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TO: Corrina Gumm, File

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FROM: Clint Smith

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DATE: 2/9/2018

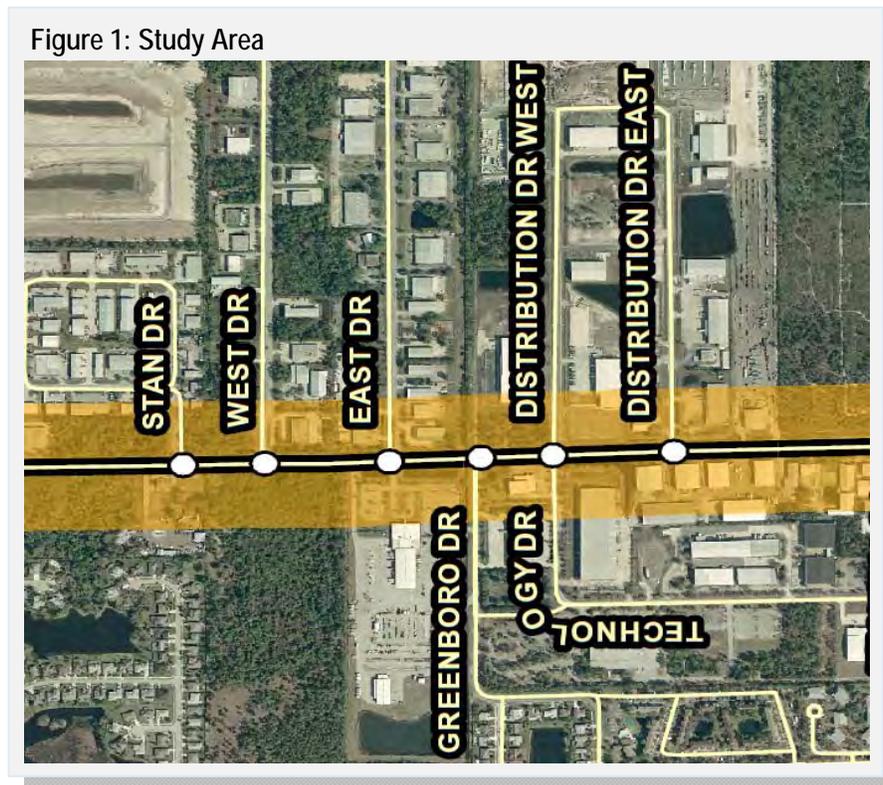
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SUBJECT: 426905-2-38-01 Ellis Road Widening: Additional Traffic Operational Analysis

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## PURPOSE

The purpose of this memorandum is to provide a summary of the Synchro operational analysis performed for various roadway layouts considered for Ellis Road. The focus area of this memorandum will be Ellis Road from Stan Drive to Distribution Drive East as shown in Figure 1 below.



## ANALYSIS PERFORMED

Three build roadway layouts were analyzed for comparing operational performance for various access arrangements for Design year 2034 conditions. Each of the build roadway layouts consider various access options at the study intersections as shown in Table 1 below. In addition, existing conditions analyses was performed using year 2015 peak hour volumes for the intersections of East Drive and Distribution Drive West. These results are documented in Table 2 of this memorandum.

Table 1: Build Roadway Layouts

<i>Build Roadway Layout</i>	Access Control Type - Ellis Road at:					
	Stan Drive	West Drive	East Drive	Greensboro Drive	Distribution Drive West	Distribution Drive East
<i>PD&amp;E Preferred Alternative</i>	Unsignalized Full Median Opening	Unsignalized RIRO	Signalized	Unsignalized RIRO	Unsignalized RIRO	Unsignalized Full Median Opening
<i>Design Option 1</i>	Unsignalized RIRO	Signalized	Unsignalized RIRO	Unsignalized RIRO	Unsignalized Full Median Opening	Unsignalized RIRO
<i>Design Option 2</i>	Unsignalized RIRO	Signalized	Unsignalized RIRO	Unsignalized RIRO	Signalized	Unsignalized RIRO

## OPERATIONAL ANALYSIS

### Peak Hour Traffic Development

Year 2015 peak hour volumes for two of the study intersections (Ellis Road at East Drive and Ellis Road at Distribution Drive West) were available from traffic counts conducted in February 2015 and were used for analysis of the existing conditions of these two intersections.

Design year 2034 peak hour volumes were obtained from Ellis Road PD&E study completed in 2011. Peak hour volumes for Build layouts for this task were developed as described below and are provided in Figure 2 – Design Year 2034: Ellis Road PD&E Preferred Alternative and Design Options 1 & 2 Peak Hour Volumes and Level of Service/Delay Comparison included in this memorandum:

1. PD&E Preferred Alternative: As obtained from Ellis Road PD&E Study
2. Design Option 1: Redistributed PD&E Preferred Alternative peak hour volumes to obtain 2034 AM (PM) peak hour volumes based on the changes in access control proposed in Design Option 1.
3. Design Option 2: Redistributed PD&E Preferred Alternative peak hour volumes to obtain 2034 AM (PM) peak hour volumes based on the changes in access control proposed in Design Option 2.

### Peak Hour Operational Analysis Methodology

Operational performance at the study intersections was assessed using Synchro 10 software. Measures of effectiveness (MOEs) include level of service (LOS), Delay (seconds per vehicle) and 95<sup>th</sup> percentile queue lengths.

### Existing Conditions 2015 Operational Analysis Summary

The intersection LOS, delay and 95<sup>th</sup> percentile queue results for the Existing Conditions 2015 for Ellis Road at East Drive and Ellis Road at Distribution Drive West intersections are summarized in Table 2. Existing conditions results show that both the intersections have side street approaches operating at LOS E or F in either one or both peak hours.

Table 2: Existing Year 2015 Conditions – Intersections Analysis Summary

Intersection Ellis Road at:	Existing Conditions 2015			
	Control	LOS	Delay	95th Percentile Queues
East Drive	Unsignalized Full Median Opening (NB/SB)	D (F) / F (F)	29.6 (57.3) / 358.2 (661.8)	4' (34') / 356' (660')
Distribution Drive West	Unsignalized Full Median Opening (NB/SBL)	E (F) / F (F)	45.3 (475.8) / 51.9 (273.9)	16' (215') / 15' (181')

### Design Conditions 2034 Operational Analysis Summary

The intersection LOS, delay and 95<sup>th</sup> percentile queue results for the Build scenarios are summarized in Tables 3 and 4. 2034 peak hour volumes are provided in Figure 2. Here is a summary of operational performance of each scenario:

#### PD&E Preferred Alternative

The intersection LOS and delay analysis results show that all intersections will operate at acceptable LOS D or better in 2034 peak hours.

Synchro 95<sup>th</sup> percentile queues are generally low and in the range of about 100' or less except for the Ellis Road at East Drive signalized intersection.

#### Design Option 1

The intersection LOS and delay analysis results show that all intersections will operate at acceptable LOS D or better except for Ellis Road at Distribution Drive West unsignalized intersection (full median opening) which will operate at LOS F in 2034 AM and PM peak hours. This intersection is a four leg intersection and controlled as Right-in/Right-out (RIRO) in the PD&E Preferred Alternative and changing to a full median opening results in failing LOS for the NB/SB approaches.

Synchro 95<sup>th</sup> percentile queues are generally low and in the range of about 100' or less except for the Ellis Road at East Drive signalized intersection and Ellis Road at Distribution Drive West unsignalized intersection.

#### Design Option 2

The intersection LOS and delay analysis results show that all intersections will operate at acceptable LOS D or better in 2034 AM and PM peak hours. However, it should be noted that this scenario considers two signalized intersections (at West Drive and Distribution Drive West) in this section of Ellis Road which are about 1,500 feet apart.

Synchro 95<sup>th</sup> percentile queues are generally low and in the range of about 100' or less except for the Ellis Road at East Drive signalized intersection and Ellis Road at Distribution Drive West signalized intersection.

Table 3: Design Year 2034 Conditions – Intersection Analysis Summary

Intersection Ellis Road at:	PD&E Preferred Alternative			Design Option 1			Design Option 2		
	Control	LOS	Delay	Control	LOS	Delay	Control	LOS	Delay
West Drive	Unsignalized RIRO (SBR)	B (B)	10.7 (11.8)	Signalized (Overall)	C (C)	31.7 (26.5)	Signalized (Overall)	C (C)	30.3 (25.4)
East Drive	Signalized (Overall)	C (C)	27.7 (25.8)	Unsignalized RIRO (SBR)	C (C)	17.7 (24.4)	Unsignalized RIRO (SBR)	B (B)	10.2 (10.6)
Distribution Drive West	Unsignalized RIRO (NBR/SBR)	B (B) / C (C)	12.0 (13.0) / 16.1 (22.4)	Unsignalized Full Median Opening (NB/SB)	F (F) / F (F)	114.8 (198.7) / 64.6 (230.1)	Signalized (Overall)	B (B)	14.3 (18.6)
Distribution Drive East	Unsignalized Full Median Opening (SB)	D (D)	28.6 (34.6)	Unsignalized RIRO (SBR)	A (A)	9.6 (10.0)	Unsignalized RIRO (SBR)	A (A)	9.6 (10.0)

Table 4: 95th Percentile Queues Summary

Intersection Ellis Road at:	PD&E Preferred Alternative			Design Option 1			Design Option 2		
	Control	Apprch/ Mvmnt	95th Percentile Queues	Control	Apprch/ Mvmnt	95th Percentile Queues	Control	Apprch/ Mvmnt	95th Percentile Queues
West Drive	Unsignalized RIRO (SBR)	SBR	16' (28')	Signalized	SB / EB / WB	#373' (#389')/ m121' (m28')/ m101' (157')	Signalized	SB / EB / WB	#373' (#389')/ m121' (m28')/ 70' (m154')
East Drive	Signalized	SB / EB / WB	280' (309')/ m#226' (m55')/ m90' (112')	Unsignalized RIRO (SBR)	SBR	26' (52')	Unsignalized RIRO (SBR)	SBR	11' (16')
Distribution Drive West	Unsignalized RIRO (NBR/SBR)	NB / SB	3' (19') / 10' (42')	Unsignalized Full Median Opening (NB/SB)	NB / SB	37' (183')/ 44' (194')	Signalized	NB/ SB / EB / WB	25' (62')/ 33' (62')/ m73' (m242')/ 22' (17')
Distribution Drive East	Unsignalized Full Median Opening (SB)	SB	11' (31')	Unsignalized RIRO (SBR)	SBR	2' (5')	Unsignalized RIRO (SBR)	SBR	2' (5')

## ACCESS MANAGEMENT

The three build alternatives considered were also comparatively analyzed based on FDOT access management criteria. The PD&E Preferred Alternative features an access management class 5 ( $\leq 45$  mph). As depicted in the attached access management exhibits (Figures 3 and 4), The PD&E Preferred Alternative does not meet median spacing requirements at three locations. Two of the locations do not meet median spacing requirements by more than 10% and therefore require a design variation. The need for these design variations was reviewed and addressed in the approved PD&E Project Development Summary Report. Both Design Option 1 and 2 feature the same access management layout. These

alternatives are more compliant with the spacing requirements and only include one location not meeting criteria. This location would require a design variation.

Impacts in access to nearby parcels were also considered and are summarized in Table 5.

**Table 5: Affected Parcels with Proposed Alternatives**

Number of Affected Parcels with Proposed Alternatives <sup>1</sup> along Ellis Road			
Direction	Crossroad	PD&E Alternative	Design Options 1&2
Eastbound	Stan Drive	0	26
	West Drive	27	0
	East Drive	0	24
	Distribution Drive W	10	0
	Distribution Drive E	0	12
Westbound	Technology Drive	15	0
	Greenboro Drive <sup>2</sup>	0	0
	Florida Power & Light	0	1
<b>Total Affected Parcels</b>		<b>52</b>	<b>63</b>

Notes: <sup>1</sup> Compared against the existing configuration along Ellis Road.

<sup>2</sup> Greenboro Drive has no parcels to be affected by the alternatives.

The PD&E Alternative affects access to 52 parcels. These affected parcels are primarily located on West Drive, Distribution Drive West, and Technology Drive. All Three of these streets are loop roads and the PD&E configuration provides access to the other leg of the loop road segment.

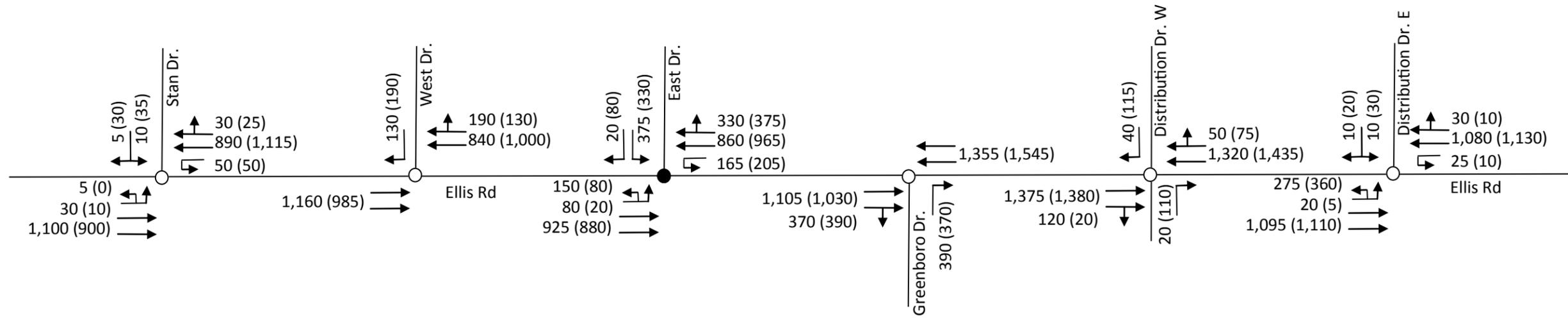
Design Option 1&2 remove eastbound access to Stan Drive. Twenty-eight (28) industrial parcels are located on Stan Drive, which is not a loop road. Design Options 1&2 also removes westbound access to a large FPL facility located opposite East Drive. Both Stan Drive and the FPL facility receive significant truck traffic that will be impacted by the alternative configuration. Figure 4 depicts the alternative routes that trucks will be required to take to access these two locations under Design Options 1&2.

## SUMMARY AND RECOMMENDATION

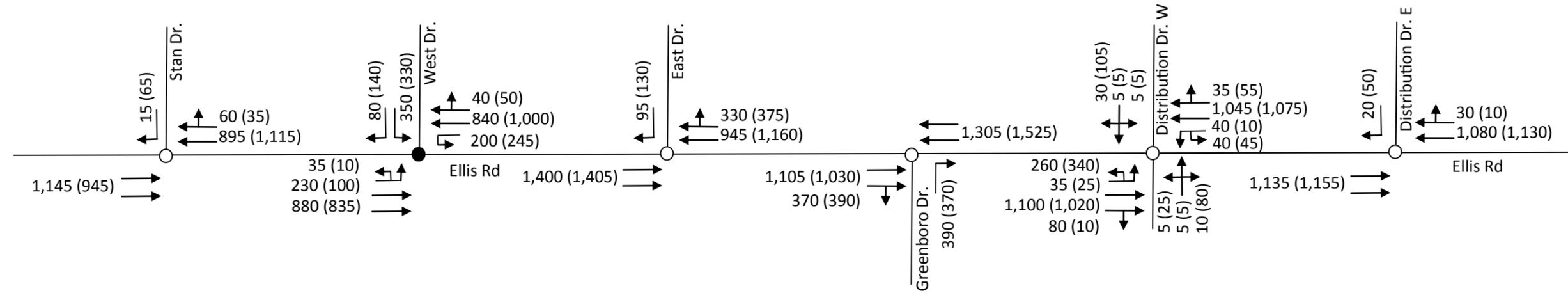
Comparison of the three scenarios considered for Ellis Road from Stan Drive to Distribution Drive East shows that both PD&E Preferred Alternative and Design Option 2 will provide acceptable performance along Ellis Road. However Design Option 2 affects access to 21% more parcels along the corridor and will significantly disrupt access to Stan Drive and the FPL facility, which are not located on loop roads with secondary connection to Ellis Road. It should also be noted that PD&E Preferred Alternative has three full median openings as compared to two full median openings in Design Options 1&2. Therefore the PD&E Preferred alternative appears to best meet the overall access management needs for the Ellis Road Corridor.



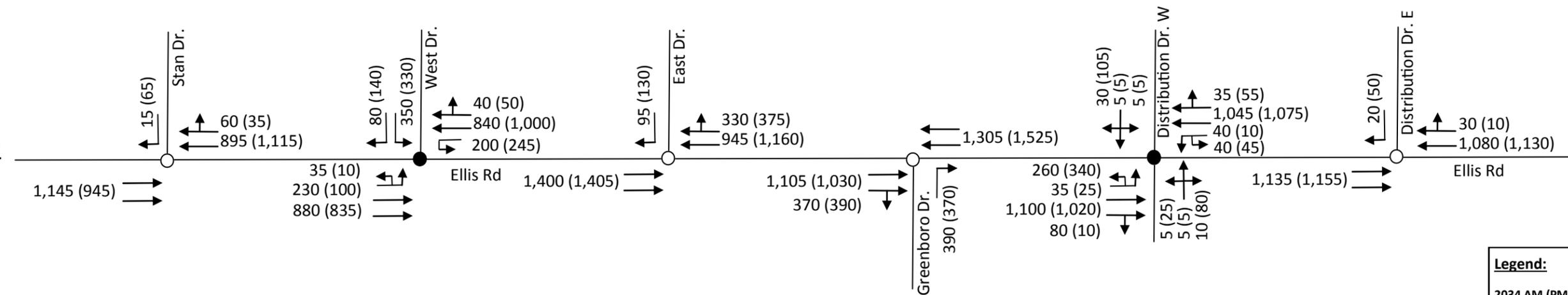
**PD&E Alt**



**Design Opt 1**



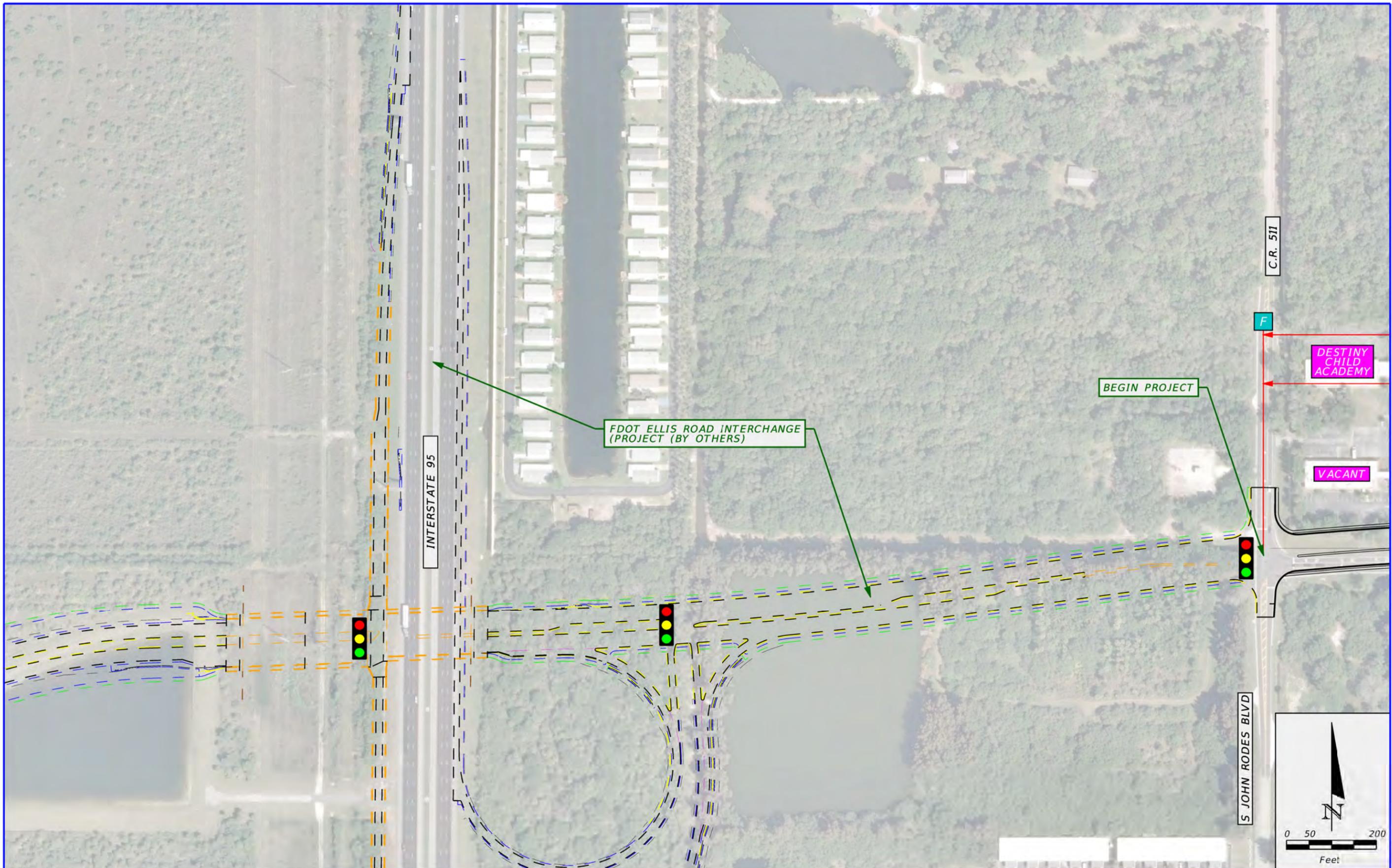
**Design Opt 2**



**Legend:**  
2034 AM (PM) Volumes  
○/● : Unsignalized/Signalized

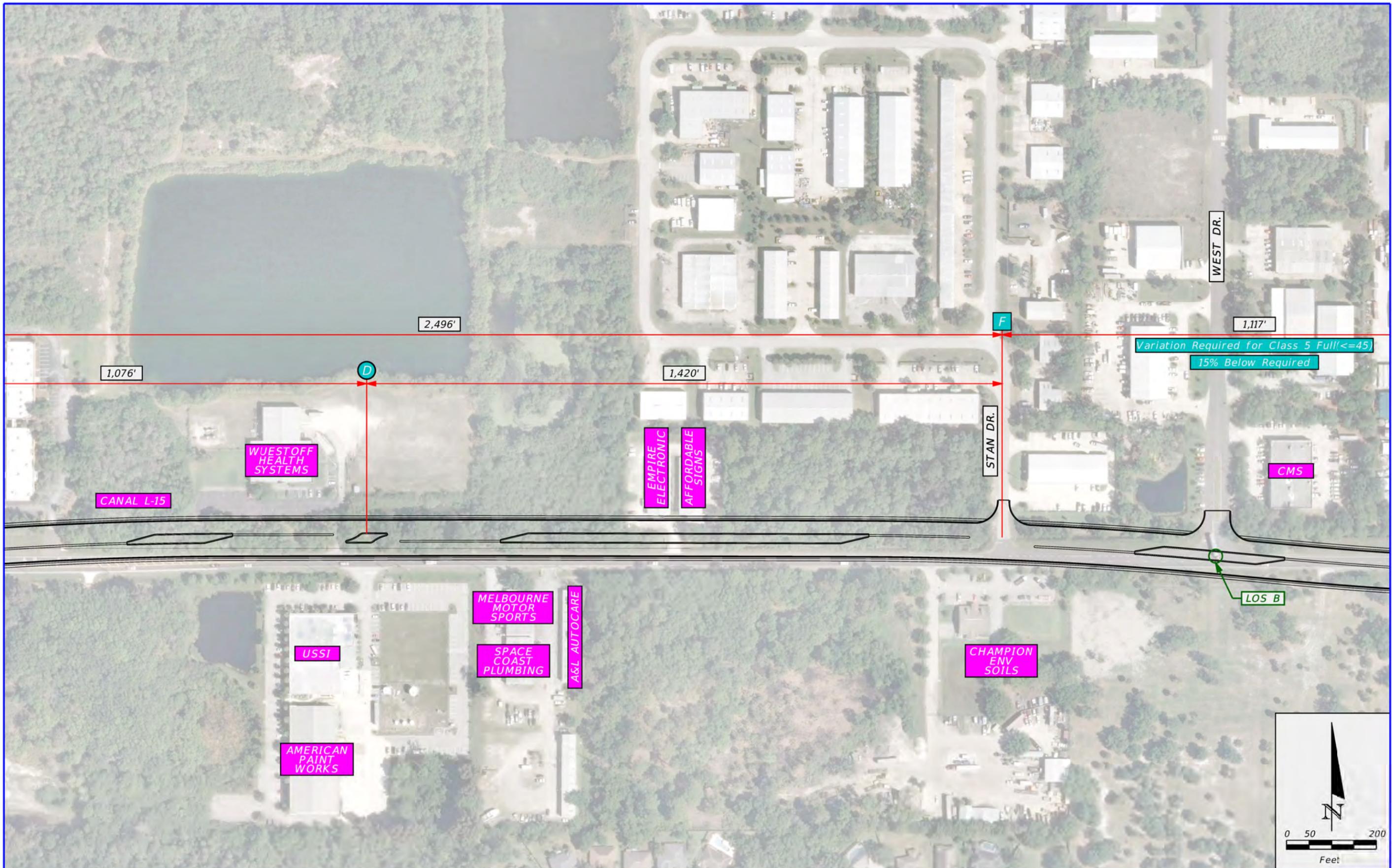
Design Year 2034: Ellis Road PD&E Preferred Alternative and Design Options 1 & 2 Peak Hour Volumes

Figure 2



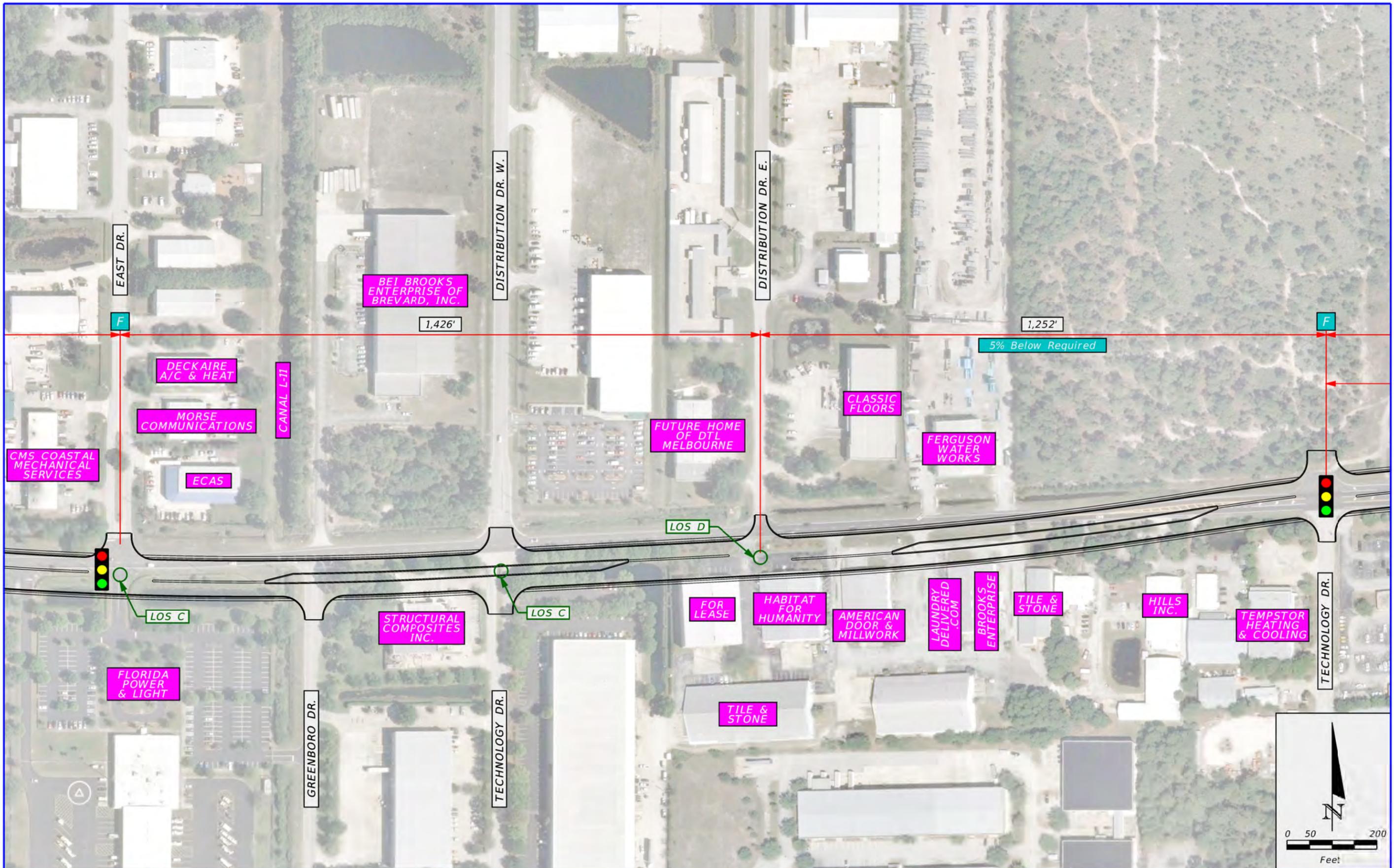
- D CLASS 3 DIRECTIONAL MEDIAN OPENING <=45MPH
- F CLASS 3 FULL MEDIAN OPENING <=45MPH
- TRAFFIC SIGNAL

**FIGURE 3: PD&E PREFERRED ALTERNATIVE  
ELLIS ROAD WIDENING  
ACCESS MANAGEMENT**



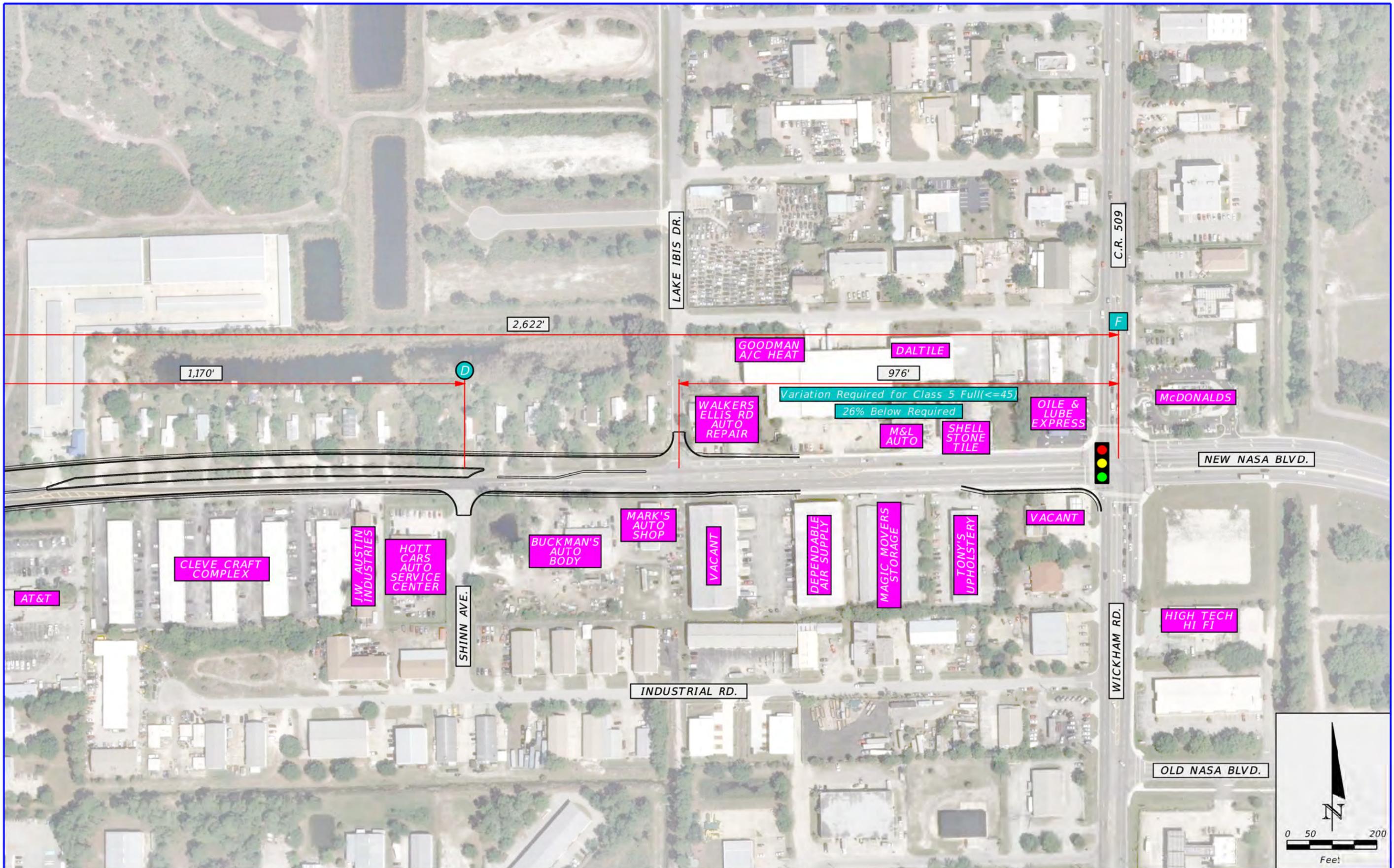
- D CLASS 3 DIRECTIONAL MEDIAN OPENING <=45MPH
- F CLASS 3 FULL MEDIAN OPENING <=45MPH
- TRAFFIC SIGNAL

**FIGURE 3: PD&E PREFERRED ALTERNATIVE  
ELLIS ROAD WIDENING  
ACCESS MANAGEMENT**



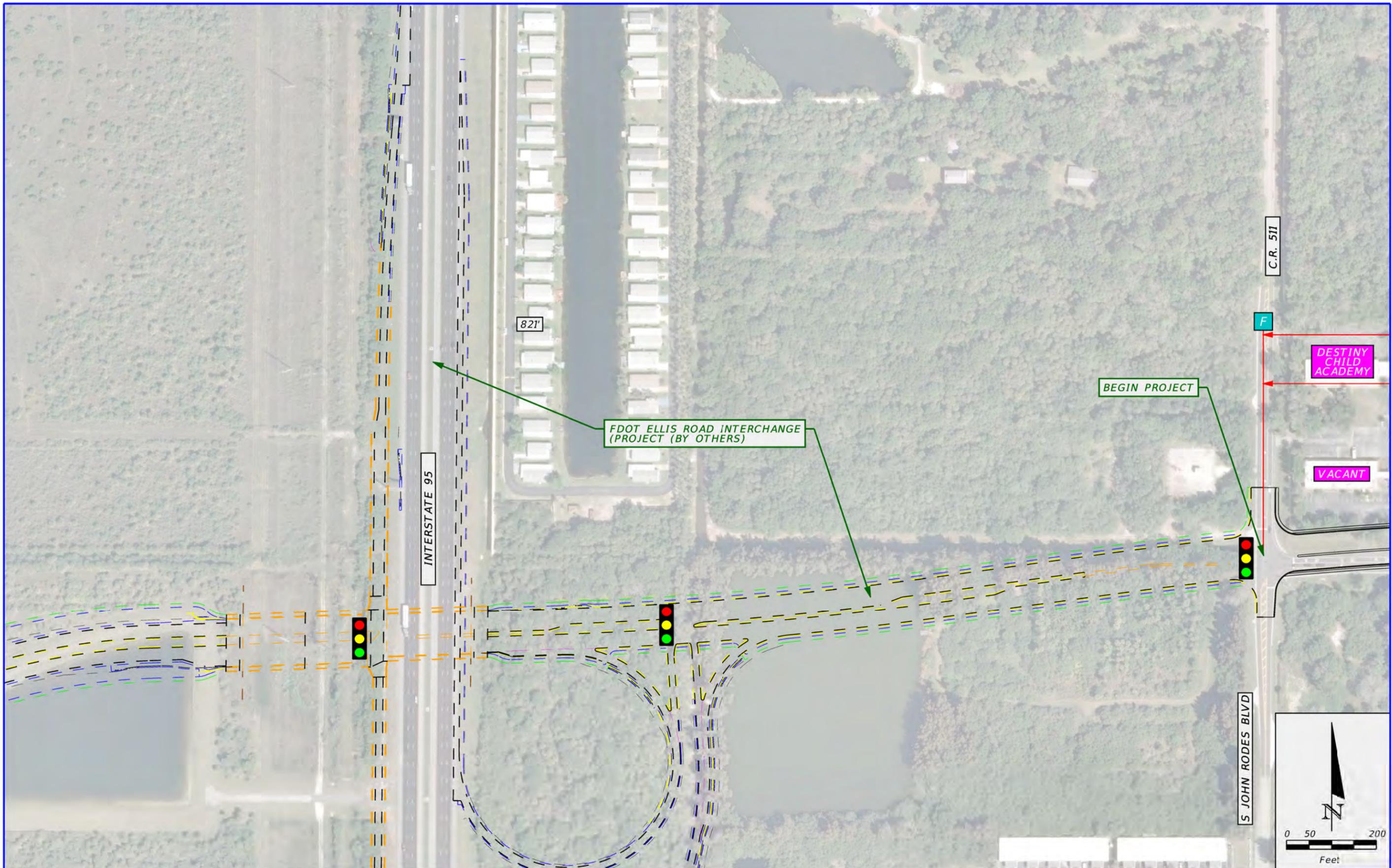
- D CLASS 3 DIRECTIONAL MEDIAN OPENING <=45MPH
- F CLASS 3 FULL MEDIAN OPENING <=45MPH
- TRAFFIC SIGNAL

**FIGURE 3: PD&E PREFERRED ALTERNATIVE  
ELLIS ROAD WIDENING  
ACCESS MANAGEMENT**



- D CLASS 3 DIRECTIONAL MEDIAN OPENING <=45MPH
- F CLASS 3 FULL MEDIAN OPENING <=45MPH
- TRAFFIC SIGNAL

**FIGURE 3: PD&E PREFERRED ALTERNATIVE  
ELLIS ROAD WIDENING  
ACCESS MANAGEMENT**



FDOT ELLIS ROAD INTERCHANGE  
(PROJECT (BY OTHERS))

BEGIN PROJECT

DESTINY CHILD  
ACADEMY

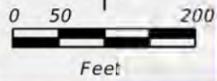
VACANT

INTERSTATE 95

821'

C.R. 511

S JOHN RODES BLVD



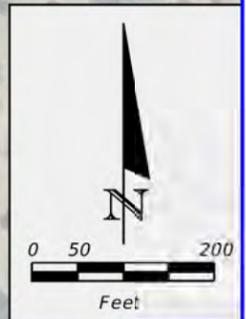
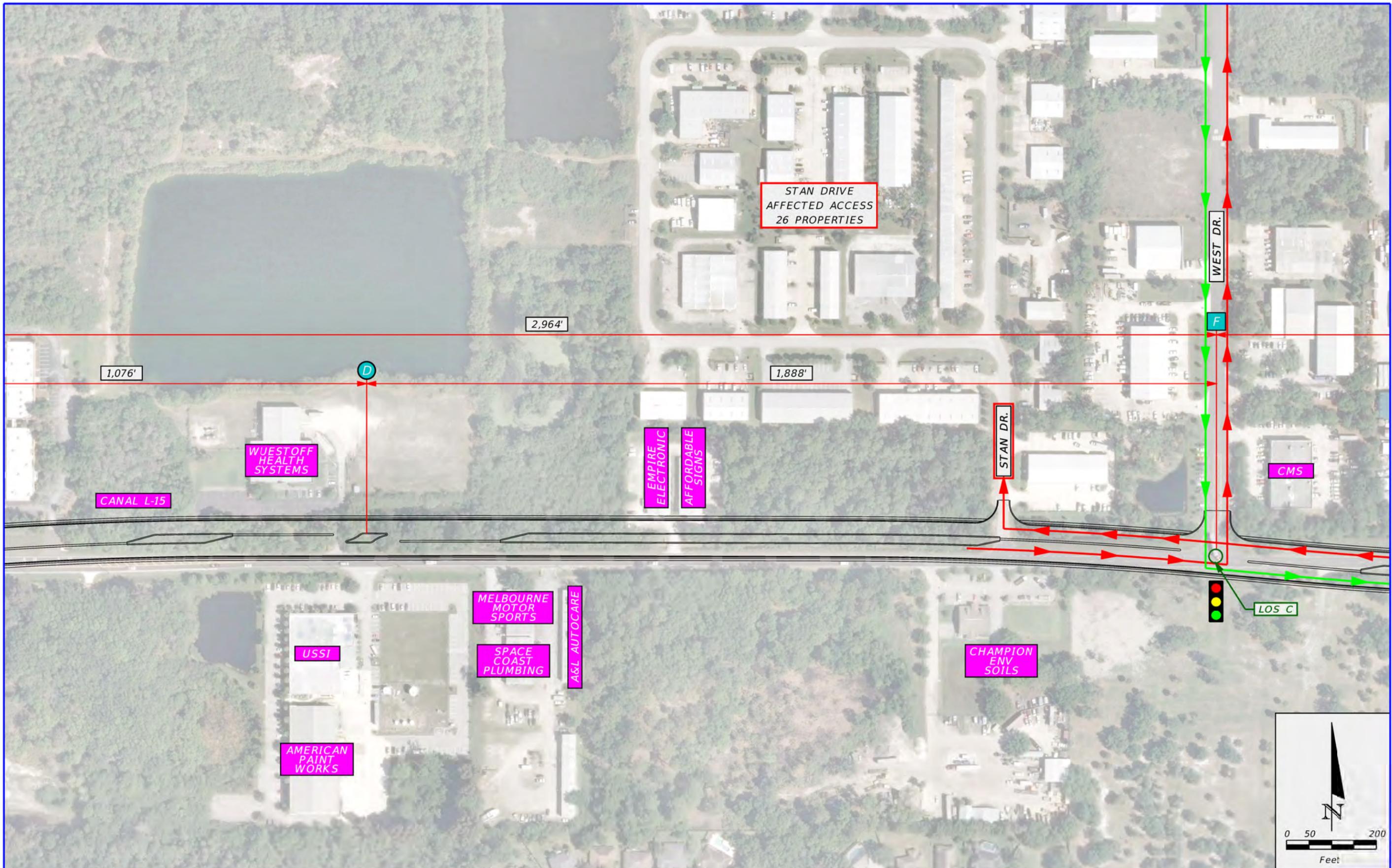
- D CLASS 3 DIRECTIONAL MEDIAN OPENING <=45MPH
- F CLASS 3 FULL MEDIAN OPENING <=45MPH



- IMPACT EASTBOUND ACCESS ROUTE
- IMPACT WESTBOUND ACCESS ROUTE

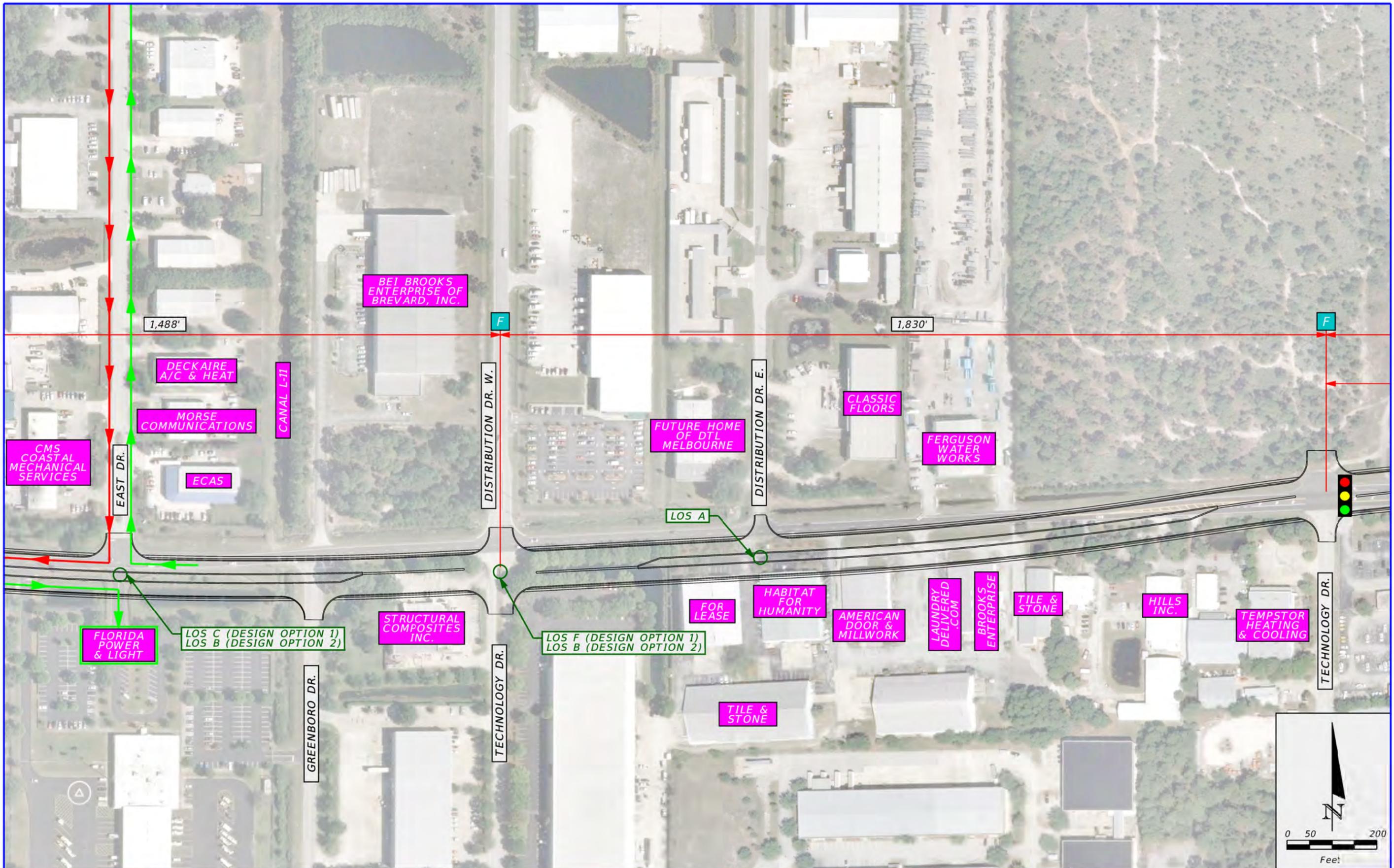
**FIGURE 4: DESIGN OPTION 1 & 2**  
**ELLIS ROAD WIDENING**  
**ACCESS MANAGEMENT**

SHEET NO.
1



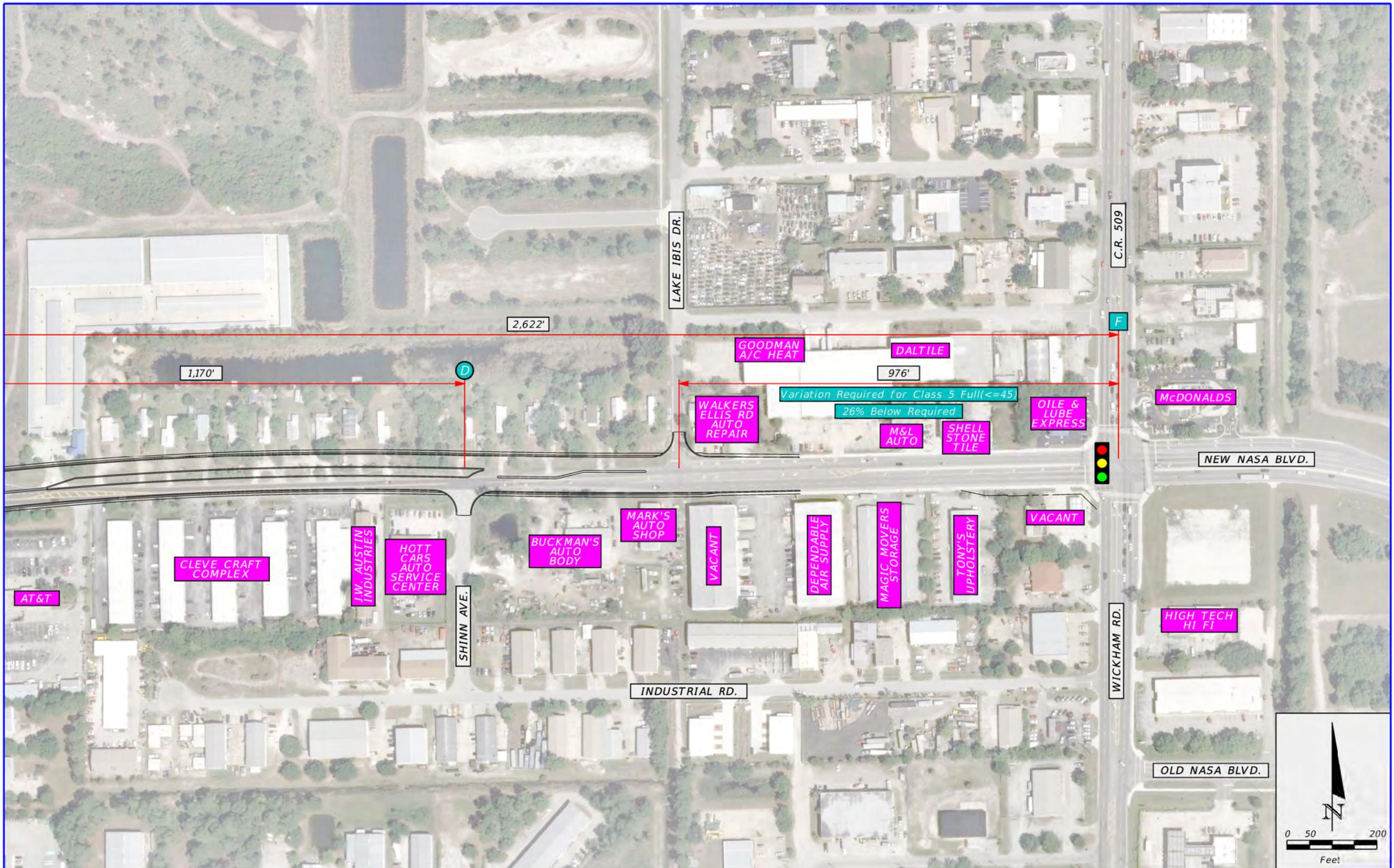
- D CLASS 3 DIRECTIONAL MEDIAN OPENING <=45MPH
- F CLASS 3 FULL MEDIAN OPENING <=45MPH
- TRAFFIC SIGNAL
- IMPACT EASTBOUND ACCESS ROUTE
- IMPACT WESTBOUND ACCESS ROUTE

**FIGURE 4: DESIGN OPTION 1 & 2  
ELLIS ROAD WIDENING  
ACCESS MANAGEMENT**



<b>D</b>	CLASS 3 DIRECTIONAL MEDIAN OPENING <=45MPH		TRAFFIC SIGNAL		IMPACT EASTBOUND ACCESS ROUTE
<b>F</b>	CLASS 3 FULL MEDIAN OPENING <=45MPH				IMPACT WESTBOUND ACCESS ROUTE

**FIGURE 4: DESIGN OPTION 1 & 2  
ELLIS ROAD WIDENING  
ACCESS MANAGEMENT**



- D CLASS 3 DIRECTIONAL MEDIAN OPENING <=45MPH
- F CLASS 3 FULL MEDIAN OPENING <=45MPH
- TRAFFIC SIGNAL
- IMPACT EASTBOUND ACCESS ROUTE
- IMPACT WESTBOUND ACCESS ROUTE

**FIGURE 4: DESIGN OPTION 1 & 2  
ELLIS ROAD WIDENING  
ACCESS MANAGEMENT**