Broward MPO
Metropolitan Planning Organization

Road Safety Analysis Report
For
Royal Palm Boulevard at NW 89th Drive
Broward County

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LICENSE
No 68399
STATE OF FLORIDA
PROFESSIONAL ENGINEER

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Dan D'Antonio, PE
2022.02.02 21:46:09 -05'00'

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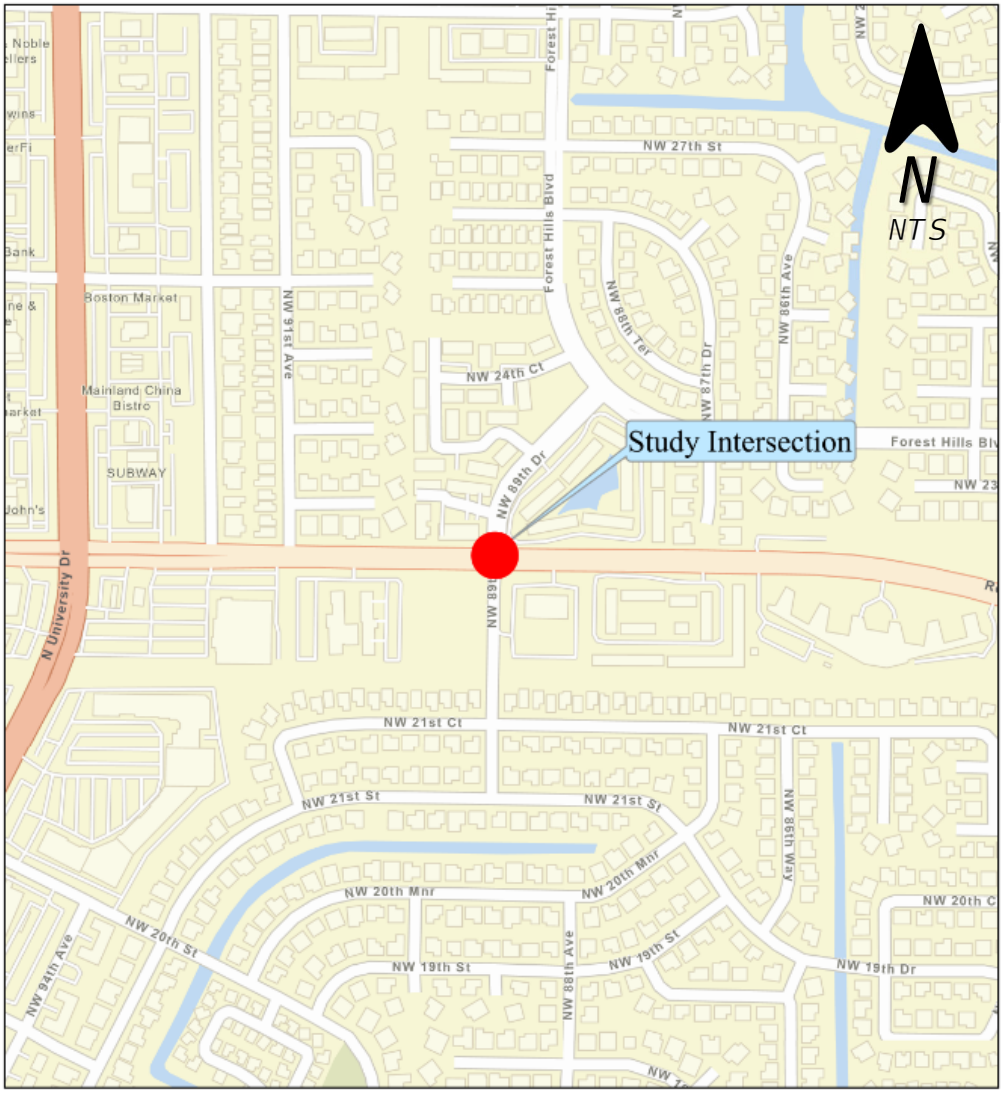
1.0 INTRODUCTION

The Royal Palm Boulevard at NW 89th Drive unsignalized intersection was identified as a high-crash location in the 2045 Metropolitan Transportation Plan (MTP) and chosen for study by the Broward Metropolitan Planning Organization (BMPO). The location is in the City of Coral Springs and under the maintenance jurisdiction of Broward County. The study intersection in relation to the surrounding roadways is graphically depicted on the Location Map below.

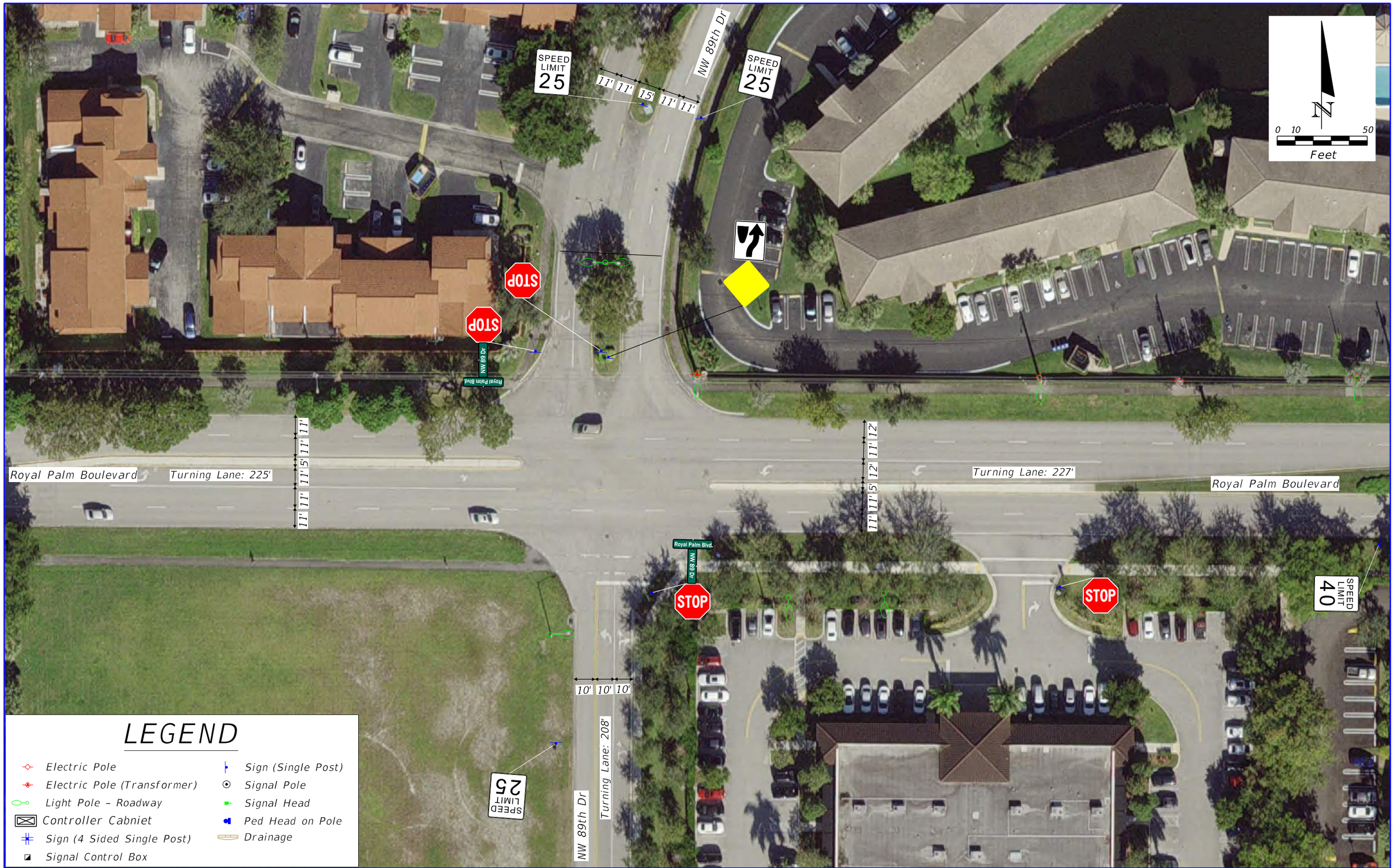


2.0 EXISTING CONDITION

The characteristics of the study intersection of Royal Palm Boulevard at NW 89th Drive located in the City of Coral Springs, Broward County, Florida are summarized below. An intersection condition diagram is provided in the following pages.

Features	Description
Main Street	Royal Palm Boulevard oriented east-west; four-lane median-divided urban minor arterial.
Minor Street	NW 89th Drive oriented north-south, four-lane median-divided on north side and two-lane undivided on south side
Number of Intersection Approach Lanes	NB Approach (NW 89th Drive): One left-turn lane, and one shared through/ right turn lane. SB Approach (NW 89th Drive): One shared through/left turn lane and one right turn lane. EB Approach (Royal Palm Boulevard): One left turn, one through lane, and one shared through/right turn lane. WB Approach (Royal Palm Boulevard): One left turn lane, one through lane, and one shared through/right turn lane.
Traffic Control	Two-way stop control (north-south)
Context Classification	C4 – Urban General; Target Speed — 30 to 45 mph
Posted Speeds	Royal Palm Boulevard: 40 mph NW 89th Drive: 25 mph
Sidewalks	Sidewalk present along both sides of Royal Palm Boulevard, west of NW 89th Drive. Sidewalk present along both sides of Royal Palm Boulevard, east of NW 89th Drive.

Features	Description
	Sidewalk present along both sides of NW 89th Drive, north of Royal Palm Boulevard. Sidewalk present along east side of NW 89th Drive, south of Royal Palm Boulevard.
Bicycle Lanes	None
Pedestrian/Bicycle Generators	High- and medium-density single-family and multi-family residential developments along Royal Palm Boulevard and NW 89th Drive.
Nearest Signalized Intersections	0.55 miles to the east along Royal Palm Boulevard Intersecting Riverside Drive 0.30 miles to the west along Royal Palm Boulevard Intersecting University Drive
Roadway Lighting	Roadway lighting present on west sides of NW 89th Drive, south of Royal Palm Boulevard. Roadway lighting present on median of NW 89th Drive, north of Royal Palm Boulevard. Roadway lighting present on north side of Royal Palm Boulevard.
Surrounding Development	Royal Palm Boulevard: High- and medium-density residential and commercial. NW 89th Drive: Medium-density residential.
Pavement, Signing & Marking Condition	Along Royal Palm Boulevard: Good Along NW 89th Drive: Not visible
Transit	Broward County Transit route 83 along Royal Palm Boulevard. WB transit stop 565 feet west of NW 89th Drive and EB transit stop 400 feet west of 89th Drive.



LEGEND

- Electric Pole
- Electric Pole (Transformer)
- Light Pole – Roadway
- Controller Cabniet
- Sign (4 Sided Single Post)
- Signal Control Box
- Sign (Single Post)
- Signal Pole
- Signal Head
- Ped Head on Pole
- Drainage

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

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CONDITION DIAGRAM
ROYAL PALM BLVD AT NW 89TH DR

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3.0 COLLISION ANALYSIS

According to crash records obtained by VHB from Signal Four Analytics, there were 64 reported crashes from January 1, 2015 to August 10th, 2021. The total property damage from these crashes was estimated at $451,350. Zero pedestrian and two bicycle crash were reported during the study period. The crash summary is attached as **Appendix A**.

The number of crashes by types are as follows:

Rear-End	20	(31.3%)
Left Turn	14	(21.9%)
Angle	13	(20.3%)
Right Turn	6	(9.4%)
Sideswipe	4	(6.3%)
Ran-off Road	2	(3.1%)
Bicycle	2	(3.1%)
Other	3	(4.7%)

The number of crashes by contributing cause is as follows:

Failed to Yield ROW	29	(45.3%)
Careless Driving	17	(26.6%)
Improper Lane Change	7	(10.9%)
Disregarded Stop Sign	6	(9.4%)
Failed to Maintain vehicle	2	(3.1%)
Other	2	(3.1%)
Improper Turn	1	(1.6%)

The number of crashes by lighting condition are as follows:

Daylight	45	(70.3%)
Dark-Lighted	16	(25.0%)
Dusk	1	(1.6%)
Dawn	1	(1.6%)
Dark-Not Lighted	1	(1.6%)

The number of crashes by analysis year are as follows:

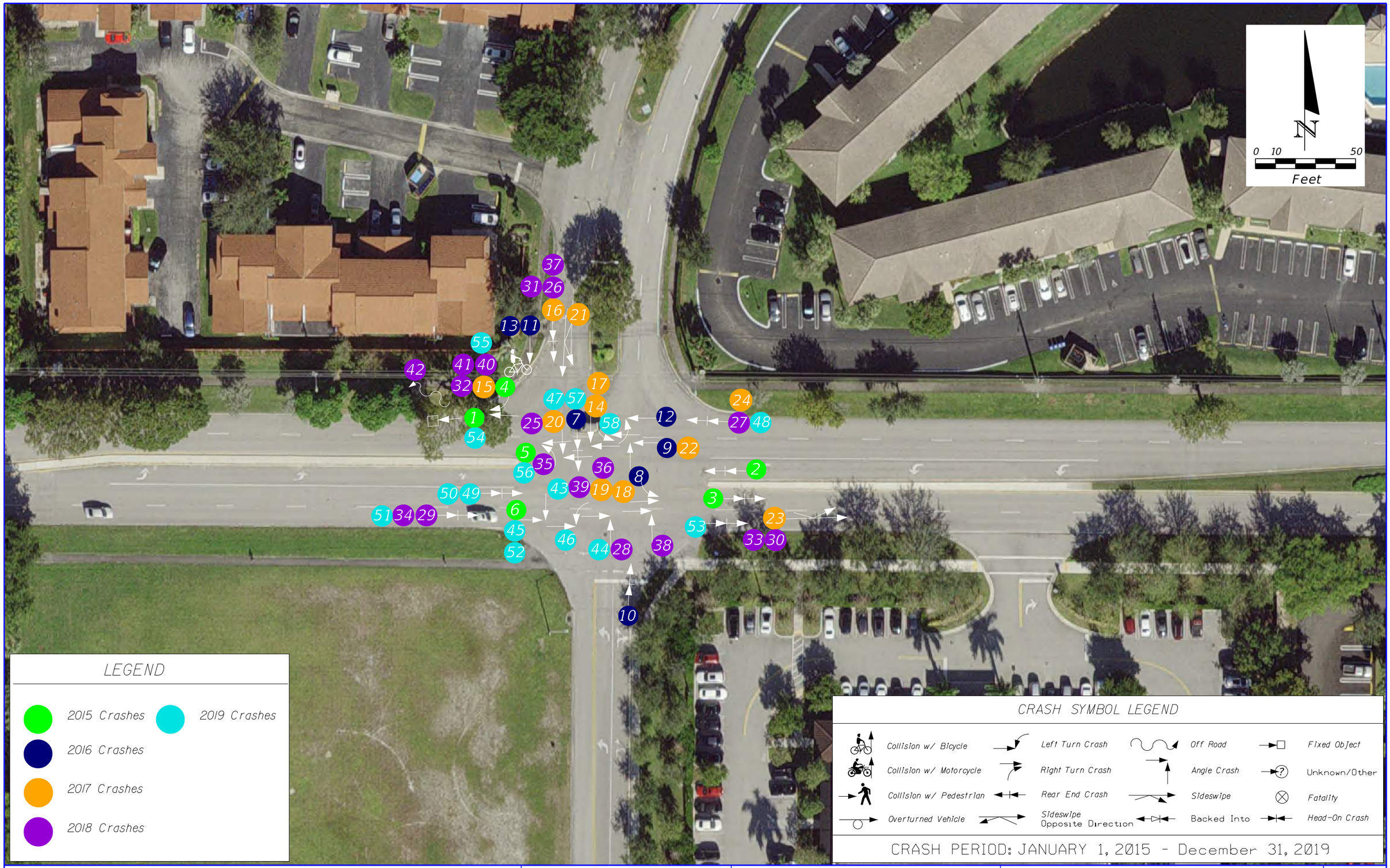
Year 2015	6	(9.4%)
Year 2016	7	(10.9%)
Year 2017	11	(17.2%)
Year 2018	18	(28.1%)
Year 2019	16	(25.0%)
Year 2020	4	(6.3%)
Year 2021 (till August 10)	2	(3.1%)

Twenty rear-end crashes were reported from January 1, 2015 to August 10th, 2021. These crashes were a result of failure to yield right of way, careless driving or inattention to stopped or slowing vehicles ahead due to congestion and improper lane change. These crashes resulted in two injuries and zero fatalities. Of these rear-end crashes, 12 occurred during daylight conditions, seven occurred under dark-lighted conditions, and one during dusk.

Fourteen left-turn crashes were reported during the study period. Failure to yield right of way was the major factor for these crashes. These crashes resulted in six injuries and one fatality. Of these left-turn crashes, 10 occurred during daylight conditions, and four occurred under dark-lighted conditions.

Thirteen angle crashes were reported during the study period. These crashes were a result of multiple factors, such as failing to yield right of way, disregarding stop sign and careless driving. These crashes resulted in six injuries and zero fatalities. Nine of these angle crashes occurred during daylight conditions, three occurred under dark-lighted conditions, and one occurred during dawn.

During this period, six right-turn crashes, four sideswipe, two bicycles, off road and other crashes each and one roll over were recorded. These crashes were a result of failure to yield right of way, careless driving or inattention to stopped or slowing vehicles ahead due to congestion, disregarding a stop sign and failing to maintain vehicle. These crashes resulted in three injuries and zero fatalities. Of these crashes, 14 occurred during daylight conditions, two occurred during dark-lighted condition and one under dark-not lighted conditions.



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

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CRASH DIAGRAM
ROYAL PALM BLVD AT NW 89TH DR

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4.0 Field Observations

A qualitative assessment based on field observations was performed by a team of stakeholders on October 5, 2021 at the study intersection of Royal Palm Boulevard at NW 89th Drive. The team consisted of the following representatives:

Name	Agency
Mark Brown	Broward MPO
Brooke Peters	Coral Springs
Derek Fernandes	Coral Springs
Lei Cai	Broward County Traffic Engineering
Edil Pena	T.Y. Lin International
Dan D'Antonio	VHB

Prior to the field observations, the RSA team was provided with corridor existing conditions data related to crash history, geometrics, and surrounding land use patterns. The crash trends were compared to traffic and physical conditions to identify field factors potentially contributing to increased crash risk. In addition, maintenance issues were identified and are detailed later in this report.

The purpose of the qualitative assessment was to evaluate safety of the intersection while taking into consideration prevailing operating traffic conditions to identify areas where improvements would be potentially beneficial for safety and efficiency. Specific attention was paid to the interaction between vehicular and non-vehicular roadway users. Field photographs are attached in **Appendix B**.

Mobility and Safety:

1. Traffic along Royal Palm Boulevard was observed approaching the intersection at or slightly above the posted speed limit of 40 mph.
2. The traffic along Royal Palm Boulevard was observed arriving in platoons, while the traffic arrival along NW 89th Drive was observed to be sporadic/random. With

the predominant residential land use along NW 89th Drive, outbound traffic peaked in the morning while inbound traffic peaked in the afternoon.

3. Pedestrians were observed crossing Royal Palm Boulevard at unmarked crossing locations to access the sidewalk located in the southwest corner of the intersection.
4. The southbound left-turn movement was observed experiencing a maximum observed queue of approximately 8-10 vehicles in the AM peak hour.
5. The eastbound left turn movement was observed experience a maximum queue of approximately 4-5 vehicles in the PM peak hour.
6. The southbound traffic volume appeared to exceed the northbound traffic volume. The directionality along Royal Palm Boulevard appeared to be balanced in the AM, mi-day, and PM peak hours.
7. Vehicles making two-stage left-turns from NW 89th Drive appeared to have difficulty positioning their vehicle within the median. The 6'-10' yellow skip striping defining the median area is worn and difficult to see.
8. The southbound left-turn movement was observed experiencing an average queue of one vehicle with a maximum observed queue of one vehicle.
9. The southbound left-turn movement was observed experiencing an average queue of one vehicle with a maximum observed queue of one vehicle.
10. The sight distance appears to be restricted by the mature trees along north side of Royal Palm Boulevard when looking west from the southbound approach on NW 89th Drive.

Maintenance:

11. The pavement condition and markings were observed to be in fair condition along Royal Palm Boulevard.
12. The pavement and markings were observed to be in poor condition along NW 89th Drive.
13. There are no pedestrian warning signs along NW 89th Drive approaching the intersection of Royal Palm Boulevard.
14. The painted median noses along Royal Palm Boulevard are worn making the yellow paint difficult to see.

5.0 Recommendations

Based on the crash records, field observations of the intersection operation, and input from the multi-disciplinary RSA team, this study recommends the following improvements. Improvements identified as maintenance can be completed within two years, near-term can be completed within three to five years, and long-term can be completed beyond five years.

1. Refurbish the existing crosswalk on NW 89th Drive and include 24-inch white longitudinal bars for special emphasis crosswalks. Near-term.
   Justification: The existing crosswalks are worn and difficult to see.

2. Install Intersection Warning (W2-1) and Advance Street Name Plaque (W16-8aP) sign assemblies along Royal Palm Boulevard to provide advance warning of traffic entering Royal Palm Boulevard from NW 89th Drive. Near-term.
   Justification: As a near term maintenance improvement, the advanced warning signs will alert drivers on Royal Palm Boulevard to expect traffic entering the roadway ahead.

3. Install W11-2 (Pedestrian Crossing) and W16-9P warning sign assemblies on NW 89th Drive 250 feet in advance of Royal Palm Boulevard. Near-term.
   Justification: Per the current Manual on Uniform Traffic Control Devices, Section 2C.50, non-vehicular warning signs may be used to alert road users in advance of locations where shared use of the roadway by pedestrians might occur.

4. Convert the full median opening to a directional left-in, right-in, right-out opening. Install R3-4 (No U-Turn) signs facing the eastbound approach of the two median openings adjacent to the east. Near-term.
   Justification: Thirteen angle crashes were reported during the study period. These crashes were a result of multiple factors, such as failing to yield right of way, disregarding stop sign and careless driving. All of these angle crashes are correctible with the recommended safety improvement. In addition to the angle crashes, 14 left turn crashes were recorded. Many of the left turn crashes were attributed to the complexity of the intersection with two-stage maneuvers from the side street and insufficient width for stacking. In addition, site distance is restricted for left-turning vehicles by the staged vehicle.

5. Reconstruct the curb ramps on the south leg per FDOT Standard Plan Index 522-002, sheet 6 of 7. Near-term.
   Justification: The curb ramps allow pedestrians to enter Royal Palm Boulevard at an unmarked location, particularly for the southeast quadrant. With a marked crosswalk and other infrastructure protection, positive guidance should be provided to discourage pedestrians from cross at this location.

6. Trim the trees along north side of Royal Palm Boulevard in the sight triangle west of NW 89th Drive. Maintenance.
   Justification: The sight distance appears to be restricted by the mature trees along north side of Royal Palm Boulevard when looking west from the southbound approach on NW 89th Drive.

A conceptual improvement diagram is attached as **Appendix C.** A construction cost estimate, benefit-cost (B-C) analysis, and net present value (NPV) analysis are attached as **Appendices D, E, and F**, respectively.

The project cost, benefit-cost ratio, and NPV are summarized in the following table.

Project Cost Estimate	$65,589.59
B-C Ratio (Benefit $/Cost $)	59.24
NPV	$4,019,258

The B-C ratio is the present value of benefits over the present value of costs. A B-C ratio greater than 1.0 indicates that benefits exceed the costs and the project is economically justified. Generally, higher B-C ratios are more desirable.

The NPV is the difference between the present value of benefits and present value of costs over the life of the improvements. NPV is sometimes called net benefits or net present worth. A positive NPV indicates that benefits exceed costs and the project is economically justified. Generally, higher NPVs are desirable.

6.0 Feasibility Review

A feasibility review was conducted for each of the recommendations. Due to the nature of some improvements, no additional feasibility review was required. These are noted as such in the summary presented below.

Recommendation 1: Refurbish the existing crosswalk on NW 89th Drive and include 24-inch white longitudinal bars for special emphasis crosswalks.

Feasibility Review: This recommendation is feasible without additional investigation.

Recommendation 2: Install Intersection Warning (W2-1) and Advance Street Name Plaque (W16-8aP) sign assemblies along Royal Palm Boulevard to provide advance warning of traffic entering Royal Palm Boulevard from NW 89th Drive.

Feasibility Review: The standard foundation size for the signs is 1′ – 6″ in diameter and 2′ – 6″ to 3′ – 6″ deep. The exact sign locations can be adjusted by the contractor to eliminate utility impacts. There is available right of way to install the signs. This recommendation is feasible without additional investigation.

Recommendation 3: Install W11-2 (Pedestrian Crossing) and W16-9P warning sign assemblies on NW 89th Drive 250 feet in advance of Royal Palm Boulevard.

Feasibility Review: The standard foundation size for the signs is 1′ – 6″ in diameter and 2′ – 6″ to 3′ – 6″ deep. The exact sign locations can be adjusted by the contractor to eliminate utility impacts. There is available right of way to install the signs. Placement of the signs may need to be coordinated with any associations that maintain the neighborhood roadways.

Recommendation 4: Convert the full median opening to a directional left-in, right-in, right-out opening. Install R3-4 (No U-Turn) signs facing the eastbound approach of the two median openings adjacent to the east.

Feasibility Review: The nature of the improvements include work within the existing travel way with excavation shallower than 18 inches. Several single post signs are proposed within medians or along the roadside. The standard foundation size for the signs is 1′ – 6″ in diameter and 2′ – 6″ to 3′ – 6″ deep. The exact sign locations can be adjusted by the contractor to eliminate utility impacts.

The improvements will cause a change in traffic patterns along NW 89th Drive. Left turn movements will no longer be allowed from the minor street at Royal Palm Boulevard.

Drivers can still access Royal Palm Boulevard for right turn movements and downstream U-turn movements. The nearest U-turn opportunity to the west is approximately 450 feet while the nearest opportunity to the east is approximately 2,000 feet. Residents of the neighborhoods accessible via NW 89th Drive have access to both Riverside Drive and N University Drive using other routes.

The final design task should include collection of traffic counts, estimated redistribution of traffic, and traffic analysis to ensure alternative intersections and turn lanes can accommodate any increases. Probe data providers, such as StreetLight, or BlueTooth® readers can be used to assist with the redistribution of traffic according to existing origin-destination patterns.

Recommendation 5: Reconstruct the curb ramps on the south leg per FDOT Standard Plan Index 522-002, sheet 6 of 7

Feasibility Review: This recommendation is feasible without additional investigation.

Recommendation 6: Trim the trees along north side of Royal Palm Boulevard in the sight triangle west of NW 89th Drive.

Feasibility Review: This recommendation is feasible without additional investigation.

The Candidate Project Feasibility Checklist for TSM&O/Safety Program Funds is provided in **Appendix G**.

7.0 Implementation Plan

The implementation plan presented below identifies the agency responsible for the implementation, the nature of the improvement with respect to maintenance/near-term/long-term, and the associated costs.

Improvement	Responsible Agency	Agency with Roadway Jurisdiction	Maint., Near-, or Long-Term	Cost
1. Refurbish the existing crosswalk on NW 89th Drive and include 24-inch white longitudinal bars for special emphasis crosswalks.	Coral Springs or Broward County	Broward County	Near-term	<$10,000
2. Install Intersection Warning (W2-1) and Advance Street Name Plaque (W16-8aP) sign assemblies along Royal Palm Boulevard to provide advance warning of traffic entering Royal Palm Boulevard from NW 89th Drive.	Coral Springs or Broward County	Broward County	Near-term	<$10,000
3. Install W11-2 (Pedestrian Crossing) and W16-9P warning sign assemblies on NW 89th Drive 250 feet in advance of Royal Palm Boulevard.	Coral Springs	Coral Springs	Near-term	<$5,000
4. Convert the full median opening to a directional left-in, right-in, right-out opening. Install R3-4 (No U-Turn) signs facing the eastbound approach of the two median openings adjacent to the east.	Coral Springs or Broward County	Broward County	Near-term	<$50,000
5. Reconstruct the curb ramps on the south leg per FDOT Standard Plan Index 522-002, sheet 6 of 7.	Coral Springs or Broward County	Broward County	Near-term	<$10,000

Improvement	Responsible Agency	Agency with Roadway Jurisdiction	Maint., Near-, or Long-Term	Cost
6. Trim the trees along north side of Royal Palm Boulevard in the sight triangle west of NW 89th Drive.	Coral Springs or Broward County	Broward County	Maintenance	<$1,000

Notes: If Coral Springs elects to champion the project within Royal Palm Boulevard right of way, permitting will be required with Broward County.

Appendix A – Crash Summary

CRASH SUMMARY

MAJOR ROUTE: Royal Palm Boulevard
INTERSECTING ROUTE: NW 89TH Drive
STUDY PERIOD: 1/1/2015 to 8/10/2021

COUNTY: Broward
ENGINEER: MW

CRASH REF. NO.	HSMV NO.	DATE	DAY	TIME	Vehicle Type Involved	ALCOHOL / DRUGS	CRASH TYPE	FATAL	INJURY	INCAPACITATING	NON-INCAPACITATING	POSSIBLE INJURY	NON- TRAFFIC FATALITY	FATALITY WITHIN 30 DAYS	PROPERTY DAMAGE	LIGHTING CONDITION	PAVEMENT CONDITIONS	CONTRIBUTING CAUSE
1	84970477	1/7/2015	Wednesday	11:31 AM	Motorized Vehicle	No	Other	0	0	0	0	0	0	0	$10,000	Daylight	Dry	FAILED TO MAINTAIN VEHICLE
2	84970925	2/25/2015	Wednesday	2:50 PM	Motorized Vehicle	No	Rear End	0	0	0	0	0	0	0	$0	Daylight	Dry	CARELESS DRIVING
3	85960954	6/3/2015	Wednesday	7:05 PM	Motorized Vehicle	No	Rear End	0	0	0	0	0	0	0	$0	Daylight	Dry	FAILED TO YIELD RIGHT OF WAY
4	83407866	6/20/2015	Saturday	4:32 PM	Motorized Vehicle	No	Right Turn	0	0	0	0	0	0	0	$2,000	Daylight	Dry	FAILED TO YIELD RIGHT OF WAY
5	85961190	7/11/2015	Saturday	4:39 PM	Motorized Vehicle	No	Left Turn	0	0	0	0	0	0	0	$6,000	Daylight	Dry	FAILED TO YIELD RIGHT OF WAY
6	85962307	11/5/2015	Thursday	7:33 AM	Motorized Vehicle	No	Angle	0	0	0	0	0	0	0	$6,000	Daylight	Dry	FAILED TO YIELD RIGHT OF WAY
7	85963273	2/6/2016	Saturday	6:46 PM	Motorized Vehicle	No	Rear End	0	0	0	0	0	0	0	$0	Dark - Lighted	Wet	FAILED TO YIELD RIGHT OF WAY
8	85963640	3/5/2016	Saturday	6:05 PM	Motorized Vehicle	No	Left Turn	0	0	0	0	0	0	0	$4,000	Daylight	Dry	FAILED TO YIELD RIGHT OF WAY
9	86742366	8/31/2016	Wednesday	3:25 PM	Motorized Vehicle	No	Angle	0	2	0	0	2	0	0	$10,100	Daylight	Wet	FAILED TO YIELD RIGHT OF WAY
10	86742935	10/17/2016	Monday	8:24 AM	Motorized Vehicle	No	Rear End	0	0	0	0	0	0	0	$0	Daylight	Dry	IMPROPER LANE CHANGE
11	86743273	11/15/2016	Tuesday	8:18 AM	Motorized Vehicle	No	Bicycle	0	0	0	0	0	0	0	$50	Daylight	Dry	CARELESS DRIVING
12	86743365	11/22/2016	Tuesday	7:01 PM	Motorized Vehicle	No	Left Turn	0	0	0	0	0	0	0	$0	Dark - Lighted	Dry	FAILED TO YIELD RIGHT OF WAY
13	86795467	12/26/2016	Monday	6:30 PM	Pedalcycle	No	Bicycle	0	0	0	0	0	0	0	$0	Dark - Not Lighted	Dry	FAILED TO YIELD RIGHT OF WAY
14	86795762	1/23/2017	Monday	8:24 AM	Motorized Vehicle	No	Angle	0	2	1	1	0	0	0	$8,000	Daylight	Dry	ALL OTHER
15	86796236	3/6/2017	Monday	2:59 PM	Motorized Vehicle	No	Right Turn	0	0	0	0	0	0	0	$30,000	Daylight	Dry	FAILED TO YIELD RIGHT OF WAY
16	86796358	3/16/2017	Thursday	7:51 AM	Motorized Vehicle	No	Rear End	0	0	0	0	0	0	0	$700	Daylight	Dry	FAILED TO YIELD RIGHT OF WAY
17	86796835	4/29/2017	Saturday	1:42 PM	Motorized Vehicle	No	Angle	0	0	0	0	0	0	0	$3,000	Daylight	Dry	CARELESS DRIVING
18	86797207	5/31/2017	Wednesday	8:24 AM	Motorized Vehicle	No	Left Turn	0	0	0	0	0	0	0	$6,000	Daylight	Dry	FAILED TO YIELD RIGHT OF WAY
19	86797533	6/27/2017	Tuesday	9:38 PM	Motorized Vehicle	No	Left Turn	0	3	0	2	1	0	0	$25,000	Dark - Lighted	Dry	FAILED TO YIELD RIGHT OF WAY
20	86797569	6/30/2017	Friday	3:45 PM	Motorized Vehicle	No	Angle	0	1	0	0	1	0	0	$12,000	Daylight	Dry	FAILED TO YIELD RIGHT OF WAY
21	86797726	7/17/2017	Monday	12:45 PM	Motorized Vehicle	No	Sideswipe	0	0	0	0	0	0	0	$3,000	Daylight	Dry	DISREGARDED STOP SIGN
22	86743573	8/29/2017	Tuesday	8:21 PM	Motorized Vehicle	No	Angle	0	0	0	0	0	0	0	$13,000	Dark - Lighted	Dry	IMPROPER TURN
23	86743965	10/2/2017	Monday	7:11 PM	Motorized Vehicle	No	Sideswipe	0	1	0	0	1	0	0	$10,000	Dark - Lighted	Dry	FAILED TO YIELD RIGHT OF WAY
24	86744076	10/13/2017	Friday	6:53 AM	Motorized Vehicle	No	Rear End	0	0	0	0	0	0	0	$5,000	Dark - Lighted	Wet	IMPROPER LANE CHANGE
25	86745229	1/17/2018	Wednesday	7:25 AM	Motorized Vehicle	No	Angle	0	0	0	0	0	0	0	$800	Daylight	Dry	CARELESS DRIVING
26	87556620	2/20/2018	Tuesday	5:39 PM	Motorized Vehicle	No	Rear End	0	0	0	0	0	0	0	$1,000	Dusk	Dry	FAILED TO YIELD RIGHT OF WAY
27	87556697	2/27/2018	Tuesday	7:00 PM	Motorized Vehicle	No	Rear End	0	0	0	0	0	0	0	$2,000	Dark - Lighted	Wet	CARELESS DRIVING
28	87556795	3/9/2018	Friday	11:38 AM	Motorized Vehicle	No	Left Turn	0	1	0	0	1	0	0	$6,000	Daylight	Dry	CARELESS DRIVING
29	87556843	3/13/2018	Tuesday	6:01 PM	Motorized Vehicle	No	Rear End	0	0	0	0	0	0	0	$6,000	Daylight	Dry	FAILED TO YIELD RIGHT OF WAY
30	87557082	4/4/2018	Wednesday	12:09 PM	Motorized Vehicle	No	Sideswipe	0	0	0	0	0	0	0	$500	Daylight	Dry	CARELESS DRIVING
31	87557127	4/8/2018	Sunday	2:37 PM	Motorized Vehicle	No	Rear End	0	0	0	0	0	0	0	$1,000	Daylight	Dry	IMPROPER LANE CHANGE
32	87557218	4/15/2018	Sunday	9:40 PM	Motorized Vehicle	No	Right Turn	0	0	0	0	0	0	0	$10,000	Dark - Lighted	Wet	CARELESS DRIVING
33	87558482	8/11/2018	Saturday	2:30 PM	Motorized Vehicle	No	Sideswipe	0	0	0	0	0	0	0	$3,900	Daylight	Wet	DISREGARDED STOP SIGN
34	87558490	8/12/2018	Sunday	10:01 PM	Motorized Vehicle	No	Rear End	0	0	0	0	0	0	0	$3,000	Dark - Lighted	Dry	IMPROPER LANE CHANGE
35	87558899	9/17/2018	Monday	9:11 AM	Motorized Vehicle	No	Left Turn	0	2	0	0	2	0	0	$20,000	Daylight	Dry	CARELESS DRIVING
36	87559248	10/16/2018	Tuesday	5:39 PM	Motorized Vehicle	No	Left Turn	0	2	0	0	2	0	0	$20,000	Daylight	Dry	FAILED TO YIELD RIGHT OF WAY
37	87914478	10/26/2018	Friday	4:45 PM	Motorized Vehicle	No	Rear End	0	0	0	0	0	0	0	$4,000	Daylight	Dry	FAILED TO YIELD RIGHT OF WAY
38	87914608	11/8/2018	Thursday	7:31 AM	Motorized Vehicle	No	Angle	0	0	0	0	0	0	0	$2,000	Daylight	Dry	CARELESS DRIVING
39	87914701	11/15/2018	Thursday	7:14 AM	Motorized Vehicle	No	Left Turn	0	2	0	0	2	0	0	$26,500	Daylight	Dry	FAILED TO YIELD RIGHT OF WAY
40	87914762	11/19/2018	Monday	1:25 PM	Motorized Vehicle	No	Right Turn	0	0	0	0	0	0	0	$15,000	Daylight	Dry	FAILED TO YIELD RIGHT OF WAY
41	87914912	12/4/2018	Tuesday	8:21 AM	Motorized Vehicle	No	Right Turn	0	0	0	0	0	0	0	$2,600	Daylight	Dry	FAILED TO YIELD RIGHT OF WAY
42	87915232	12/25/2018	Tuesday	11:18 AM	Motorized Vehicle	No	Other	0	1	0	0	1	0	0	$7,000	Daylight	Dry	CARELESS DRIVING
43	87915350	1/8/2019	Tuesday	8:34 AM	Motorized Vehicle	No	Left Turn	0	0	0	0	0	0	0	$1,000	Daylight	Dry	FAILED TO YIELD RIGHT OF WAY
44	87915679	2/5/2019	Tuesday	2:36 PM	Motorized Vehicle	No	Angle	0	0	0	0	0	0	0	$2,000	Daylight	Dry	DISREGARDED STOP SIGN
45	87916441	4/11/2019	Thursday	4:50 AM	Motorized Vehicle	Yes	Angle	0	1	0	1	0	0	0	$9,000	Dawn	Dry	FAILED TO YIELD RIGHT OF WAY
46	87916511	4/16/2019	Tuesday	8:24 AM	Motorized Vehicle	No	Left Turn	0	1	1	0	0	0	0	$18,000	Daylight	Dry	IMPROPER LANE CHANGE
47	87916555	4/19/2019	Friday	11:10 PM	Motorized Vehicle	No	Angle	0	1	0	1	0	0	0	$10,000	Dark - Lighted	Dry	FAILED TO YIELD RIGHT OF WAY
48	87916968	5/22/2019	Wednesday	3:18 PM	Motorized Vehicle	No	Rear End	0	0	0	0	0	0	0	$6,500	Daylight	Dry	FAILED TO YIELD RIGHT OF WAY
49	87917044	5/29/2019	Wednesday	3:20 PM	Motorized Vehicle	No	Rear End	0	0	0	0	0	0	0	$2,500	Daylight	Dry	FAILED TO YIELD RIGHT OF WAY
50	87917577	7/17/2019	Wednesday	10:13 AM	Motorized Vehicle	No	Rear End	0	0	0	0	0	0	0	$5,000	Daylight	Dry	CARELESS DRIVING
51	87917725	8/1/2019	Thursday	8:55 AM	Motorized Vehicle	No	Rear End	0	0	0	0	0	0	0	$2,000	Daylight	Wet	CARELESS DRIVING
52	87918020	8/25/2019	Sunday	8:58 PM	Motorized Vehicle	No	Angle	0	0	0	0	0	0	0	$5,000	Dark - Lighted	Dry	IMPROPER LANE CHANGE
53	87918038	8/27/2019	Tuesday	7:51 AM	Motorized Vehicle	No	Rear End	0	0	0	0	0	0	0	$10,000	Daylight	Dry	ALL OTHER
54	87918183	9/7/2019	Saturday	11:31 AM	Motorized Vehicle	No	Off Road	0	0	0	0	0	0	0	$700	Daylight	Dry	FAILED TO YIELD RIGHT OF WAY
55	87918221	9/10/2019	Tuesday	8:24 AM	Motorized Vehicle	No	Right Turn	0	0	0	0	0	0	0	$1,500	Daylight	Dry	CARELESS DRIVING
56	87918921	11/6/2019	Wednesday	7:04 PM	Motorized Vehicle	No	Left Turn	0	0	0	0	0	0	0	$3,000	Dark - Lighted	Dry	FAILED TO MAINTAIN VEHICLE
57	87919121	11/25/2019	Monday	6:20 AM	Motorized Vehicle	No	Rear End	0	0	0	0	0	0	0	$1,000	Dark - Lighted	Dry	CARELESS DRIVING
58	88698854	12/17/2019	Tuesday	12:32 PM	Motorized Vehicle	No	Left Turn	1	0	0	0	0	0	0	$15,000	Daylight	Dry	IMPROPER LANE CHANGE
59	88700881	8/15/2020	Saturday	8:37 PM	Motorized Vehicle	No	Rear End	0	2	0	0	2	0	0	$20,000	Dark - Lighted	Dry	CARELESS DRIVING
60	88701323	10/8/2020	Thursday	3:49 PM	Motorized Vehicle	No	Rollover	0	1	0	0	1	0	0	$30,000	Daylight	Dry	FAILED TO YIELD RIGHT OF WAY
61	88701607	11/13/2020	Friday	1:05 PM	Motorized Vehicle	No	Angle	0	1	0	0	1	0	0	$4,500	Daylight	Dry	DISREGARDED STOP SIGN
62	89992026	12/8/2020	Tuesday	5:41 PM	Motorized Vehicle	No	Left Turn	0	0	0	0	0	0	0	$5,000	Dark - Lighted	Dry	DISREGARDED STOP SIGN
63	89993101	3/28/2021	Sunday	9:03 PM	Motorized Vehicle	No	Rear End	0	1	0	0	1	0	0	$10,000	Dark - Lighted	Dry	DISREGARDED STOP SIGN
64	89993562	5/13/2021	Thursday	12:43 PM	Motorized Vehicle	No	Off Road	0	0	0	0	0	0	0	$4,500	Daylight	Dry	CARELESS DRIVING
							TOTAL	**1**	**25**	**2**	**5**	**18**	**0**	**0**	**$ 451,350**			

CRASH DESCRIPTION

TOTAL CRASHES	FATAL	INJURY CRASHES	TOTAL INJURIES	INCAPACITATING	NON-INCAPACITATING	POSSIBLE INJURY	NON-TRAFFIC FATALITY	FATALITY WITHIN 30 DAYS	PROPERTY DAMAGE CRASHES	MOTORIZED VEHICLE	PEDESTRIAN/PEDALCYCLE	LIGHTING CONDITION					ROADWAY CONDITIONS	
												DAYLIGHT	DARK-LIGHTED	DARK-NOT LIGHTED	DUSK	DAWN	WET	DRY
64	1	17	25	2	5	18	0	0	46	63	1	45	16	1	1	1	7	57
100%	2%	27%	39%	3%	8%	28%	0%	0%	72%	98%	2%	70.31%	25.00%	1.56%	1.56%	1.56%	10.9%	89.1%

CRASH TYPE										CONTRIBUTING CAUSE						
ANGLE	LEFT TURN	RIGHT TURN	REAR END	SIDESWIPE	HEAD ON	PEDESTRIAN	Bicycle	RAN OFF ROAD	ALL OTHER	CARELESS DRIVING	FAILED TO YIELD RIGHT OF WAY	FAILED TO MAINTAIN VEHICLE	IMPROPER LANE CHANGE	IMPROPER TURN	DISREGARDED STOP SIGN	ALL OTHER	
13	14	6	20	4	0	0	2	2	3	17	29	2	7	1	6	2	
20.31%	21.88%	9.38%	31.25%	6.25%	0.00%	0.00%	3.13%	3.13%	4.69%	26.56%	45.31%	3.13%	10.94%	1.56%	9.38%	3.13%	

Appendix B – Field Photographs

Looking east into the intersection

Looking south into the intersection

Looking west through the north leg

Looking west into the intersection

Looking southeast at sight distance restriction

Looking northwest into the intersection

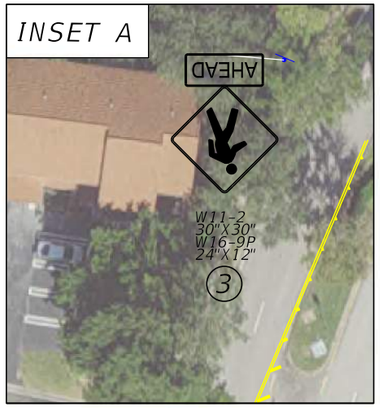
Looking northeast at curb ramp

Looking northwest at curb ramp

Looking north into the intersection

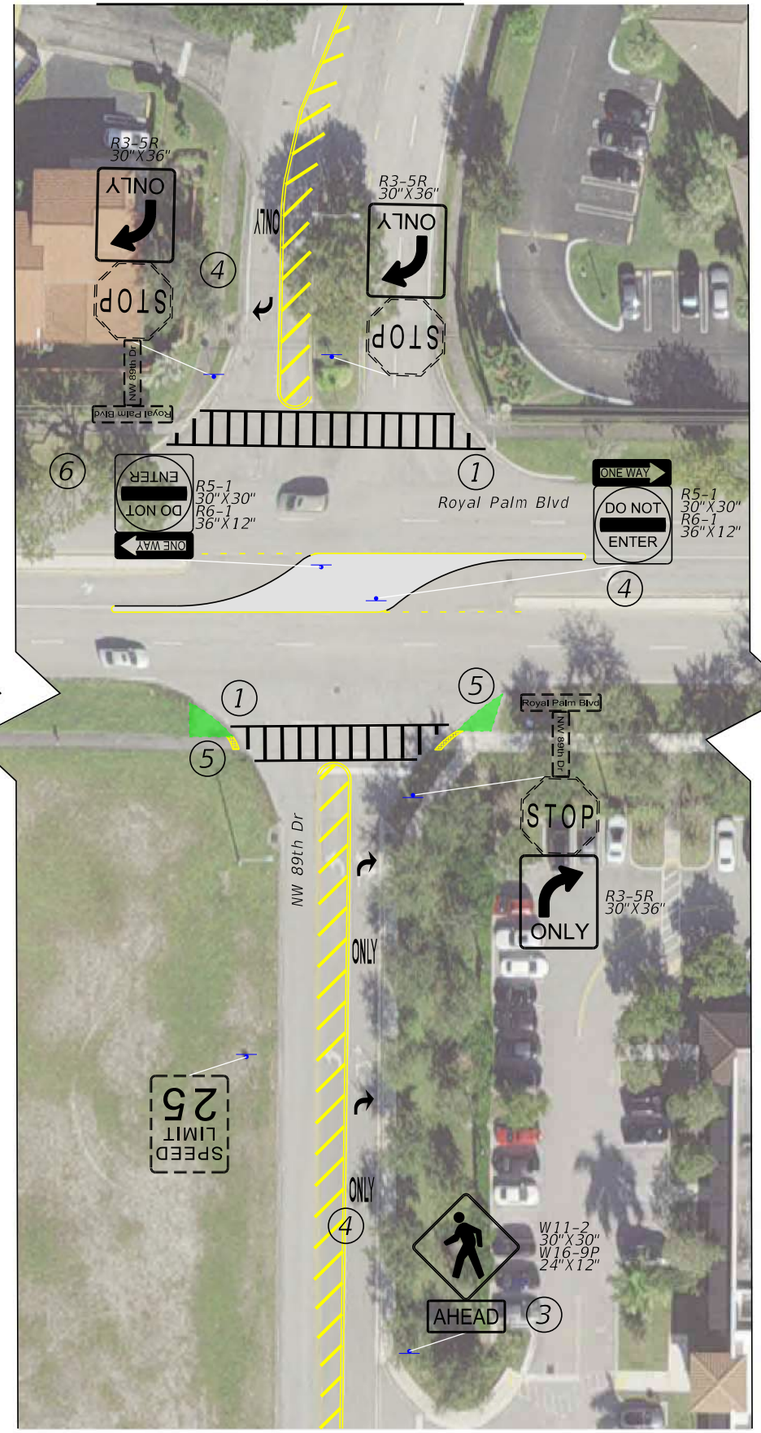
Looking north into the intersection

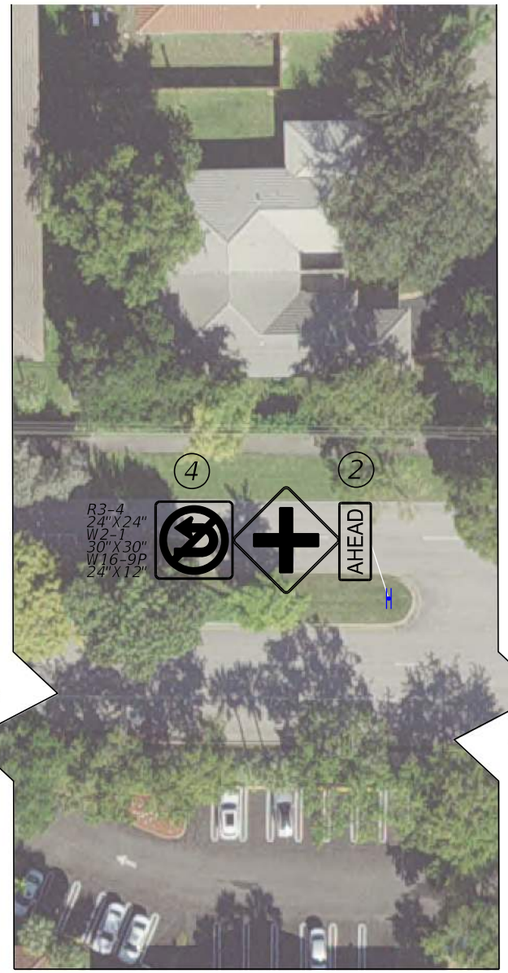
Appendix C – Conceptual Improvement Diagram

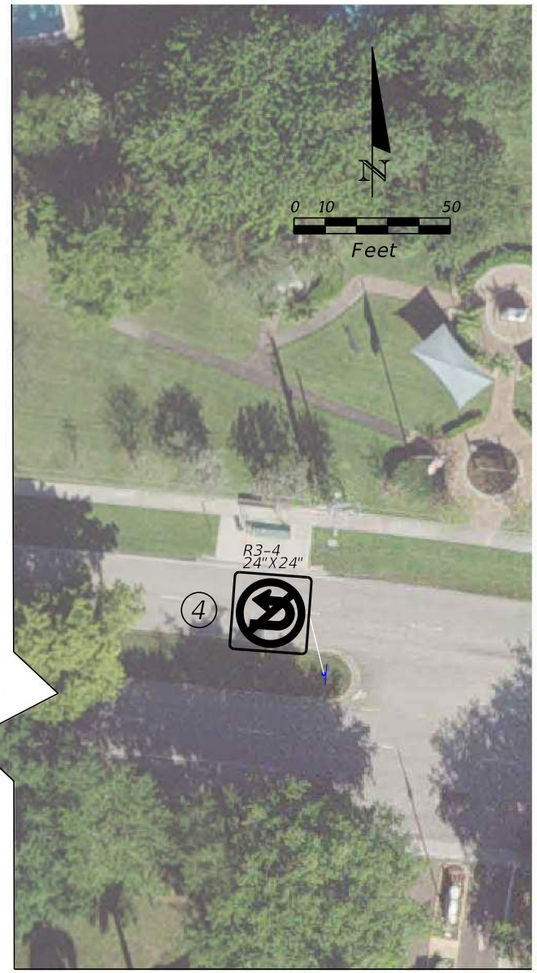


MATCHLINE

MATCHLINE (SEE INSET A)







RECOMMENDATIONS:

1. REFURBISH THE EXISTING CROSSWALK ON NW 89TH DRIVE AND INCLUDE 24-INCH WHITE LONGITUDINAL BARS FOR SPECIAL EMPHASIS CROSSWALK.
2. INSTALL INTERSECTION WARNING AND ADVANCE STREET NAME PLAQUE SIGN ASSEMBLIES ALONG ROYAL PALM BLVD TO PROVIDE ADVANCED WARNING OF TRAFFIC ENTERING.
3. INSTALL PEDESTRIAN CROSSING AND WARNING SIGN ASSEMBLIES ON NW 89TH DRIVE.
4. CONVERT THE FULL MEDIAN OPENING TO A DIRECTIONAL MEDIAN OPENING AND INSTALL NO U-TURN SIGNS FACING THE EASTBOUND APPROACH OF THE TWO MEDIAN OPENINGS ADJACENT TO THE EAST.
5. RECONSTRUCT THE CURB RAMPS ON THE SOUTH LEG.
6. TRIM THE TREES ALONG THE NORTH SIDE OF ROYAL PALM BOULEVARD IN THE SIGHT TRIANGLE WEST OF NW 89TH DRIVE.

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

DAN D'ANTONIO, P.E.
P.E. LICENSE NUMBER 68399
VANASSE HANGEN BRUSTLIN, INC.
501 E KENNEDY BLVD #1010
TAMPA, FL 33602 (813)327-5450

Broward MPO
Metropolitan Planning Organization

CONCEPT PLAN
ROYAL PALM BLVD AT 89TH DR

SHEET NO. 1

Appendix D – Construction Cost Estimate

ENGINEER'S ESTIMATE - Royal Palm Blvd. at NW 89th Dr.

PAY ITEM NUMBER	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
101-1	MOBILIZATION	LS	1	10%	See Below
102-1	MAINTENANCE OF TRAFFIC	LS	1	10%	See Below
104-18	INLET PROTECTION SYSTEM	EA	4	$111.56	$446.24
104-10-3	SEDIMENT BARRIER	LF	400	$1.12	$448.00
110-1-1	CLEARING & GRUBBING	AC	0.09	$8,675.58	$764.59
110-4-10	REMOVAL OF EXIST CONC	SY	20	$16.52	$330.40
520-1-10	CONCRETE CURB & GUTTER, TYPE F	LF	314	$22.84	$7,171.76
520-70	CONCRETE TRAFFIC SEPARATOR, SP- VAR WIDT	SY	112	$102.82	$11,539.37
522-2	CONCRETE SIDEWALK AND DRIVEWAYS, 6" THICK	SY	14	$51.77	$747.79
527-2	DETECTABLE WARNINGS	SF	20	$27.93	$558.60
570-1-2	PERFORMANCE TURF, SOD	SY	20	$2.41	$48.20
700-1-11	SINGLE POST SIGN, F&I, GM, <12	AS	6	$353.42	$2,120.52
700-3-101	SIGN PANEL, FURNISH & INSTALL GROUND MOUNT, UP TO 12 SF	EA	4	$220.29	$881.16
705-11-1	DELINEATOR, FLEXIBLE TUBULAR	EA	2	$65.04	$130.08
710-11-290	PAINTED PAVEMENT MARKINGS, STANDARD, YELLOW, ISLAND NOSE	SF	20	$2.18	$43.60
711-11-241	THERMOPLASTIC, STANDARD, YELLOW, 2-4 DOTTED GUIDE LINE /6-10 DOTTED EXTENSION LINE, 6"	GM	0.017	$1,794.61	$29.87
711-11-123	THERMOPLASTIC, STANDARD, WHITE, SOLID, 12" FOR CROSSWALK AND ROUNDABOUT	LF	306	$1.84	$563.04
711-11-160	THERMOPLASTIC, STANDARD, WHITE, MESSAGE OR SYMBOL	EA	6	$93.78	$562.68
711-11-170	THERMOPLASTIC, STANDARD, WHITE, ARROW	EA	6	$52.11	$312.66
711-11-224	THERMOPLASTIC, STD, YELLOW, SOLID, 18"	LF	674	$2.92	$1,968.08
711-14-125	THERMOPLASTIC, PREFORMED, WHITE, SOLID, 24" FOR CROSSWALK	LF	301	$14.66	$4,415.59
711-16-101	THERMOPLASTIC, STANDARD-OTHER SURFACES, WHITE, SOLID, 6"	GM	0.025	$3,906.86	$98.41
711-16-201	THERMOPLASTIC, STD-OTH, YELLOW, SOLID, 6"	GM	0.332	$3,893.17	$1,293.30
711-17-1	THERMOPLASTIC, REMOVE EXISTING THERMOPLASTIC PAVEMENT MARKINGS- SURFACE TO REMAIN	SF	24	$2.41	$57.84
999-25	INITIAL CONTINGENCY (DO NOT BID)	LS		5%	See Below
	CONTINGENCY (PROJECT UNKNOWNS)			15%	See Below
				SUBTOTAL:	$34,531.79
				(101-1) MOB (MOBILIZATION) 10%	$3,453.18
				SUBTOTAL:	$37,984.97
				(102-1) MOT (MAINTENANCE OF TRAFFIC) 10%	$3,798.50
				SUBTOTAL:	$41,783.46
				PU (PROJECT UNKNOWNS) 15%	$6,267.52
				SUBTOTAL:	$48,050.98
				(999-25) INITIAL CONTINGENCY (DO NOT BID) 5%	$2,402.55
				SUBTOTAL:	$50,453.53
				RIGHT-OF-WAY	$0.00
				PROJECT TOTAL:	**$50,453.53**

12 Month Area 12 Average Unit Costs 12/1/2020 - 11/30/2021

Appendix E – Benefit Cost Analysis

Roadway Design
Florida's Transportation Engineers

Rev. 02/2014

Benefit-Cost Analysis

District: **Four** County: **86 - Broward** Date Prepared: 01/18/22

Location: **Royal Palm Boulevard at NW 89th Drive**

Section : Beg. Milepost : End Milepost :

Rdway Type: **4 - 5 Lanes Suburban Divided**

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

Convert a full median opening to directional median opening

ANNUAL COST OF IMPROVEMENTS

Type	Cost	Service Life	Capital Recovery Factor	Total
ROW		100	0.0408	$ -
P.E.C.E.I.	$ 15,136.06	15	0.0899	$ 1,360.73
Structure		75	0.0425	$ -
Roadway	$50,453.53	20	0.0736	$ 3,713.38
Drainage		20	0.0736	$ -
Signal		20	0.0736	$ -
Other		20	0.0736	$ -
Sub-Total	$ 65,589.59			$ 5,074.11
			Annual Cost =	$ 5,074.11

Total number of crashes = 58
# of correctable crashes, PC = 29
# of years of crash data, YD = 5
PC/YD = 5.80
Crash reduction factor, CRF = 23.00%
CRF x (PC/YD) = 1.33
Cost per crash, CPC = $225,315.00
Benefit = $300,570

Primary crash reduction factor (%): 23

Convert an open median to a directional median

Additional crash reduction factor:

Additional crash reduction factor:

BENEFIT/COST RATIO

$$\frac{\text{Benefit}}{\text{Cost}} = \frac{\$300,570.21}{\$5,074.11} = \mathbf{59.24}$$

Countermeasure: Convert an open median to a directional median, used on all crash types of K,A,B, C severity.

Prepared by: VHB

Appendix F – Net Present Value

Net Present Value (NPV)

Project Name	Royal Palm Blvd at NW 89th Dr Safety Study
Project Category	Unsignalized Intersection
Current Year	2022
Project Completion	2024
Project Life	20
Project Ends	2042
Discount Rate	0.04

Project Description
Convert full median opening to directional opening

NPV
$4,019,258

Cost / Benefits				Calculation		
Year #	Calendar Year	Estimated Cost	Estimated Benefits	Discount Factor	Discount Cost	Discounted Benefits
0	2022	$65,590	$0	1.000	($65,590)	$0
1	2023	$0	$300,570	0.962	$0	$289,010
2	2024	$0	$300,570	0.925	$0	$277,894
3	2025	$0	$300,570	0.889	$0	$267,206
4	2026	$0	$300,570	0.855	$0	$256,929
5	2027	$0	$300,570	0.822	$0	$247,047
6	2028	$0	$300,570	0.790	$0	$237,545
7	2029	$0	$300,570	0.760	$0	$228,409
8	2030	$0	$300,570	0.731	$0	$219,624
9	2031	$0	$300,570	0.703	$0	$211,177
10	2032	$0	$300,570	0.676	$0	$203,054
11	2033	$0	$300,570	0.650	$0	$195,245
12	2034	$0	$300,570	0.625	$0	$187,735
13	2035	$0	$300,570	0.601	$0	$180,515
14	2036	$0	$300,570	0.577	$0	$173,572
15	2037	$0	$300,570	0.555	$0	$166,896
16	2038	$0	$300,570	0.534	$0	$160,477
17	2039	$0	$300,570	0.513	$0	$154,305
18	2040	$0	$300,570	0.494	$0	$148,370
19	2041	$0	$300,570	0.475	$0	$142,663
20	2042	$0	$300,570	0.456	$0	$137,176

Appendix G – Candidate Project Feasibility Checklist for TSM&O/Safety Program Funds

Candidate Project Feasibility Checklist for TSM&O/Safety Program Funds

The project requires additional feasibility review if "Yes" is checked for questions 1, 2, 3, 5, 6, or 7.

1. Will the proposed project need right of way?

☐ Yes ☒ No ☐ Unknown

Source(s) to determine existing right of way: Field inspection of existing typical section elements (i.e., back of sidewalk). Review of Broward County property appraiser GIS of property lines.

2. Will the proposed project have utility impacts or require utility adjustments?

☐ Yes ☒ No ☐ Unknown

Source(s) to determine existing utilities: Review of field conditions of above ground utilities, manhole covers, valves, and other markers. The majority of work will done in the median and will not include underground work.

3. Does the proposed project modify existing access to residences or businesses?

☒ Yes ☐ No ☐ Unknown

3a. If answered "Yes" to the above, please describe the process needed to gain approval to make the proposed access changes: Coordination with Coral Springs and Broward County is required.

4. Can the project be designed to meet all applicable design criteria and standards?

☒ Yes ☐ No ☐ Unknown

4a. If answered "No" to the above, can design exceptions or variations reasonably be obtained?

☐ Yes ☐ No ☐ Unknown

Please provide a preliminary list of exceptions and/or variations: _____

_____

5. Does the project impact existing structures?

☐ Yes ☐ No

5a. If answered "Yes" to the above, has a preliminary structural review been conducted to determine the acceptability of the impact and all costs been accounted for in the estimate?

☐ Yes ☐ No

6. Does the project affect environmental or cultural resources?

☐ Yes ☒ No ☐ Unknown

7. Are any other agency permits required?

☐ Yes ☒ No ☐ Unknown

8. Does the project require a project development and environment (PD&E) study?

☐ Yes ☒ No ☐ Unknown

8a. If answered "Yes" to the above, what level of PD&E is anticipated?

☐ Type 1 Categorical Exclusion (see FDOT Type 1 CE Checklist) ☐ Type 2 Categorical Exclusion ☐ Environmental Assessment or Impact Statement

9. Is the agency, or agencies for intersections, with jurisdiction over the facility in support of the project?

☐ Yes ☐ No ☒ Unknown

Broward Metropolitan Planning Organization
Move People & Goods | Create Jobs | Strengthen Communities

Broward Metropolitan Planning Organization
Trade Centre South
100 West Cypress Creek Road, Suite 650, 6th Floor
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For more information on activities and projects of the Broward MPO, please visit:
BrowardMPO.org

For complaints, questions or concerns about civil rights or nondiscrimination; or for special requests under the Americans with Disabilities Act, please contact Carl Ema at emac@browardmpo.org

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Title VI Coordinator at (954) 876-0058 or emac@browardmpo.org