



Legend

- A
- AE
- AH
- OPEN WATER
- ELEVATION CONTOURS (5ft)






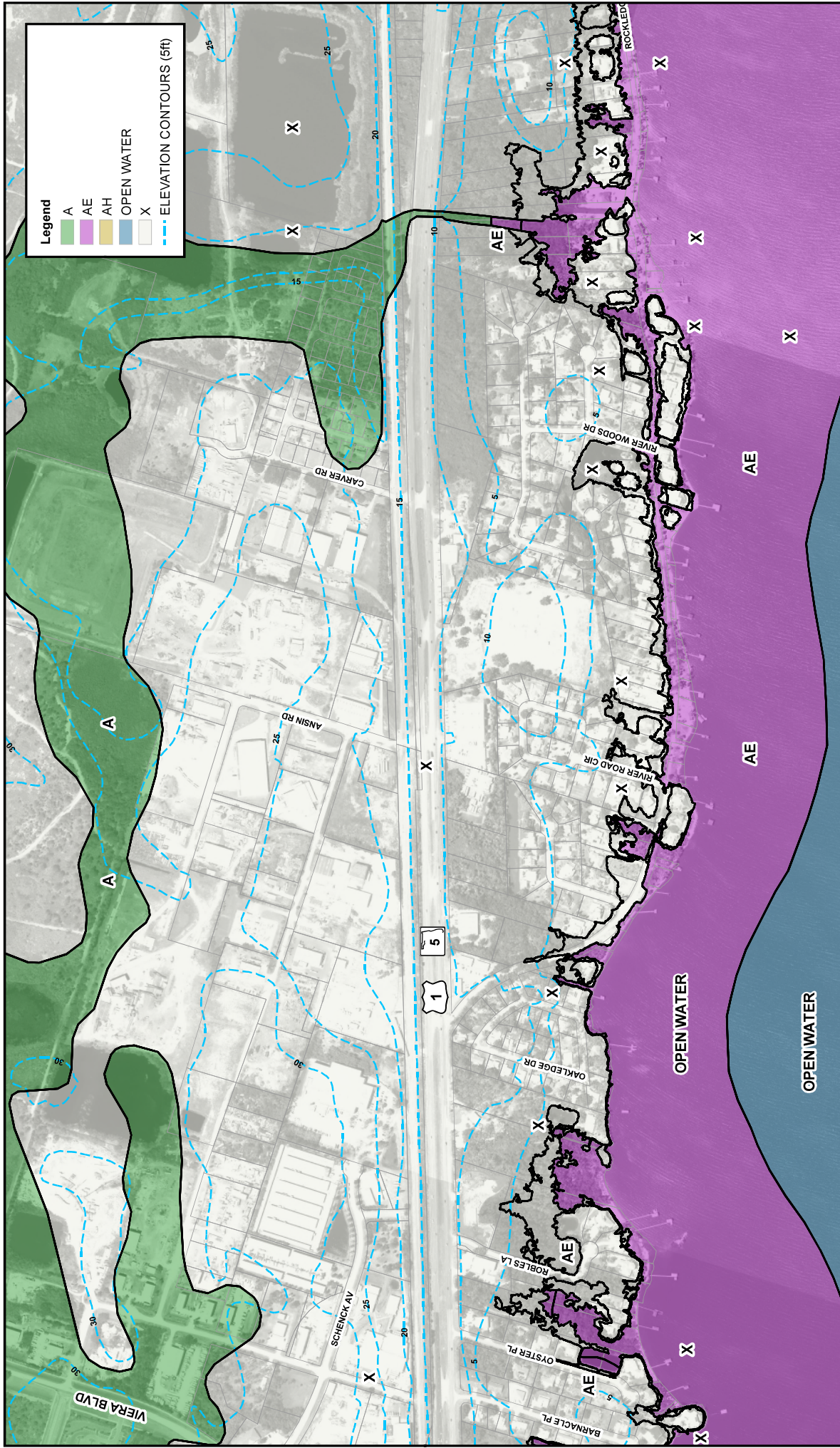
Sheet
3 of 6

FIGURE 7
FEMA FLOODPLAIN MAP

Florida Department of Transportation
District 5

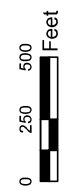
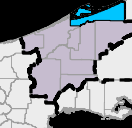


US 1 Corridor Planning Study
from Pineda Causeway (SR 404)
to Park Avenue
Brevard County, Florida
Financial Project ID: 433604-1-12-01
Federal Project No. n/a



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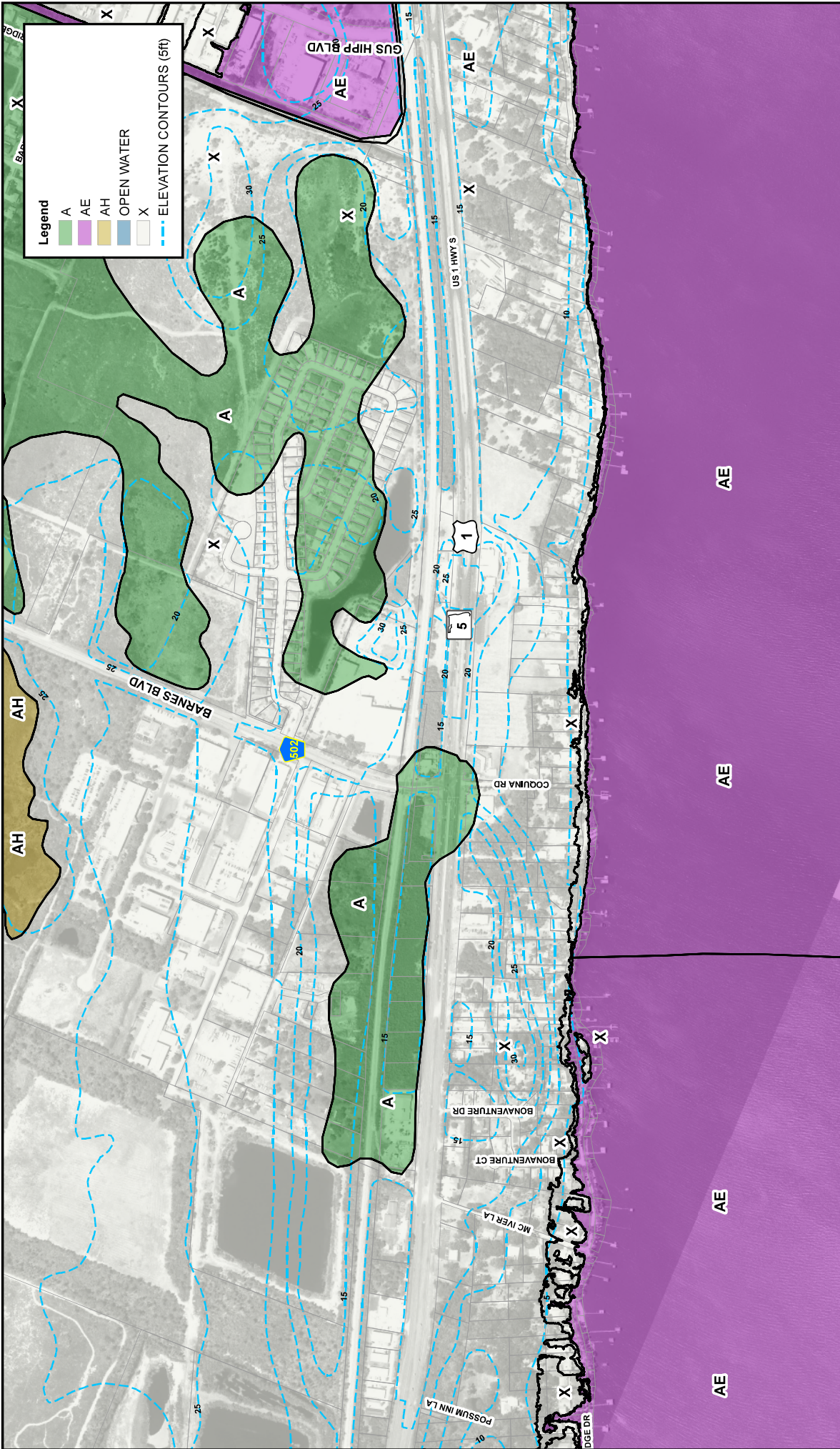


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FIGURE 7
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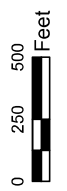


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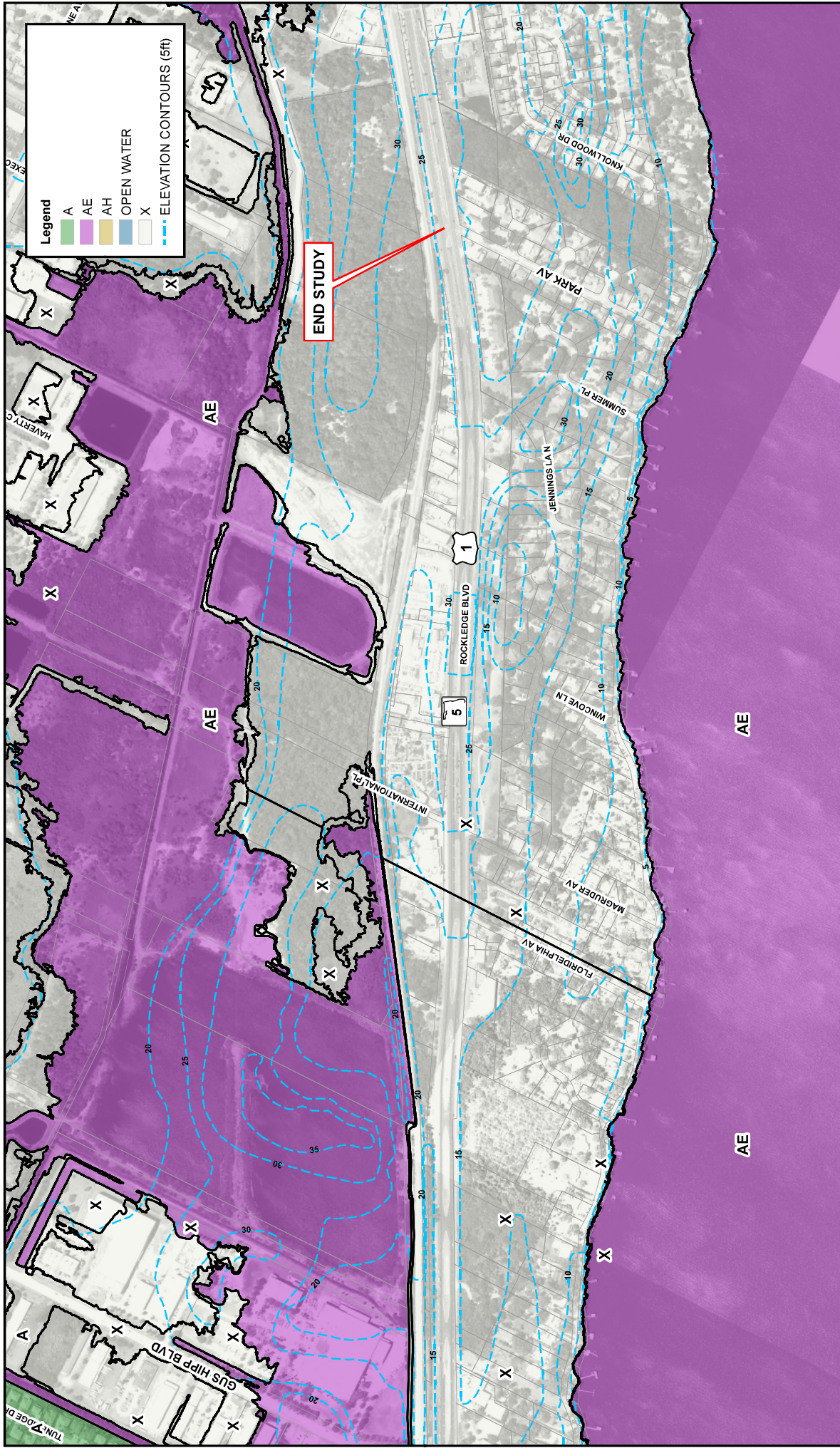
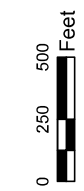
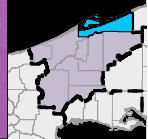


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6.8. Structures

There are no bridges on this segment of US 1; cross drains and other minor structures are shown on the straight-line diagram listed in **Appendix B**.

6.9. Lighting / Aesthetics

Lighting and aesthetic features are not present on the corridor in the existing condition. The grassed medians provide opportunities for landscaping / aesthetic features.

6.10. Existing Traffic Data and Characteristics

The following intersections were identified as the study area intersections:

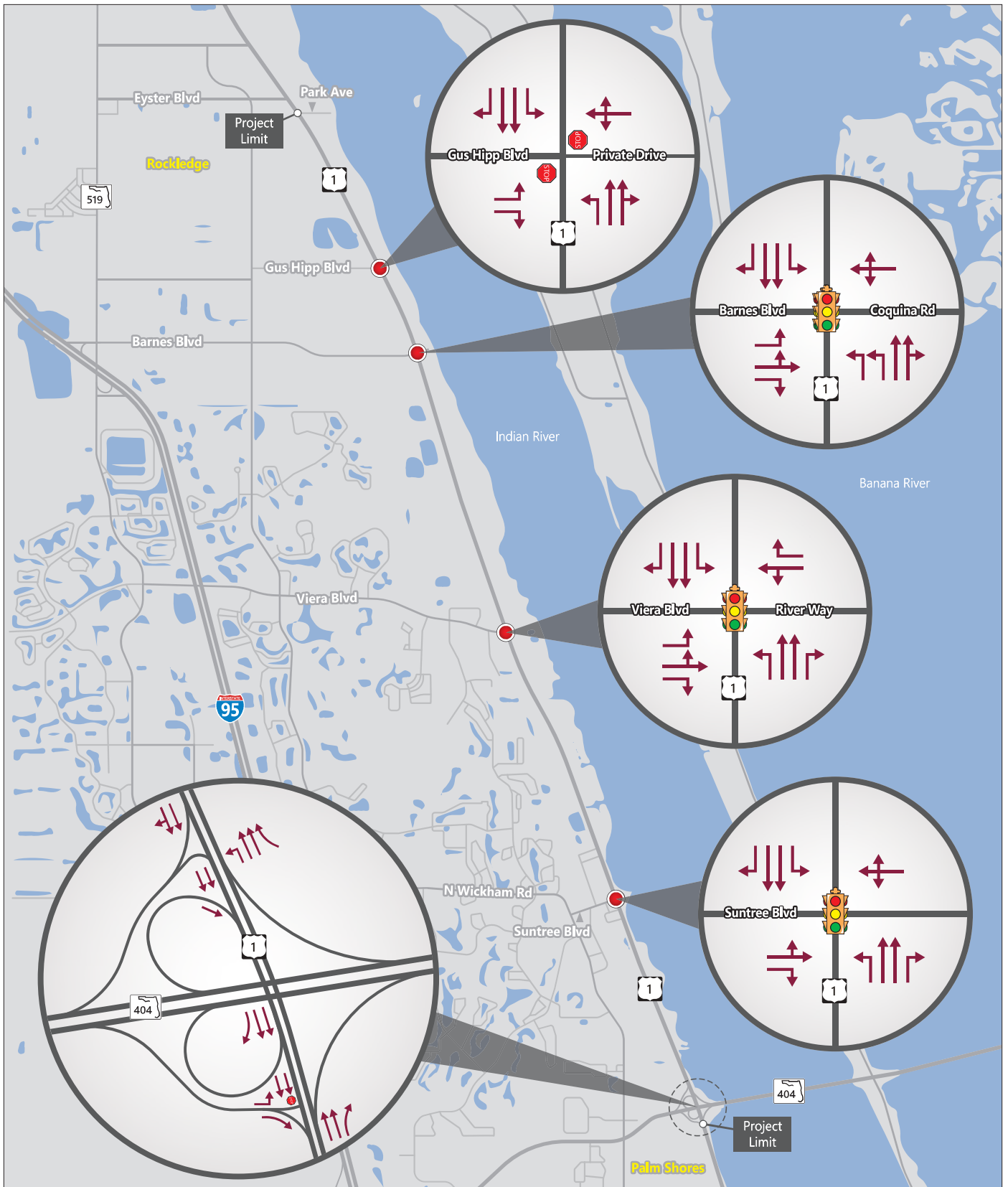
- US 1 at SR 404 eastbound off ramp (unsignalized)
- US 1 at SR 404 westbound on ramp (unsignalized)
- US 1 at Suntree Boulevard (signalized)
- US 1 at Viera Boulevard/River Way (signalized)
- US 1 at Barnes Boulevard/Coquina Rd (signalized)
- US 1 at Gus Hipp Boulevard (unsignalized)

The existing intersection geometries for each of these intersections are provided in **Figure 8**.

Existing traffic counts were collected in February of 2019 in the study area. Roadway volume counts were collected with 24-hour bi-directional tube counts at the following locations:

- US 1 south of Roberts Road (south of SR 404 interchange)
- US 1 northbound ramp to SR 404 eastbound
- SR 404 westbound loop to US 1 southbound
- US 1 southbound loop to SR 404 eastbound
- SR 404 westbound ramp to US 1 northbound
- US 1 south of Anderson Way
- US 1 north of Compass Drive
- US 1 north of Carver Road
- US 1 between Barnes Boulevard and Gus Hipp Boulevard
- US 1 north of Magruder Avenue

Weekday turning movement counts were collected at the study area intersection or the AM (7:00 – 9:00 AM) and PM (4:00 – 6:00 PM) peak hours. Count data is shown on **Figure 9** and in **Appendix D**.



→ Lane Geometry



Signalized Intersection



Stop-Controlled Intersection



Figure 8

Intersection Geometry

6.11. Existing Operational Analysis (LOS)

Existing 2019 operational analyses were conducted to determine the Level of Service (LOS) for the roadway segments and the study corridor intersections. Peak hour peak direction volumes along the different segments were compared against the latest Generalized Peak Hour Directional Service Volumes Tables from the 2013 FDOT Quality/Level of Service Handbook to obtain the arterial LOS. The LOS for the study area intersections were determined using the procedures as outlined in the Transportation Research Board’s (TRB) – Highway Capacity Manual (HCM 2000 and HCM 6th) using Synchro Software (version 10.0). The LOS for the ramps and merge/diverge points on the interchange with SR 404 (Pineda Park Causeway) were determined using HCS 2010 software.

6.11.1. Roadway Operational Analysis

According to FDOT, the study corridor is classified as an “urban principal arterial other” and has an adopted LOS “D”. The generalized Annual Average Daily Traffic service volumes were taken from Table 1 of the 2013 FDOT Quality/Level of Service Handbook, and the generalized peak hour directional service volumes for the LOS letters “A” through “F” were obtained from Table 7 of the same. These were compared with volumes collected from the 24-Hour bi-directional tube counts. A summary of the LOS analysis for the study roadways is included in **Table 3**.

Table 3
Existing Roadway Level of Service for US 1

Segment	Daily		AM Peak (Peak Direction)		PM Peak (Peak Direction)	
	AADT*	LOS	Volume	LOS	Volume	LOS
Madrid Drive to SR 404	40,000	C	2,160	C	2,120	C
SR 404 to Suntree Boulevard	36,000	C	1,810	C	1,980	D
Suntree Boulevard to Viera Boulevard	31,000	C	1,660	C	1,690	C
Viera Boulevard to Barnes Boulevard	27,000	C	1,290	C	1,440	C
Barnes Boulevard to Gus Hipp Boulevard	27,000	C	1,440	C	1,380	C
Gus Hipp Boulevard to Park Avenue	26,000	C	1,350	C	1,350	C

*2013 FDOT Quality/Level of Services Handbook Tables

*AADT = Collected 24-hour count × Seasonal Factor (0.89) × Axle Factor (0.99)

As shown in **Table 3**, all roadway segments within the study area operate within acceptable LOS limits. **Figure 9** illustrates the existing arterial LOS conditions.

6.11.2. Intersection Operational Analysis

To determine the year 2019 intersection LOS, the turning movement counts (TMCs) collected in the field were applied to the existing geometry. Using Synchro 10.0, HCM 6th Edition, analysis was conducted for the intersections with Suntree Boulevard and Gus Hipp Boulevard. HCM 2000 analyses were conducted at Barnes Boulevard and Viera Boulevard due to the non-standard signal timing implemented at these intersections.

According to the HCM Methodology, for signalized intersections, an average control delay per vehicle from 55 seconds up to 80 seconds is considered a LOS E condition. Beyond 80 seconds is considered a LOS F condition. For unsignalized intersections, LOS E includes delays from 35 to 55 seconds, and anything longer than 55 seconds is considered LOS F. **Table 4** below gives a summary of the existing LOS for the study intersections, each value reported for v/c and delay is based on the intersection as a whole.

Table 4
Existing Intersection Level of Service

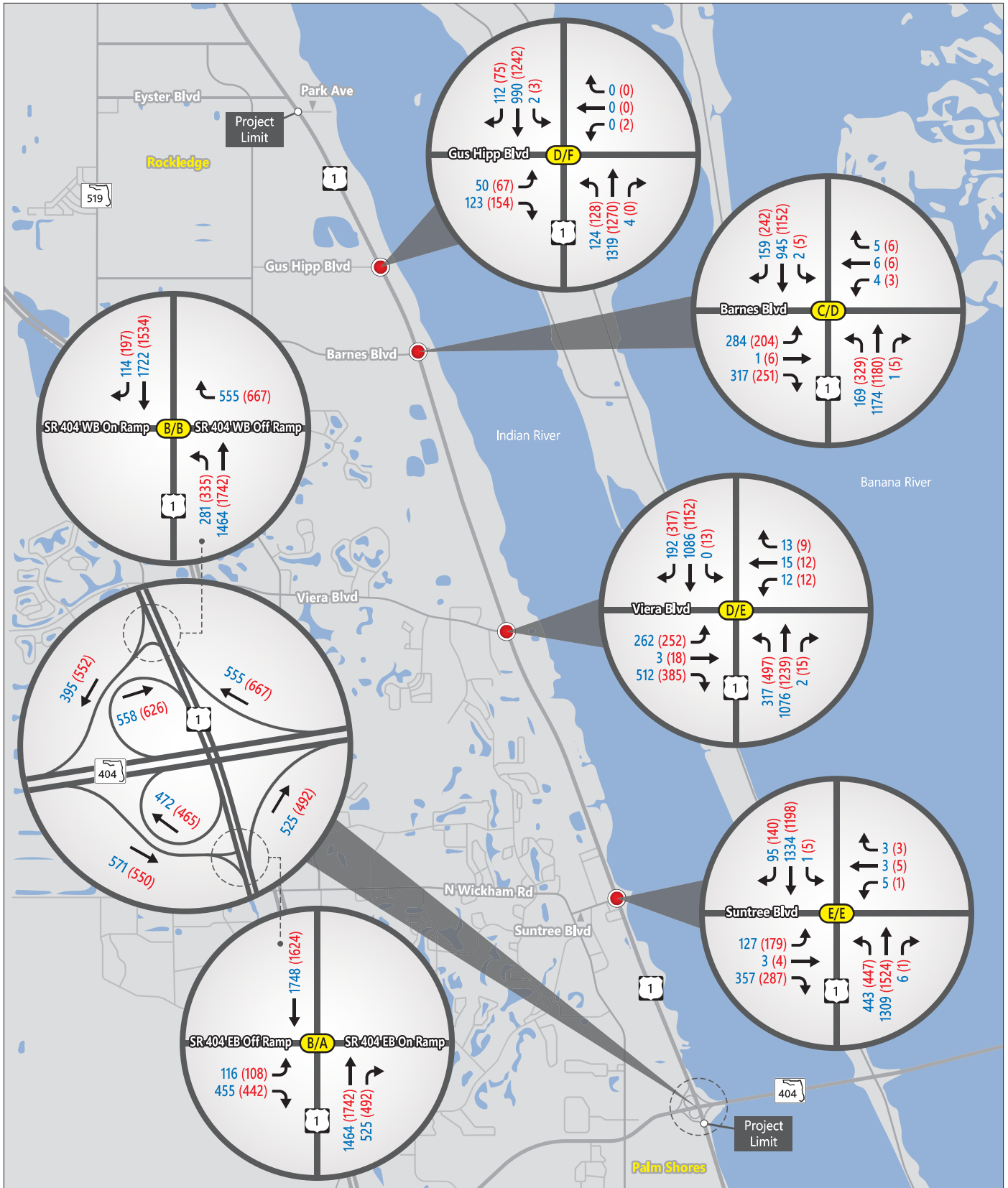
Intersection	Intersection Control Type	2019 AM Peak Hour			2019 PM Peak Hour		
		v/c	Delay*	LOS	v/c	Delay*	LOS
US 1 @ Suntree Boulevard	Signalized	-	66.1	E	-	79.8	E
US 1 @ Viera Boulevard	Signalized	0.8	51.3	D	1.0	74.2	E
US 1 @ Barnes Boulevard	Signalized	0.7	28.4	C	0.8	44.5	D
US 1 @ Gus Hipp Boulevard	Stop Controlled	-	32.9	D	-	103.3	F

*Delay is measured in seconds per vehicle.

Note: For the intersections of Suntree Boulevard and Gus Hipp Boulevard, the v/c for the overall intersection is not calculated in HCM 6th Edition.

As shown above, all intersections operate at acceptable LOS conditions in the AM peak hour – the intersection at Suntree Boulevard, however, does operate below the target LOS of ‘D’. During the PM peak hour, the Barnes Boulevard intersection meets the target LOS standard. The Suntree Boulevard and Viera Boulevard intersections do not meet the target LOS but do operate acceptably, and the Gus Hipp Boulevard intersection operates at a failing LOS. The reason for the long delay reported at Gus Hipp Boulevard is primarily due to the left-turning traffic from the side streets.

The existing intersection operations and volumes are illustrated in **Figure 10**. The Synchro summary sheets are provided in **Appendix D**.



- A/A Intersection LOS
- Traffic Movement
- AM (PM) Peak Hour Traffic Volumes



Figure 10

Existing Peak Hour Traffic Volumes & Intersection Level of Service (LOS)

6.11.3. Interchange Analysis

The merge and diverge points at the interchange at SR 404 (Pineda Park Causeway) were analyzed using HCS 2010 software. Synchro 10.0, using HCM 6th Edition, was used to analyze the southern intersection formed by US 1 and the eastbound SR 404 exit ramp (node 10) and the northern intersection between US 1 and the westbound SR 404 entry ramp (node 1). **Table 5** below shows the calculated LOS for each merge/diverge point on the interchange. **Figure 11** shows the labeled interchange nodes corresponding to the first column of **Table 5**.

Figure 11
US 1 at SR 404 Interchange



Table 5
Existing Interchange Level of Service

Node	Location on Interchange	Ramp Description	AM		PM	
			Density*	LOS	Density*	LOS
1	North	US 1 Southbound Off-Ramp	19.5	B	16.1	B
2	North	US 1 Northbound On-Ramp	24.1	C	25.8	C
3	West	SR 404 Westbound On-Ramp	14.4	B	19.1	B
4	West	SR 404 Eastbound Off-Ramp	18.6	B	17.5	B
5	Center	SR 404 Westbound Off-Loop	15.7	B	19.8	B
6	Center	SR 404 Eastbound On-Loop	16.3	B	15.5	B
7	Center	US 1 Southbound Weaving Section	17.2	B	16.5	B
8	East	SR 404 Westbound Off-Ramp	19.5	B	24.6	C
9	East	SR 404 Eastbound On-Ramp	25.2	C	23.1	C
10	South	US 1 Northbound Off-Ramp	9.3	A	11.3	B

*Density = passenger cars/mile/lane

As can be seen in the above table, each ramp operates at an acceptable level of service both during the AM and PM peak hour. HCS output sheets are provided in **Appendix D**.

The intersections at the north and south points (nodes 1 and 10) of the interchange were analyzed using the procedures in HCM 6th Edition using Synchro Software (version 10.0). In analyzing these intersections, the primary focuses were as follows:

- US 1 @ SR 404 westbound entry ramp (node 1): Northbound left turn movement.
- US 1 @ SR 404 eastbound exit ramp (node 10): Eastbound left turn movement.

Table 6 below gives a summary of the existing LOS for the analyzed movements and the intersections overall. As shown in the table, the analyzed movements are over capacity to varying degrees in both the AM and PM peak hour conditions, with delays lasting anywhere from ~2.5 to ~4.5 minutes. The intersections overall, however, operate at acceptable LOS for both the AM and PM peak conditions.

Table 6
Interchange Intersections Existing Level of Service

Intersection	Movement	2019 AM Peak Hour			2019 PM Peak Hour		
		v/c ¹	Delay ²	LOS ³	v/c ¹	Delay ²	LOS ³
US 1 @ SR 404 EB Exit	EBL	1.31	269.2	F	1.06	171.5	F
	<i>Overall</i>	-	10.2	<i>B</i>	-	5.8	<i>A</i>
US 1 @ SR 404 WB Entry	NBL	1.21	161.6	F	1.18	142.2	F
	<i>Overall</i>	-	11.9	<i>B</i>	-	12.4	<i>B</i>

1) Volume to Capacity Ratio (Maximum v/c for approach); 2) Average delay in seconds per vehicle; 3) Level of Service; 4) HCM 2000 based Synchro 10 results are reported; 5) HCM 6th Edition does not provide a value for overall intersection v/c

6.12. Crash Data

6.12.1. Crash Data

Crash data was obtained using Signal4 Analytics and Crash Analysis Reporting System (CARS) for the previous five years (January 01, 2014 to December 31, 2018) along US 1 from south of the interchange with SR 404 (Pineda Park Causeway) to Park Avenue and along SR 404 from west of the interchange to east of the interchange with US 1. The collected data was checked for any duplicates, if any were found then the Signal4 Analytics results were deferred to. The following sections provide highlights about the crash data.

6.12.2. US 1 Total Crashes

Along US 1 a total of 829 crashes, 315 of those resulting in injuries and 9 resulting in fatalities, were reported over the five-year period within the study area, as illustrated in the following tables and figures.

Table 7 provides a general summary of the crashes along the project corridor, including information on fatalities, injuries, night crashes, and wet condition crashes. 2018 was the year with the overall highest number of crashes, while 2016 had the most fatal crashes. Overall, the numbers of night crashes and wet condition crashes have remained stable over the past five years. **Figure 12** provides a visualization of the summary of crash data based on the project segments and intersections.

Table 7
Crash Data Summary by Year

Year	Total Number of Crashes	Number of Injury Crashes	Total Number of Injuries	Number of Fatal Crashes	Total Number of Fatalities	Number of Night Crashes	Number of Wet Crashes
2014	150	56	84	1	1	25	31
2015	176	69	107	1	1	33	34
2016	167	72	122	6	6	28	31
2017	158	54	73	0	0	27	30
2018	178	64	123	1	1	32	32
Total	829	315	509	9	9	145	158
<i>Average</i>	165.8	63	101.8	1.8	1.8	29	31.6
<i>Percent</i>	-	38%	-	1%	-	17%	19%

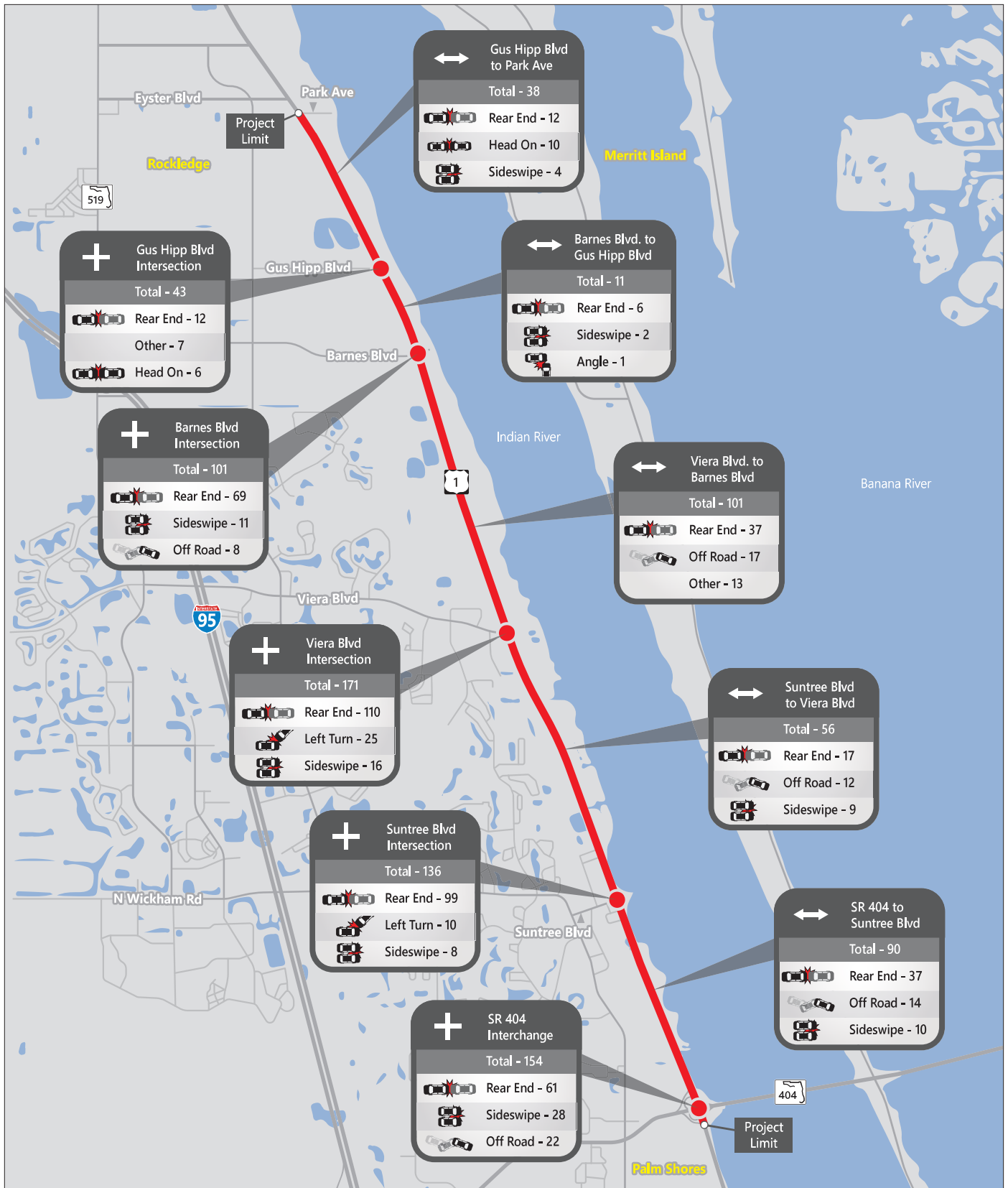


Figure 12
Crash Locations and Types