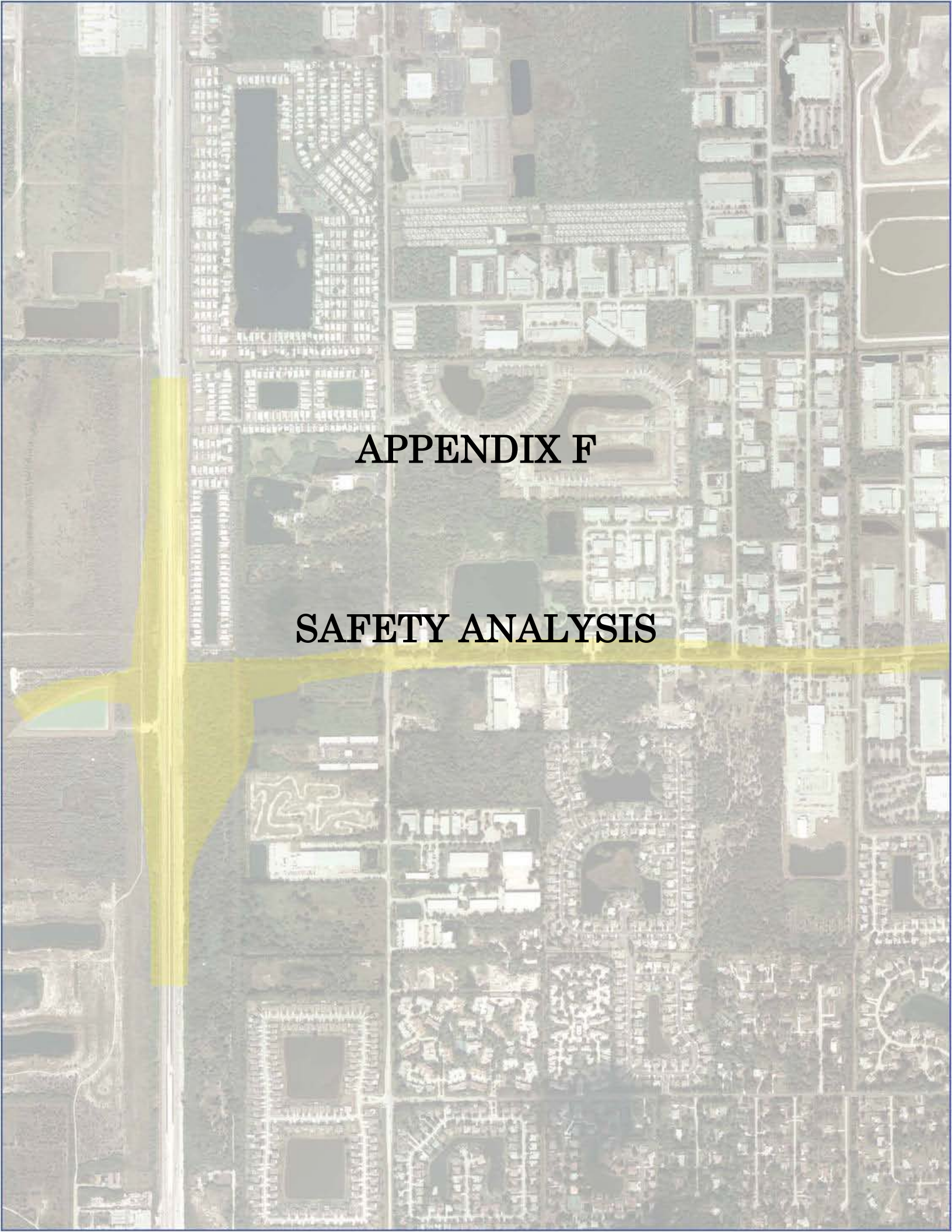

APPENDIX F

SAFETY ANALYSIS

SAFETY ANALYSIS

I-95 / Ellis Road Interchange and
Ellis Road from I-95 to Wickham Road (CR 509)
Project Development & Environment Study

Brevard County, Florida

Financial ID No. 426905-1-22-01

Federal Aid No. SFT1251R

Prepared For:

The Florida Department of Transportation, District 5

Prepared By:

RS&H
IMPROVING YOUR WORLD

January 2013

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A Safety Analysis was performed as part of the I-95 at Ellis Road Project Development and Environment Study. The following report describes the methodology, the analysis, and the conclusions.

1.1 Crash Data

Ellis Road

Crash data for Ellis Road was collected from Brevard County and was analyzed for the years 2005, 2006, 2007, 2008 and 2009. The data received was in the form of field police reports of each accident. Data contained in the police reports included date, time, type of crash, roadway and lighting conditions, site location, contributing cause, vehicular maneuvers, direction of travel, number of injuries and fatalities, and number of vehicles involved. Crashes were analyzed on Ellis Road from John Rodes Boulevard to Wickham Road. Ellis Road is not a state road, and therefore no milepost data is given. Sixty-four crashes were analyzed for the five-year period. Crashes on John Rodes Boulevard and Wickham Road that were within the Ellis Road intersection limits were included in the analysis. An important point to note is that the crashes in this study period occurred prior to the completion of recent intersection improvements at John Rodes Boulevard and Wickham Road, including a realignment of NASA Boulevard.

No crashes occurred for the months of July 2007 through July 2008. Brevard County was contacted and asked to verify that there were no crashes in this time frame. The County confirmed they have no records of crashes within this time period.

The City of Melbourne Police Department was also contacted via phone on March 21, 2011 regarding crash reports for years 2007, 2008, and 2009. The records manager indicated that the only crash records available were along John Rodes Boulevard. The Ellis Road and John Rodes Boulevard intersection is not included in the City of Melbourne's jurisdiction. The records manager suggested that the City of West Melbourne be contacted. The City of West Melbourne was contacted by phone on March 22, 2011 and noted that any crash data would have to be obtained through a records request by e-mail. Multiple e-mail requests for crash records were unsuccessful in obtaining additional crash data.

I-95

Crash data for I-95 was collected from the Department of Transportation and was analyzed for the years 2005, 2006, 2007, 2008 and 2009. The data was received in the form of a Crash Analysis Reporting System (CARS) document. The data included milepost, date, time, lighting condition, weather, road surface, vehicle direction, contribution cause, vehicle movement, number of injuries and fatalities, and vehicles involved. Crashes were analyzed from the north gore of the I-95 / New Haven Avenue (SR 500) interchange to the south gore of the I-95 / Eau Gallie Boulevard (SR 518) interchange. This segment of I-95 comprises 2.408 miles between milepost 20.902 and 23.310. A total of ninety-three crashes were analyzed for the five-year period.

The following procedure was used to perform the analysis:

1. The crash data was received and entered into an Excel spreadsheet. The raw data was entered in order of crash date.
2. A second spreadsheet reordered the data into four segments: I-95, Ellis Road, and the two major intersections, John Rodes Boulevard and Wickham Road.
3. Two summary spreadsheets (Tables 1 and 2) were created to display the crash summary and crash characteristics per each segment. For intersections, the geographical area extended between the tapers of the turn lanes on each intersection approach.
4. Actual crash rates were calculated for each segment and compared to the state and district average crash rates.
5. Each crash was assigned a number, and collision diagrams were plotted on 11x17 sheets as shown on Figures 1A to 1I.

1.2 General Observations

After studying Tables 1 and 2 and the collision diagrams (Figure 1) at the end of this report, the following conclusions can be drawn:

Ellis Road

- Crashes per year decreased every year over the five years;
- Of the total 64 recorded crashes over five years, 59% were rear-end, followed by sideswipes at 13%;
- Of the crashes, 88% occurred in daylight and 89% occurred in dry conditions;
- Only three crashes occurred on Ellis Road that were outside the two intersection segments;
- Only one crash involved a single vehicle and the driver was cited for DUI;
- Collisions between automobiles and pickup trucks accounted for 99% of the crashes. One crash involved a medium or large truck, and no crashes involved motorcycles or bicycles;
- Of the crashes, 76% were in the same direction, 10% in the opposite direction, and 14% in a perpendicular direction;
- The majority of crashes reporting a contributing cause were due to careless driving or failure to yield;
- Out of 64 crashes involving 139 drivers, 12 people (9%) were injured, and there were no fatalities;
- There was one head-on crash at the Wickham Road intersection. There were no injuries;
- One crash involved a DUI;
- Most of the crashes (84%) occurred in the Wickham Road intersection segment;
- There were a significant number of left turn crashes at Wickham Road;
- There were several rear-end crashes in the southbound direction just south of the South Wickham Road intersection. These crashes appear to indicate that the NASA Boulevard intersection traffic is queuing into the Ellis Road intersection;
- The John Rodes Boulevard segment and Ellis Road segment are both below the State and District crash averages, with a 1.59 mile section of Ellis Road showing 3 crashes in 5 years;

- Five crashes at the Wickham Road intersection segment were removed for actual crash rate calculations due to the police report determining that they were not influenced by the intersection. Four of these crashes were side swipes and the other one was a DUI;
- Three southbound rear-end crashes just south of Ellis Road on Wickham Road were within the limits of the segment. However, they may have been caused more by the close proximity of the NASA Boulevard intersection than the Ellis Road intersection.

The high percentage of multi-vehicle crashes, coupled with the "careless driving" and "failure to yield" contributing causes, suggests that driver inattention is responsible for the majority of the crashes. The relatively low percentage of injuries also suggests that the speed is low in these angle and rear end crashes.

I-95

The following observations can be made regarding the I-95 crashes:

- The average number of crashes for the first four years was 14.25;
- There were 36 crashes in 2009, more than double any other year;
- Of the crashes, 63% occurred in daylight and 73% occurred in dry conditions;
- Eleven accidents involved drugs or alcohol;
- Collisions between automobiles and pickup trucks accounted for 96% of the crashes. Two crashes involved medium or large trucks, and two involved motorcycles;
- 31% of the crashes involved single vehicles including eight overturns;
- Out of 184 drivers, 107 (65%) were injured and there were 7 (4%) fatalities;
- Rear end crashes were the most common at 27% and careless driving was the most common contributing factor;
- The crashes were clustered at four locations:
    - Near the northern end of the ramp erminals at New Haven Avenue;
    - Approximately ½ mile north of these ramp terminals;
    - Approximately ½ mile north of the location where Ellis Road would cross I-95;
    - Near the southern end of the ramp terminals at Eau Gallie Boulevard;

- A number of the crashes are rear end or related to vehicles striking objects beyond the roadway;
- Crashes increased dramatically after March 2009.

Ellis Road

The first two segments, Johns Roads Boulevard Intersection and Ellis Road, are well below the average crash rate for both the State and the District. The last segment, the Wickham Road intersection, had a notably higher crash rate than both the State and District crash rate. During the time that the crashes were reported, the NASA Boulevard intersection was located roughly 700 feet to the south. Traffic from this intersection queued into the Ellis intersection causing rear-end crashes for vehicles traveling south. In addition, the McDonalds entrance, located just north of the Ellis Road intersection, likely contributes to crashes in this location.

The crash data evaluated in the 2005 to 2009 time period does not reflect the completion of the NASA Boulevard realignment at the east end of the project. Fortunately, the completed realignment of NASA Boulevard and improved signalization will improve overall safety at this intersection.

1.3 Comparison of Actual and Statewide Crash Rates

Table 1 includes a tabulation of actual versus statewide crash rates for each segment and major intersection. The following definitions explain the concepts involved in the computations:

- **5-Year VMT** – 5-year vehicles miles traveled = length x AADT x 365 x 5 years
- **Actual Crash Rate** - The number of reported crashes per million vehicle miles (MVM) for segments or per million entering vehicles for intersections.

  For segments,

$$\text{Actual Crash Rate} = \frac{\text{5-year crash total}}{\text{5-year VMT / 1,000,000 miles}} = \frac{\text{1,000,000 miles x 5-year crash total}}{\text{5-year VMT}}$$

For intersections,

$$\text{Actual Crash Rate} = \frac{\text{5-year crash total x 1,000,000}}{\text{(No. years of study period) x (365 days/yr) x (No. of entering vehicles)}}$$

Where No. of entering vehicles = Σ Approach AADT/2

The AADT values for each segment are obtained from the design traffic technical memorandum, which uses 2010 as the base year. To approximate the annual vehicle miles traveled, these AADT values were assumed for all 5 years of the study period. A more accurate VMT computation requires specific AADT values for each roadway segment per each year of the study period.

Table 1 displays a comparison of the actual versus statewide crash rates. Ellis Road is classified as urban minor arterial, while I-95 is a rural interstate. Although Ellis Road is not a state route, statewide crash rates based on an urban segment are used for comparison. Ellis Road shares similar speed and traffic characteristics to a two-lane urban state roadway. For comparison with actual crash rates, the following average statewide and district crash rates were used (based on historical rates between 2004 and 2008):

- Urban segment, 2-3 lane, 2 way, undivided – 3.452 (statewide avg.); 2.196 (district avg.);
- Urban 3-leg intersection, 2-3 lane, 2 way, undivided – 0.237 (statewide avg.); 0.150 (district avg.);
- Urban 3-leg intersection, 4-5 lane, 2 way, divided, Paved – 0.313 (statewide avg.); 0.197 (district avg.);
- Interstate rural – 0.339 (statewide avg.).

Five crashes at the Wickham Road intersection segment were removed for actual crash rate calculations due to the police report determining that the motorists were not influenced by the intersection. Four of these crashes were side swipes, which a single crash involved alcohol.

The first two segments, Johns Roads Boulevard Intersection and Ellis Road, are below the average crash rate for both the state and the district. The last segment, the Wickham Road

intersection, had a notably higher crash rate (0.876) than both the State (0.313) and District (0.197) crash rates. The NASA Boulevard intersection is approximately 700 feet to the south. Traffic from this intersection queues into the Ellis intersection, thereby causing rear-end crashes for southbound vehicles. The proximity of the McDonalds entrance to the intersection likely contributes to the number of crashes of vehicles leaving this driveway. The collision diagrams also demonstrate the frequency of left turn crashes emanating from Ellis Road. The completed re-alignment of NASA Boulevard is expected to improve the operational characteristics and reduce crashes at this intersection.

1.4 Discussion of Collision Diagrams

Using the collision diagrams in conjunction with Tables 1 and 2, a number of crash clusters and patterns can be observed. The following conclusions can be drawn:

- Crashes along the Ellis Road corridor are grouped into two general locations – the intersections with John Rodes Boulevard on the west end and Wickham Road on the east end;
- In examining the collision diagram, the majority of crashes at the Wickham Road intersection are rear end. Ten rear end crashes occurred in the eastbound direction, 16 in the southbound direction, and 8 in the northbound direction;
- Sideswipe, head-on, angle, and left / right turning crashes accounted for 20 crashes at Wickham Road;
- There are several southbound rear-end crashes just south of the Wickham Road intersection. These crashes suggest that the NASA Boulevard intersection traffic queues into the Ellis Road intersection;
- Three southbound rear-end crashes just south of Ellis Road on Wickham Road were within the limits of the segment but are likely caused by the close proximity of the NASA Boulevard intersection rather than the Ellis Road intersection;

I-95

- Crashes are clustered in four general locations:
    - Near the northern end of the ramp terminals at New Haven Avenue;
    - Approximately ½ mile north of these ramp terminals;

- Approximately ½ mile north of the location where Ellis Road would cross I-94;
- Near the southern end of the ramp terminals at Eau Gallie Boulevard;

- A number of the crashes are rear end or related to vehicles striking objects beyond the roadway;

1.5 Impact of Multi-Lane Divided Roadway on Crashes

Wickham Road intersection segment accounted for 84% of the crashes. Of the 54 crashes at Wickham Road, 31 involved rear end movements. As part of the NASA Boulevard realignment, a portion of Ellis Road was also reconstructed as a four lane facility in the vicinity of the intersection. Extending a four lane section on Ellis Road west to I-95 would be expected to further reduce the number of rear-end crashes on Ellis Road.

Expanding Ellis Road to a 4-Lane divided roadway will accomplish the following.

- Enable Ellis Road to accommodate the amount of traffic that an interchange at I-95 will bring;
- Two lanes in each direction will allow through vehicles to bypass vehicles slowing for turns, thereby reducing potential rear-end crashes.
- A 22-foot-wide or larger median will provide channelization for left-turning vehicles. Currently, no channelization exists.
- Although no incidents involving pedestrians or cyclists were recorded during the 5-year crash history, dedicated facilities for cyclists and pedestrians such as bicycle lanes and sidewalks will further improve safety. There are no provisions for cyclists and pedestrians on the existing roadway.

1.6 Conclusions and Recommendations

Ellis Road

The intersection at John Rodes Boulevard and the roadway segment between this intersection and Wickham Road are below the average crash rate for both the state and the district. The last segment, the Wickham Road intersection, had a higher crash rate than both the state and district crash rates. As mentioned above, the NASA Boulevard

intersection was located roughly 700 feet south of Ellis Road during this reporting period, allowing traffic from this intersection to queue into the Ellis Road intersection. The close proximity of these intersections caused numerous rear-end crashes for vehicles traveling south and contributed to the overall high crash rate at this location.

I-95

An examination of Table 3 reveals that crashes for the years 2005, 2006, 2007, and 2008 totaled 12, 11, 16, and 18, respectively. The crashes increased significantly to 36 in 2009, when widening for I-95 began in the spring of 2009. This increase in crashes can likely be attributed to the construction project and the resulting change in traffic patterns.

The segment of I-95 between the New Haven Avenue (SR 518) intersection and Eau Gallie Boulevard (SR 500) intersection has no horizontal curves and is relatively flat. Despite the significant increase in crashes in 2009, the actual crash rate (0.321) is still below the statewide crash rate (0.480).

In summary, the safety analysis demonstrates that existing I-95 and Ellis Road appear to operate relatively safely, with the exception of the Wickham Road intersection. Since the crash history analyzed as part of this study does not reflect the NASA Boulevard realignment, the intersection at Wickham road is expected to improve and may experience additional improvement if Ellis Road is extended westward as a multi-lane roadway. The introduction of an interchange along I-95 is not anticipated to cause safety concerns based on the existing crash history and existing roadway geometry of I-95.

Table 1 – Ellis Road Crash Analysis Summary

	Length (Miles)	Land Use Type	Year					Accident Type									Lighting Condition					Actual vs. State & District-wide Crash Rates							
			2005	2006	2007	2008	2009	Unknown	Rear-End	Head-On	Angle	Left-Turn	Right-Turn	Sideswipe	utility pole	All Other	Total	Daylight	Dusk	Dawn	Dark - St. Light	Dark - No St. Light	Ellis Road AADT	North Leg 2009 AADT	South Leg 2009 AADT	Per Segment 5-Year VMT	Per Intersection No. of Vehicles	Actual Crash Rate	State-wide Crash Rate	District-wide Crash Rate
Intersection - John Rodes Blvd	***0.04***		**2**	**2**	**3**	**0**	**0**	**0**	**4**	**0**	**1**	**2**	**0**	**0**	**0**	**0**	**7**	**7**	**0**	**0**	**0**	**0**	5,900	9,900	9,900		28,835,000	0.035	0.237	0.150
Percent of segment total	*2%*	**Industrial**	*29%*	*29%*	*43%*	*0%*	*0%*	*0%*	*57%*	*0%*	*14%*	*29%*	*0%*	*0%*	*0%*	*0%*	*100%*	*100%*	*0%*	*0%*	*0%*	*0%*								
Segment - Ellis Rd	***1.59***	**Industrial**	**2**	**1**	**0**	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**2**	**1**	**0**	**0**	**0**	9,450			27,421,538		0.109	3.452	2.196
Percent of segment total	*95%*		*67%*	*33%*	*0%*	*0%*	*0%*	*0%*	*100%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*100%*	*67%*	*33%*	*0%*	*0%*	*0%*								
Intersection - Wickham	***0.05***	**Commercial**	**21**	**11**	**7**	**9**	**6**	**2**	**31**	**1**	**4**	**5**	**2**	**8**	**1**	**0**	**54**	**47**	**0**	**0**	**4**	**3**	9,300	26,000	26,000		55,936,250	0.876	0.313	0.197
Percent of segment total	*3%*		*39%*	*20%*	*13%*	*17%*	*11%*	*4%*	*57%*	*2%*	*7%*	*9%*	*4%*	*15%*	*2%*	*0%*	*100%*	*87%*	*0%*	*0%*	*7%*	*6%*								
Grand-Totals	**1.68**		***25***	***14***	***10***	***9***	***6***	***2***	***38***	***1***	***5***	***7***	***2***	***8***	***1***	***0***	***64***	***56***	***1***	***0***	***4***	***3***								
			39%	22%	16%	14%	9%	3%	59%	2%	8%	11%	3%	13%	2%	0%	100%	88%	2%	0%	6%	5%								

Denotes crash rate exceeds statewide and district averages

5 crashes removed because crashes resulted from non-intersection factors

Table 2 – Ellis Road Crash Characteristics

	Length (Miles)	Land Use Type	Wet-Dry		Access-related			Vehicle Type					Direction			Fatalities / Injuries							Contributing Cause														Driver Manuevers							
			Wet	Dry	Intersection-Related	Non-Intersection Related	Driveway-Related	Automobile	Pickup Truck / Passenger Van	Motorhome	Medium-Large Truck	Motorcycle	Same Direction	Opposite Direction	Perpendicular directon	Drivers involved	Accidents involving alcohol / drugs	Fatalities	Accidents involving fatalities	Injuries	Accidents involving injuries	Multi-vehicle crashes	No improper Driving	Careless driving	Failure to yield / stop	Improper backing	Improper lane change	Followed to closely	Exceeded safe speed	Failure to maintain equipment	Improper passing	Improper load	Driver distraction	Straight ahead	Slowing / stopped	Making left turn	Making right turn	Changing lanes	Parking-related	U-turn	Passing
Intersection - John Rodes Blvd	**0.20**		**1**	**6**	**7**	**0**	**0**	**8**	**7**	**0**	**0**	**0**	**4**	**1**	**2**	**15**	**0**	**0**	**0**	**3**	**3**	**7**	**0**	**3**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**2**	**5**	**1**	**0**	**0**	**0**	**0**
Percent of segment total	*11%*	**Industrial**	14%	86%	100%	0%	0%	53%	47%	0%	0%	0%	57%	14%	29%		0%		0%		43%	100%																			
Segment - Ellis Rd	**1.68**	**Industrial**	**1**	**2**	**0**	**3**	**0**	**4**	**2**	**0**	**0**	**0**	**3**	**0**	**0**	**6**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**2**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**4**	**2**	**0**	**0**	**0**	**0**	**0**	**0**
Percent of segment total	*88%*		*33%*	*67%*	*0%*	*100%*	*0%*	*67%*	*33%*	*0%*	*0%*	*0%*	*100%*	*0%*	*0%*		*0%*		*0%*		*0%*	*100%*																			
Intersection - Wickham	**0.02**	**Commercial**	**5**	**46**	**47**	**6**	**1**	**63**	**54**	**0**	**1**	**0**	**41**	**5**	**7**	**118**	**1**	**0**	**0**	**9**	**6**	**53**	**1**	**18**	**21**	**0**	**10**	**3**	**0**	**2**	**0**	**0**	**1**	**63**	**31**	**7**	**9**	**4**	**0**	**0**	**0**
Percent of segment total	*1%*		10%	90%	87%	11%	2%	53%	46%	0%	1%	0%	77%	9%	13%		2%		0%		11%	98%																			
Grand-Totals			***7***	***54***	***54***	***9***	***1***	***75***	***63***	***0***	***1***	***0***	***48***	***6***	***9***	***139***	***1***	***0***	***0***	***12***	***9***	***63***	***1***	***23***	***25***	***0***	***10***	***4***	***0***	***2***	***0***	***0***	***1***	***74***	***35***	***12***	***10***	***4***	***0***	***0***	***0***
			11%	89%	84%	14%	2%	54%	45%	0%	1%	0%	76%	10%	14%		2%	0%	0%	9%	14%	98%																			

Note: Percentages for Vehicle Type, Driver Characteristics, and Driver Manuevers are based on total number of drivers and not crashes.

Table 3 – I-95 Crash Analysis Summary

	Length (Miles)	Land Use Type	Year					Accident Type																														Lighting Condition					Actual vs. State & District-wide Crash Rates							
			2005	2006	2007	2008	2009	Unknown	Rear-End	Head-On	Angle	Left-Turn	Right-Turn	Sideswipe	Backed into	Parked Car	mv on roadway	pedestrian	bicycle	Ran in ditch/culvert	animal	collision with post / gate	utility pole	guardrail	fence	ran off road into water	tree / shrub	fixed object	object on road	overturned	construction barricade	cargo loss or shift	hit concrete barrier wall	Coll. w/ fixed object above rroad	Separation of units	All Other	Total	Daylight	Dusk	Dawn	Dark - St. Light	Dark - No St. Light	I-95 AADT	East Leg AADT	West Leg AADT	Per Segment 5- Year VMT	Per Intersection No. of Vehicles	Actual Crash Rate	State-wide Crash Rate	District-wide Crash Rate
I-95 Between MP 20.905 to 23.310	**2.41**	**Interstate**	**12**	**11**	**16**	**18**	**36**	**3**	**25**	**1**	**6**	**0**	**0**	**11**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**2**	**1**	**0**	**1**	**1**	**8**	**0**	**6**	**8**	**1**	**0**	**8**	**0**	**0**	**8**	**93**	**59**	**0**	**0**	**1**	**33**	65,900			289,844,675		0.321	0.339	0.480
Percent of segment total			*13%*	*12%*	*17%*	*19%*	*39%*	*3%*	*27%*	*1%*	*6%*	*0%*	*0%*	*12%*	*1%*	*1%*	*1%*	*0%*	*0%*	*0%*	*0%*	*2%*	*1%*	*0%*	*1%*	*1%*	*9%*	*0%*	*6%*	*9%*	*1%*	*0%*	*9%*	*0%*	*0%*	*0%*	*9%*	*100%*	*63%*	*0%*	*0%*	*1%*	*35%*								

Table 4 – I-95 Crash Characteristics

	Length (Miles)	Land Use Type	Wet-Dry		Vehicle Type					Direction			Driver Characteristics								Contributing Cause												Driver Maneuvers					
			Wet	Dry	Automobile	Pickup Truck / Passenger Van	Motorhome	Medium-Large Truck	Motorcycle	Same Direction	Opposite Direction	Perpendicular directon	Drivers involved	Accidents involving alcohol / drugs	Fatalities	Accidents involving fatalities	Injuries	Accidents involving injuries	Multi-vehicle crashes	No improper Driving	Careless driving	Failure to yield / stop	Drove left of center	Improper lane change	Followed to closely	Exceeded safe / stated speed limit	Failure to maintain equipment	Improper passing	Improper load	Driver distraction	Straight ahead	Slowing / stopped	Changing lanes	Parking-related	U-turn	Passing
I-95 Between MP 20.905 to 23.310	**2.41**	**Interstate**	**24**	**68**	**89**	**47**	**0**	**2**	**2**	**60**	**4**	**0**	**184**	**11**	**7**	**5**	**107**	**60**	**64**	**16**	**42**	**2**	**1**	**13**	**1**	**13**	**4**	**0**	**1**	**0**	**114**	**18**	**19**	**2**	**1**	**1**
Percent of segment total	*0%*		26%	73%	48%	26%	0%	1%	1%	65%	4%	0%		12%		5%		65%	69%	9%	23%	1%	1%	7%	1%	7%	2%	0%	1%	0%	62%	10%	10%	1%	1%	1%

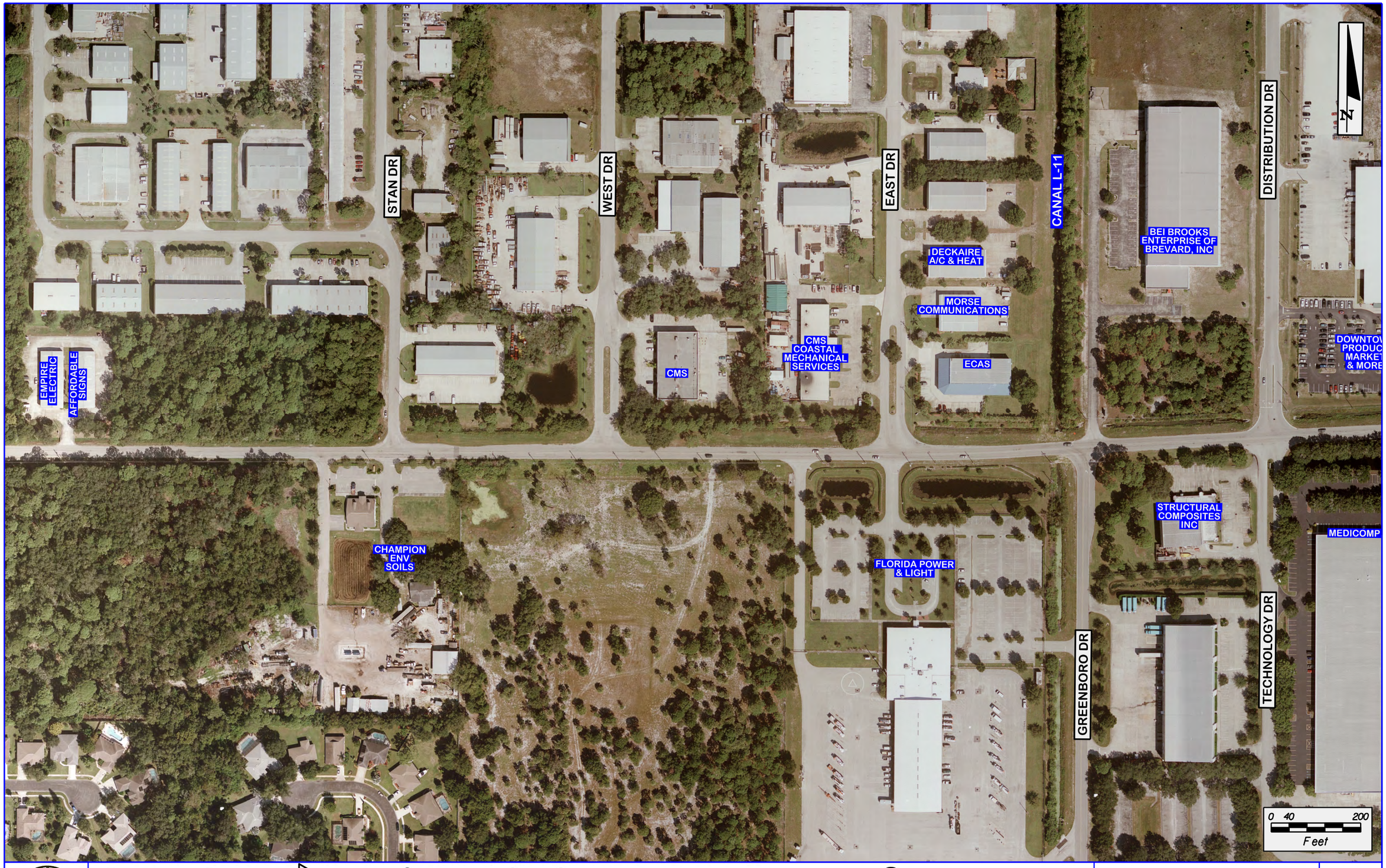
Note: Percentages for Vehicle Type, Driver Characteristics, and Driver Manuevers are based on total number of drivers and not crashes.

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

= DAY = NIGHT = 2005 = 2006 = 2007 = 2008 = 2009 = REAR END = HEAD ON = SIDESWIPE = TURNING

ELLIS RD PD&E STUDY
CRASH ANALYSIS

FIGURE NO.
1A



= DAY = 2005 = 2007 = 2009 = REAR END

= NIGHT = 2006 = 2008 = HEAD ON = SIDESWIPE = TURNING

ELLIS RD PD&E STUDY
CRASH ANALYSIS

FIGURE NO.
1B

= DAY = 2005 = 2007 = 2009 = REAR END

= NIGHT = 2006 = 2008 = HEAD ON = SIDESWIPE = TURNING

ELLIS RD PD&E STUDY
CRASH ANALYSIS

FIGURE NO.
1C

= DAY
= NIGHT
= 2005
= 2006
= 2007
= 2008
= 2009
= REAR END
= HEAD ON
= SIDESWIPE
= TURNING

ELLIS RD PD&E STUDY
CRASH ANALYSIS

FIGURE NO.
1D

= DAY = 2005 = 2007 = 2009 = REAR END

= NIGHT = 2006 = 2008 = HEAD ON = SIDESWIPE = TURNING

ELLIS RD PD&E STUDY
CRASH ANALYSIS

FIGURE NO.
1E

= DAY = 2005 = 2007 = 2009 = REAR END

= NIGHT = 2006 = 2008 = HEAD ON = SIDESWIPE = TURNING

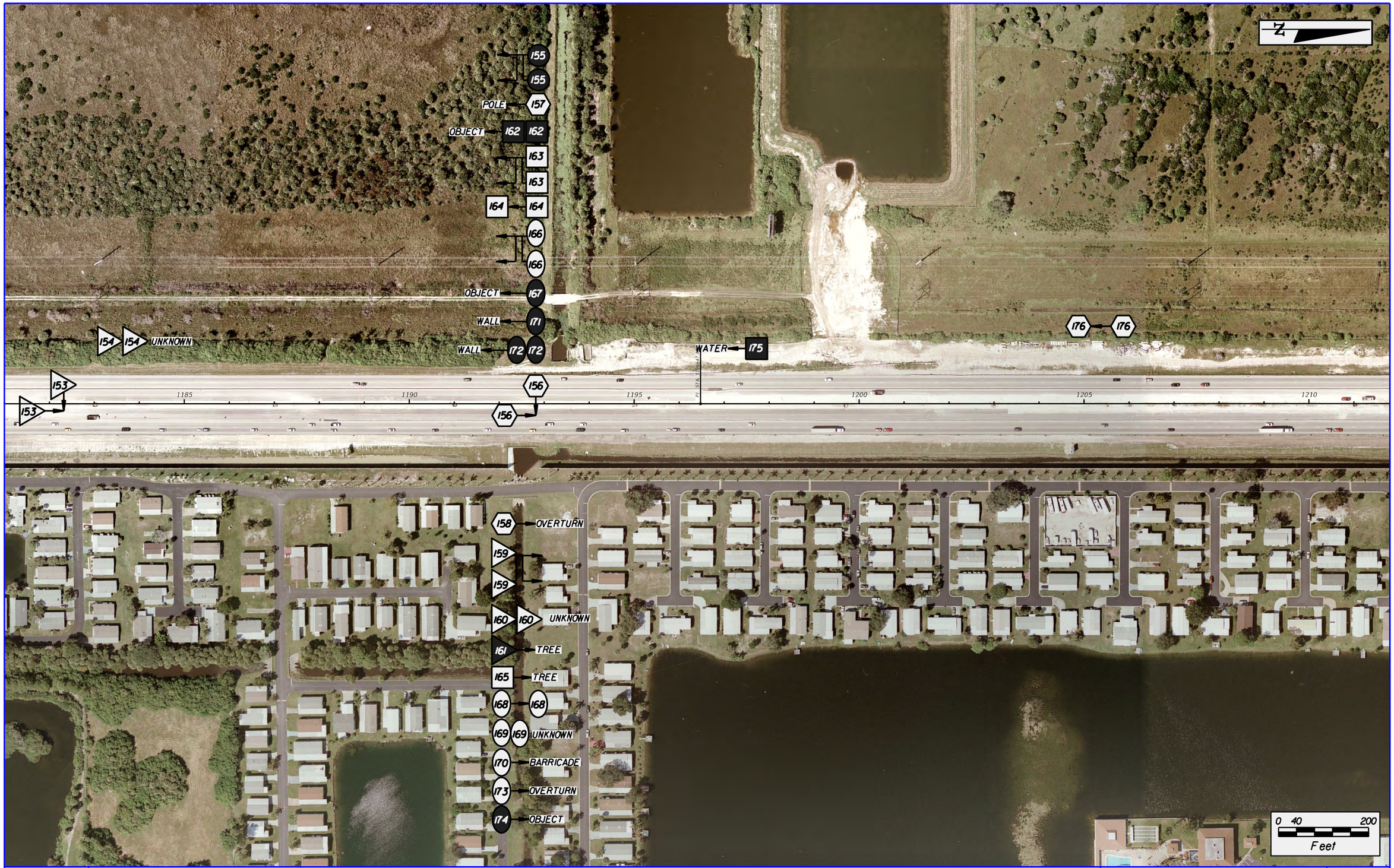
ELLIS RD PD&E STUDY
CRASH ANALYSIS

FIGURE NO.
1F

= DAY
= NIGHT
= 2005
= 2006
= 2007
= 2008
= 2009
= REAR END
= HEAD ON
= SIDESWIPE
= TURNING

ELLIS RD PD&E STUDY
CRASH ANALYSIS

FIGURE NO.
1G



= DAY = 2005 = 2007 = 2009 = REAR END

= NIGHT = 2006 = 2008 = HEAD ON = SIDESWIPE = TURNING

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FIGURE NO.
1H

N

0 40 200
Feet

= DAY
= NIGHT
= 2005
= 2006
= 2007
= 2008
= 2009
= REAR END
= HEAD ON
= SIDESWIPE
= TURNING

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FIGURE NO.
11