 St Westbound: Left turning vehicles proceeding on red light

Figure 72: Field Review – *W 28 Avenue and W 68 Street*

Figure 73: Conceptual Plan – *W 28 Avenue and W 68 Street*



3.19. W 16 Avenue and W 68 Street

3.19.1. Site Description

This intersection is a signalized four legged intersection located in the City of Hialeah in the area of Northwest Miami Dade County. W 16 Avenue is a four lane undivided urban collector that runs north-south, and W 68 Street is an east-west four lane urban arterial divided on the west leg and undivided on the east leg.

3.19.2. Safety Conditions and Analysis

The intersection of W 16 Avenue and W 68 Street is ranked number 19 in our high crash locations list. A review of the hard copy police reports for the years 2011 through 2013 was performed. During the three-year analysis period, 79 relevant crashes occurred at the intersection. The analysis indicated that the average number of crashes per year is 26. The crash summaries, crash statistics and collision diagrams for the intersection are documented in *Appendix A*.

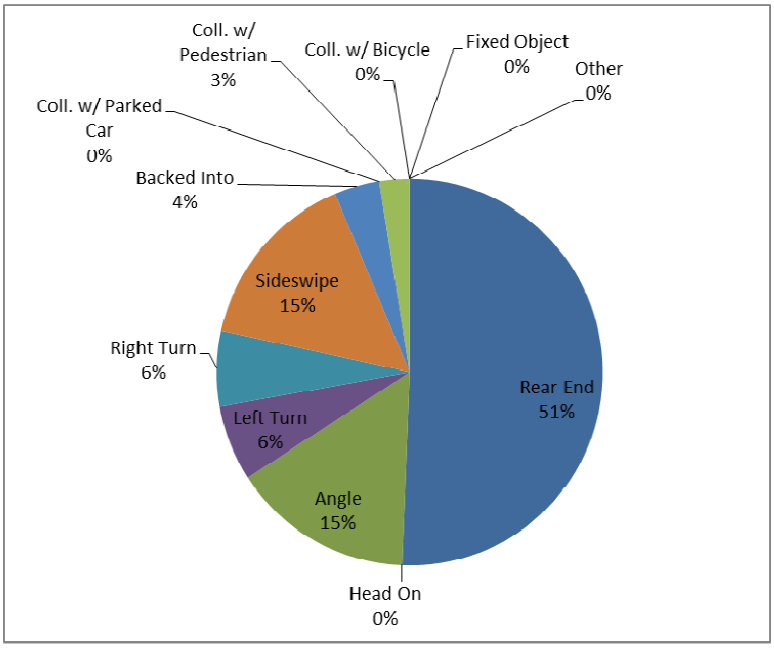


Figure 74 Predominant Crash Types
W 16 AVE & W 68 ST

Based on the analysis of crash records for this intersection, the predominant types of crashes are shown in *Figure 74.*

Calculated intersection mean crash per year were compared to the average Miami-Dade Crash Rate for County corridors to assess the safety conditions at the study intersection in relation to other roadways with similar traffic and geometric characteristics. This study is based on the 2010 FDOT's "Expected Value Analysis." *Table 41* illustrates the expected accident volume analysis of this intersection as well as the safety ratios and the confidence levels during the analysis period.

Based on a regression growth of 8% from the 2014 entering volume, the calculated safety ratios for the years 2011, 2012, and 2013 were 1.213, 0.874, and 0.928, respectively. The safety ratio for the three years averaged 1.005. Also, results of confidence level indicated that this intersection has been a high crash location during the three years with a confidence level higher than 99.95%.

Table 41 – Crash Analysis – W 16 Avenue and W 68 Street

W 16 Avenue & W 68 Street

(4 Lane x 4 Lane, Signalized, With Turn Lanes, 4 Leg Intersection - Table 28) - URBAN Spot

	TYPE OF CRASH	NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	EXPECTED ANNUAL CRASH VALUE			ABNORMALLY HIGH CRASHES		
		2011	2012	2013				MEAN	90th Percentile	95th Percentile	Mean	90th Percentil	95th Percentil
COLLISION TYPE	Rear End	17	10	13	40	51%	13.33	5.70	16.96	19.12	X		
	Head On	0	0	0	0	0%	0.00	0.33	1.02	1.15			
	Angle	5	3	4	12	15%	4.00	3.05	7.08	7.85	X		
	Left Turn	1	1	3	5	6%	1.67	1.67	4.02	4.47			
	Right Turn	0	5	0	5	6%	1.67	0.33	1.25	1.42	X	X	X
	Sideswipe	6	4	2	12	15%	4.00	1.60	4.64	5.22	X		
	Backed Into	1	0	2	3	4%	1.00	0.17	0.56	0.63	X	X	X
	Coll. w/ Parked Car	0	0	0	0	0%	0.00	0.10	0.51	0.59			
	Coll. w/ Pedestrian	0	0	2	2	3%	0.67	0.28	1.04	1.19	X		
	Coll. w/ Bicycle	0	0	0	0	0%	0.00	0.09	0.33	0.38			
	Fixed Object	0	0	0	0	0%	0.00	0.03	0.21	0.24			
	Ran Off Road	0	0	0	0	0%	0.00	0.00	0.00	0.00			
	Overtuned	0	0	0	0	0%	0.00	0.03	0.21	0.24			
	Other	0	0	0	0	0%	0.00	3.70	8.83	9.82			
	Total Crashes	30	23	26	79	100%	26.33	17.77	40.96	45.39	X		
SEVERITY	PDO crashes	28	22	23	73	92%	24.33	9.93	22.30	24.67	X	X	
	Fatal crashes	0	0	0	0	0%	0.00	0.05	0.26	0.29			
	Injury crashes	2	1	3	6	8%	2.00	13.14	33.08	36.90			
LIGHT CONDITIONS	Day Light	20	11	21	52	66%	17.33	12.40	29.18	32.39	X		
	Dusk	2	1	0	3	4%	1.00	0.28	0.87	0.98	X	X	X
	Dawn	0	0	0	0	0%	0.00	0.17	0.56	0.63			
	Dark	8	11	5	24	30%	8.00	4.56	10.53	11.68	X		
	Unknown	0	0	0	0	0%	0.00	0.35	1.05	1.18			
SURFACE CONDITIONS	Dry	27	19	22	68	86%	22.67	15.30	34.45	38.12	X		
	Wet	3	4	4	11	14%	3.67	2.10	6.02	6.76	X		
	Others	0	0	0	0	0%	0.00	0.37	1.10	1.24			
MONTH OF A YEAR	January	1	0	1	2	3%	0.67	1.42	3.33	3.69			
	February	1	2	1	4	5%	1.33	1.42	3.53	3.93			
	March	2	1	2	5	6%	1.67	1.67	4.12	4.59			
	April	4	1	3	8	10%	2.67	1.30	3.21	3.57	X		
	May	2	3	2	7	9%	2.33	1.74	4.46	4.99	X		
	June	4	0	6	10	13%	3.33	1.38	3.49	3.90	X		
	July	5	1	2	8	10%	2.67	1.35	3.22	3.58	X		
	August	1	6	3	10	13%	3.33	1.56	3.99	4.46	X		
	September	2	4	1	7	9%	2.33	1.46	3.73	4.16	X		
	October	3	0	0	3	4%	1.00	1.47	3.59	4.00			
	November	1	1	2	4	5%	1.33	1.39	3.53	3.94			
	December	4	4	3	11	14%	3.67	1.61	4.43	4.97	X		
DAY OF THE WEEK	Sunday	1	2	1	4	5%	1.33	2.70	6.42	7.13			
	Monday	5	3	2	10	13%	3.33	2.49	6.18	6.88	X		
	Tuesday	5	4	3	12	15%	4.00	2.56	5.84	6.47	X		
	Wednesday	4	0	0	4	5%	1.33	2.88	7.20	8.03			
	Thursday	6	4	11	21	27%	7.00	3.07	7.50	8.35	X		
	Friday	3	5	5	13	16%	4.33	2.61	6.40	7.13	X		
	Saturday	6	5	4	15	19%	5.00	1.46	3.47	3.85	X	X	X
HOUR OF THE DAY	00:00-06:00	1	0	0	1	1%	0.33	1.70	3.39	3.71			
	06:00-09:00	0	3	2	5	6%	1.67	1.98	5.12	5.72			
	09:00-11:00	1	2	2	5	6%	1.67	1.72	4.23	4.71			
	11:00-13:00	4	5	1	10	13%	3.33	2.40	6.30	7.05	X		
	13:00-15:00	0	1	7	8	10%	2.67	1.95	5.32	5.96	X		
	15:00-18:00	7	1	8	16	21%	5.33	3.58	7.81	8.62	X		
	18:00-24:00	17	10	6	33	42%	11.00	4.42	10.63	11.82	X	X	

	YEAR			3-Year Average
	1	2	3	
Average Daily Traffic ADT *(Vehicles per Day)*	45,468	49,422	53,720	49,537
Florida Average Crash rate *(Crashes per Million Entering Vehicles)*	0.757	0.757	0.757	0.757
Traffic Base	16.596	18.039	19.608	18.081
Actual Crash Rate *(Crashes per Million Entering Vehicles)*	1.808	1.275	1.326	1.470
Critical Crash Rate *(Crashes per Million Entering Vehicles)*	1.490	1.459	1.429	1.459
Safety Ratio	**1.213**	**0.874**	**0.928**	**1.005**
High Crash Location??	***YES***	***NO***	***NO***	***YES***

$$Actual\ \ Crash\ \ Rate\ \ =\ \ \frac{A \times 1{,}000{,}000}{V}$$

Where:
A = Total number of crashes or number of crashes by type occurring in a 1 year period.
V = Average Annual Daily Traffic X 365

$$CriticalCrashRate = AVR + \frac{0.5}{TB} + TF\sqrt{\frac{AVR}{TB}}$$

Where:
AVR = Average Statewide Crash Rate for a particular type of intersection or roadway segment.
TB = Traffic Base
TF = Test Factor (z-value)
= *1.96 (assume 95% Confidence Level for RURAL areas)*
= *3.29 (assume 99.95% Confidence Level for URBAN areas)*

$$Traffic\ Base = \frac{Years \times ADT \times 365}{1{,}000{,}000}$$

$$Safety\ \ Ratio\ \ =\ \ \frac{Actual\ \ Crash\ \ Rate}{Critical\ \ Crash\ \ Rate}$$

Confidence Level (%)	Constant Z
68.30	1.00
86.60	1.50
90.00	1.64
95.00	1.96
95.50	2.00
98.80	2.50
99.00	2.58
99.70	3.00
99.95	3.29

Table 42 – Abnormal Crash Details & Countermeasures
W 16 Avenue and W 68 Street

W 16 Avenue & W 68 Street

(4 Lane x 4 Lane, Signalized, With Turn Lanes, 4 Leg Intersection - Table 28) - URBAN Spot

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHE	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Rear End	Total Rear End Crashes		**17**	**10**	**13**	**40**	**100%**	**13.33**	(8)	4
	Lighting Conditions	Day Light	11	6	13	30	75%	10.00	(10)	8
		Dawn/Dusk	0	0	0	0	0%	0.00	(16)	13
		Dark	6	4	0	10	25%	3.33		19
	Hours of Day	00:00 - 06:00	1	0	0	1	3%	0.33		
		06:00 - 09:00	0	0	0	0	0%	0.00		
		09:00 - 11:00	1	1	2	4	10%	1.33		
		11:00 - 13:00	1	1	0	2	5%	0.67		
		13:00 - 15:00	0	1	5	6	15%	2.00		
		15:00 - 18:00	4	0	4	8	20%	2.67		
		18:00 - 24:00	10	7	2	19	48%	6.33		
	Direction	North	8	2	3	13	33%	4.33		
		South	1	0	0	1	3%	0.33		
		East	3	6	7	16	40%	5.33		
		West	4	2	3	9	23%	3.00		
		Unknown	1	0	0	1	3%	0.33		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHE	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Angle	Total Rear End Crashes		**5**	**3**	**4**	**12**	**100%**	**4.00**	(1)	2
	Lighting Conditions	Day Light	3	1	4	8	67%	2.67	(3)	4
		Dawn	0	0	0	0	0%	0.00	(7)	7
		Dark	2	2	0	4	33%	1.33	(12)	
	Hours of Day	00:00 - 06:00	0	0	0	0	0%	0.00		
		06:00 - 09:00	0	1	2	3	25%	1.00		
		09:00 - 11:00	0	0	0	0	0%	0.00		
		11:00 - 13:00	2	0	0	2	17%	0.67		
		13:00 - 15:00	0	0	1	1	8%	0.33		
		15:00 - 18:00	0	1	1	2	17%	0.67		
		18:00 - 24:00	3	1	0	4	33%	1.33		
	Direction	NB + EB	0	2	1	3	25%	1.00		
		NB + WB	3	0	2	5	42%	1.67		
		SB + EB	1	1	1	3	25%	1.00		
		SB + WB	1	0	0	1	8%	0.33		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHE	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Sideswipe (Overtake)	Total Left Turn Crashes		**6**	**4**	**2**	**12**	**100%**	**4.00**	(9)	9
	Lighting Conditions	Day Light	6	2	2	10	83%	3.33	(13)	13
		Dawn	0	0	0	0	0%	0.00		17
		Dark	0	2	0	2	17%	0.67		
	Hours of Day	00:00 - 06:00	0	0	0	0	0%	0.00		
		06:00 - 09:00	0	0	0	0	0%	0.00		
		09:00 - 11:00	0	1	0	1	8%	0.33		
		11:00 - 13:00	1	1	1	3	25%	1.00		
		13:00 - 15:00	0	0	0	0	0%	0.00		
		15:00 - 18:00	3	0	1	4	33%	1.33		
		18:00 - 24:00	2	2	0	4	33%	1.33		
	Direction	North	3	1	1	5	42%	1.67		
		South	0	1	1	2	17%	0.67		
		East	3	2	0	5	42%	1.67		
		West	0	0	0	0	0%	0.00		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHE	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Right Turn	Total Right Turn Crashes		**0**	**5**	**0**	**5**	**100%**	**1.67**	(1)	8
	Lighting Conditions	Day Light	0	4	0	4	80%	1.33	(8)	13
		Dawn	0	0	0	0	0%	0.00		19
		Dark	0	1	0	1	20%	0.33		
	Hours of Day	00:00 - 06:00	0	0	0	0	0%	0.00		
		06:00 - 09:00	0	2	0	2	40%	0.67		
		09:00 - 11:00	0	0	0	0	0%	0.00		
		11:00 - 13:00	0	2	0	2	40%	0.67		
		13:00 - 15:00	0	0	0	0	0%	0.00		
		15:00 - 18:00	0	0	0	0	0%	0.00		
		18:00 - 24:00	0	1	0	1	20%	0.33		
	Direction	NB→EB	0	3	0	3	60%	1.00		
		EB→SB	0	0	0	0	0%	0.00		
		WB→NB	0	0	0	0	0%	0.00		
		SB→WB	0	2	0	2	40%	0.67		
		Unknown	0	0	0	0	0%	0.00		

From this analysis, it was determined that right turn and backing presented abnormal crash patterns that exceed the 95th percentile and 90th percentile confidence level threshold limits. Also, rear end, angle, sideswipe and pedestrian collisions exceeded the mean. Those results indicate that these types of collisions were abnormally high during the period of 2011 through 2013. A detailed review of the abnormal crashes as well as probable countermeasures is presented in *Table 42*.

3.19.3. Traffic Operation Conditions and Analysis

In order to identify the traffic operation characteristics and safety relevant conflicts, field observations at W 16 Avenue & W 68 Street were performed on a typical weekday on May 20, 2014. A summary of the traffic data is presented in *Figure 75*, and the field review is presented in *Figure 76*.

This intersection has single left-turn bays for all approaches. The signal operation is protected/permissive for all approaches left-turn traffic. Left turn five-section head on east mast arm is missing the hood in one of the lenses.

Two gas stations and a strip mall are present at this intersection with many consecutive driveways that generate potential conflicts with other movements. Lot of Impatient drivers and red light running was observed at the intersection.

Pavement Markings and Pedestrian crosswalks at all four legs are faded. No pedestrian signal heads are installed at any of the corners.

3.19.4. Recommendations

Based on the safety analysis, field observations and traffic operations for the intersection of W 16 Avenue and W 68 Street, the following is recommended:

- Refurbish pavement markings including high visibility ladder crosswalks using thermoplastic painting at all four legs.
- Install “Turning Vehicles Yield to Pedestrians” sign on all approaches.
- Install pedestrian ramp on northeast corner for north crossing (existing ramp is aligned for east crossing but a bit far for the north crossing).
- Install pedestrian signals and upgrade push buttons.
- Bus Stop on east leg is too close to the intersection and on driveway, needs to be relocated farther east.
- Install retroreflective backplates on signals.
- Straighten road alignment on the west side (see sketch).
- Add painted islands on northeast and southwest corners (see sketch).
- Add “Right Turn Only” sign to all driveways close to the intersection.

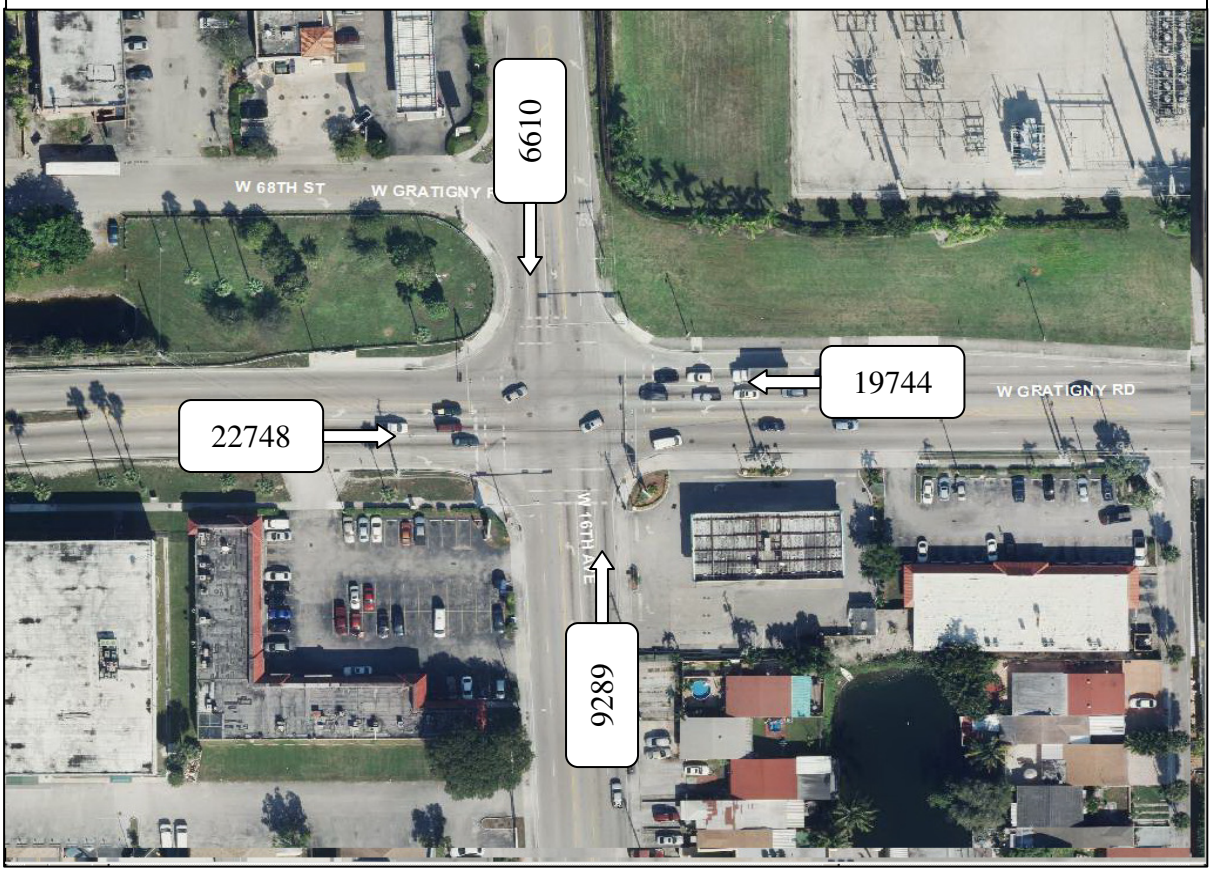
A conceptual vision of the proposed roadway improvements is exhibited in *Figure 77*.

3.19.5. Cost Estimate

Based on the recommended improvements and the Conceptual Plan, the estimated cost for this project is approximately $161,005. The details of the preliminary project costs are presented in *Appendix D*.

Construction costs were obtained from items cost on the latest pay item Average Unit Cost Report for the Area 13 (Miami-Dade County), and the Miami-Dade Traffic Signal Division price list.

24-hr Approach Counts



Turning Movement Counts (TMC)

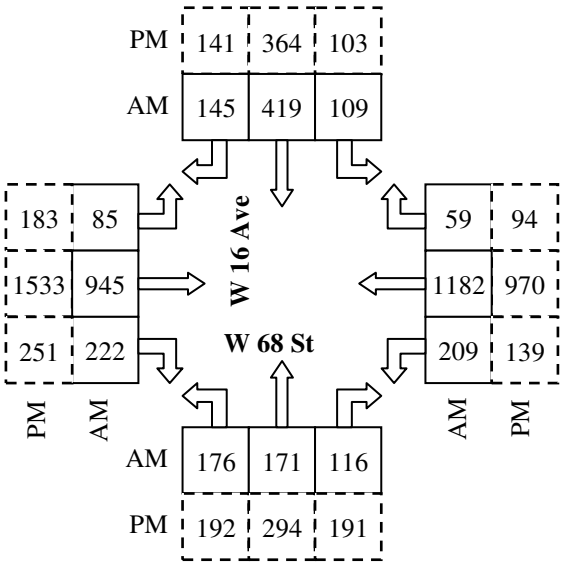


Figure 75: Traffic Data – *W 16 Avenue and W 68 Street*

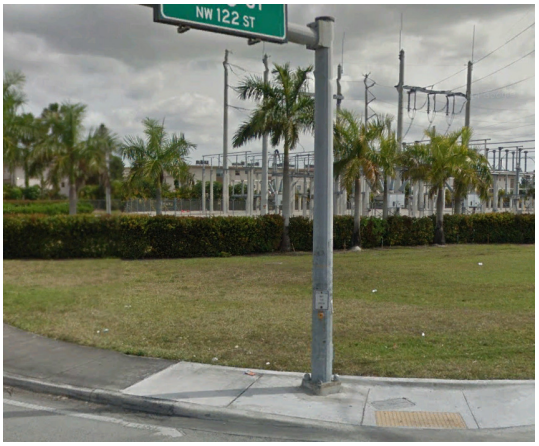
Southeast corner: Bus stop is too close to the intersection and gas station driveway.

Southeast corner: gas station driveways are too close to the intersection.

Faded pavement markings.

Turning vehicles conflict with crossing pedestrians.

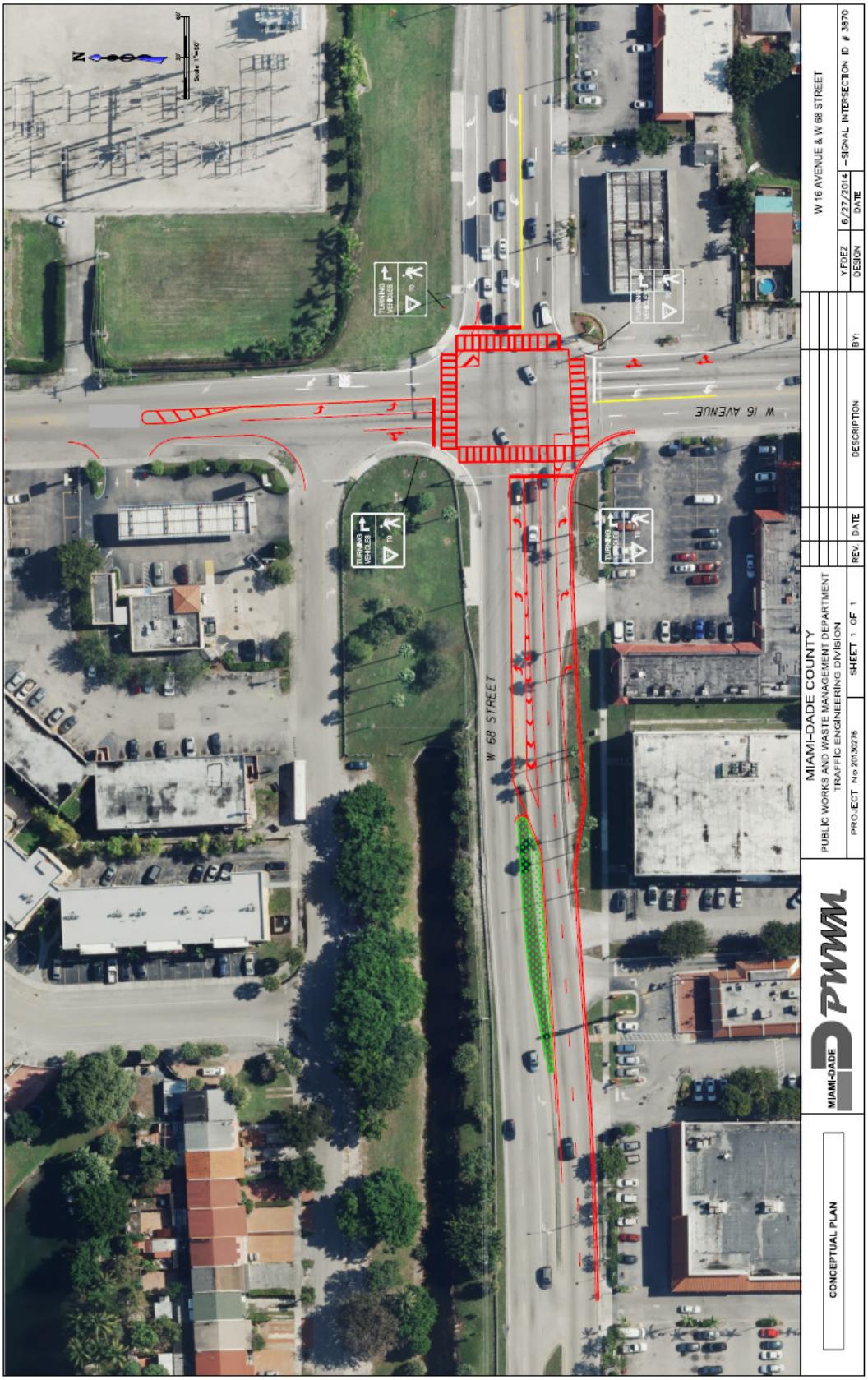
Pedestrian features need to be upgraded.



No pedestrian signal heads at all corners.

Figure 76: Field Review – *W 16 Avenue and W 68 Street*

Figure 77: Conceptual Plan – *W 16 Avenue and W 68 Street*



3.20. W 20 Avenue and W 68 Street

3.20.1. Site Description

This intersection is a signalized four legged intersection located in City of Hialeah in the area of Northwest Miami Dade County. W 20 Avenue is two lane roadway that runs north-south with its north leg connected to the southbound exit ramp of Palmetto Expressway and South leg ending at the ramp to Palmetto Expressway. W 68 Street is a four lane urban collector divided by a raised median at this location that runs east-west.

3.20.2. Safety Conditions and Analysis

The intersection of W 20 Avenue and W 68 Street is ranked number 20 in our high crash locations list. A review of the hard copy police reports for the years 2011 through 2013 was performed. During the three-year analysis period, 74 relevant crashes occurred at the intersection. The analysis indicated that the average number of crashes per year is 25. The crash summaries, crash statistics and collision diagrams for the intersection are documented in *Appendix A*.

Based on the analysis of crash records for this intersection, the predominant types of crashes are shown in *Figure 78.*

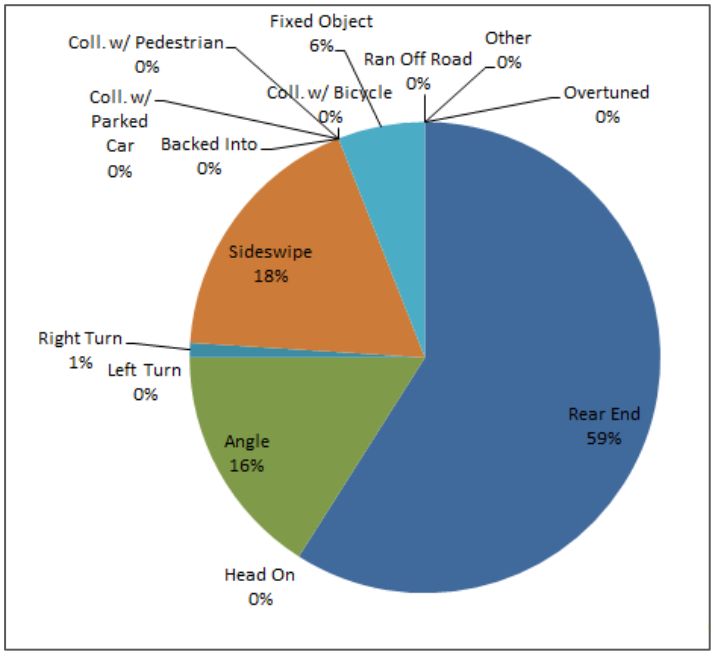


Figure 78 Predominant Crash Types
W 20 AVE & W 68 ST

Calculated intersection mean crash per year were compared to the average Miami-Dade Crash Rate for County corridors to assess the safety conditions at the study intersection in relation to other roadways with similar traffic and geometric characteristics. This study is based on the 2010 FDOT's "Expected Value Analysis." *Table 43* illustrates the expected accident volume analysis of this intersection as well as the safety ratios and the confidence levels during the analysis period.

Based on a regression growth of 8% from the 2014 entering volume, the calculated safety ratios for the years 2011, 2012, and 2013 were 0.788, 0.987, and 0.827, respectively. The safety ratio for the three years averaged 0.868.

Table 43 – Crash Analysis – W 20 Avenue and W 68 Street

W 20 Avenue & W 68 Street

(6 Lane x 4 Lane, Signalized, With Turn Lanes, T-Intersection - Table 34) - URBAN Spot

	TYPE OF CRASH	NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	EXPECTED ANNUAL CRASH VALUE			ABNORMALLY HIGH CRASHES		
		2011	2012	2013				MEAN	90th Percentile	95th Percentile	Mean	90th Percentil	95th Percentil
COLLISION TYPE	Rear End	11	16	17	44	59%	14.67	4.84	15.32	17.32	X		
	Head On	0	0	0	0	0%	0.00	0.18	0.53	0.59			
	Angle	6	3	3	12	16%	4.00	1.67	5.18	5.85	X		
	Left Turn	0	0	0	0	0%	0.00	1.20	3.45	3.88			
	Right Turn	0	1	0	1	1%	0.33	0.56	1.81	2.05			
	Sideswipe	3	6	4	13	18%	4.33	1.56	3.91	4.36	X	X	
	Backed Into	0	0	0	0	0%	0.00	0.16	0.66	0.75			
	Coll. w/ Parked Car	0	0	0	0	0%	0.00	0.02	0.16	0.19			
	Coll. w/ Pedestrian	0	0	0	0	0%	0.00	0.13	0.48	0.55			
	Coll. w/ Bicycle	0	0	0	0	0%	0.00	0.02	0.16	0.19			
	Fixed Object	1	2	1	4	5%	1.33	0.04	0.24	0.27	X	X	X
	Ran Off Road	0	0	0	0	0%	0.00	0.00	0.00	0.00			
	Overtuned	0	0	0	0	0%	0.00	0.00	0.00	0.00			
	Other	0	0	0	0	0%	0.00	2.31	6.52	7.32			
	Total Crashes	21	28	25	74	100%	24.67	13.62	37.27	41.80	X		
SEVERITY	PDO crashes	20	27	23	70	95%	23.33	8.98	27.74	31.33	X		
	Fatal crashes	0	0	0	0	0%	0.00	0.04	0.33	0.38			
	Injury crashes	1	1	2	4	5%	1.33	7.20	15.92	17.59			
LIGHT CONDITIONS	Day Light	15	16	17	48	65%	16.00	10.04	29.07	32.71	X		
	Dusk	1	2	0	3	4%	1.00	0.18	0.59	0.66	X	X	X
	Dawn	1	1	1	3	4%	1.00	0.18	0.72	0.83	X	X	X
	Dark	3	8	7	18	24%	6.00	3.09	7.48	8.32	X		
	Unknown	1	1	0	2	3%	0.67	0.13	0.41	0.46	X	X	X
SURFACE CONDITIONS	Dry	17	25	24	66	89%	22.00	10.82	30.00	33.67	X		
	Wet	3	2	1	6	8%	2.00	2.49	7.02	7.89			
	Others	1	1	0	2	3%	0.67	0.31	0.75	0.83	X		
MONTH OF A YEAR	January	0	3	1	4	5%	1.33	1.13	2.84	3.17	X		
	February	0	1	3	4	5%	1.33	1.11	3.56	4.03	X		
	March	1	2	2	5	7%	1.67	1.07	3.38	3.82	X		
	April	3	0	2	5	7%	1.67	1.22	3.60	4.05	X		
	May	4	2	0	6	8%	2.00	1.02	2.92	3.28	X		
	June	3	2	3	8	11%	2.67	1.11	2.75	3.07	X		
	July	4	3	0	7	9%	2.33	0.91	2.60	2.93	X		
	August	3	4	0	7	9%	2.33	1.27	3.63	4.08	X		
	September	0	2	4	6	8%	2.00	1.27	3.38	3.79	X		
	October	0	2	3	5	7%	1.67	1.13	3.69	4.18	X		
	November	2	5	2	9	12%	3.00	1.13	3.87	4.40	X		
	December	1	2	5	8	11%	2.67	1.24	3.68	4.15	X		
DAY OF THE WEEK	Sunday	2	5	4	11	15%	3.67	2.27	6.77	7.63	X		
	Monday	3	2	2	7	9%	2.33	2.02	6.05	6.83	X		
	Tuesday	1	3	3	7	9%	2.33	2.11	5.43	6.07	X		
	Wednesday	3	4	6	13	18%	4.33	1.98	6.00	6.77	X		
	Thursday	2	5	1	8	11%	2.67	2.35	6.51	7.30	X		
	Friday	8	7	3	18	24%	6.00	1.71	4.69	5.26	X	X	X
	Saturday	2	2	6	10	14%	3.33	1.18	2.98	3.33	X	X	X
HOUR OF THE DAY	00:00-06:00	4	5	2	11	15%	3.67	0.78	1.93	2.15	X	X	X
	06:00-09:00	3	2	5	10	14%	3.33	1.35	3.25	3.61	X	X	
	09:00-11:00	2	3	0	5	7%	1.67	1.47	3.94	4.42	X		
	11:00-13:00	1	4	3	8	11%	2.67	1.56	4.61	5.20	X		
	13:00-15:00	5	2	6	13	18%	4.33	1.98	6.88	7.81	X		
	15:00-18:00	3	7	3	13	18%	4.33	3.24	10.19	11.52	X		
	18:00-24:00	3	5	6	14	19%	4.67	3.24	7.93	8.82	X		

	YEAR			3-Year Average
	1	2	3	
Average Daily Traffic ADT *(Vehicles per Day)*	41,738	45,367	49,312	45,472
Florida Average Crash rate *(Crashes per Million Entering Vehicles)*	0.911	0.911	0.911	0.911
Traffic Base	15.234	16.559	17.999	16.597
Actual Crash Rate *(Crashes per Million Entering Vehicles)*	1.378	1.691	1.389	1.486
Critical Crash Rate *(Crashes per Million Entering Vehicles)*	1.748	1.713	1.679	1.713
Safety Ratio	**0.788**	**0.987**	**0.827**	**0.868**
High Crash Location??	***NO***	***NO***	***NO***	***NO***

$$Actual\ \ Crash\ \ Rate\ \ =\ \ \frac{A \times 1{,}000{,}000}{V}$$

Where:
A = Total number of crashes or number of crashes by type occurring in a 1 year period.
V = Average Annual Daily Traffic X 365

$$CriticalCrashRate = AVR + \frac{0.5}{TB} + TF\sqrt{\frac{AVR}{TB}}$$

$$Traffic\ Base = \frac{Years \times ADT \times 365}{1{,}000{,}000}$$

$$Safety\ \ Ratio\ \ =\ \ \frac{Actual\ \ Crash\ \ Rate}{Critical\ \ Crash\ \ Rate}$$

Where:
AVR = Average Statewide Crash Rate for a particular type of intersection or roadway segment.
TB = Traffic Base
TF = Test Factor (z-value)
= 1.96 (assume 95% Confidence Level for RURAL areas)
= 3.29 (assume 99.95% Confidence Level for URBAN areas)

Confidence Level (%)	Constant Z
68.30	1.00
86.60	1.50
90.00	1.64
95.00	1.96
95.50	2.00
98.80	2.50
99.00	2.58
99.70	3.00
99.95	3.29

Table 44 – Abnormal Crash Details & Countermeasures
W 20 Avenue and W 68 Street

W 20 Avenue & W 68 Street

(6 Lane x 4 Lane, Signalized, With Turn Lanes, T-Intersection - Table 34) - URBAN Spot

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Angle	Total Rear End Crashes		**6**	**3**	**3**	**12**	**100%**	**4.00**	(3)	10
	Lighting Conditions	Day Light	2	2	2	6	55%	2.00		11
		Dawn/Dusk	0	0	0	0	0%	0.00		
		Dark	3	1	1	5	45%	1.67		
	Hours of Day	00:00 - 06:00	1	0	0	1	8%	0.33		
		06:00 - 09:00	0	0	0	0	0%	0.00		
		09:00 - 11:00	1	0	0	1	8%	0.33		
		11:00 - 13:00	0	1	1	2	17%	0.67		
		13:00 - 15:00	0	0	0	0	0%	0.00		
		15:00 - 18:00	2	1	0	3	25%	1.00		
		18:00 - 24:00	2	1	2	5	42%	1.67		
	Direction	NB + EB	0	0	0	0	0%	0.00		
		NB + WB	0	0	0	0	0%	0.00		
		SB + EB	1	0	1	2	18%	0.67		
		SB + WB	4	3	2	9	82%	3.00		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Sideswipe (Overtake)	Total Rear End Crashes		**3**	**6**	**4**	**13**	**100%**	**4.33**	(18)	19
	Lighting Conditions	Day Light	3	5	3	11	85%	3.67	(19)	21
		Dawn/Dusk	0	0	0	0	0%	0.00		
		Dark	0	1	1	2	15%	0.67		
	Hours of Day	00:00 - 06:00	0	0	0	0	0%	0.00		
		06:00 - 09:00	0	0	1	1	8%	0.33		
		09:00 - 11:00	0	0	0	0	0%	0.00		
		11:00 - 13:00	0	1	0	1	8%	0.33		
		13:00 - 15:00	2	2	2	6	46%	2.00		
		15:00 - 18:00	0	2	0	2	15%	0.67		
		18:00 - 24:00	1	1	1	3	23%	1.00		
	Direction	North	0	0	0	0	0%	0.00		
		South	0	1	0	1	8%	0.33		
		East	0	4	4	8	62%	2.67		
		West	3	1	0	4	31%	1.33		
		Unknown	0	0	0	0	0%	0.00		

			NUMBER OF CRASHES YEAR			3 YEAR TOTAL CRASHES	% of Total	MEAN Accidents per Year	Possible Cause(s)	Counter-measure(s)
			2011	2012	2013					
Fixed Object	Total Rear End Crashes		**1**	**2**	**1**	**4**	**100%**	**1.33**	(17)	5
	Lighting Conditions	Day Light	1	0	0	1	25%	0.33		17
		Dawn/Dusk	0	0	0	0	0%	0.00		
		Dark	0	2	1	3	75%	1.00		
	Hours of Day	00:00 - 06:00	0	2	0	2	50%	0.67		
		06:00 - 09:00	0	0	1	1	25%	0.33		
		09:00 - 11:00	0	0	0	0	0%	0.00		
		11:00 - 13:00	1	0	0	1	25%	0.33		
		13:00 - 15:00	0	0	0	0	0%	0.00		
		15:00 - 18:00	0	0	0	0	0%	0.00		
		18:00 - 24:00	0	0	0	0	0%	0.00		
	Direction	North	0	0	0	0	0%	0.00		
		South	0	0	0	0	0%	0.00		
		East	0	2	0	2	50%	0.67		
		West	1	0	1	2	50%	0.67		
		Unknown	0	0	0	0	0%	0.00		

From this analysis, it was determined that fixed object collisions presented abnormal crash patterns that exceed the threshold limits for the 95th percentile and 90th percentile confidence level; and sideswipe type exceeded the 90th percentile level. Also, the rear end and angle collisions exceeded the mean. Those results indicate that these types of collisions were abnormally high during the period of 2011 through 2013. A detailed review of the abnormal crashes as well as probable countermeasures is presented in *Table 44*.

3.20.3. Traffic Operation Conditions and Analysis

In order to identify the traffic operation characteristics and safety relevant conflicts, field observations at W 20 Avenue and W 68 Street were performed on a typical weekday on May 25, 2014. A summary of the traffic data is presented in *Figure 79*, and the field review is presented in *Figure 80*.

The signal operation is synched with the Palmetto Expressway ramp signal.

Pavement markings and pedestrian crosswalk at all four legs are in good conditions.

Lot of impatient drivers and red light running was observed at the intersection.

The westbound merge storage length is extremely short, a crash was observed while performing review.

The "stop here on red" sign for eastbound traffic on the southwest corner of the intersection is not noticed by some drivers.

3.20.4. Recommendations

Based on the safety analysis, field observations and traffic operations for the intersection of W 20 Avenue & W 68 Street, the following is recommended:

- Improve pavement markings on the northeast corner to better delineate the westbound traffic emerging from the SR 826 S. Off-Ramp.
- Increase length of merge lane on northwest side of intersection to approximately 270 feet.
- Add R10-11 sign on the mast arm for eastbound traffic.
- Add tubular delineators on the right lane of the eastbound approach of the intersection.
- Paint the top of the noses of the concrete separators on the east side of the intersection (eastbound direction).

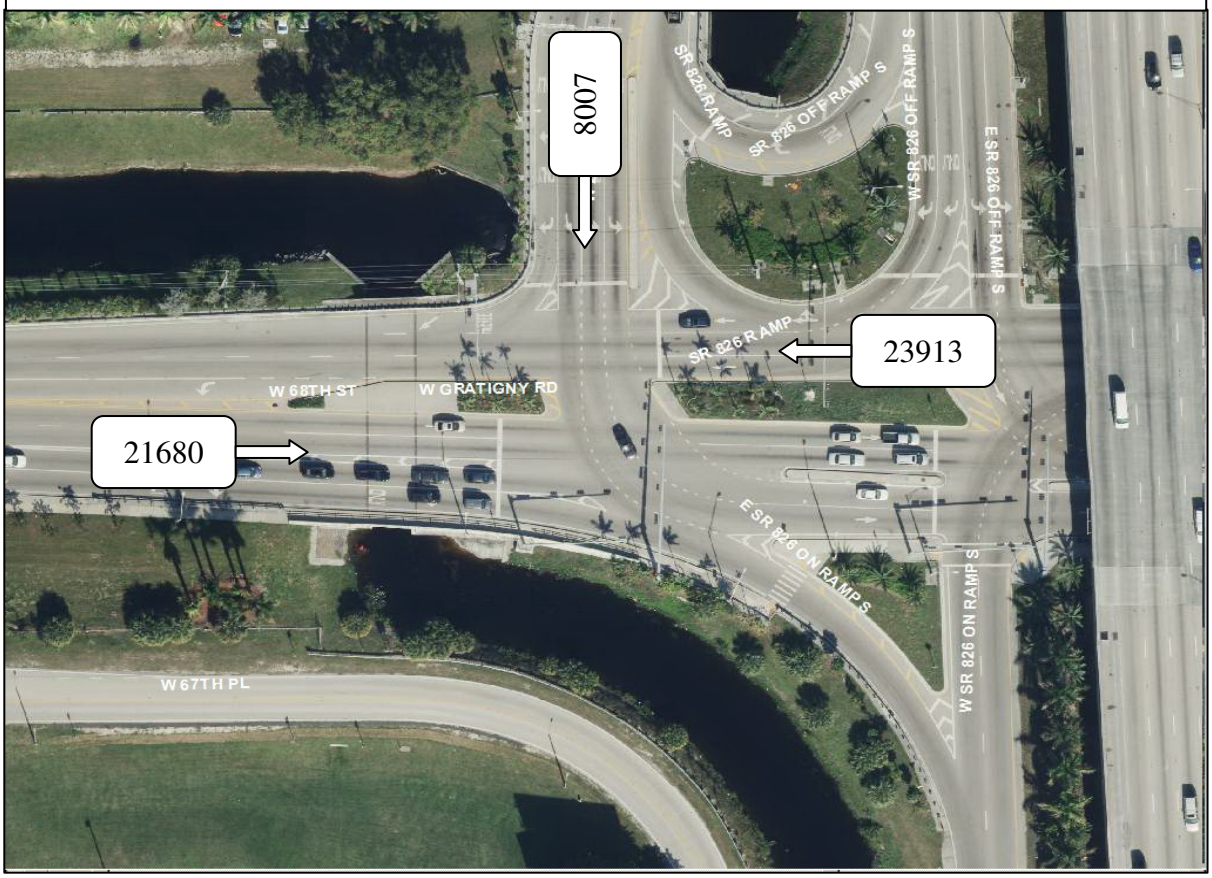
A conceptual vision of the proposed roadway improvements is exhibited in *Figure 81*.

3.20.5. Cost Estimate

Based on the recommended improvements and the Conceptual Plan, the estimated cost for this project is approximately $116,816. The details of the preliminary project costs are presented in *Appendix D*.

Construction costs were obtained from items cost on the latest pay item Average Unit Cost Report for the Area 13 (Miami-Dade County), and the Miami-Dade Traffic Signal Division price list.

24-hr Approach Counts



Turning Movement Counts (TMC)

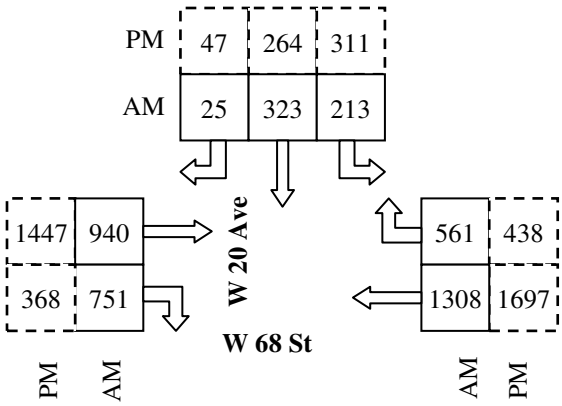


Figure 79: Traffic Data – *W 20 Avenue and W 68 Street*

Northwest corner: short merge length for westbound traffic.

Pavement markings and pedestrian ramps are in good conditions.

The intersection is too close to SR 826 Off-Ramp.

Pedestrian ramps and signs are in good conditions.

Eastbound approach: Stop Here on Red sign is not noticed.

Southbound approach: overhead lane assignment signs.

Figure 80: Field Review – *W 20 Avenue and W 68 Street*

Figure 81: Conceptual Plan – *W 20 Avenue and W 68 Street*